JUNE 28, 2019 | FINAL REPORT

Mn 220 N Corridor Study

Prepared for:

Overcoming Barriers Strengthening Connections

M.P.O. M.P.O. M.P.O.

Grand Forks - East Grand Forks Metropolitan Planning Organization

Ensuring Opportunities Planning One Community

"A community that provides a variety of complementary transportation choices, that are fiscally constrained, for people and goods."

ALLIANT

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Notice

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Executive Summary

The Grand Forks-East Grand Forks Metropolitan Planning Organization (GF-EGF MPO), in cooperation with MnDOT, NDDOT, Polk County, and City of East Grand Forks, is advancing the MN (Mn) 220N (referred to in the following as Mn 220) Corridor Study. The Mn 220 corridor provides an important connection within the region, connecting downtown, residential and commercial areas within East Grand Forks, MN.

There have been several previous studies completed for the Mn 220 corridor. Recommendations from these past studies have resulted in some infrastructure improvements already and a few planned improvements identified for future investment through the Metropolitan Transportation Plan (MTP). Recent developments of the MnDOT District Safety Plan and Polk County Safety Plan have found concerns at the Mn 220/US 2 intersection which will be further investigated. In addition, the recent development of the 2045 East Grand Forks Land Use Plan anticipates future redevelopment of agriculture areas north of 23rd Street NW, which may influence the transportation and multimodal needs of the corridor. The purpose of the study is to update previous evaluations and develop a document which will provide recommendations for future transportation facility needs along Mn 220 and its crossroads.

Study Purpose

Although Mn 220 services a regional transportation need, most of the study corridor traverses through a dense commercial center with residential neighborhoods adjoining. However, 23rd Street serves as a dividing line between urban and rural land uses, with agricultural activity currently located in the northern end of the corridor. This agricultural area could serve as an ideal location for urban development, so understanding any planned land use changes or potential land use changes will influence investment within the corridor.

Specific goals of the project are:

- **Goal 1:** Examine traffic operations at key intersections and develop potential options to improve mobility, access, and safety. Evaluate the current locations of lane drops (at 20th Street and north of 17th Street) and evaluate current plans to extend the four-lane to 23rd Street and to expand to a three-lane segment north of 23rd Street to 140th Street.
- **Goal 2:** Review past study recommendations and develop potential improvements to access management strategies.
- **Goal 3:** Improve pedestrian crossing opportunities and safety at key locations along the corridor.

The outcome of the study will provide a recommended transportation plan showing recommended infrastructure improvements, capital improvement programming costs, and an implementation plan that will be consistent with the Planning and Environmental Linkage (PEL) for transportation projects.

Public Involvement

The public involvement process included 5 Steering Review Committee (SRC) meetings, 2 public open houses, 2 EGF City Council Working Sessions, over 6 newspaper articles in both local newspapers, and a website with a public feedback survey. Additionally, public display boards were on display for one week at the East Grand Forks Library. The SRC met throughout the study process and provided review and guiding direction for the study. The public open houses were held at key project milestones to encourage citizen participation in the study. Survey Monkey, and online survey software, was used to develop, collect, and analyze a simple survey questionnaire of 21 questions. At the conclusion of the survey, 52 responses were obtained. The 52 respondents who completed the survey provided important feedback relating to the current issues, important priorities, and improvements needed along the project corridor.

A website was established at the beginning of the project. The URL for the site is *http://www.alliant-inc.com/grandforks/*.The purpose of the website was to provide another way for the general public to be informed about the project status and to disseminate information.

Project Need

The analysis of existing and future conditions throughout the Mn 220 N study corridor has identified numerous needs/deficiencies that either currently exist or are expected to develop based on future traffic projections. **Figure ES-1** graphically illustrates the key deficiencies and needs identified throughout the study corridor with respect to the Federal Highway Administration (FHWA) NEPA transportation decision making process.

Alternative Analysis

To address identified deficiencies and the purpose and needs for the Mn 220 corridor numerous improvement alternatives were identified to address four primary objectives of the study:

- Improve access control
- Improve safety
- Improve mobility/capacity; and
- Improve pedestrian crossings of Mn 220

The evaluation of the identified alternatives consists of a layered approach that included:

- Assessing and comparing high level considerations such as key pros/cons, trade-offs and design considerations or fatal flaws;
- Technical analysis of intersection capacity, safety benefits, right of way needs, construction costs and economic viability as applicable (benefit/cost ratio); and
- Qualitative evaluation scoring of key metrics identified in the planning process that are consistent with the Purpose and Need statement and 2045 Metropolitan Transportation Plan (MTP) objectives and performance goals.

The highest ranked alternatives considered all the factors and were identified based on input from the SRC, public participation process, requirements of the purpose and need, the results of the technical analysis and evaluation matrices completed herein. The highest ranked alternatives

are summarized below, along with correlating technically feasible alternatives to be carried forward through the environmental process:

Intersection Control, Safety and Mobility

- 23rd Street NW:
  - Highest ranked: roundabout (refer to Section 6.6 for further discussion on design)
  - No other feasible alternative. The traffic signal system alternative does not meet the purpose and need.
- 20th Street NW:
  - Highest ranked: maintain existing intersection control, traffic lanes and access configuration with roundabouts at 17th Street NW and 23rd Street NW
  - Feasible alternative: convert to ¾ Access configuration if a traffic signal system were to ultimately be installed at 17th Street NW following detailed evaluation during preliminary design.
- 17th Street NW:
  - Highest ranked: roundabout (refer to Section 6.6 for further discussion on design)
  - Feasible alternative: traffic signal system
- 15th Street NE:
  - Highest ranked: maintain existing intersection control, traffic lanes and access configuration
  - No other feasible alternatives. Alternatives identified did not meet the purpose and need.
- 14th Street NW:
  - Highest ranked: replace traffic signal system
  - No other feasible alternatives. The roundabout alternative was determined to be infeasible due to footprint size requirement and spacing of frontage roads.
- US 2:
  - Highest ranked: replace traffic signal system and improve intersection lane geometrics
  - Feasible alternatives: roundabout and eastbound displaced left turn. The interchange alternatives were discarded due to fiscal constraint.
- 10th Street NE:
  - Highest ranked: maintain existing intersection control and access configuration and relocate utility boxes on the southwest corner to improve visibility. Continue to monitor intersection and reevaluate the intersection with longer source of crash history.
  - Feasible alternative: convert to ¾ access configuration or other access management strategy. Property access and area circulation is challenging to effectively serve the business needs. Potential solutions may be high cost, or high impact for less return. Further evaluation of alternatives, including potential traffic control device options should be explored in the future should the crash experience at this intersection increase.
- 9th Street NE:

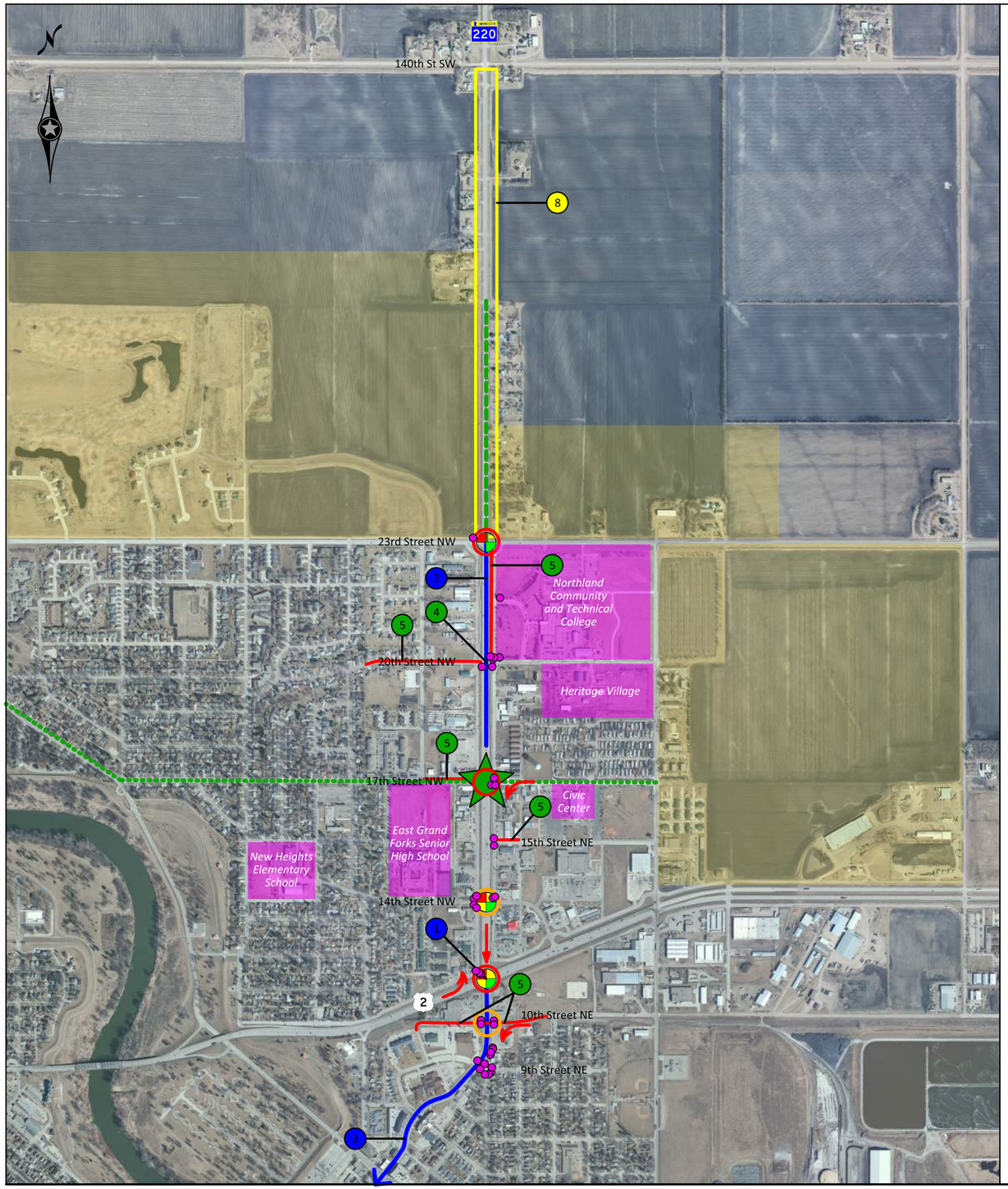
  - Highest ranked: maintain existing intersection control, traffic lanes and access configuration and relocate the lane drop to the south and improve the left turn lane alignment and definition.
  - No other feasible alternatives
- 17th Street NW to 23rd Street NW segment:
  - Highest ranked: two lane divided roadway cross-section with roundabout alternatives
  - Feasible alternative: 2-lane segment between 20th Street and 23rd Street and four-lane segment between 17th Street and 20th Street with traffic signal system at 17th Street
- 23rd Street NW to 140th Street SW segment:
  - Highest ranked alternative: two lane rural roadway cross-section with turn lanes added at future development access intersections.

Pedestrian Accessibility and Transit

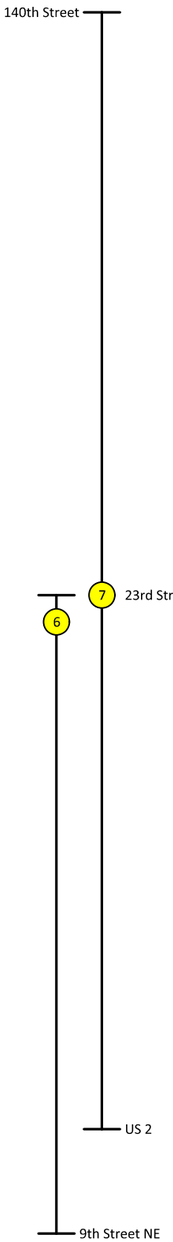
- 17th Street NW: improve crosswalk on south leg and ADA accessibility
- Neighborhood connections: establish sidewalk connections at the six locations where connection gaps exist
- Transit accessibility:
  - Provide transit stop signing, concrete pad and bench at four existing transit stops
  - Coordinate with Cities Area Transit (CAT) to reevaluate transit routes and service as future development occurs north of 23rd Street NW.

Implementation Plan

The implementation plan for the Mn 220 N Corridor Study is intended to assist with the identification of key infrastructure improvements and prioritization timeline to address needs within the study area. In most cases, implementation of individual improvement strategies is mutually exclusive; individual strategies could be constructed at any time. All improvements identified should be further evaluated during the design development phase and are subject to further environmental analysis and design requirements. To address the critical needs of the corridor, the implementation plan has been developed to prioritize the recommendations over near term (within 5 years), mid-term (2025 to 2034) and long term (2035-2045+) horizons. **Figure ES-2** illustrates the recommended components (highest ranked alternatives) of the near-term implementation plan. **Figure ES-3** illustrates the recommended components (highest ranked alternatives) of the mid-term and long-term implementation plan. It is noted, the implementation plan could be subject to change based on unforeseen traffic changes or funding sources that may unfold post the development of this plan.



ROADWAY DEFICIENCIES



LEGEND

CAPACITY
- Movement Expected to Reach Unacceptable LOS by 2045

TRANSPORTATION DEMAND
- Potential Future Signal
- Illustrative Reconstruction Project (2045 MTP)

SOCIAL OR ECONOMIC DEMAND
- Key Land Use
- Significant Growth Area (Expected to Impact Corridor)

MODAL INTERRELATIONSHIPS
- Gaps in Sidewalk Connectivity
- Ped Ramp Doesn't Meet Current Standards
- Future Bike Route (Crossing Mn 220)
- Future Multiuse Trail (Along Mn 220)
- Preferred Crossing Point for Area Schools (currently uncomfortable crossing for bikes and peds)

ROADWAY DEFICIENCIES
- Signal System Expected to Reach End of Useful Life by 2030

SAFETY
- Crash Issue (Exceeds Statewide Average)
- Crash Issue (Exceeds Critical Rate)

Notes:

1. Previously identified project to provide right turn/merge modifications and signal timing improvements *(2045 MTP).*
2. Illustrative project to extend 4-lane to 2-lane transition to 23rd Street *(2045 MTP)*
3. Illustrative project to reconstruct DeMers Avenue *(2045 MTP). DeMers Avenue is on National Highway System. Greater Minnesota mobility has identified potential mobility concerns.*
4. Pedestrians must cross roadway to continue north/south connectivity
5. Gap in sidewalk network and accessibility.
6. Current spacing of intersections betwen 9th Street and 23rd Street do not meet MnDOT access spacing guidelines.
7. MnDOT project assessment indicates that this segment will require concrete rehabilitation in 2033 and reconstruction in 2058.
8. Increased traffic demand north of 23rd Street likely to warrant turn lanes at key locations between 23rd Street and 140th Street. Additionally, future redevelopment of adjacent agricultural land will require access management guidance.

Mn 220 N Corridor Study

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Figure ES-1
Corridor Deficiencies and Transportation System Needs

Near Term Improvements (2019-2024)

Location 1: Mn 220 at 17th Street NW

Improve pedestrian crosswalk with curb bump-outs, median island, crosswalk pavement markings, and signage.
Total Cost: $71,600

Location 2: 10th St NE to 9th St NE

Improve southbound lane configuration. Relocate southbound lane drop south of 9th St NE beyond curve, and provide separated southbound left turn lane at 9th St NE.
Total Cost: $25,300

Location 3: Mn 220 at US 2

Install sidewalk from northeast corner to Frontage road and ADA accessible connection.
Total Cost: $8,200

Location 4: Mn 220 at 17th Street NE

Provide bus stop signage for bus stop on northeast corner.
Total Cost: $700

Location 5: Mn 220 at 14th Street NE

Provide bus stop signage for bus stop on northeast corner.
Total Cost: $700

Location 6: DeMers Avenue at 10th Street NE

Provide bus stop signage for bus stop on southeast corner.
Total Cost: $700

Location 7: DeMers Avenue at 10th Street NW

Provide bus stop signage for bus stop on northwest corner.
Total Cost: $700

Location 8: DeMers Avenue at 10th Street NW

Relocate utilities to improve corner visibility. Monitor crash rates and conduct intersection study if there is a safety issue.
Total Cost: unknown, coordinate with utility owner.

Note: Highest-Ranked Alternatives are illustrated.

Note:
Construction costs reflect the highest feasible alternative and are estimated year of expenditure (YOE) with an assumed 3% inflation rate. YOE is assumed to be mid-point of improvement range. Engineering, Administration, Utilities and Inspection are assumed to be 25% of the construction cost.

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Figure ES-2
Near Term Implementation Plan (2019-2024)

Mid Term Improvements (2025-2034)

Location 9: Mn 220 at 14th Street NW

Replace traffic signal system (install Flashing Yellow Arrows, improve phasing, coordination, etc.) and delineate eastbound/westbound lane configuration.
Total Cost: $519,100

Location 10: Mn 220 at US 2

Intersection control and geometric improvements.
Total Cost: $6,021,500

Location 11: 23rd Street NW to 140th Street SW

Construct left and right turn lanes as applicable at public street access as land develops.
Total Cost: TBD, construction scope and cost to be determined as part of development plan at future time.

Location 12: Upgrade Non-Compliant Pedestrian Ramps

Upgrade non-compliant pedestrian ramps (33 ramps on Mn 220 N Corridor).
Total Cost: ADA ramps are incorporated in full intersection improvements as applicable. Refer to the City of East Grand Forks ADA Transition plan for standalone pedestrian ramp upgrades.

Location 13: 20th Street NW (both sides) from 5th Avenue NW to Mn 220

Install sidewalks.
Total Cost: $207,700

Location 14: 15th Street NE (north side) from Mn 220 to East of Frontage Road

Install sidewalk.
Total Cost: $22,500

Long Term Improvements (2035-2045+)

Location 15: Mn 220 at 23rd Street NW

Intersection control improvements.
Total Cost: $6,819,600

Location 16: Mn 220 at 17th Street NW

Intersection control improvements.
Total Cost: $6,340,700

Location 17: 17th Street NW to 23rd Street NW

Rehabilitate pavement, convert to two-lane divided highway.
Total Cost: MnDOT maintenance and preservation.

Location 18: US 2 to 17th Street NW

Rehabilitate pavement, maintain four-lane divided highway.
Total Cost: MnDOT maintenance and preservation.

Location 19: Mn 220 (east side) from 20th Street NE to 23rd Street NE

Install sidewalks.
Total Cost: $145,400

Location 20: 10th Street NW (both sides) from Terrace Drive to DeMers Avenue

Install sidewalks.
Total Cost: $84,300

Location 21: 10th Street NW (both sides) from DeMers Avenue to 2nd Avenue NE

Install sidewalks.
Total Cost: $78,500

Location 22: Mn 220 at 17th Street NE

Provide bus bench at bus stop on northeast corner.
Total Cost: $7,000

Location 23: Mn 220 at 14th Street NE

Provide bus bench at bus stop on northeast corner.
Total Cost: $7,000

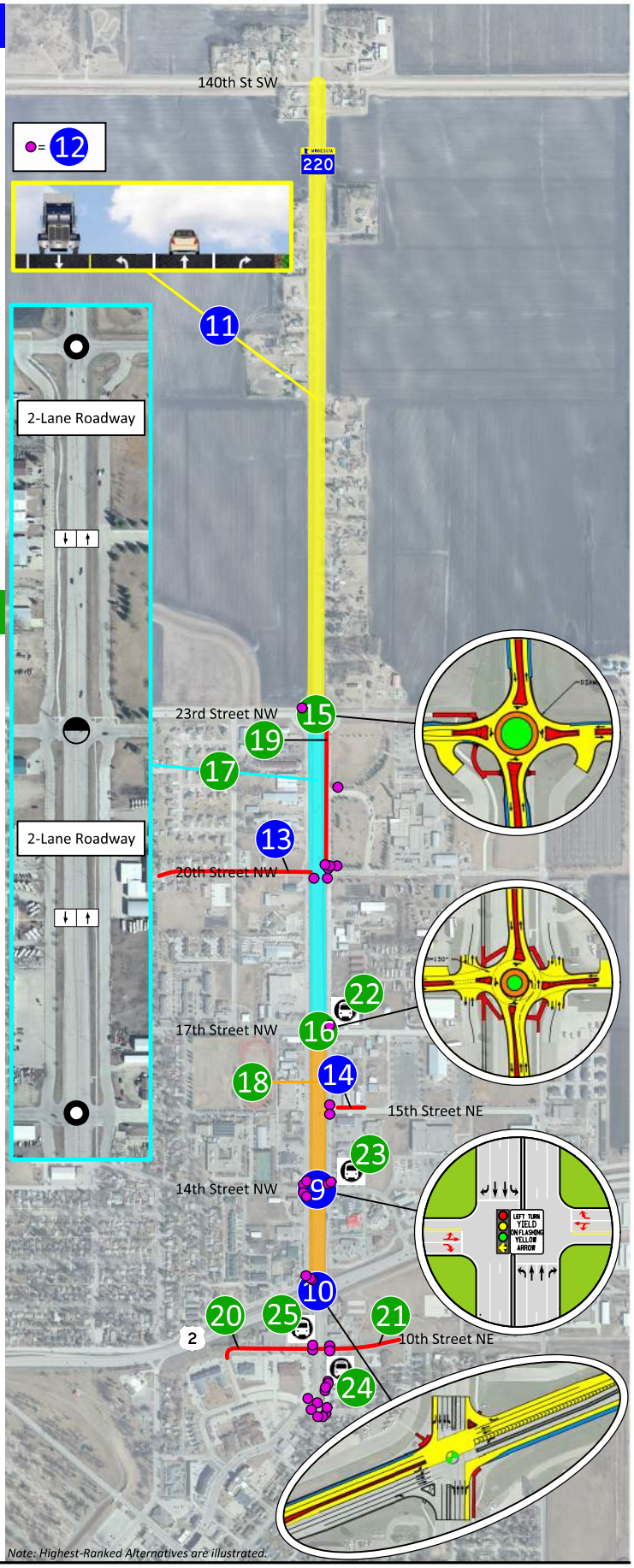
Location 24: DeMers Avenue at 10th Street NE

Provide concrete pad, sidewalk access, and bus bench at bus stop on southeast corner.
Total Cost: $8,700

Location 25: DeMers Avenue at 10th Street NW

Provide concrete pad, sidewalk access, and bus bench at bus stop on northwest corner.
Total Cost: $8,700

Note:
Construction costs reflect the highest feasible alternative and are estimated year of expenditure (YOE) with an assumed 3% inflation rate. YOE is assumed to be mid-point of improvement range. Engineering, Administration, Utilities and Inspection are assumed to be 25% of the construction cost.



Note: Highest-Ranked Alternatives are illustrated.

Mn 220 N Corridor Study

Figure ES-3

Mid Term (2025-2034) and Long Term (2035-2045+) Implementation Plan

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1. Introduction

The Grand Forks-East Grand Forks Metropolitan Planning Organization (GF-EGF MPO), in cooperation with MnDOT, NDDOT, Polk County, and City of East Grand Forks, is advancing the MN (Mn) 220N (referred to in the following as Mn 220) Corridor Study. The Mn 220 corridor provides an important connection within the region, connecting downtown, residential and commercial areas within East Grand Forks, MN.

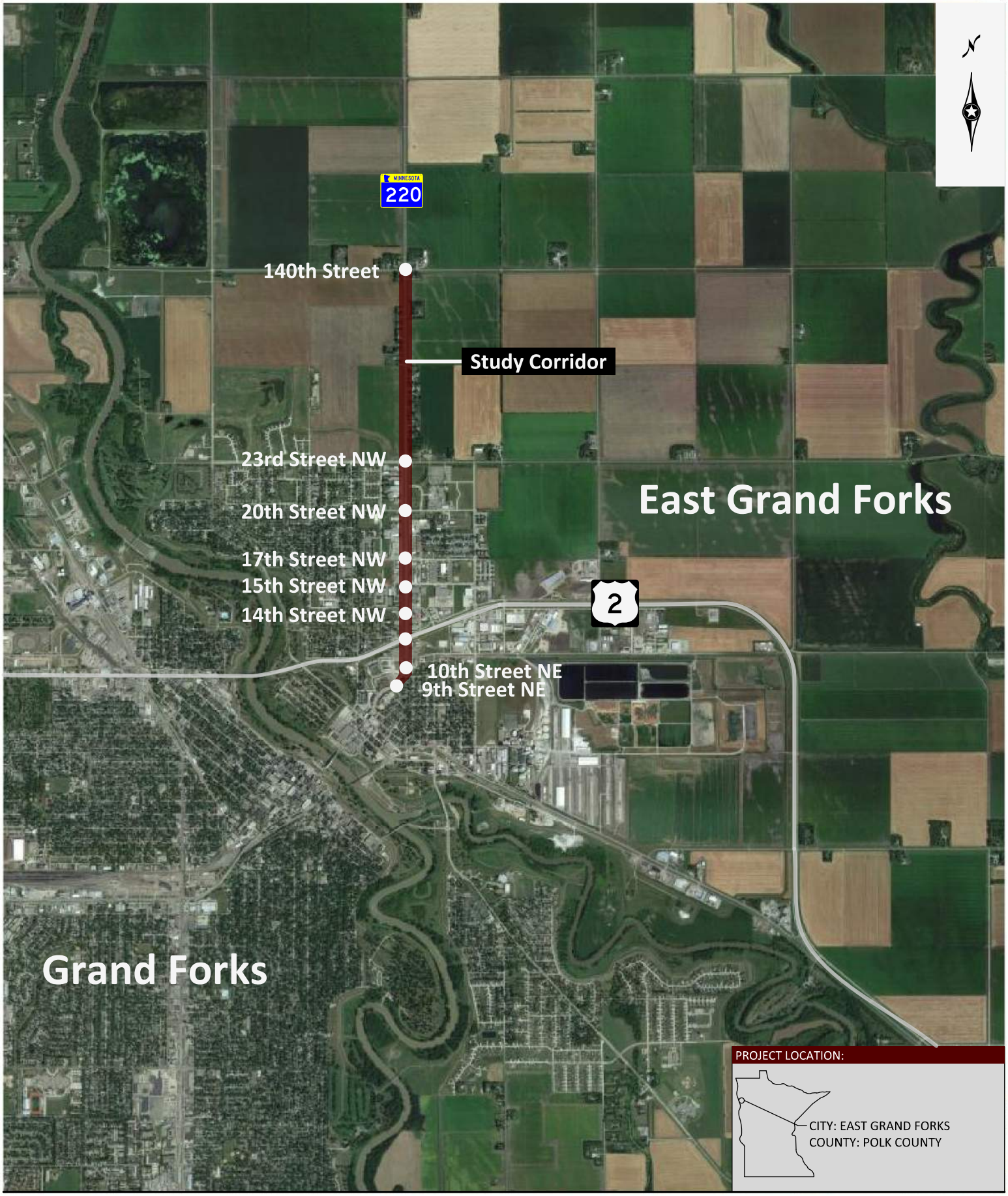
There have been several previous studies completed for the Mn 220 corridor. Recommendations from these past studies have resulted in some infrastructure improvements already and a few planned improvements identified for future investment through the Metropolitan Transportation Plan (MTP). Recent developments of the MnDOT District Safety Plan and Polk County Safety Plan have found concerns at the Mn 220/US 2 intersection which will be further investigated. In addition, the recent development of the 2045 East Grand Forks Land Use Plan anticipates future redevelopment of agriculture areas north of 23rd Street NW, which may influence the transportation and multimodal needs of the corridor. The purpose of the study is to update previous evaluations and develop a document which will provide recommendations for future transportation facility needs along Mn 220 and its crossroads.

1.1 Study Area

The Study Corridor comprises about 2 miles of Mn 220 on the northerly edge of the city of East Grand Forks and the county of Polk in Minnesota. The study area limits are approximately from the intersection of 140th Street SW (township road/north levee) on the north of Mn 220, south along Mn 220 (Central Avenue) to its transition at 9th Street NE to DeMers Avenue. The study area is illustrated in **Figure 1-1**. Nine intersections will be evaluated:

- Mn 220 at 140th Street SW
- Mn 220 at 23rd Street NW
- Mn 220 at 20th Street NW
- Mn 220 at 17th Street NW
- Mn 220 at 15th Street NW
- Mn 220 at 14th Street NW
- Mn 220 at US 2 (Gateway Drive)
- Mn 220 at 10th Street NE
- Mn 220 at 9th Street NE

The street quadrant labels (e.g., NW, NE, SW) are listed for reference above and apply to all intersections discussed throughout the document, though they may not be specifically denoted in the following.



Mn 220 N Corridor Study

Figure 1-1
Study Area

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1.2 Study Purpose

Although Mn 220N (Mn 220) services a regional transportation need, most of the study corridor traverses through a dense commercial center with residential neighborhoods adjoining. However, 23rd Street serves as a dividing line between urban and rural land uses, with agricultural activity currently located in the northern end of the corridor. This agricultural area could serve as an ideal location for urban development, so understanding any planned land use changes or potential land use changes will influence investment within the corridor.

Specific goals of the project are:

- **Goal 1:** Examine traffic operations at key intersections and develop potential options to improve mobility, access, and safety. Evaluate the current locations of lane drops (at 20th Street and north of 17th Street) and evaluate current plans to extend the four-lane to 23rd Street and to expand to a three-lane segment north of 23rd Street to 140th Street.
- **Goal 2:** Review past study recommendations and develop potential improvements to access management strategies.
- **Goal 3:** Improve pedestrian crossing opportunities and safety at key locations along the corridor.

The outcome of the study will provide a recommended transportation plan showing recommended infrastructure improvements, capital improvement programming costs, and an implementation plan that will be consistent with the Planning and Environmental Linkage (PEL) for transportation projects.

1.3 Stakeholder and Public Involvement

A key part to the completion of the study is the stakeholder and public involvement process, which included the following:

- Steering Review Committee (SRC)
- Public Meetings
- Public Survey
- Project Website

1.3.1 Steering Review Committee

The SRC consisted of the City of East Grand Forks, Polk County, MnDOT, Northland College, Safe Kids Grand Forks, and various local businesses. The SRC was at the center of the public involvement process and provided review and guiding direction for the study. They were given the opportunity to provide feedback on technical analysis, make recommendations on improvement alternatives, and guide the development of the study recommendations.

The SRC met five times over the course of the study and was an integral part in determining recommendations for the study area.

- **SRC Meeting 1:** Alliant presented an overview of existing and future conditions along the corridor. The SRC discussed the project goals, challenges, and set a framework for key assumptions in the development of the future improvement alternatives.

- **SRC Meeting 2:** Presented key issues and concerns identified in the traffic operations and analysis and the study purpose and need. The SRC brainstormed potential alternatives to investigate.
- **SRC Meeting 3:** Presented a wide range of improvement alternatives to address the key mobility concerns, bicycle and pedestrian improvements, and traffic control devices that address the key issues. Feedback and direction on key alternatives and alternative ideas was obtained.
- **SRC Meeting 4:** Summarized the alternatives analysis process and presented the highest-ranked alternatives. Discussed implementation plan – how to prioritize improvement projects and the potential funding sources.
- **SRC Meeting 5:** Discussed implementation plan, draft report, and project development process.

1.3.2 Public Meetings

Two public open houses were held to encourage citizen participation in the study. The goal of the public open houses was to provide a forum that allowed interested citizens the opportunity to:

- Be actively engaged in the planning process;
- Provide comment and express ideas;
- Distribute and present information; and
- Serve as listening sessions for the project team

Comments and feedback received throughout the public meeting process have been incorporated as appropriate throughout the study recommendations. The public open houses were advertised through a press release, neighborhood association meetings, the MPO website, and other venues. The following provides details of each meeting:

- **Public Open House 1:** The existing conditions and deficiencies of the study area were presented, and meeting participants were given the opportunity to provide areas of concerns, outline key issues, and to discuss important priorities for the corridor.
- **Public Open House 2:** Proposed highest ranked and feasible alternatives for intersections, corridor segments, multimodal, identified issues and study objectives were presented and discussed. The pros and cons of each alternative and traffic control device, including the range of construction costs were discussed.

Meeting Minutes from the Public Open House can be found in **Appendix A**.

1.3.3 Public Opinion Survey

Throughout the entire Mn 220 Corridor Study, community outreach was prioritized in an effort to maximize involvement and input from the community and stakeholders. Survey Monkey, an online survey software, was used to develop, collect, and analyze a simple survey questionnaire of 21 questions. The survey was advertised through advertisements, emails, the project website and other venues.

At the conclusion of the survey, 52 responses were obtained. The 52 respondents who completed the survey were providing important feedback relating to the current issues, important priorities, and improvements needed along the project corridor. Figure 1-2 shows how the respondents rated important corridor priorities. The chart displays a weighted average of the respondents' top 3 priorities. The full survey response summary is included in **Appendix B**.

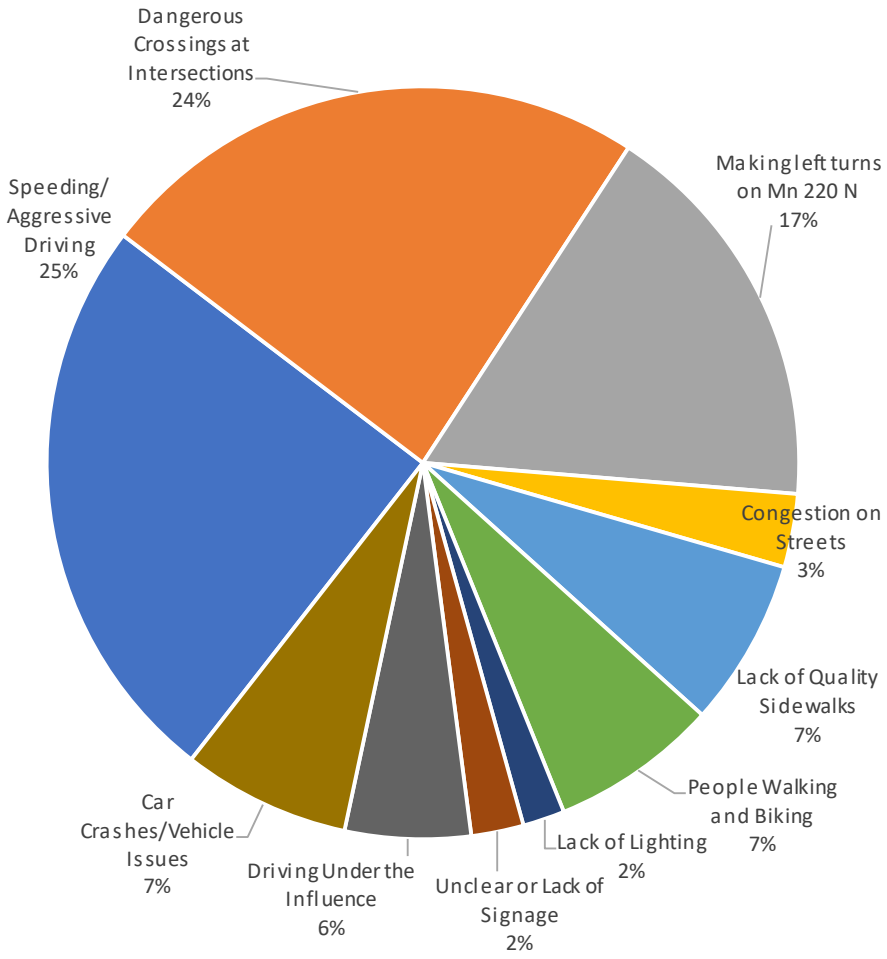


Figure 1-2. Survey Response Summary – Top Concerns on Mn 220 Corridor

Key conclusions include:

- The top three safety concerns were the following:
  1. Speeding/aggressive driving
  2. Dangerous crossings at intersections
  3. Making left turns on Mn 220
- The top three intersections perceived to be the most unsafe are Mn 220 at 23rd Street, 17th Street and US 2.
- There is a high level of concern in the community around pedestrian crossings. Improving crossings was indicated as the top priority.

- The second highest improvement priority is the installation of improved traffic control devices (public suggests traffic signals).
- A common concern heard through the survey and during the public engagement is the consideration of agricultural and large truck traffic in the corridor alternatives.

Alternatives identified and evaluated within this study will consider input and concerns raised through the public engagement process.

1.3.4 Project Website

A website was established at the beginning of the project. The URL for the site is *http://www.alliant-inc.com/grandforks/*.The purpose of the website is to provide another way for the general public to be informed about the project status and to disseminate information. All documents prepared for the project and public meetings have been posted to the website.

1.4 Previous and Concurrent Studies

A key element of the Mn 220 Corridor Study is to evaluate current programmed improvements and past recommendations in consideration of an updated technical analysis based on the current and forecasted conditions of the corridor. Key supporting studies include:

- Central Avenue Corridor Study[1]
- East Grand Forks 2045 Land Use Plan[2]
- Grand Forks-East Grand Forks Metropolitan Transportation Plan[3]
- Grand Forks Northwest Street Network Study[4]

1.5 Study Approach

The Mn 220 Corridor Study was developed in three primary phases, as documented in **Figure 1-3.**

- Phase 1 collected data, documented, and reviewed the existing and future conditions. The findings of Phase 1 were used to inform the development of intersection and corridor alternatives that address issues raised and the studies purpose and need statement. (Section 2 through Section 4)
- Phase 2 identified improvement alternatives and defined the evaluation criteria that was used to evaluate and identify feasible alternatives (Section 5 and 6).

[1] Central Avenue Corridor Study, December 2007, JLG Architects

[2] East Grand Forks 2045 Land use Plan, March 2016, SRF Consulting Group

[3] Grand Forks-East Grand Forks Metropolitan Transportation Plan, October 2018, WSB/Kimley-Horn

[4] East Grand Forks Northwest Street Network Study, February 2012, Alliant Engineering, Inc.

- Phase 3 developed an implementation plan (Section 7) to support the final transportation plan and documentation of prioritized infrastructure investment within the corridor.

The process also includes a review of existing environmental factors with the study area. These factors are reviewed as part of the evaluation criteria to determine potential impacts as a result of any alternatives evaluated. This evaluation, along with the purpose and need statement help to inform future National Environmental Policy Act (NEPA) documentation during project development.

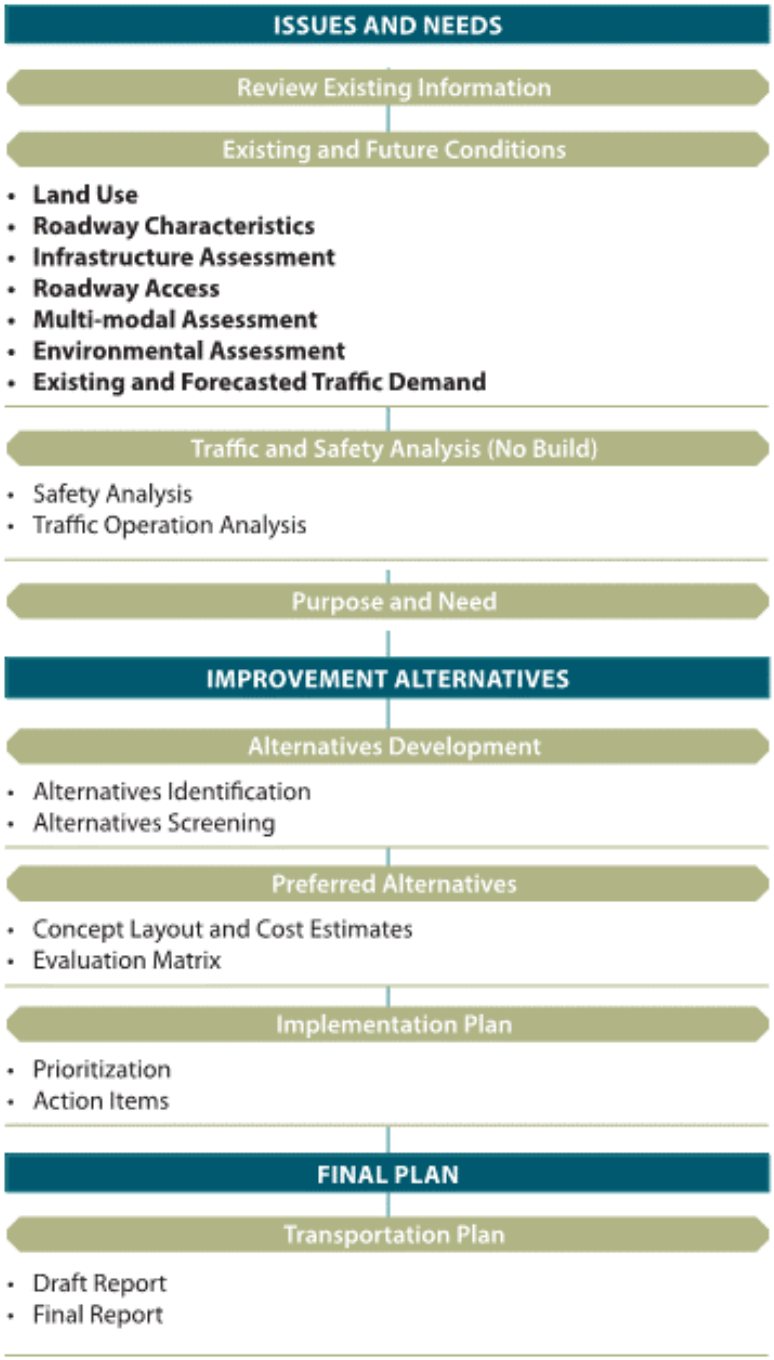


Figure 1-3. Study Approach

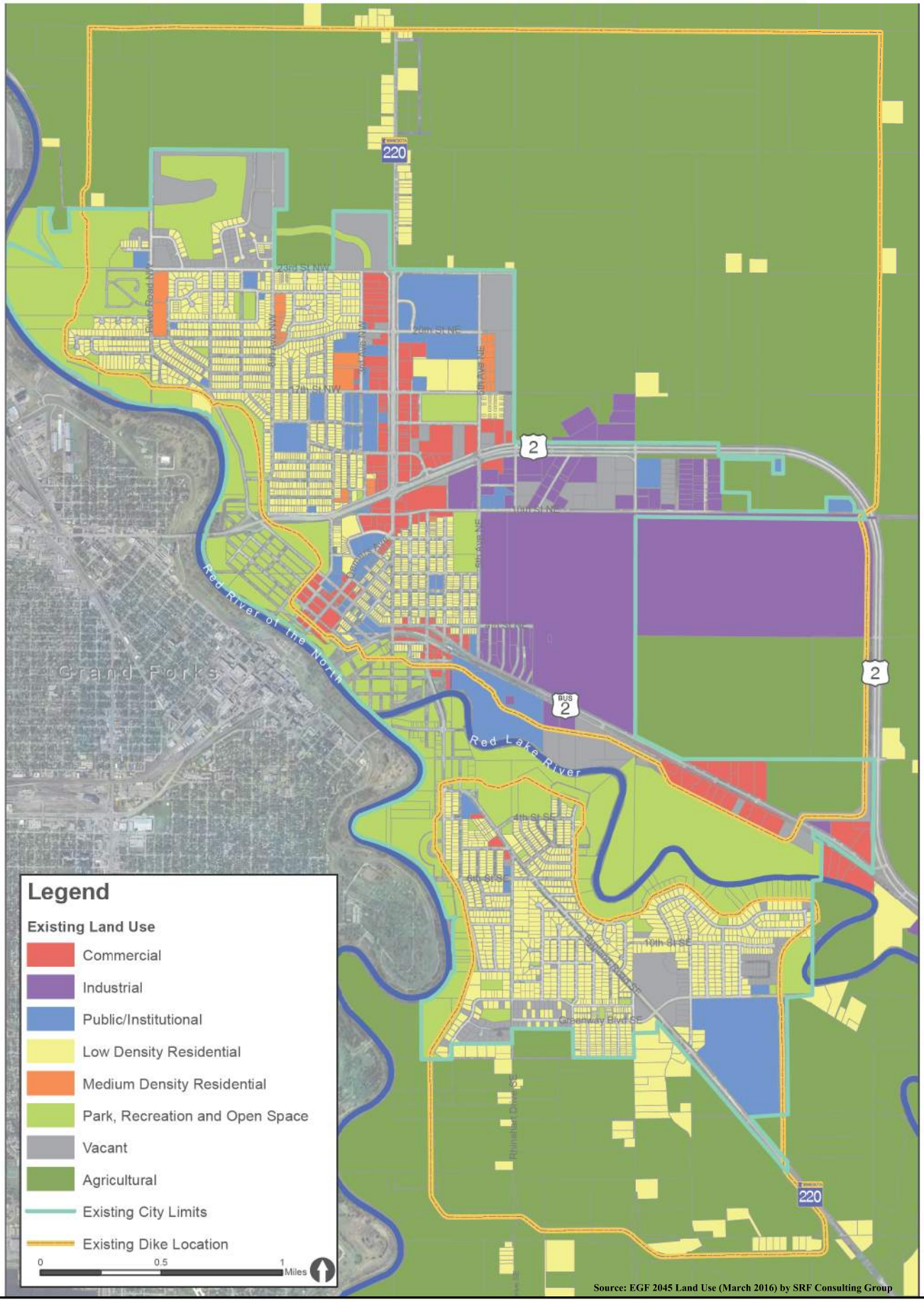
2. Existing and Future Conditions

Key components of the existing and future conditions for the Mn 220 Corridor Study include land use, corridor characteristics, infrastructure, public/private access, multimodal characteristics, environmental characteristics and motor vehicle demand. The existing and future transportation network conditions are documented in the following sections.

2.1 Land Use

The Mn 220 study corridor traverses through a concentrated commercial area and plays a major role in connecting a variety of land uses. Currently, the northern portion of the corridor (north of 23rd Street) has a multitude of single-family residences along the corridor. North of 23rd Street, the land use is largely agricultural requiring access to agricultural equipment and related challenges, particularly during the harvest season. South of 23rd Street, the land use is predominantly commercial with some public/institutional buildings. The major institution along the corridor is the Northland Community and Technical College. There is also the East Grand Forks Senior High School and the Civic Center (among other public/institutional facilities) located in close proximity to the corridor. The specific land use sites quite varied and include fast food restaurants, financial institutions, and automobile repair, among industrial type uses. The existing land uses within East Grand Forks area are illustrated in **Figure 2-1.**

According to the East Grand Forks 2045 Land Use map, much of the commercial uses adjacent to the corridor south of 23rd Street are expected to remain as such. Some residential and commercial growth is planned less than half a mile east of the corridor beyond year 2025. Similarly, residential and some commercial growth is anticipated to occur in the northwest quadrant of Mn 220/23rd Street intersection. This area immediately adjacent to the corridor has been identified as a priority development site and is proposed to have a large variety of single-family housing, multi-family housing, and commercial land uses. The 2045 East Grand Forks Land Use plan adopted in 2016 is illustrated on **Figure 2-2.**



Mn 220 N Corridor Study

Figure 2-1
Existing Land Use

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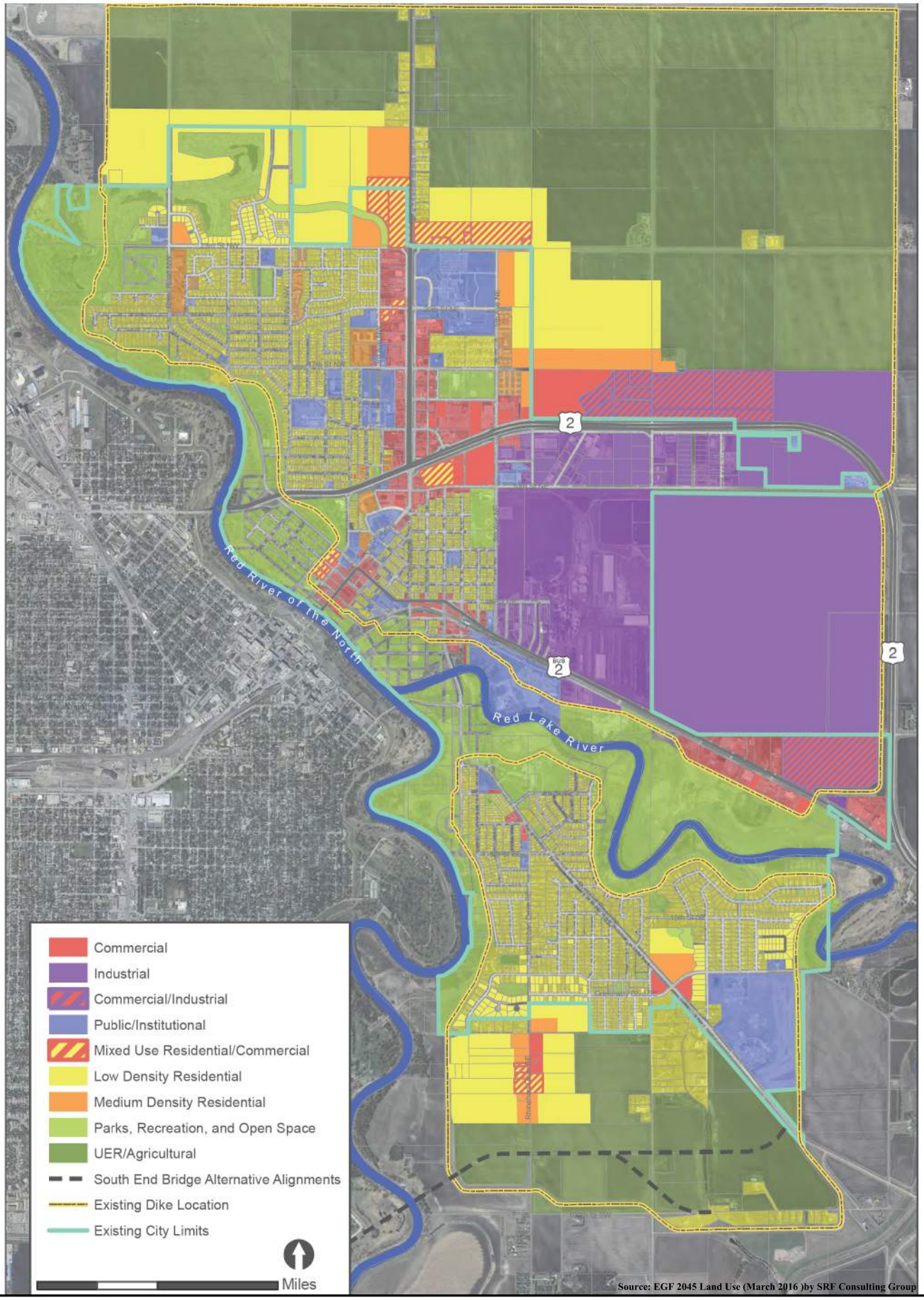

Figure 2-2
East Grand Forks Future Land Use Map

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2.2 Roadway Characteristics

The following sections define the key roadway characteristics including the functional classification, roadway geometrics, traffic control devices and right of way.

2.2.1 Function Classification

Roadways serve two major functions: access and mobility. The function of a roadway is dependent on its classification. Interstates and principal arterials provide the highest degree of mobility but are limited in providing land access. Local streets provide a high degree of land access with less mobility. **Figure 2-3** shows a comparison of the different functional classifications relating access to mobility.

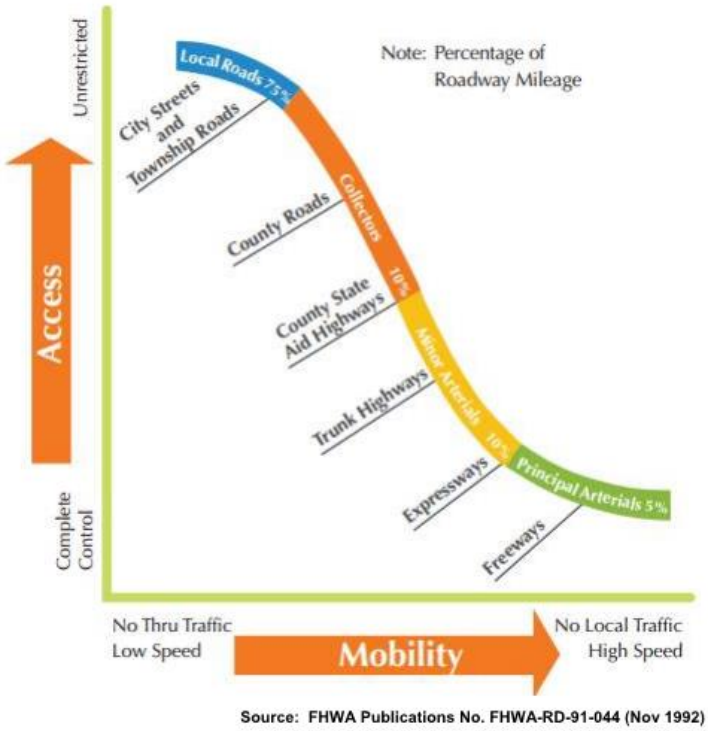
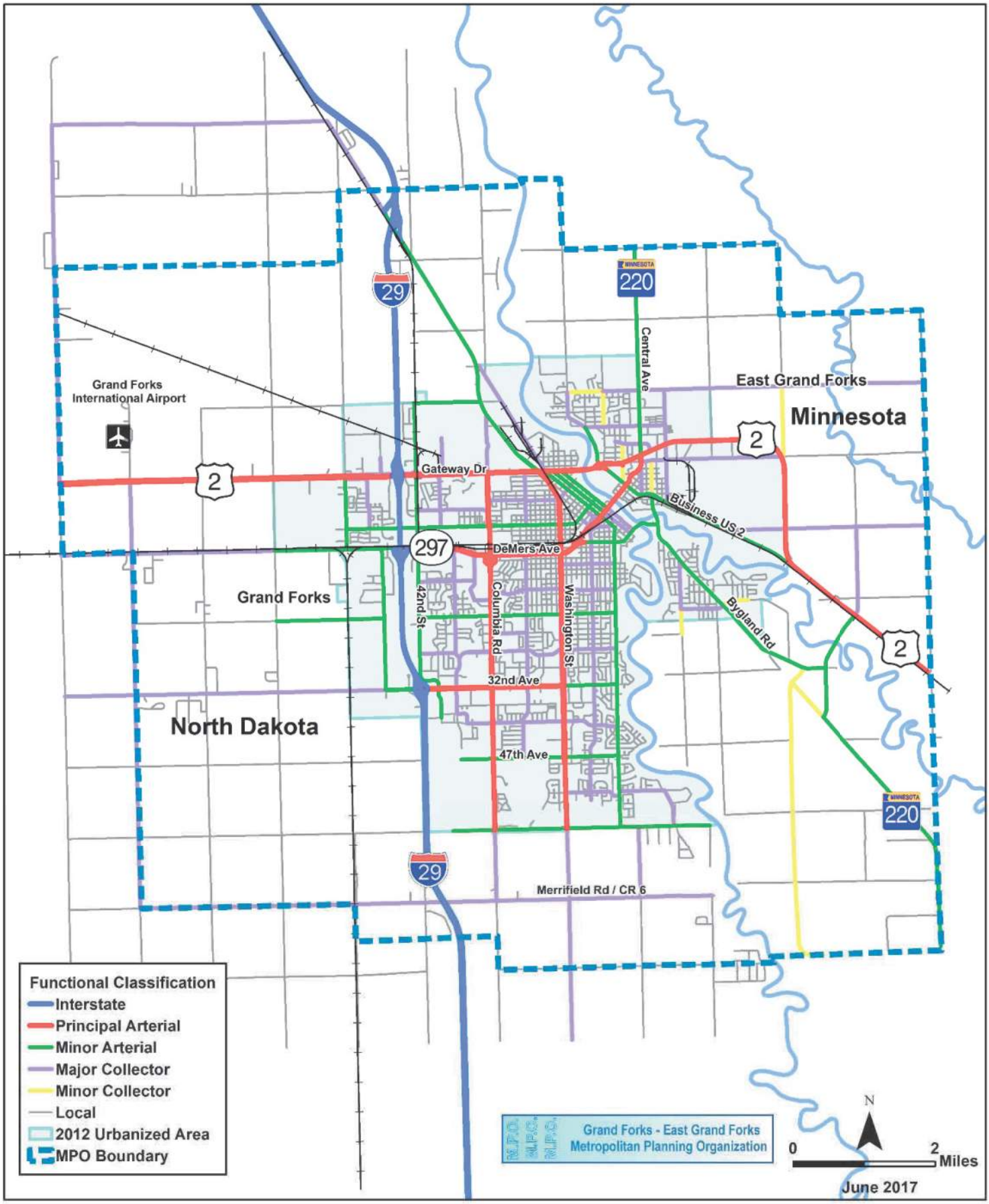


Figure 2-3. Access and Mobility Relationship to Functional Classification

Mn 220 is classified as a principal arterial south of 23rd Street and a minor arterial north of 23rd Street (Access Management Category 5B), as detailed in the GF-EGF 2045 Metropolitan Transportation Plan (MTP). **Figure 2-4** shows the transportation system functional classification of the surrounding roadway network.



Source: 2045 Metropolitan Transportation Plan - Chapter 3 - Grand Forks/East Grand Forks MPO

Mn 220 N Corridor Study

Figure 2-4

Metropolitan Area Transportation System Functional Classification

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2.2.2 Lane Geometrics, Traffic Control, Typical Sections and Street Lighting

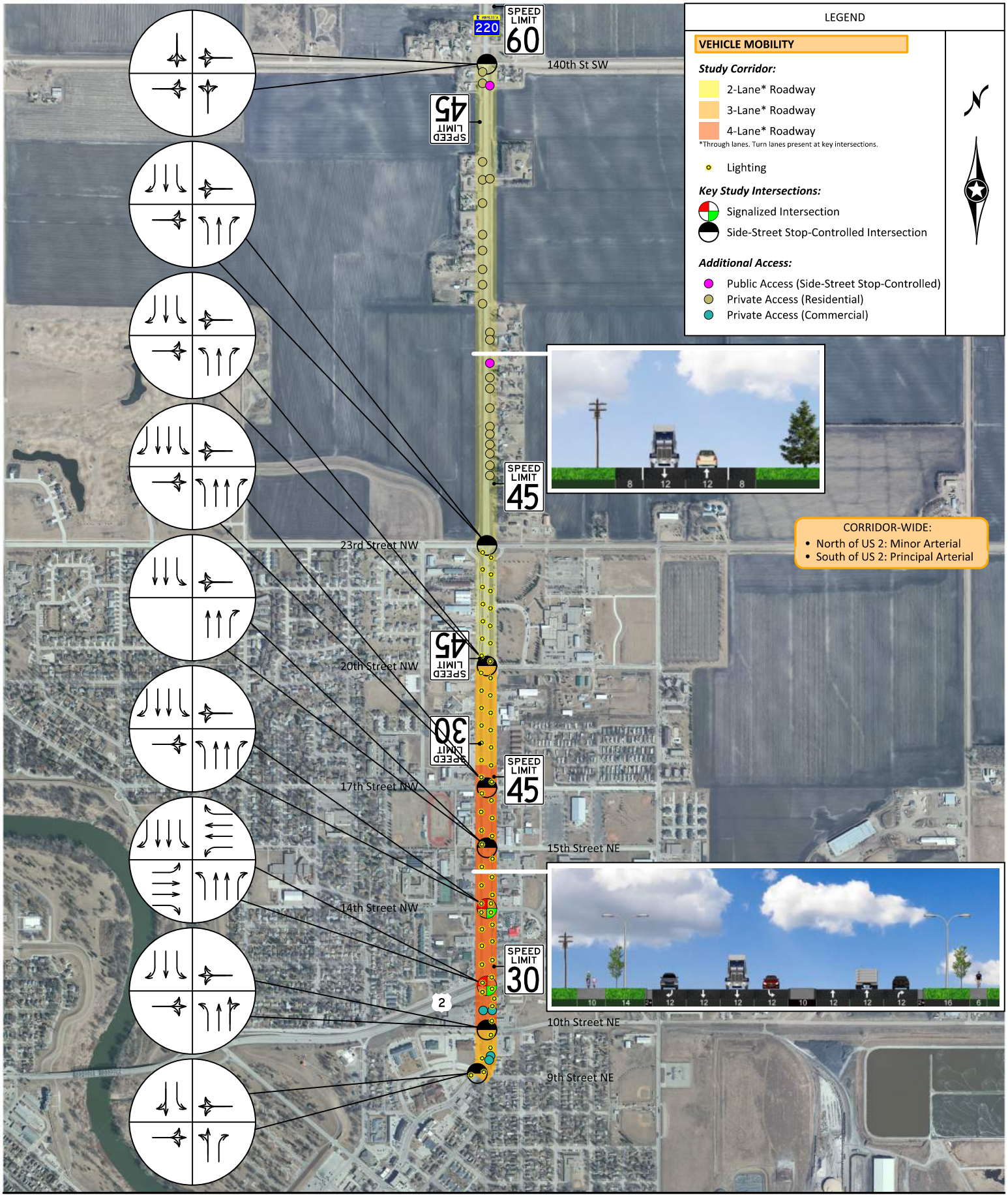
The Mn 220 corridor consists of a varying typical section with the study area. The following general characteristics are present:

- **9th Street NE and 10th Street NE:**
  Three lane divided urban design (two lanes northbound and one lane southbound) with key turn lanes and a 30-mph posted speed limit. Traffic control consists of through stop control (side street stop signs).
- **10th Street NE to just north of 17th Street NW:**
  Four lane divided urban design roadway with left and right turn lanes and a 30-mph posted speed limit. Traffic control consists of through stop control (side street stop signs), with exception of the US 2 and 14th Street intersections where traffic signal systems are in operation.
- **Just north 17th Street NW to 23rd Street NW:**
  The roadway transitions from a four-lane divided typical section to a three-lane divided urban design roadway (two lanes southbound and one lane northbound) with left and right turn lanes. The posted speed limit increases to 45 mph. Traffic control consists of through stop control (side street stop signs).
- **North of 23rd Street NW:**
  Two lane undivided rural design roadway with eight-foot shoulders and a posted speed limit of 45 mph.

Roadway lighting standards are provided along both sides of Mn 220 between 9th Street and 23rd Street. **Figure 2-5** illustrates the key roadway lane geometrics, typical sections, traffic control devices and roadway lighting locations.

2.2.3 Right of Way and Above Ground Utilities

Right of way parcel mapping was provided by the GF-EGF MPO. MnDOT maintains approximately 100 feet of right of way south of US 2, 230 feet of right of way between US 2 and 23rd Street (including the frontage roads) and approximately 150 feet of right of way north of 23rd Street. Above ground utilities in the corridor consist primarily of transmission power lines along the west side of Mn 220, electric transformer pads and drainage structures and features. A small retaining pond and overflow basin is present on the southwest corner of 9th Street and culverts are provided below each residential driveway accessing Mn 220 north of 23rd Street. **Figure 2-6** illustrates the estimated right of way (property parcels) and above ground utility features.



Mn 220 N Corridor Study

Figure 2-5

Roadway Geometric, Traffic Control and Lighting Characteristics

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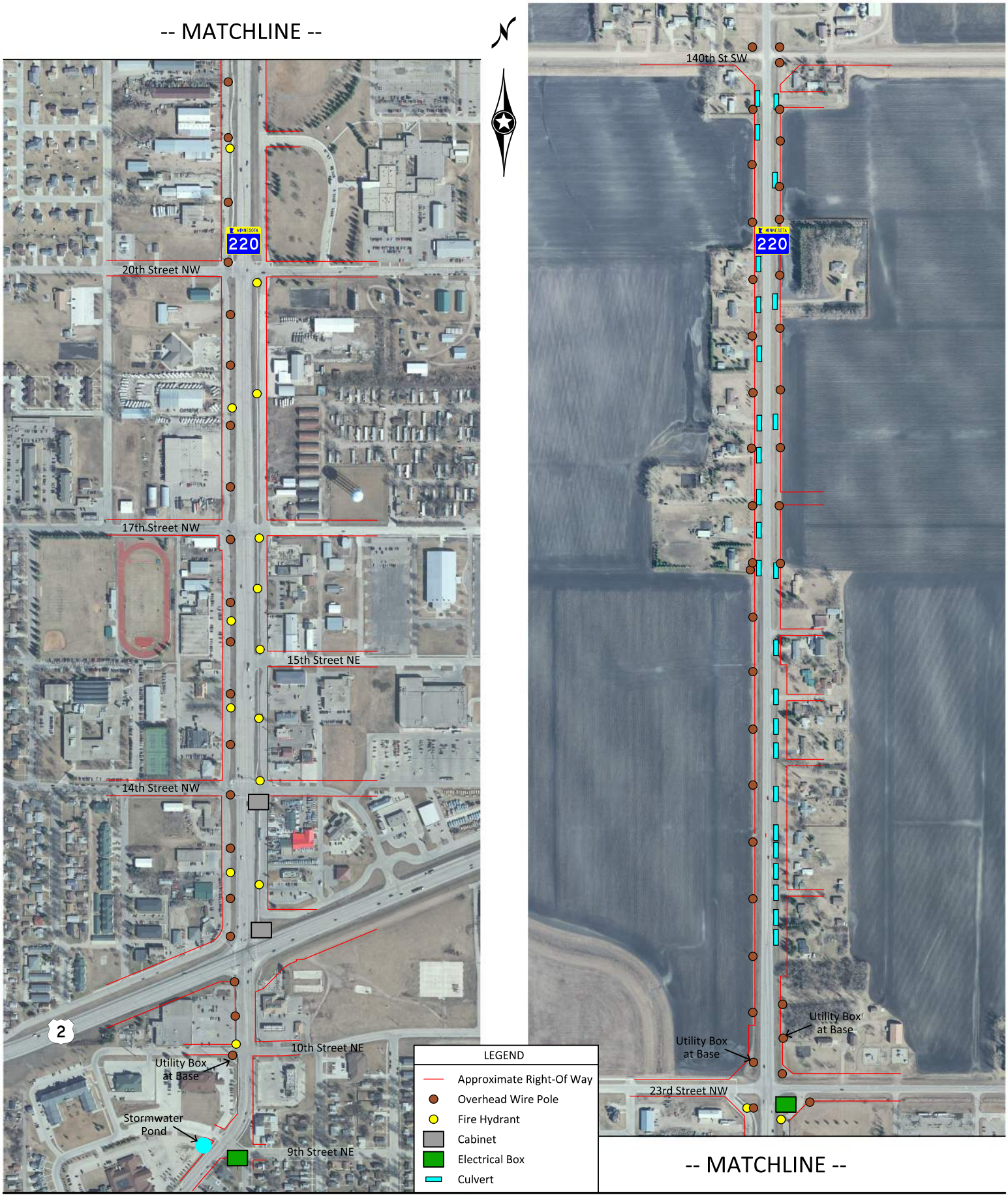

Mn 220 N Corridor Study

Figure 2-6
Right of Way and Above Ground Utilities

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2.3 Infrastructure Assessment

The following sections provide an assessment of the existing infrastructure (roads and signals) along with documentation of the planned future infrastructure investments within the corridor.

2.3.1 Existing Pavement and Traffic Signal System Condition

The existing roadway pavement conditions and traffic signal system infrastructure was reviewed. **Table 2-1** summarizes this assessment.

Table 2-1. Existing Pavement Rating and Traffic Signal Conditions

Pavement Condition

Location	Length (miles)	Width (feet)	Pavement Type	Last Reconstruction Year	Last Rehab Year	Ride Quality Index (RQI)	Ride Quality Index Rating
US 2 to 23rd Street	0.91	34/32	Concrete	1991	2013	**2.8**	**Fair**
23rd Street to Northern Limits	4.97	28	Bituminous over Concrete	1951	2010	**2.8**	**Fair**

Source: MnDOT

Traffic Signal Systems

Intersection Location	Original Traffic Signal Installation	Last Rebuild Year	Typical Service Life Cycle
US 2 at Mn 220	1953	2003	25 years
Mn 220 at 14th Street	1992	2003	25 years

Source: MnDOT

MnDOT evaluation of the Mn 220 corridor pavement conditions indicates a Ride Quality Index (RQI) of 2.8, which is given a "fair" rating. MnDOT has completed a full capital project assessment and found that over next 50 years this segment of highway will require a concrete rehabilitation in 2033 and concrete reconstruction in 2058. The traffic signal systems are approximately 15 years old and can be expected to reach the end of their useful life by year 2030.

2.3.2 Planned Infrastructure Improvements

Improvements are planned for the Mn 220 corridor area in the near term through the adopted 2019-2022 Transportation Improvement Plan (TIP), City of East Grand Forks Capital Improvement Plan (CIP) and MnDOT State Transportation Improvement Plan (STIP). Illustrative projects are identified within the 2045 Metropolitan Transportation Plan (MTP). Based on a review of these documents and previous planning documents **Figure 2-7** illustrates the anticipated infrastructure improvements and to occur by year 2030 and year 2045. **Figure 2-7** also highlights key recommendations that have been previously made for the corridor that are currently not planned. It should be noted there are no improvements programmed for the immediate five years.

PROGRAMMED AND PLANNED IMPROVEMENTS

2019 - 2022 Transportation Improvement Program (TIP)

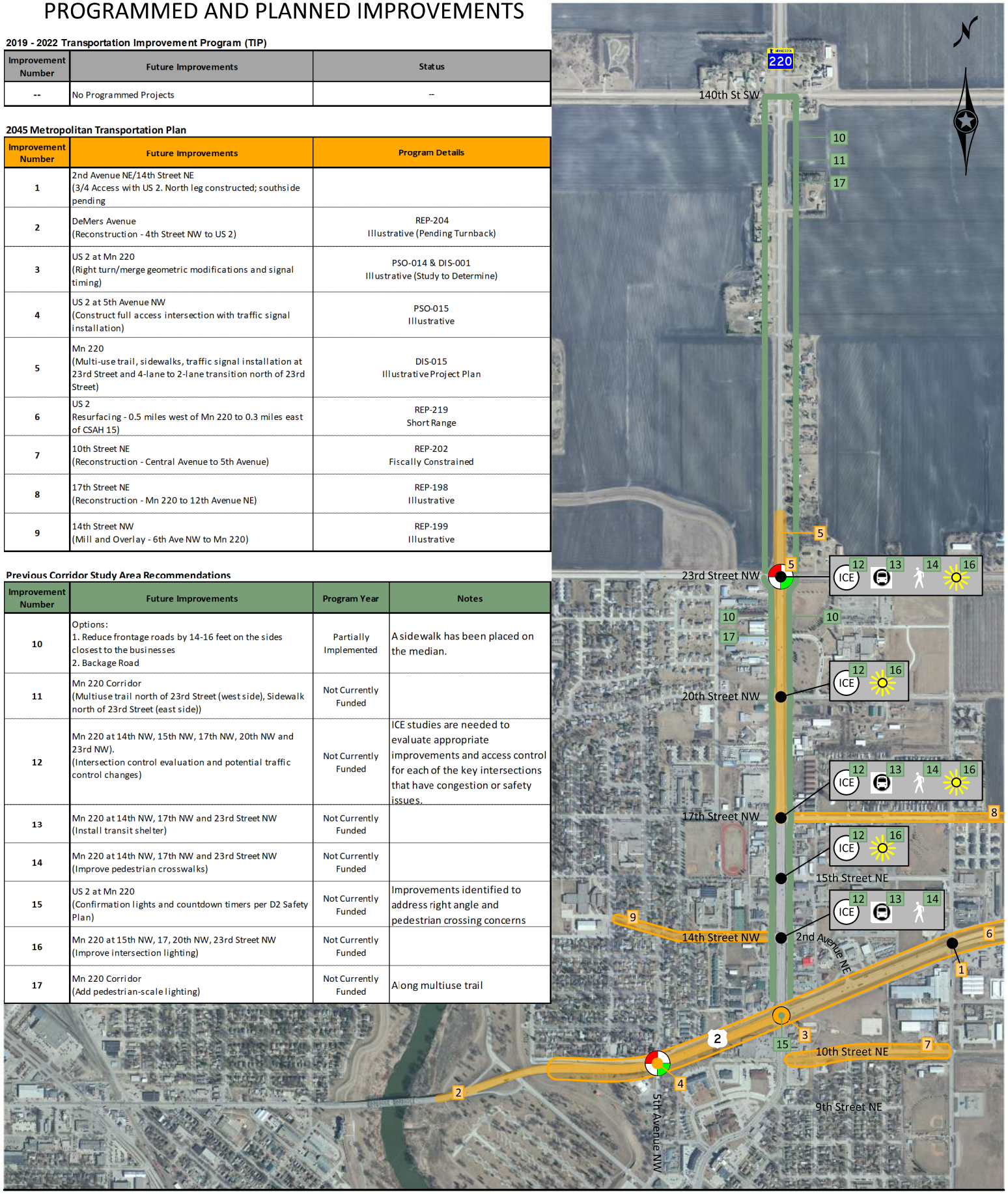
Improvement Number	Future Improvements	Status
--	No Programmed Projects	--

2045 Metropolitan Transportation Plan

Improvement Number	Future Improvements	Program Details
1	2nd Avenue NE/14th Street NE (3/4 Access with US 2. North leg constructed; southside pending	
2	DeMers Avenue (Reconstruction - 4th Street NW to US 2)	REP-204 Illustrative (Pending Turnback)
3	US 2 at Mn 220 (Right turn/merge geometric modifications and signal timing)	PSO-014 & DIS-001 Illustrative (Study to Determine)
4	US 2 at 5th Avenue NW (Construct full access intersection with traffic signal installation)	PSO-015 Illustrative
5	Mn 220 (Multi-use trail, sidewalks, traffic signal installation at 23rd Street and 4-lane to 2-lane transition north of 23rd Street)	DIS-015 Illustrative Project Plan
6	US 2 Resurfacing - 0.5 miles west of Mn 220 to 0.3 miles east of CSAH 15)	REP-219 Short Range
7	10th Street NE (Reconstruction - Central Avenue to 5th Avenue)	REP-202 Fiscally Constrained
8	17th Street NE (Reconstruction - Mn 220 to 12th Avenue NE)	REP-198 Illustrative
9	14th Street NW (Mill and Overlay - 6th Ave NW to Mn 220)	REP-199 Illustrative

Previous Corridor Study Area Recommendations

Improvement Number	Future Improvements	Program Year	Notes
10	Options: 1. Reduce frontage roads by 14-16 feet on the sides closest to the businesses 2. Backage Road	Partially Implemented	A sidewalk has been placed on the median.
11	Mn 220 Corridor (Multiuse trail north of 23rd Street (west side), Sidewalk north of 23rd Street (east side))	Not Currently Funded	
12	Mn 220 at 14th NW, 15th NW, 17th NW, 20th NW and 23rd NW). (Intersection control evaluation and potential traffic control changes)	Not Currently Funded	ICE studies are needed to evaluate appropriate improvements and access control for each of the key intersections that have congestion or safety issues.
13	Mn 220 at 14th NW, 17th NW and 23rd Street NW (Install transit shelter)	Not Currently Funded	
14	Mn 220 at 14th NW, 17th NW and 23rd Street NW (Improve pedestrian crosswalks)	Not Currently Funded	
15	US 2 at Mn 220 (Confirmation lights and countdown timers per D2 Safety Plan)	Not Currently Funded	Improvements identified to address right angle and pedestrian crossing concerns
16	Mn 220 at 15th NW, 17, 20th NW, 23rd Street NW (Improve intersection lighting)	Not Currently Funded	
17	Mn 220 Corridor (Add pedestrian-scale lighting)	Not Currently Funded	Along multiuse trail



Mn 220 N Corridor Study

Figure 2-7

Programmed and Planned Infrastructure Improvements

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2.4 Roadway Access

One of the key factors affecting the quality of mobility and the safety characteristics (motor vehicle and multimodal) on the Mn 220 corridor is roadway access. MnDOT manages roadway access along Mn 220 throughout the study area. This section discusses MnDOT access management categories and the existing access conditions.

2.4.1 Access Management Categories

Access Management is the planning, design, and implementation of land use and transportation strategies between the road and surrounding land. Appropriate spacing and design of public street intersections and private access is key to this strategy. The MnDOT Access Management Manual provides recommended access spacing for various roadway classifications[5]. A roadway classification assignment has been given to all MnDOT facilities in accordance with their function and priority. Within the study area, Mn 220 is currently assigned Category 5B. Each primary access classification is then further divided into subcategories, which is intended to allow for some variation in access spacing based on adjacent land uses.

The Mn 220 corridor is assigned a Subcategory B. This subcategory is intended for areas outside of urban cores that are either urbanized or planned for urbanization with a full range of urban services, especially a local supporting street network. This subcategory will generally apply to areas within municipal boundaries or in transition areas outside municipal boundaries.

Each access subcategory has spacing recommendations for primary full-movement intersections and secondary intersections. **Figure 2-8** provides a summary of the MnDOT street spacing recommendations which are applicable to the Mn 220 corridor.

The MnDOT Access Management Manual (Section 3.3.2) provides policy regarding driveway connections to trunk highways. The policy reflects the following considerations regarding driveways and property access:

- Property access via the local street system, when available, is generally preferred over direct driveway connections to the trunk highway system, as this is most conducive to safety and mobility. However, property access via the local street system must provide reasonably convenient and suitable access.
- Within urban/urbanizing areas, MnDOT strongly encourages the development of a complete supporting local road network to serve as an alternative to direct driveway access to the trunk highway system. Urban/urbanizing areas offer the greatest opportunity to improve mobility and safety through access management.

[5] *MnDOT Access Management Manual* (MnDOT, January 8, 2008)

2.4.2 Access Inventory

An illustration and description of each access point along the Mn 220 study corridor is provided in **Figure 2-8**.

The current locations of public and private accesses along the corridor do not specifically match the guidelines for a Category 5B corridor, which suggests 1/4-mile full access, 1/8-mile secondary and 1/4-mile signal spacing. A frontage road system is in place between US 2 and 23rd Street; however, the frontage road intersections at the major cross streets are quite close (about 50 feet) to the Mn 220 intersections, which could potentially pose both safety and operational considerations.

In a previous study, it was recommended that part of the frontage road on the east side be reconfigured into a “backage” road. However, this is not currently planned. Access management strategies as part of this study will be considered within the corridor right of way to better facilitate safe and efficient travel along the corridor. This may include reviewing different access control or potentially restrictions for certain movements. Additionally, as the area north of 23rd Street urbanizes, the plan should provide guidance to ensure access management principles are being incorporated. Currently, numerous residential homes have direct access to Mn 220 as a result of the roadway characteristics on this segment of the corridor.

Recommended Street Spacing for Non-IRCs

Category	Area or Facility Type	Typical Functional Class	Public Street Spacing		Signal Spacing
			Primary Full-Movement Intersection	Secondary Intersection	
5B	Urban/ Urbanizing	Minor Arterials	1/4 mile	1/8 mile	1/4 mile

Mn 220 N Corridor Study

Figure 2-8
Access Management Characteristics

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2.5 Multimodal Characteristics

The existing and future characteristics of the pedestrian, bicycle and transit network was evaluated. The following sections document the key features.

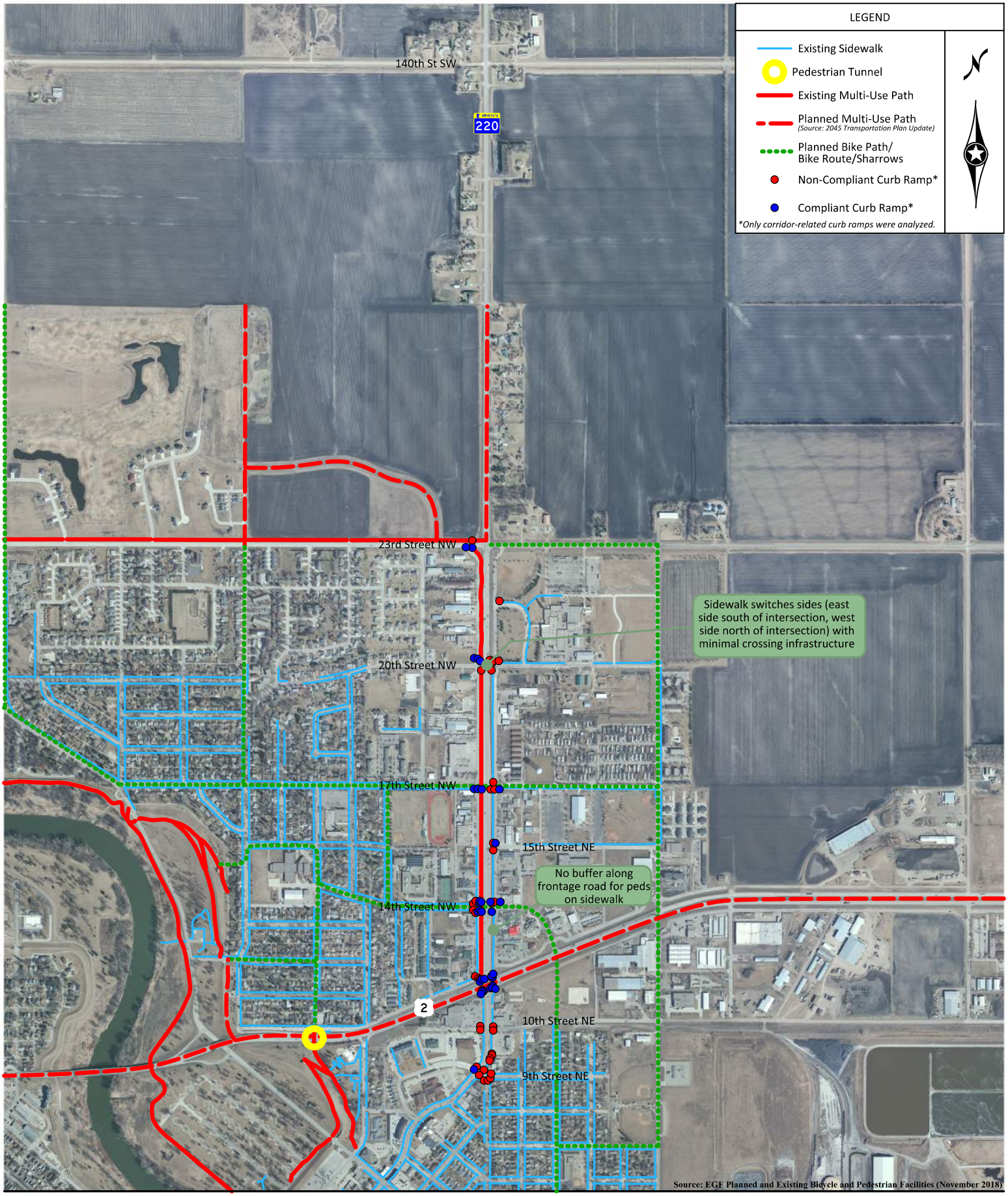
2.5.1 Sidewalk, Trails, Bike Lanes

Sidewalk or multiuse trails exist along most the Mn 220 corridor. A new segment of multiuse trail was recently constructed (fall 2018) along the western side of Mn 220 between US 2 and 20th Street NW, which connects to the existing multiuse trail extending to 23rd Street NW. This multi-use path crosses 23rd Street NW and continues west for approximately 1 mile. North of 23rd Street NW, there are currently no pedestrian or bicycle amenities other than the wide shoulders. South of US 2, there is a sidewalk on either side of the roadway. There are several gaps in sidewalks along 20th Street NW/NE, 17th Street NW/NE and 15th Street NE, resulting in poor connection of the Mn 220 corridor to the adjoining neighborhoods. Crosswalks and pedestrian ramps are provided at intersection corners; however, ADA accessibility is not ideal in all locations (e.g., ramp orientation or slopes) and positive crossing infrastructure (refuge medians or devices) are not present. Approximately 33 pedestrian ramps (60 percent) do not meet current ADA compliance. On the east side of Mn 220 (US 2 to 20th Street NE) there is a sidewalk between Mn 220 and the eastern frontage road.

Future plans have identified a multi-use path for a ½ mile segment of roadway north of 23rd NW Street. Additionally, multi-use paths, bike lanes, and bike routes are planned for connecting and nearby local streets. There are no planned bike or pedestrian improvements south of US 2. Evaluating gaps or barriers in the pedestrian/bicycling network and exploring opportunities to improve the existing infrastructure, provide safer connections and access to/across Mn 220, and further expand the network will be an important study consideration. **Figure 2-9** illustrates the existing and planned future sidewalk, trails and bicycle facilities.

2.5.2 Transit

Cities Area Transit (CAT) is the public transportation system serving Grand Forks and East Grand Forks metropolitan area. Routes 3/4, 6/7, and 12 serve the study area with a few dedicated stops along Mn 220. **Figure 2-10** illustrates the CAT network.



Mn 220 N Corridor Study

Figure 2-9

Existing and Planned Sidewalk, Trails and Bicycle Facilities

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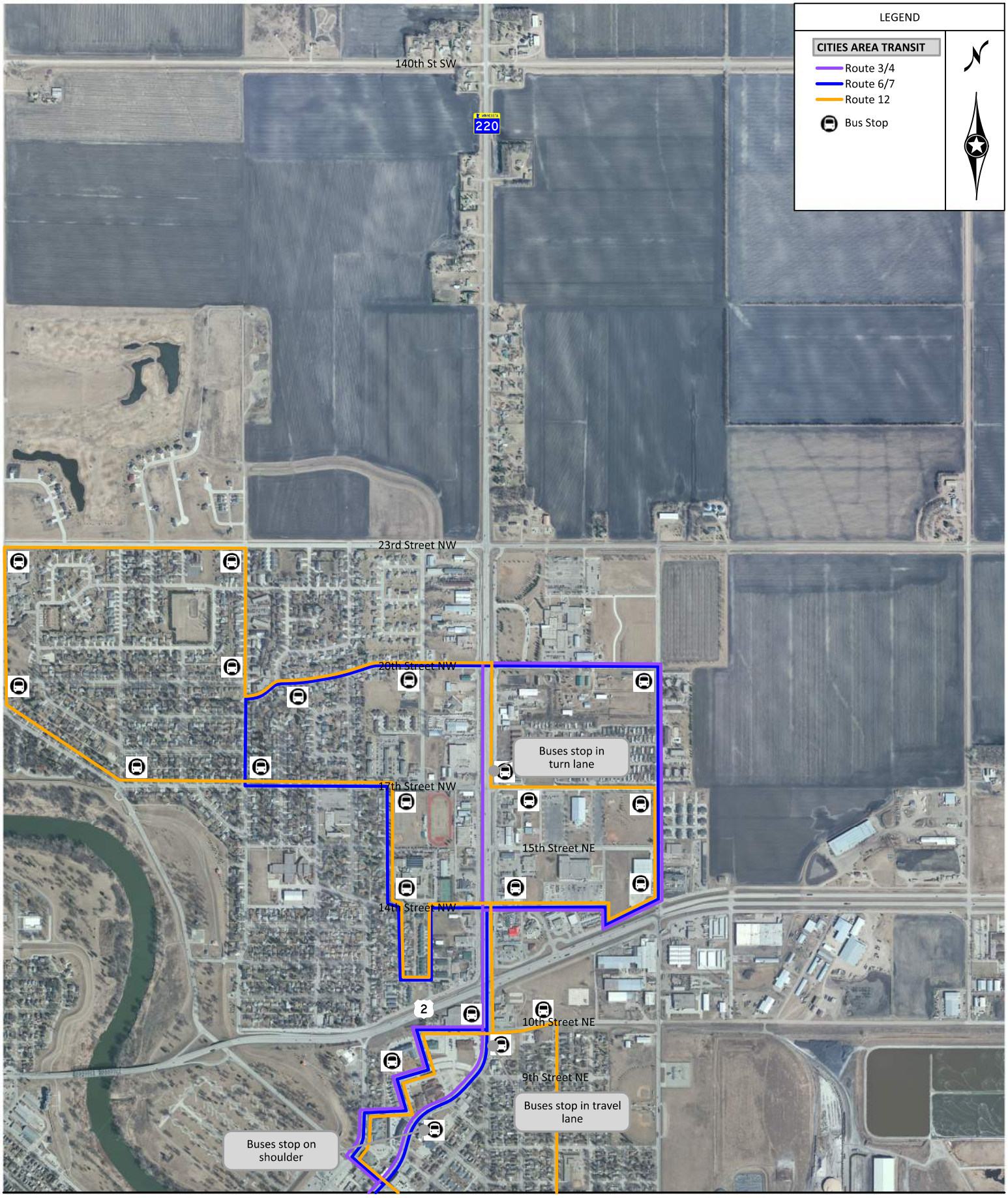

Mn 220 N Corridor Study

Figure 2-10
Existing Transit Routes and Bus Stops

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2.6 Environmental Assessment

A review of the existing environmental characteristics within the scope of the Mn 220 corridor was completed. Key elements reviewed are summarized below.

Farmland

Agricultural production is a significant industry for East Grand Forks and Polk County. The portion of the Mn 220 corridor north of 23rd Street is partially bordered by land currently in use for agricultural production. According to the USDA Natural Resources Conservation Service (NRCS), land in agricultural production within the study area is identified as prime farmland or prime farmland if drained. Potential impacts to the prime farmland areas should be considered during the review of potential improvements.

Economic/Social

Changes to the social and economic character of an area can be directly experienced by improvements to the transportation system. These changes can provide benefits and negative impacts as access changes, capacity is modified, and other changes occur. Due to the industrial and agricultural nature of the corridor, economic impacts should be carefully considered as alternatives are developed. Impacts to existing businesses along with impacts to future economic growth should be considered. These impacts may include benefits or burdens to business operations and growth as a result of modifications to access management, wayfinding, heavy commercial traffic movements and overall travel time. Impacts to the social environment shall also be considered as it relates to system linkage and changes to connectivity to and from the region.

Noise

Noise related to construction related activities, as well as increased noise in the post-construction environment can be disruptive and reduce quality of life. East Grand Forks Senior High School and Northland Community and Technical College are both located within the study area. Additionally, residential communities adjoin the study area. Impacts resulting from noise to the residential areas, schools, and businesses along the corridor should be considered as it relates to quality of life and disruptiveness of daily activities.

Wetlands

The United State Fish and Wildlife Service National Wetlands Inventory (NWI) was utilized to explore the presence of wetlands within the study area. No wetlands are indicated within the study area. The Minnesota Department of Natural Resources Public Waters Inventory does not depict any wetlands or waterbodies within the study area. Aerial imagery indicates the presence of wetlands, mainly north of 23rd Street, in roadway ditches. These wet ditch features are likely created to provide stormwater conveyance. These features should be defined by a field wetland delineation to determine the size and wetland type.

The United States Army Corps of Engineers shall complete a jurisdictional determination following the delineation to determine the jurisdiction of each of the wetlands identified within the study area during project development efforts. Similarly, the Minnesota Department of Transportation, serving as the Wetland Conservation Act Local Government Unit for areas within the right-of-way, shall provide a Notice of Decision for the wetland delineation and any proposed exemptions or needed mitigation plan.

Invasive Plants

Invasive plant species have an impact on agriculture, native plant communities, and the natural environment. It is not known if any invasive plants are present within the study area. Every effort should be made during construction to prevent the propagation and spread of invasive plants. Prior to any construction activity a noxious weed survey should be conducted to determine the presence and extend of any plants listed on the Minnesota Noxious Weed List. If present, a noxious weed plan should be developed that outlines specific eradication plans for each species present, as well as guidelines for the prevention of spreading of seed and plant materials during construction.

Floodplain

The Red River of the North is located to the southwest of the study area. The Federal Emergency Management Agency (FEMA) has mapped the existing floodplain associated with the river.

Preliminary Flood Insurance Rate Maps dated July 4, 2014 reflect changes resulting from the construction of the earthen levee. The earthen levee was constructed around the City of East Grand Forks following the historic 1997 flood, providing flood protection within the city and key growth areas.

The study area is located in Zone X, defined as areas of 500-year flood; areas of 100-year flood with average depths of less than 1-foot, or areas protected by levees from 100-year flood. Proposed changes within this floodway area will require close coordination and appropriate approvals obtained with the East Grand Forks floodplain manager during project development.

Threatened and Endangered Species

The National Heritage Information System (NHIS) is managed by the Minnesota Department of Natural Resources (DNR) and identifies the State's rare plant, animal, native plant communities, and other rare features. Rare species tracked within the NHIS include sightings of Federally listed threatened and endangered species, along with species lists as State endangered, threatened or special concern. The NHIS was reviewed for species known to occur within a one-mile radius of the study area.

The NHIS review identified three state-listed species:

- Lark Sparrow (*Chondestes grammacus*) – Special Concern bird species
  This bird species is found in open, grass land areas with scattered trees and shrubs. They build their nest on the ground, in a shrub or a small tree. If feasible, avoid initial

disturbance to grassland areas and tree/shrub removal from May 15th through August 15th to avoid disturbance of nesting birds.

- Black Sandshell (*Ligumia recta*) – Special Concern mussel species
- Lake Sturgeon (*Acipenser fulvescens*) – Special Concern fish species

Both Black Sandshell and Lake Sturgeon have been documented in the Red River in the vicinity of the proposed corridor study area. These species can be adversely impacted by actions which alter stream hydrology or decrease water quality. Therefore, it is important that effective erosion prevention and sediment control practices be implemented and maintained throughout the duration of the project.

The Information for Planning and Consultation (IPaC) is an online project planning tool which streamlines the U.S. Fish and Wildlife Service environmental review process. The online tool was utilized to determine if any Federally listed species, critical habitat, or other natural resources may be impacted by a project.

The following species were identified as Federally listed. While these species may potentially be affected by a future project, no critical habitat for these species exists within the study area:

- Northern Long-eared Bat (*Myotis septentrionalis*) – Threatened bat species
- Dakota Skipper (*Hesperia dacotae*) – Threatened insect species
- Poweshiek Skipperling (*Oarisma Poweshiek*) – Endangered insect species

Additional species listed on the State's endangered, threatened or special concern list should also be reviewed within the study area. Potential impacts to Federally and State listed species should be carefully reviewed, avoided and mitigated during project development.

Hazardous Waste

Potentially contaminated materials may be encountered during construction activities. The Minnesota Pollution Control Agency's "What's in My Neighborhood" searchable database of known contaminated sites and environmental permits and registrations indicates thirteen sites located within the Mn 220 right-of-way, all of which are south of 23rd Street. These sites include hazardous waste, petroleum remediation, and underground tank sites. A Phase I Environmental Site Assessment may be warranted to identify all potential hazardous waste sites within the project area that may be disturbed during construction. A Phase II Environmental Site Assessment may also be needed to further evaluate the extend and composition of contaminated materials within the project area.

Visual

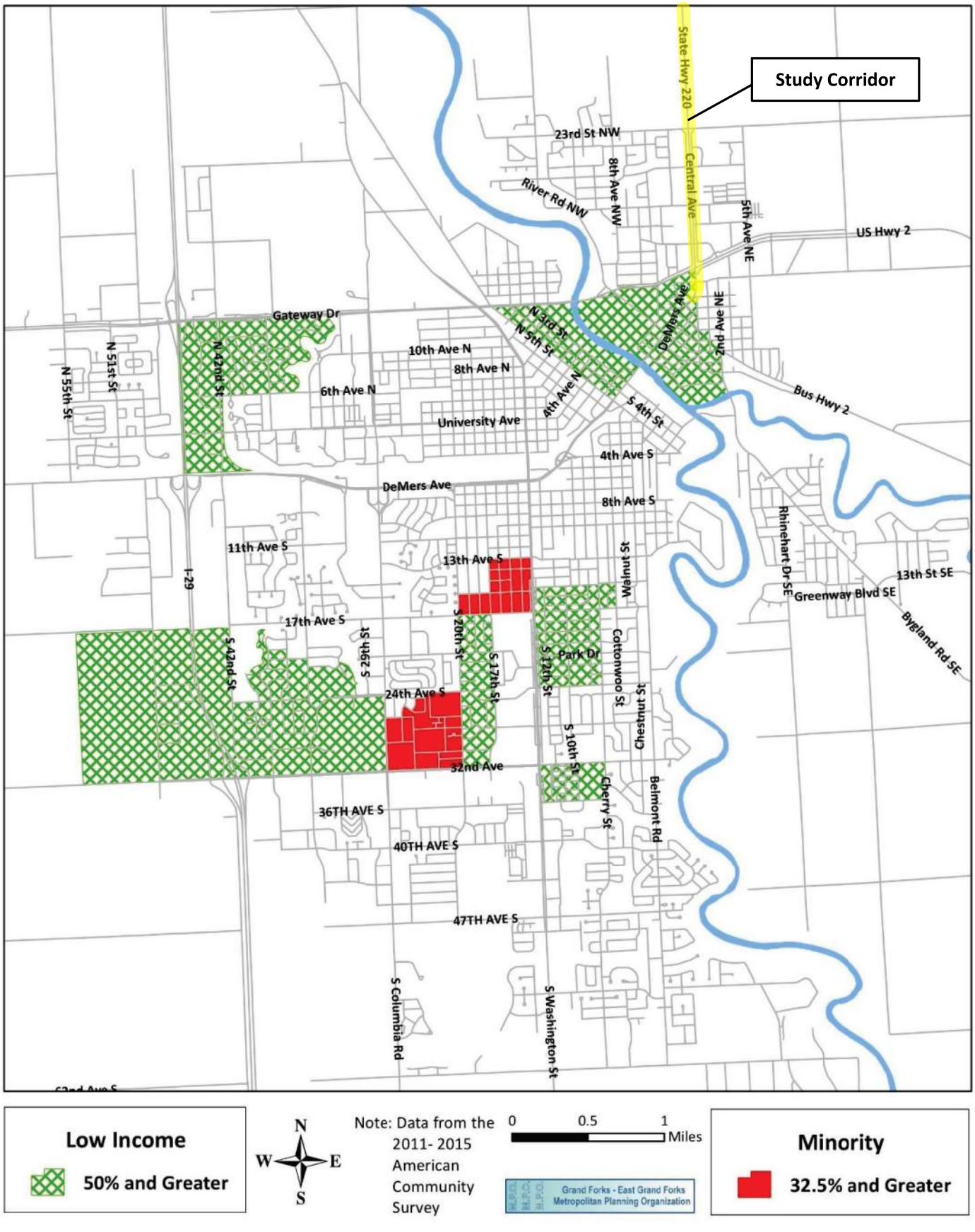
Impacts to the visual quality of the corridor should be considered as alternatives are developed for the corridor. Particularly, any improvements that include a roadway grade separation or vertical alignment shifts shall be reviewed for visual impacts to the corridor and surrounding land uses.

Trees

A limited number of boulevard trees are located along the corridor. About two dozen trees are located on the west side of Mn 220, south of 23rd Street. These trees appear to be younger and possibly planted within the past decade or so. A majority of these trees appear to be directly below the electrical transmission line corridor. It is unclear if the trees are in compliance with the transmission line right-of-way. Any future landscape plan associated with the Mn 220 corridor should consider the transmission line right-of-way requirements for the electrical utility company where a no planting buffer and maximum height requirements are generally mandated. Any proposed tree removal should be conducted outside the bat roosting season. The U.S. Fish and Wildlife Service provides guidance for tree removal to avoid bat impacts.

Environmental Justice

The GF-EFG MPO's Environmental Justice Program Manual outlines the procedures for delineating the presence of environmental justice populations within a study area. Based on this guidance and the 2015 American Community Survey Estimates, a 50 percent and greater presence of low-income demographics was identified southwest of the Mn 220/US 2 intersection. **Figure 2-11** illustrates the Environmental Justice areas within the Grand Forks-East Grand Forks region.



Source: EGF 2045 Long-Range Transportation Plan (November 2017)

Mn 220 N Corridor Study

Figure 2-11

Grand Forks-East Grand Forks Environmental Justice Area

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2.7 Existing and Forecast Traffic Demand

Preserving and improving mobility of Mn 220 is an important priority and goal for the study. The motor vehicle traffic demand directly correlates to the quality of vehicle mobility at intersections and will influence the transportation roadway needs. Existing pedestrian volumes crossing Mn 220 is also documented. The existing and forecast traffic demands are documented in the following sections.

2.7.1 Existing Traffic Volumes

The GF-EGF MPO collected a variety of traffic data for the Mn 220 corridor. The field counts were collected in the fall of 2018, which included full-intersection turning movements for a 12-hour period at the 9 study intersections. The traffic counts included motor vehicles, pedestrians and heavy trucks (during beet harvest season). **Figure 2-12** illustrates the hourly traffic volume profile along Mn 220. As shown, the highest peaks occur between 7:00 and 8:00 a.m. and 4:30 to 5:30 p.m. The existing a.m. and p.m. peak hour intersection traffic volumes, and pedestrians (crossing of Mn 220 volumes) are illustrated in **Figure 2-13**. The existing year 2018 average daily traffic (ADT) volumes are shown in **Table 2-2**.

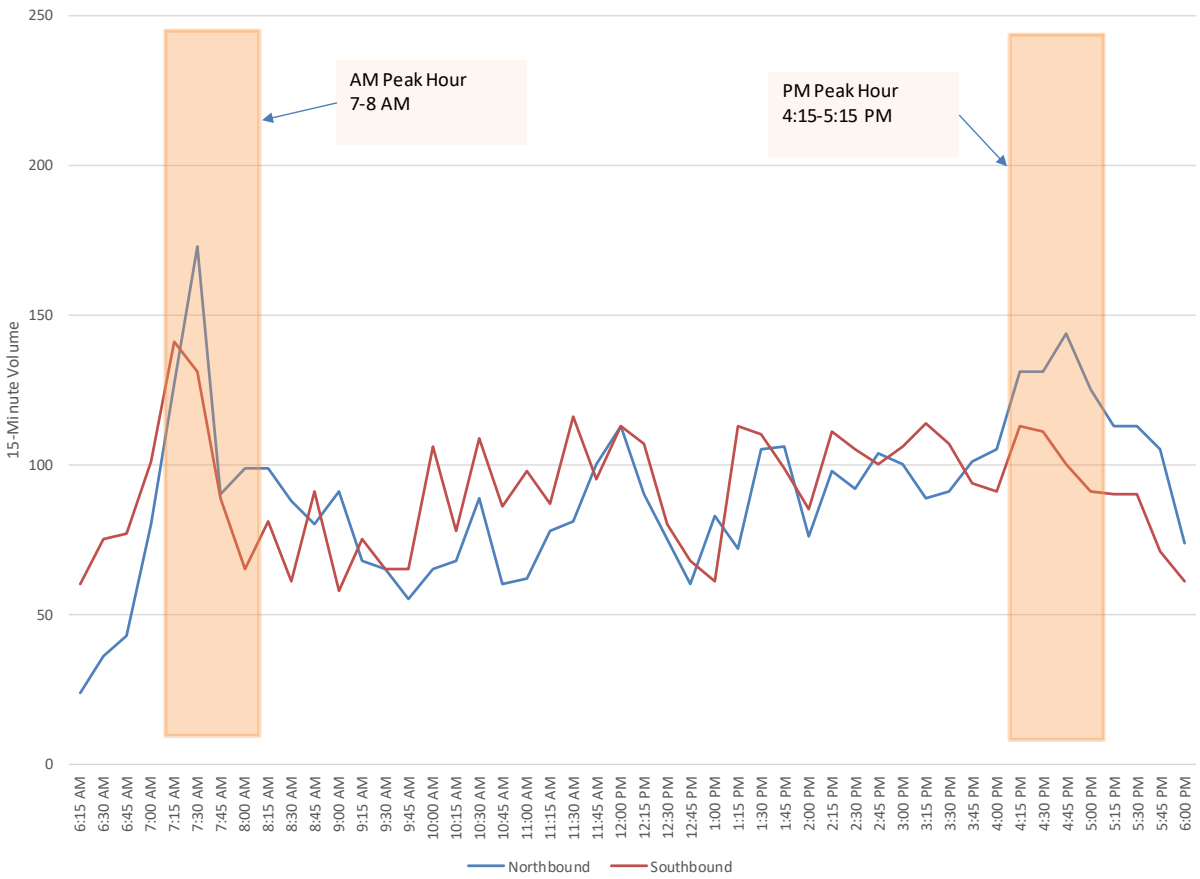


Figure 2-12. Hourly Traffic Volume Profile

Table 2-2. Existing Average Daily Traffic Volumes

Segment	Corridor	ADT (2018)	AADT (2030)	AADT (2045)	Functional Classification
9th Street NE to 10th Street NE	Mn 220	9,940	**10,200**	**11,300**	Principal Arterial
US 2 to 14th Street NW	Mn 220	13,600	**14,100**	**14,600**	Minor Arterial
17th Street NW to 20th Street NW	Mn 220	7,300	**8,800**	**11,700**	Minor Arterial
20th Street NW to 23rd Street NW	Mn 220	5,600	**7,200**	**9,900**	Minor Arterial
23rd Street NW to 140th Street SW	Mn 220	3,730	**5,200**	**7,100**	Minor Arterial
West of Mn 220	US 2	12,350	**16,700**	**21,200**	Principal Arterial
East of Mn 220	US 2	8,970	**9,100**	**12,200**	Principal Arterial

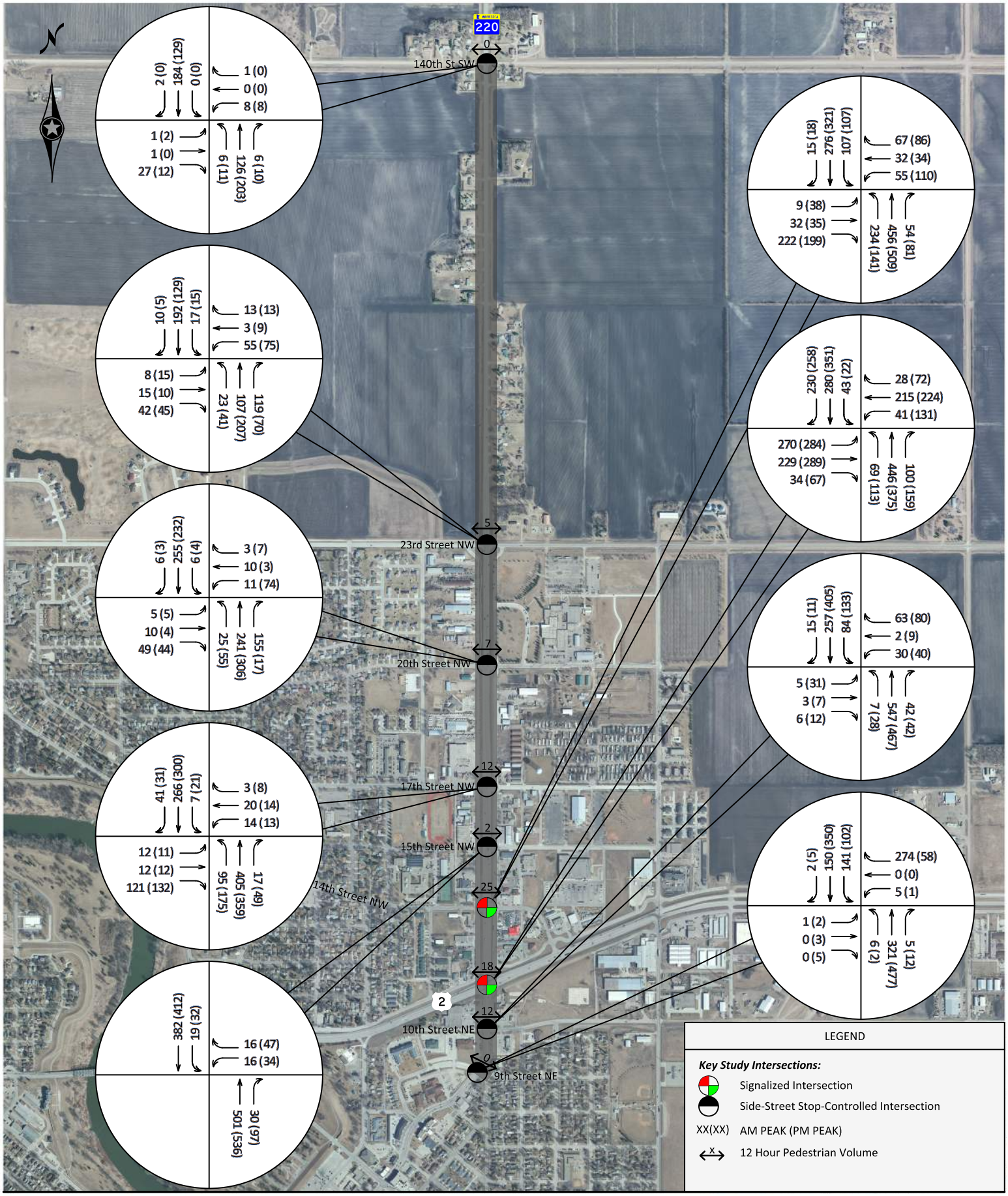
2.7.2 Institutional Traffic Volumes

East Grand Forks High School and Northland Community and Technical College reside within the Mn 220 Corridor Study area. The existing traffic volume demands associated to or with both schools are accounted for in the a.m. and p.m. peak hour turning movement volumes.

2.7.3 Heavy Commercial Compatibility

Many of the industrial land uses within the City of East Grand Forks are located along the US 2 corridor and utilize the study area intersections to gain access and to move goods and services regionally. In addition, the regional sugar beet harvest stretches from September to May of each year, generating over 4,500 heavy commercial traffic movements per day for the American Crystal Sugar plant, located to the southeast of the Mn 220 Corridor Study area. Beet deliveries are strategically timed during all hours of the day to reduce impacts to peak hour travel.

Heavy commercial traffic volumes for the Mn 220 corridor were collected during the beat harvest season, which found an average of approximately 5 percent heavy trucks during peak periods and throughout the day. Approximately 8 percent heavy truck traffic (peak observation) was observed during the mid-day time periods. The heavy truck percentages observed carry isolated impacts to mobility (i.e, when truck is present); however, has an overall negligible impact to the capacity of the system.



Mn 220 N Corridor Study

Figure 2-13

Existing Interesction Traffic Volumes - AM and PM Peak Hour

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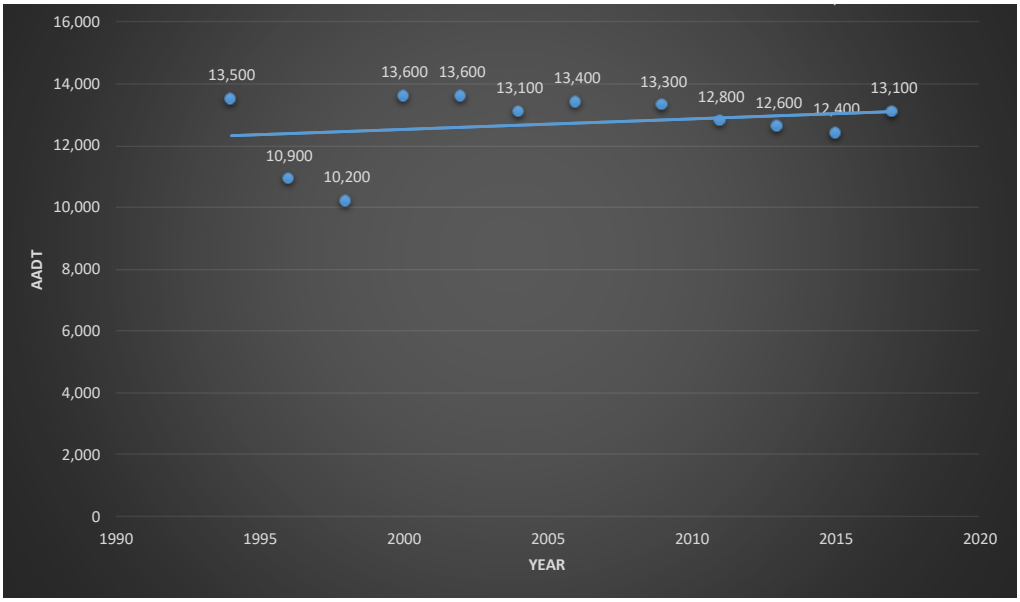
2.7.4 Historical Average Daily Traffic

The historical traffic volumes along Mn 220 were reviewed to observe trends in the corridor ADT over the past 20 years. This is informative information; however, are not necessarily used as the basis for projecting future traffic growth. **Figure 2-14** illustrates the historical annual average daily traffic (AADT) on Mn 220 near 14th Street. The trend indicates an approximately 0.25 percent per year growth rate has occurred, historically. Segments of Mn 220 further to north indicate closer to a 1 percent per year growth; however, the year to year AADT has shown much greater fluctuation than the southern segments of the corridor.



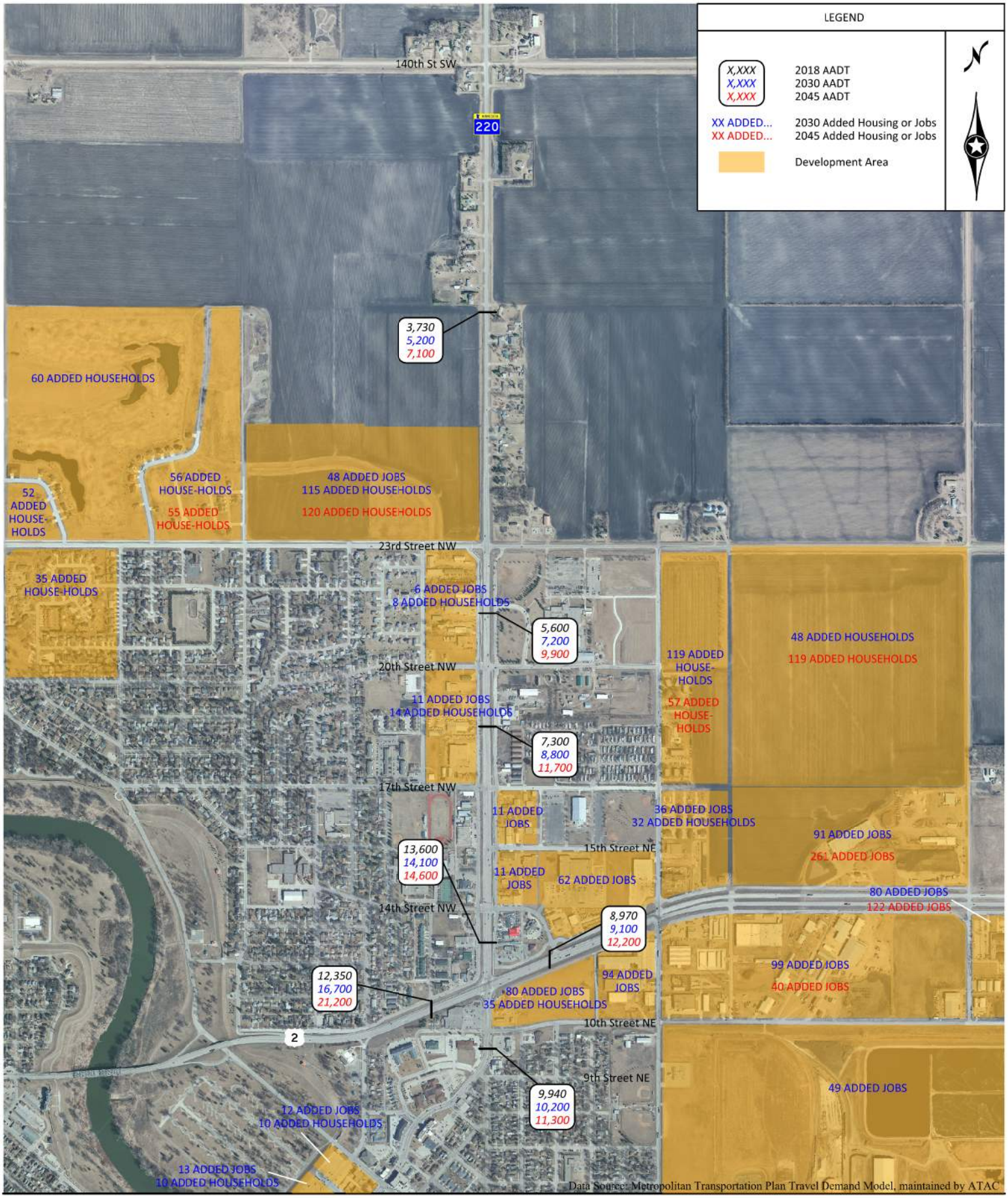
Source: MnDOT Traffic Flow Maps

Figure 2-14. Historical Traffic Volumes – North/South Mn 220 between US 2 and 14th Street NW

2.7.5 Forecast 2030 and 2045 Traffic Volumes

The forecast traffic volumes are based on the travel demand model (TDM) developed for the 2045 MTP and maintained by the Advanced Traffic and Analysis Center (ATAC). The TDM incorporates existing and expected socioeconomic data, changes in land use, and expected roadway facilities to estimate changes in traffic volumes. The land use model assumed in the TDM includes the East Grand Forks 2045 Land Use Plan and 2045 MTP. Based on the TDM, the forecast 2030 and 2045 ADT volumes, along with key land use growth areas, are illustrated in **Figure 2-15**.

A comparison of the forecast annual average daily traffic to the existing ADT is made to estimate traffic volume level changes at each intersection. As a result, the forecast intersection turning movements can be estimated based upon applying the estimated change in AADT volume (converted to an estimated annual growth rate) to the existing intersection volumes. The forecast year 2030 and 2045 a.m. and p.m. peak hour intersection traffic volumes are illustrated in **Figure 2-16** and **Figure 2-17**, respectively.



Data Source: Metropolitan Transportation Plan Travel Demand Model, maintained by ATAC

Mn 220 N Corridor Study

Figure 2-15

Forecast 2030 and 2045 Average Daily Traffic Volumes

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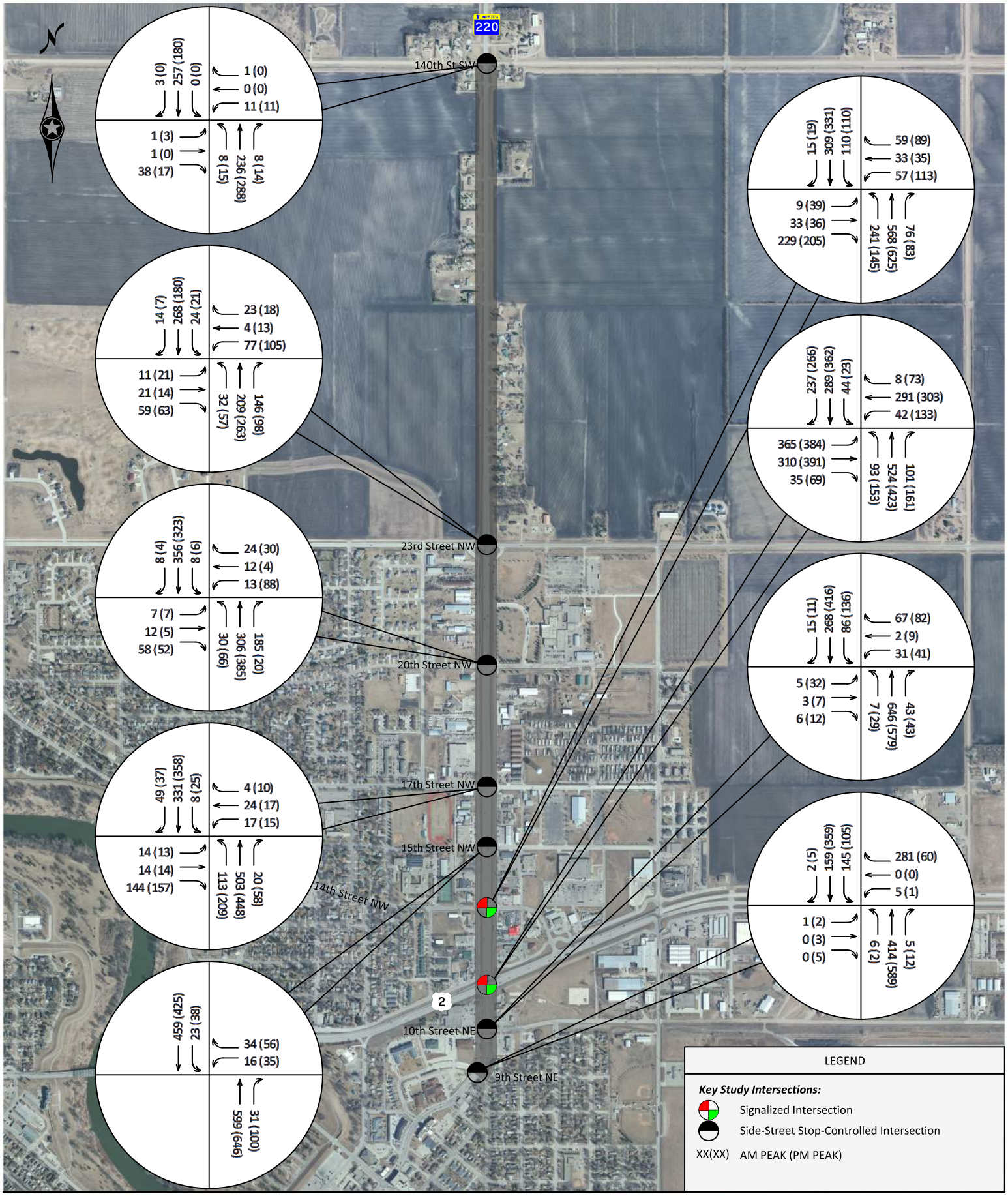

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Figure 2-16

Forecast Year 2030 Intersection Traffic Volumes - AM and PM Peak Hour

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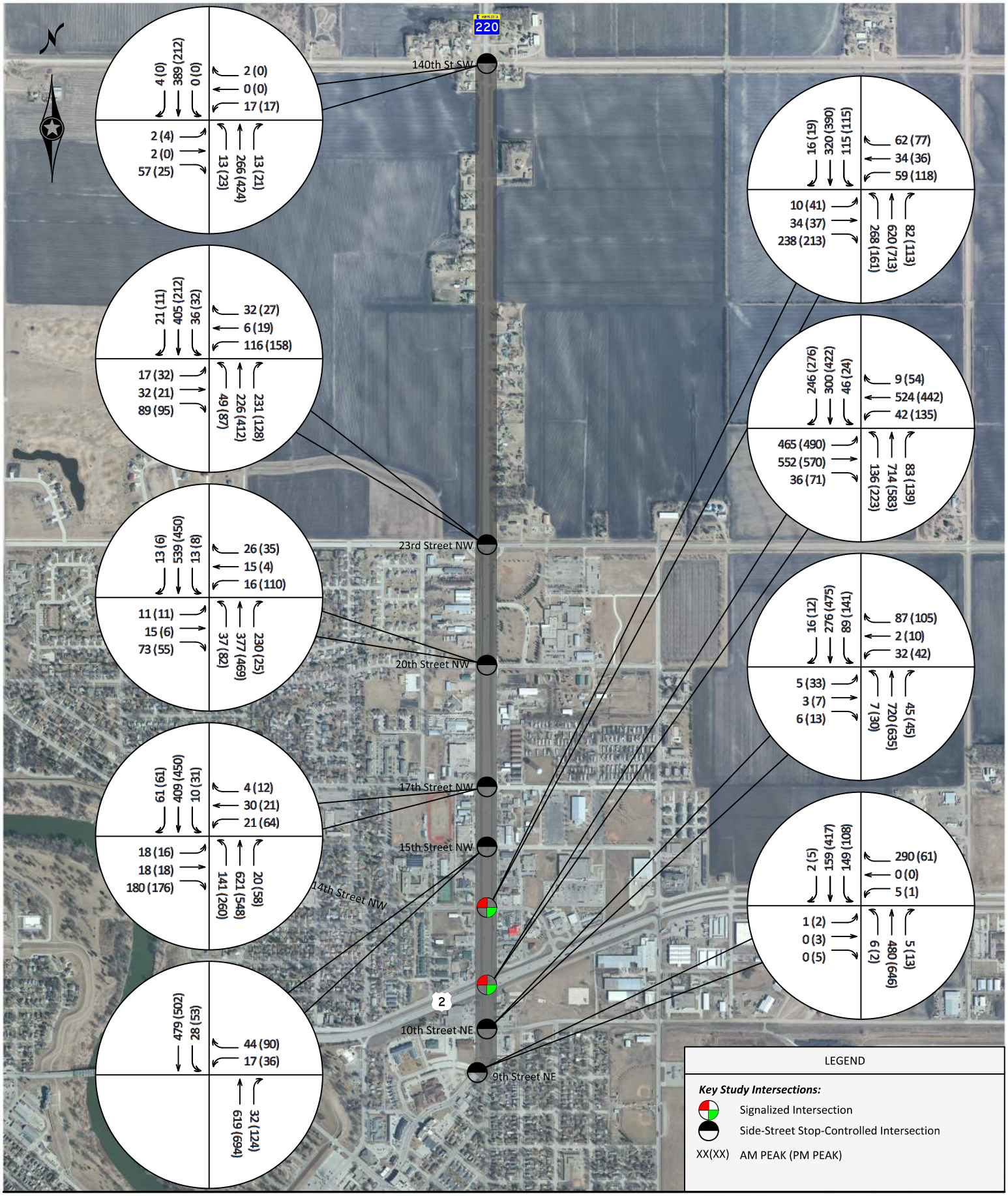

Mn 220 N Corridor Study

Figure 2-17

Forecast Year 2045 Intersection Traffic Volumes - AM and PM Peak Hour

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3. Roadway Safety and Traffic Operation Analysis

In order to understand and identify safety considerations and transportation mobility deficiencies, a safety and traffic operation analysis was completed for existing and future conditions.

3.1 Roadway Safety

The number, location, type, and severity of crashes in the study area were analyzed to help identify and address safety problem areas. Crash data can be analyzed to identify problem intersections or segments, crash patterns, and probable causes. If the root causes of crashes can be identified, a means to reduce the number and severity of crashes may be developed.

The GF-EGF MPO recently completed crash history performance measures for the metropolitan area as part of the 2045 MTP[6]. Those crash statistics are based on upon data provided by MnDOT for years 2012-2015. The Mn 220 Corridor Study provides a closer evaluation of the safety characteristics specific to the corridor and are generally consistent to the 2045 MTP. The MPO will update remaining corridors throughout East Grand Forks as data is provided by MnDOT. Historical crash data for Mn 220 from the most recently available five-year period (2011-2015) was obtained from the MnDOT Crash Mapping Analysis Tool (MnCMAT). In addition, police reports were requested and reviewed to further evaluate the details of specific crashes reported at 17th Street and the US 2/Mn 220 intersections.

3.1.1 Key Factors in Safety Analysis

In examining the crash data obtained, four key factors were considered: (1) crash rate, (2) critical crash rate, (3) crash severity, and (4) crash type distribution.

Crash Rate

History has proven that crashes are a function of exposure. Roadways with higher traffic volumes experience more crashes than similar roadways with lower volumes. Rather than simply documenting the number of crashes that occur over a segment or at an intersection, crash rates must be considered. Crash rates normalize different locations with varying traffic volumes, providing a useful tool in comparing the locations with respect to safety.

The first key factor in safety analysis is the crash rate. Intersection crash rates are defined by the number of crashes occurring per million entering vehicles (MEV). Intersections with high volumes can be compared to intersections with low volumes using the intersection crash rate. Actual crash rates at specific locations can be compared to average or typical values for a roadway of the same type.

[6] Grand Forks-East Grand Forks MPO 2045 Metropolitan Transportation Plan, Figure 3-20

Critical Crash Rate

While physical roadway conditions (such as access control, mobility, and capacity) can contribute to increased crash rates, crash occurrence is somewhat random by nature. Identifying every segment or intersection with a crash rate above the average value in an analysis would produce a large amount of data that may not be statistically relevant with respect to safety deficiencies. The critical crash rate, the second key factor in safety analysis, identifies locations that have a crash rate higher than similar facilities by a statistically significant margin. The critical crash rate is calculated by adjusting the system-wide average based on the amount of exposure and a statistical constant indicating level of confidence. Although varying confidence levels are often utilized, the 99.5 percentile confidence interval was selected for this safety analysis. At locations where the actual crash rate exceeds the critical crash rate, it is 99.5 percent certain that the crashes are a result of deficiencies in the segment or intersection design.

Crash Severity

The third key factor in safety analysis is crash severity. Crash severity quantifies how severe the crashes are at a particular location. In the crash data obtained from MnCMAT, crashes are categorized into five major categories of severity:

- Property Damage – No injuries occurred
- Possible Injury – An injury may have occurred
- Non-Incapacitating Injury – A minor injury occurred
- Incapacitating Injury – An injury occurred that cause impairment
- Fatal – A fatality occurred in the crash

The purpose of analyzing this statistic is to identify locations that may experience a low crash rate but have a high percentage of injury or fatal crashes. These occurrences are often found at high speed low volume rural intersections, and improvement alternatives to address crash severity may yield a different set of solutions than for high crash/low severity instances. Conversely, locations which have high crash rates with a large proportion of property damage crashes may not warrant as much priority when deficiencies are being addressed. Critical severity rate and critical K/A rate (combination of Type K (Fatal) and Type A (Incapacitating Injury) crashes) in **Table 3-1** are also based on the same statistical method but with lower confidence level of 80 percent as a more conservative cut-off for significance. Of the 110 crashes observed along the Mn 220 corridor, 99 occurred at intersections and only two were reported as a Type A serious injury. Zero fatalities were reported.

Crash Type Distribution

The fourth key factor in safety analysis is crash type distribution. Each crash is classified as one of the following types:

- Rear End
- Sideswipe (Passing)
- Right Angle
- Head On
- Sideswipe (Opposite Direction)
- Other

The crash type distribution for the above critical intersections was investigated to determine if there are any underlying factors that could be creating the unsafe conditions. **Figure 3-1** illustrates the crash type diagrams by intersection.

3.1.2 Crash Summary

Crash data was analyzed for the most recent five years available, 2011-2015. **Table 3-1** summarizes intersection crash rates along the evaluation corridor. As shown, a total of 99 crashes have occurred over the five-year study period, with half of them occurring at the US 2/Mn 220 intersection.

Table 3-1. Intersection Crash Rate Summary (2011-2015)

Intersection	Traffic Control	Total Crashes[1]	Total Entering Volume[2]	Crash Rate per MEV	State Average Crash Rate[3]	Crash Critical Rate[4, 5]	Crash Severity Rate[6]	State Average Severity Rate[3]	Crash Severity Critical Rate[4, 5]	K/A Crashes	K/A Rate	State Average K/A Rate	K/A Critical Rate[4, 5]
Mn 220 at 9th Street	Urban Through-Stop	2	16,005,250	0.12	0.18	0.48	0.19	0.26	0.45	0	0.00	0.33	5.29
Mn 220 at 10th Street	Urban Through-Stop	7	20,412,625	**0.34**	0.18	0.45	**0.34**	0.26	0.43	0	0.00	0.33	4.41
Mn 220 at US 2	Low Volume, Low Speed	49	38,446,667	**1.27**	0.52	0.83	**1.90**	0.71	0.90	1	**2.60**	0.42	3.06
Mn 220 at 14th Street	Low Volume, Low Speed	18	25,565,208	**0.70**	0.52	0.91	**0.94**	0.71	0.94	1	**3.91**	0.42	4.02
Mn 220 at 15th Street	Urban Through-Stop	2	18,645,417	0.11	0.18	0.46	0.11	0.26	0.44	0	0.00	0.33	4.72
Mn 220 at 17th Street	Urban Through-Stop	13	18,417,292	**0.71**	0.18	0.46	**0.81**	0.26	0.44	0	0.00	0.33	4.76
Mn 220 at 20th Street	Urban Through-Stop	2	13,206,917	0.15	0.18	0.52	0.15	0.26	0.48	0	0.00	0.33	6.14
Mn 220 at 23rd Street	Urban Through-Stop	6	11,193,333	**0.54**	0.18	0.55	**0.80**	0.26	0.50	0	0.00	0.33	7.00
Mn 220 at 140th Street	Rural Through-Stop	0	6,588,250	0.00	0.25	0.83	0.00	0.41	0.81	0	0.00	1.05	13.76

[1] Crash Data obtained from MnCMAT and detailed police crash reports.
[2] AADT obtained from MnDOT Traffic Data Map
[3] MnDOT's 2015 Green Sheets were used to determine the State average crash rate.
[4] The critical rate is a statistically adjusted crash rate to account for random nature of crashes
[5] A 99.5% confidence level was assumed for critical crash rate and an 80% confidence level was assumed for critical severity and K/A rate.
[6] Severity rate factors: 5 for Fatal Crashes, 4 for A type, 3 for B type, 2 for C type, and 1 for Property Damage Crashes

Two intersections along Mn 220 have calculated crash rates (CR) above the critical rate:

- US 2 at Mn 220 (CR of 1.27 vs. 0.83)
- Mn 220 at 17th Street (CR of 0.71 vs. 0.46)

Three intersections along Mn 220 have calculated crash severity rates (SR) above the critical rate:

- US 2 at Mn 220 (SR of 1.9 vs. 0.9)
- Mn 220 at 17th Street (SR of 0.81 vs. 0.44)
- Mn 220 at 23rd Street (SR of 0.8 vs 0.50)

While the Mn 220 at 10th Street NE intersection does not have crash rates above the critical rate, the crash rate and crash severity rate are both above state average for an urban through-stop (CR of 0.34 and SR of 0.34). None of the intersections along the corridor have K/A (Fatal / Incapacitating Injury) rates above critical, but the US 2 at Mn 220 and Mn 220 at 14th Street intersections have K/A rates above the state average for low volume, low speed signalized intersections (K/A rate of 2.6 and 3.9 respectively). However, this statistic can be a little misleading as both intersections only recorded one Type A crash each. Without these crashes their K/A rate would be zero; therefore, these occurrences are under-represented. **Figure 3-1** illustrates the existing crash hot spot locations and crash type diagrams by intersection.

3.1.3 Pedestrian and Bicycle Crash Summary

There were no pedestrian-related crashes reported during the study period. Bicycle-related crashes are also denoted in **Figure 3-1**. The following intersections had bicycle-related crashes:

- DeMers Avenue at 10th Street (1 bicycle crash)
- US 2 at Mn 220 (1 bicycle crash)
- Mn 220 at 14th Street (1 bicycle crash)

Detailed crash reports regarding these crashes were not available, so the contributing factors are unclear in most cases. However, it is quite clear that crashes involving non-motorized traffic is occurring in the southern, more urban, section of the corridor.

3.1.4 Corridor Performance Measures

The Safety Performance Measures (PM) Final Rule also establishes the process for State Departments of Transportation (DOTs) and Metropolitan Planning Organizations (MPOs) to establish and report their safety targets, and the process that FHWA will use to assess whether State DOTs have met or made significant progress toward meeting their safety targets. The following summarizes the key corridor safety PM's for 2011-2015 five-year period.

- **Number of Traffic Fatalities.** There have been zero reported fatalities for the Mn 220 corridor.
- **Traffic Fatality Rate.** Rate is 0.0, since there have been no reported fatalities during the study period.

- **Number of Crash Related Serious Injuries.** The total number of serious crashes (Type A) reported is 2. One each at Mn 220/14th Street and US 2. The five-year rolling average for the corridor is 0.4 Type A crashes per year.
- **Serious Injury Rate.** The traffic related serious injury rate per 100 million vehicle miles traveled was found to be 15.46. For 2018, the region established a target of 5.93 or lower.
- **Number of Non-Motorized Fatalities and Serious Injuries**. Three non-motorized crashes were found for the last five-year period (0.6 per year). Of these crashes, none were reported to be of serious injury or fatality.

3.1.5 Crash Hot Spot Analysis

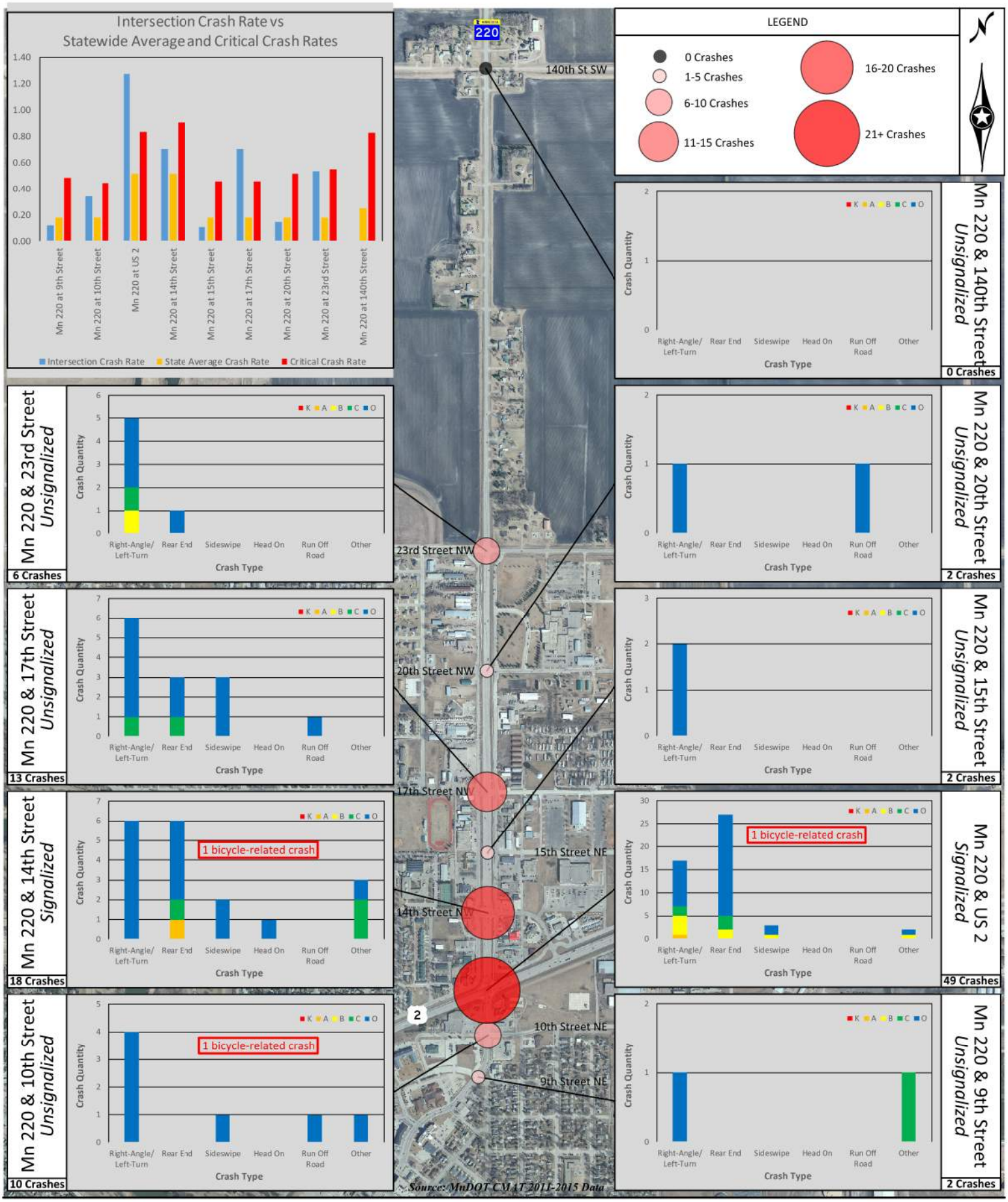
Understanding crash patterns is key to identifying contributing factors and the appropriate countermeasures to address the deficiencies Based on the observed crash, severity and characteristics of crashes observed, intersection hot spot analyses were completed for the following intersections

- DeMers Avenue at 10th Street NE
- US 2 at Mn 220
- Mn 220 at 14th Street NW
- Mn 220 at 17th Street NW
- Mn 220 at 23rd Street NW

The hot spot analyses are summarized in **Table 3-2** through **Table 3-6**, below and on the following pages.

Table 3-2. DeMers Avenue at 10th Street NE Hot Spot Analysis

Metric	Description
Crash Rate	0.34 exceeds statewide average 0.18
Severity Rate	0.34 exceeds statewide average 0.26
Summary	7 crashes during the 2011-2015 time period. Four of these crashes were right angle or left turn related (57%). One of the recorded right-angle crashes was actually a bicycle making a right turn into traffic and being struck.
Crash Type Observations	•3 of the 4 right angles involved eastbound motorists failing to yield right of way. Two of those 3 crashes the eastbound motorist collided with a westbound 10th Street motorist. Only 1 crash involved a right angle with a motorist on DeMers Avenue. •1 side swipe crash was recorded for the southbound direction, likely attributed to the lane merge located in the intersection vicinity.
At Fault Motorist Age	29% younger than age of 25 14% older than age 60
Other Factors	2 to 1 lane transition at intersection



Mn 220 N Corridor Study

Figure 3-1

Crash Hot Spot Locations and Crash Type Diagrams

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Table 3-3. US 2 at Mn 220 Hot Spot Analysis

Metric	Description
Crash Rate	1.27 exceeds critical rate of 0.83
Severity Rate	1.90 exceeds critical rate of 0.90
Summary	49 crashes during the 2011-2015 time period. Of these, 17 (35%) were right-angle or involved left-turns. 26 of the 49 crashes (53%) were rear-end crashes. Although the 26 crashes appear to be significant, this number is similar to the expected crash percentage of total crashes experienced statewide at signalized intersections.
Crash Type Observations	•9 of the 17 right-angle/left-turn crashes involved a motorist making a left turn movement. •8 of the 9 left-turn crashes involved a left-turning motorist on the east or west leg failing to yield on a permissive green ball. 50% (4) of these involved an eastbound left turn motorist failing to yield the right of way. Two involved a westbound motorist failing to yield the right of way. One involved an eastbound motorist running the red light, presumably striking a westbound motorist turning on the green arrow. The last crash had unknown details. •1 of the 9 left turn crashes involved a southbound motorist striking a westbound through vehicle. Details are unknown. •8 right angle crashes occurred. Four of the 8 involved a southbound motorist failing to yield (running the red light). The other four occurred on each of the remaining three approaches. •4 of the 26 rear end crashes were denoted as occurring on the right turn channelized islands. The crash records indicate that an additional 16 of the 26 may also be related to right turn movements; however, the information isn't clear enough to make this determination.
At Fault Motorist Age	37% younger than age of 25 8% older than age 60
Other Factors	• Intersection skew • Cross product of left turning motorists versus opposing through vehicles • lateral left turn lane alignment • high speed channelized right turn movements resulting in poor visibility • Signal timing and signal head placement

Table 3-4. Mn 220 at 14th Street NW Hot Spot Analysis

Metric	Description
Crash Rate	0.70 exceeds statewide average rate of 0.52
Severity Rate	0.94 exceeds statewide average rate of 0.71
Summary	18 crashes during the five year study period. Of these, the predominate crash types included 6 (33%) right-angle/left-turns and 6 rear end (33%)
Crash Type Observations	•3 of the 6 rear end crashes involved southbound motorists, 2 were northbound (during AM school arrival) and 1 westbound. The factors largely involved vehicles stopped in traffic, following too closely, in the case of the westbound motorist, sun in the eyes. •3 of the 6 right angle crashes found eastbound motorists failing to yield and being struck by southbound or northbound vehicles. Two involved northbound motorists failing to yield and 1 crash involved a westbound left turn motorists colliding with an eastbound through vehicle. •No particular trend in time of day was noted; however, 50% of the crashes occurred on wet, snow or ice packed roadway surface.
At Fault Motorist Age	33% younger than age of 25 22% older than age 60
Other Factors	None Noted

Table 3-5. Mn 220 at 17th Street NW Hot Spot Analysis

Metric	Description
Crash Rate	0.71 exceeds critical rate of 0.46
Severity Rate	0.81 exceeds critical rate of 0.44
Summary	13 crashes during the 2011-2015 time period. Of these, 6 (46%) were right-angle or involved left-turns
Crash Type Observations	•4 of the 6 right-angle/left-turn involved an eastbound motorist failing to yield. Two of these involved southbound motorists and two involved northbound motorists. •1 of the 6 involved a westbound motorist being struck by a northbound vehicle. •1 of the 6 involved a northbound left turn motorist failing to yield right of way to a southbound vehicle. •3 sideswipe crashes were reported. One of these involved a chemically impaired motorist. The other two involved two eastbound motorists attempting to make right turns onto Mn 220 and colliding. •Nearly all crashes were reported on weekdays between 9 a.m. and 5 p.m., with 38% of them occuring between 9-10 a.m.
At Fault Motorist Age	23% younger than age of 25 8% older than age 60
Other Factors	None Noted

Table 3-6. Mn 220 at 23rd Street NW Hot Spot Analysis

Metric	Description
Crash Rate	0.54 exceeds statewide average rate of 0.18
Severity Rate	0.80 exceeds critical rate of 0.50
Summary	6 crashes during the 2011-2015 time period. Of these, 5 (83%) were right-angle or involved left-turns
Crash Type Observations	• 3 of the 5 right angle/left turn crashes involved a westbound motorist failing to yield the right of way and turning into a southbound motorist. • 2 of the 5 right angle/left turn crashes involved a southbound left turn motorist failing to yield the right of way to a northbound through vehicle. • 5 of the 6 crashes occurred between 730 a.m. and 1100 a.m.
At Fault Motorist Age	33% younger than age of 25 16% older than age 60
Other Factors	None Noted

3.2 Mobility

Preserving and improving mobility of Mn 220 is an important priority and goal for the study. An assessment of the existing quality of mobility (traffic operations) for the corridor and intersections was completed. The quality of traffic flow and mobility is measured using Level of Service (LOS) methodology. LOS analysis was performed for the study area for each of the study design years (existing, 2030 and 2045). The discussion of the capacity including LOS is included in the following sections.

3.2.1 Level of Service Methodology

The concept of LOS is a method to estimate the quality of traffic flow through intersections and along roadway segments. In general, the capacity of a street is a measure of its ability to accommodate a certain volume of moving vehicles. Typically, street capacity refers to the maximum number of vehicles that can be expected to be accommodated in a given time period under the prevailing roadway characteristics and conditions. The LOS methodology is standardized by the Transportation Research Board (TRB) and is applied uniformly regardless of jurisdictional boundaries. The method uses algorithms that are based on delay and driver expectations of acceptable delay or traffic flow to assign a LOS grade.

LOS results are categorized on a LOS A to LOS F scale. LOS A represents high quality traffic operations where motorists experience little or no delay (i.e. free flow conditions). Conversely, LOS F corresponds to low quality operations with significant delays and potentially congestion.

The LOS grade for an intersection as a whole is based on the weighted average delay of each movement. The delays can vary greatly based on traffic volume, lane geometry, and intersection traffic control (e.g. traffic signal, through-stop, all-way-stop). Grades are different at unsignalized and signalized intersections; due to drivers anticipating longer delays at signalized intersections.

Although the measure of effectiveness used in determining LOS for each facility (e.g. arterial street vs. rural highway vs. signalized intersection) may differ, the concept of the LOS grade is the same. The general relationship between capacity and LOS is displayed in **Table 3-7**.

Table 3-7. Level of Service

LOS	Description	Facility Type	Signalized Intersection	Un-Signalized Intersection	Urban Street LOS	
		Volume to Capacity Ratio	Intersection Delay (Seconds / Vehicle)	Intersection Delay (Seconds / Vehicle)	Average Travel Speed (mph)	
					Base Speed (45 mph)	Base Speed (30 mph)
A	**Free Flow.** Low volumes and no delays.	0 - 0.6	0 - 10	0 - 10	>36	>24
B	**Stable Flow.** Speeds restricted by travel conditions, minor delays.	0.61 - 0.7	>10 - 20	>10 - 15	>30	>20
C	**Stable Flow.** Speeds and maneuverability closely controlled due to higher volumes.	0.71 - 0.8	>20 - 35	>15 - 25	>23	>15
D	**Stable Flow.** Speeds considerably affected by change in operating conditions. High density traffic restricts maneuverability, volume near capacity.	0.81 - 0.91	>35 - 55	>25 - 35	>18	>12
E	**Unstable Flow.** Low speeds, considerable delay, volume at or slightly over capacity.	0.91 - 1.00	>55 - 80	>35 - 50	>14	>9
F	**Forced Flow.** Very low speeds, volumes exceed capacity, long delays with stop and go traffic.	> 1.0	> 80	> 50	<=14	<=9

Source:
1. Highway Capacity Manual, 6th Edition (Published 2016), Transportation Research Board, Exhibit 18-1 for Signalized Intersections, Exhibit 19-8 for Un-Signalized Intersections, and Exhibit 16-3 for Urban Street Facilities.
2. Transportation Research Board (TRB), Highway Capacity Manual, Special Report 209

3.2.2 Planning Level Analysis of Capacity by Facility Type

The Mn 220 corridor consists of a varying typical section and design type within the study area. Most of the urban design area (9th Street to just 23rd Street) is a four-lane roadway with only two traffic signals. North of 23rd Street follows a rural design with two lanes and no traffic control devices to interrupt the mainline traffic flow. An assessment was completed to determine whether the current lane facilities will be enough to accommodate the future traffic volumes or if additional travel lanes may be required. The assessment is a planning level analysis that compares the existing and forecast daily traffic volumes (AADT) against estimated capacity thresholds for various facility types. **Figure 3-2** illustrates this comparison.

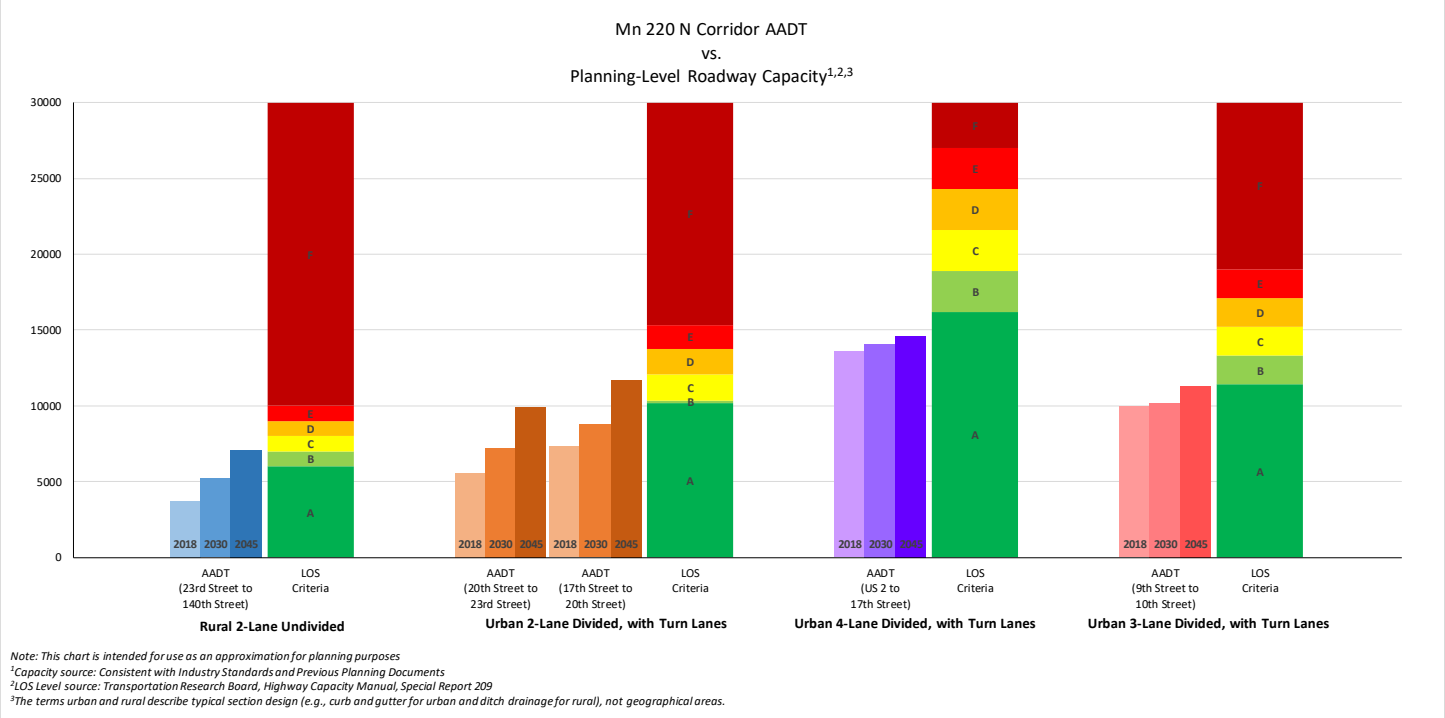


Figure 3-2. Corridor Capacity Assessment by Facility Type

As shown in **Figure 3-2**, the forecast daily traffic volumes for each corridor segment are well within the available capacity of the facility type. Absent the installation of any new traffic control devices that would interrupt traffic flow on Mn 220, the existing typical cross-section roadway design has excess capacity. North of 23rd Street, the forecast 2045 AADT suggest that the addition of turn lanes is likely appropriate.

3.2.3 Arterial and Intersection Performance

To understand the benefit of improvements that will be developed, a baseline must be established for comparison. This "No Build" analysis was completed for existing conditions and forecasted 2030 and 2045 volumes with applicable planned improvements identified in Section 2. **Table 3-8** and **Table 3-9** summarize the arterial performance of the Mn 220 corridor over the existing and future analysis years for the a.m. and p.m. peak hours, respectively.

Table 3-8. Arterial Performance Summary – AM Peak Hour

Direction	Segment	Base FFS (mph)	2018 Existing		2030 Forecast		2045 Forecast	
			Average Speed (mph)	LOS	Average Speed (mph)	LOS	Average Speed (mph)	LOS
Northbound	9th Street NE to 17th Street NW	30	19.2	C	18.9	C	18.1	C
	17th Street NW to 23rd Street NW	45	41.8	A	42.0	A	41.9	A
	23rd Street NWto 140th Street SW	45	46.8	A	46.3	A	45.2	A
Southbound	140th Street SW to 23rd Street NW	45	44.3	A	43.4	A	42.4	A
	23rd Street NW to 17th Street NW	45	43.0	A	42.7	A	43.0	A
	17th Street NW to 9th Street NE	30	19.5	C	19.2	C	18.1	C

Table 3-9. Arterial Performance Summary – PM Peak Hour

Direction	Segment	Base FFS (mph)	2018 Existing		2030 Forecast		2045 Forecast	
			Average Speed (mph)	LOS	Average Speed (mph)	LOS	Average Speed (mph)	LOS
Northbound	9th Street NE to 17th Street NW	30	19.8	C	19.4	C	18.4	C
	17th Street NW to 23rd Street NW	45	41.1	A	40.5	A	41.7	A
	23rd Street NWto 140th Street SW	45	45.3	A	44.6	A	43.5	A
Southbound	140th Street SW to 23rd Street NW	45	44.5	A	44.6	A	43.7	A
	23rd Street NW to 17th Street NW	45	42.3	A	42.7	A	41.3	A
	17th Street NW to 9th Street NE	30	18.1	C	17.2	C	14.3	D

Table 3-10 and **Table 3-11** summarize the overall intersection and worst performing movement delay and associated LOS for the existing, forecast 2030 and forecast 2045 a.m. and p.m. peak hours. Unsignalized intersections with high volume mainlines will frequently perform at an overall LOS A while their side-street through and left-turn movements perform at a significantly lower LOS. This occurs because mainline traffic does not stop (i.e. little to no delay) and overall LOS is the average delay of all vehicles using the intersection. Some motorists, especially on the side-street, are likely to experience much longer delays.

Table 3-10. Intersection Delay and LOS Summary —AM Peak Hour

Intersection Name	Control	MOE	2018 Existing	2030 Forecast	2045 Forecast
Mn 220 at 140th Street SW	Side-Street Stop	Delay/Veh	1.3 / 5.7	2.1 / 11.1	2.3 / 13.0
		LOS	A A	A B	A B
Mn 220 at 23rd Street NW	Side-Street Stop	Delay/Veh	2.6 / 10.0	3.5 / 10.8	5.8 / 17.3
		LOS	A A	A B	A C
Mn 220 at 20th Street NW	Side-Street Stop	Delay/Veh	1.3 / 9.5	1.6 / 11.7	2.3 / 17.7
		LOS	A A	A B	A C
Mn 220 at 17th Street NW	Side-Street Stop	Delay/Veh	2.6 / 18.1	3.1 / 23.7	4.2 / 44.5
		LOS	A C	A C	A E
Mn 220 at 15th Street NW	Side-Street Stop	Delay/Veh	1.6 / 11.6	2.0 / 14.6	1.7 / 12.5
		LOS	A B	A B	A B
Mn 220 at 14th Street NW	Signalized	Delay/Veh	10.3	10.2	9.2
		LOS	B	B	A
US 2 at Mn 220	Signalized	Delay/Veh	19.3	22.8	37.9
		LOS	B	C	D
Mn 220 at 10th Street NE	Side-Street Stop	Delay/Veh	2.9 / 20.5	3.2 / 24.2	4.2 / 32.8
		LOS	A C	A C	A D
Mn 220 at 9th Street NE	Side-Street Stop	Delay/Veh	2.8 / 11.8	2.8 / 12.7	4.8 / 22.2
		LOS	A B	A B	A C

Table 3-11. Intersection Delay and LOS Summary —PM Peak Hour

Intersection Name	Control	MOE	2018 Existing	2030 No Build	2045 No Build
Mn 220 at 140th Street SW	Side-Street Stop	Delay/Veh	2.3 / 6.1	3.0 / 7.5	4.1 / 7.6
		LOS	A A	A A	A A
Mn 220 at 23rd Street NW	Side-Street Stop	Delay/Veh	2.6 / 8.7	3.6 / 10.9	7.0 / 24.3
		LOS	A A	A B	A C
Mn 220 at 20th Street NW	Side-Street Stop	Delay/Veh	2.0 / 11.4	2.6 / 17.0	4.1 / 26.4
		LOS	A B	A C	A D
Mn 220 at 17th Street NW	Side-Street Stop	Delay/Veh	2.8 / 22.5	3.4 / 27.5	11.7 / 139.4
		LOS	A C	A D	B F
Mn 220 at 15th Street NW	Side-Street Stop	Delay/Veh	1.9 / 13.8	2.3 / 19.4	2.4 / 19.3
		LOS	A B	A C	A C
Mn 220 at 14th Street NW	Signalized	Delay/Veh	11.3	11.8	11.6
		LOS	B	B	B
US 2 at Mn 220	Signalized	Delay/Veh	20.2	25.1	44.8
		LOS	C	C	D
Mn 220 at 10th Street NE	Side-Street Stop	Delay/Veh	4.5 / 25.1	5.5 / 29.1	7.8 / 52.2
		LOS	A D	A D	A F
Mn 220 at 9th Street NE	Side-Street Stop	Delay/Veh	1.4 / 20.8	1.5 / 26.7	1.7 / 38.5
		LOS	A C	A D	A E

Note:
(## / ##) = Overall Intersection Delay / Worst Stop Sign Approach Delay

3.2.4 Traffic Operations Analysis Summary

The corridor level traffic operation analysis makes the following conclusions:

- The planning level analysis of the corridor AADT found the existing roadway typical cross-section design to be appropriate lane sizing for the forecast AADT with the corridor expected to have excess capacity into the future.
- The segment of Mn 220 north of 23rd Street is likely to warrant the addition of turn lanes at key locations to maintain optimal mobility and safety of a two-lane rural design. This may suggest a three-lane cross-section will be an appropriate future alternative.
- The urban arterial performance analysis found the corridor is expected to operate at either free-flow or stable-flow depending on the area and time of day. This is largely due in part to the fact there are no interruptions for mainline Mn 220 motorists north of 14th Street. The analysis confirms the planning level evaluation that there is expected to be excess lane capacity along Mn 220 into the future.

On an intersection level, the traffic operation analysis found the following:

- Under the current existing year traffic volumes all intersections operate at LOS C or better during the a.m. and p.m. peak periods. This is not to say there aren't very short periods of higher delay and queueing that correlate with school arrival and exiting time periods; however, on average operate acceptably.
- Under the forecast 2030 horizon, all intersections are expected to operate at an acceptable LOS C or better, with exception to the 17th Street and 10th Street NE intersections. The westbound stopped approach at 17th Street and the westbound stopped approach at 10th Street NE are expected to operate at a LOS D.
- Under the forecast 2045 horizon all intersections are expected to operate at an acceptable LOS C or better, with exception to the following:
    - The US 2 at Mn 220 intersection is expected to degrade to LOS D during both the a.m. and p.m. peak hours. The eastbound left turn movement and southbound through movement (unbalanced lane utilization resulting from the downstream lane drop) are expected to contribute to much of this delay.
    - During the p.m. peak hour, there is expected to be significant delay (LOS E) for westbound left turns at 10th Street NE.
    - Westbound left turns at 17th Street are expected to degrade to LOS E during the a.m. peak hour and at LOS F during the p.m. peak hour.

3.3 Transit System Performance

The GF-EGF recently completed the Transit Development Plan[7] (TDP) for the metropolitan region. Transit service within the Mn 220 corridor operates at acceptable LOS at intersections (comparable to motor vehicles) as limited congestion exists or is projected for the major movements along the transit routes. Over the route, the existing transit LOS may be defined by

[7] Transit Development Plan, July 2017

frequency, on time performance and relative travel time comparison between major destinations versus traveling in a motor vehicle. Specific evaluation specific to Routes 3/4, 6/7 and 12 are not provided in the TDP. However, on average, the transit system routes operate at approximately 82 percent on time (LOS D), and 30-minute headways for Route 3 (LOS D) to 60-minute headways for all other region routes (LOS F). In general, the transit system routes within the region take about three times longer to reach major destinations in comparison to traveling via motor vehicle (LOS C to LOS D).

3.4 Bicycle and Pedestrian Mobility

Bicycle and pedestrian mobility can be defined in the form of perceived comfort and accessibility, measured in terms of Level of Stress (LTS)[8]. The LTS is a rating given to a road segment or crossing indicating the traffic stress it imposes on bicyclists or pedestrians. Levels of traffic stress range from 1 to 4:

- LTS 1: Strong separation from all except low speed, low volume traffic. Simple crossings.
- LTS 2: Except in low speed / low volume traffic situations, cyclists have their own place to ride that keeps them from having to interact with traffic except at formal crossings. Physical separation from higher speed and multilane traffic. Crossings that are easy for an adult to negotiate.
- LTS 3: Involves interaction with moderate speed or multilane traffic, or close proximity to higher speed traffic.
- LTS 4: Involves interaction with higher speed traffic or close proximity to high speed traffic. Difficult intersections to cross.

The LTS evaluation is a high-level measurement that can provide the MPO a useful tool to identify and prioritize roadway segments and intersection crossings throughout the region. **Table 3-12** highlights the LTS evaluation for the Mn 220 corridor and the major intersection crossings.

[8] Level of Traffic Stress, Northeastern University, Peter G. Furth

Table 3-12. Mn 220 Bicycle and Pedestrian Level of Stress Evaluation

Segment or Intersection Crossing	Width of Crossing	Control Type	Level of Traffic Stress (1)	Notes
Segment				
Mn 220 - US 2 to 23rd Street			**LTS 1**	Multi use Trail separated from traffic
Intersection Crossing				
Mn 220 at 9th Street NE	3-Lane	Unsignalized	**LTS 1**	
Mn 220 at 10th Street NE	4-Lane	Unsignalized	**LTS 2**	
US 2 at Mn 220	NA	Traffic Signal	**LTS 1**	Pedestrian crossing indications
Mn 220 at 14th Street	NA	Traffic Signal	**LTS 1**	Pedestrian crossing indications
Mn 220 at 15th Street	5-Lane	Unsignalized	**LTS 2**	Tee configuration
Mn 220 at 17th Street	5-Lane	Unsignalized	**LTS 4**	Speed Limit change to 45 mph
Mn 220 at 20th Street	3-Lane	Unsignalized	**LTS 3**	High Speed
Mn 220 at 23rd Street	3-Lane	Unsignalized	**LTS 3**	High Speed
Mn 220 at 140th Street	2-Lane	Unsignalized	**LTS 3**	High Speed

Source: Level of Traffic Stress Criteria, Northeastern University, Peter G. Furth, Table 1 and Table 6

4. Purpose and Need

According to 23 CFR 450 Appendix A, the transportation planning process is the primary source of a project purpose and need. A vision for the transportation system and goals for achieving that vision are typically developed through the planning process and can be used to develop a purpose and need for a project that frames the scope of the problem to be addressed. The purpose and need statement identified within this study can be carried into or refined for future NEPA documentation during project development (if applicable).

4.1 Project Purpose

The purpose of the Mn 220 Corridor Study is to identify existing and future transportation issues within the study corridor and develop project alternatives to address them. Transportation issues may include capacity deficiencies, current or future transportation demands, social or economic demands, model interrelationships, safety and roadway deficiencies.

4.2 Project Need

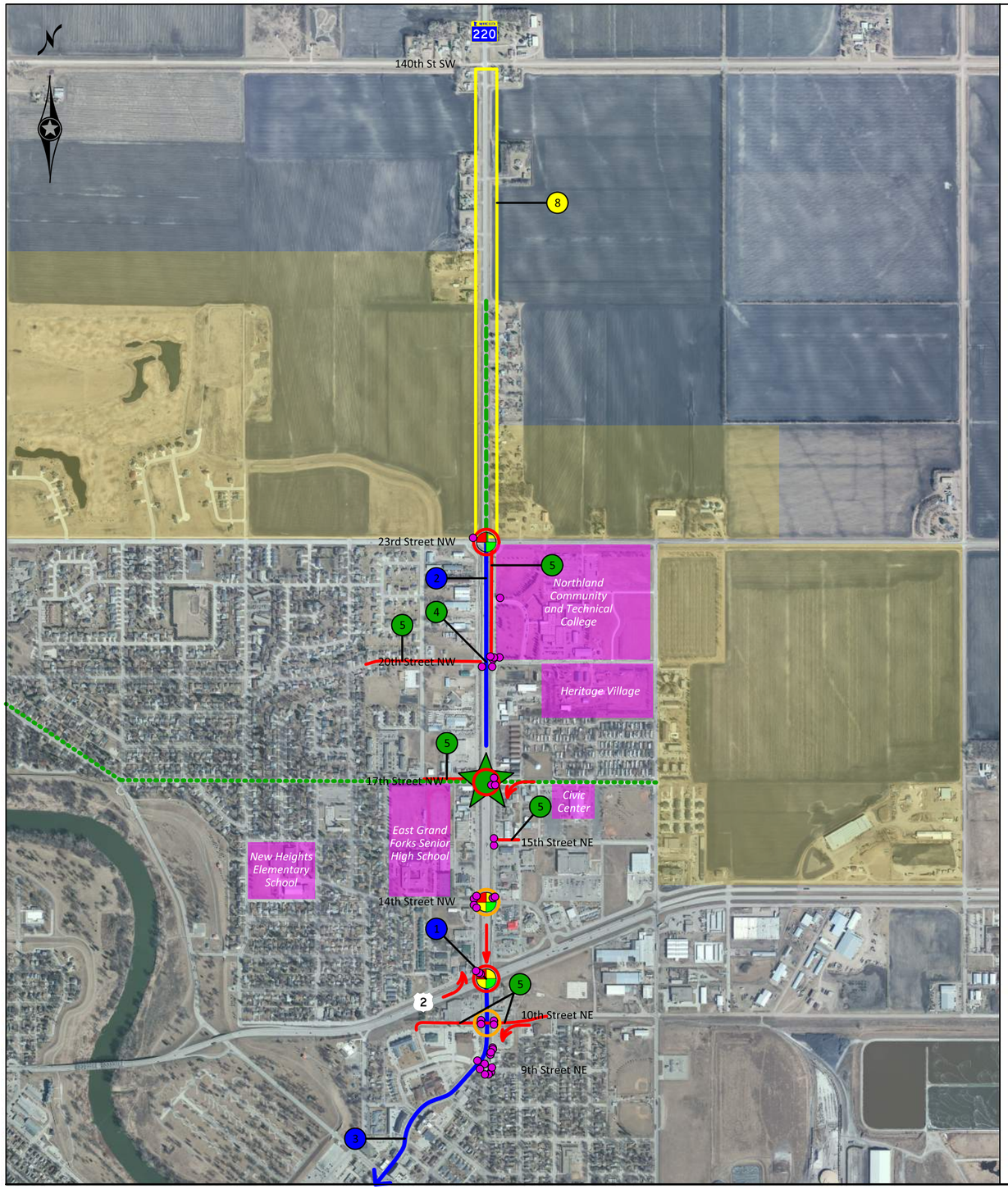
The analysis of existing and future conditions throughout the Mn 220 study corridor has identified numerous needs/deficiencies that either currently exist or are expected to develop based on future traffic projections. **Table 4-1** summarizes the key deficiencies and needs identified throughout the study corridor with respect to the Federal Highway Administration (FHWA) NEPA transportation decision making process. **Figure 4-1** graphically illustrates the corridor needs.

Table 4-1. Mn 220 Corridor Needs

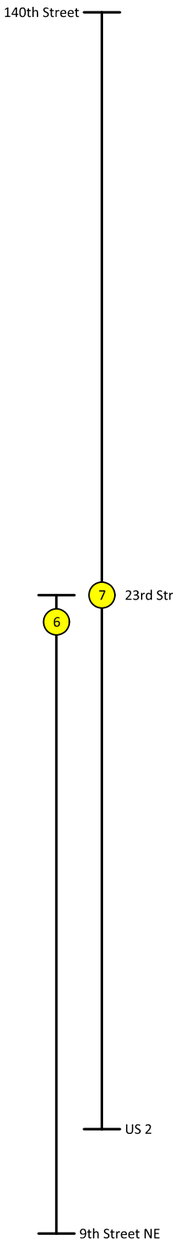
FHWA Purpose and Need Guidelines	Functional Area	Specific Needs Within Functional Area
Capacity	Mn 220 at 10th Street NE	**o** During the p.m. peak hour, the westbound stopped approach is expected to operate at a LOS D by year 2030 and a LOS E by year 2045
	US 2 at Mn 220	**o** The US 2 at Mn 220 intersection is expected to degrade to LOS D during both the a.m. and p.m. peak hours by year 2045. The eastbound left turn movement and southbound through movement (unbalanced lane utilization resulting from the downstream lane drop) are expected to contribute to much of this delay
	Mn 220 at 17th Street	**o** The westbound stopped approach is expected to operate at a LOS D by year 2030 and a LOS E (a.m. peak hour) and LOS F (p.m. peak hour) by year 2045
Transportation Demand	US 2 at Mn 220	**o** A previously identified project has been included in the Grand Forks-East Grand Forks 2045 MTP to provide right turn/merge geometric modifications and signal timing improvements
	Mn 220 - 17th Street to 23rd Street	**o** The 2045 MTP identifies an illustrative project to extend the 4-lane to 2-lane transition to 23rd Street, add a multiuse trail for 1/2 mile north of 23rd Street, and to install a traffic signal system at 23rd Street
	DeMers Avenue - US 2 to Kennedy Bridge	**o** The 2045 MTP identifies an illustrative project to reconstruct DeMers Avenue. DeMers is a potential turnback corridor on the National Highway System and has been identified by Greater MN Mobility as a mobility need
Social or Economic Demand	Corridor Wide	**o** Significant growth is anticipated in the northern and northeastern areas of East Grand Forks. Improving the quality of access to Mn 220, improving mobility and improving safety at key intersections is expected to benefit area businesses and provide for redevelopment and economic growth.
Modal Interrelationships	Corridor Wide	**o** There are 33 pedestrian ramps (60%) that are not compliant with current ADA design standards.
	Mn 220 - 17th Street to 23rd Street	o The motor vehicle speeds and crossing distance results in an uncomfortable experience and difficulty for pedestrians and bicyclists
	Mn 220 at 20th Street	**o** There is a gap in the sidewalk system between Mn 220 and 5th Avenue NW, which limits the pedestrian neighborhood connectivity to Mn 220 corridor o There is no sidewalk between 20th Street NE and 23rd Street NE on the east side of Mn 220. Pedestrians must cross Mn 220 to continue north/south connectivity.
	Mn 220 at 17th Street	**o** There is a gap in the sidewalk system between Mn 220 and 5th Avenue NW, which limits the pedestrian neighborhood connectivity to Mn 220 corridor. o This intersection is a preferred crossing point for access to the area schools west of Mn 220. o A future bicycle route is planned for 17th Street NW/NE and will cross Mn 220
	Mn 220 at 15th Street	**o** There is a gap in the sidewalk system between Mn 220 and 2nd Avenue NE, which limits the pedestrian neighborhood connectivity to Mn 220 corridor
	DeMers Avenue at 10th Street NE	**o** There are no sidewalks along 10th Street NE on either side of DeMers Avenue, which limits the pedestrian neighborhood connectivity to Mn 220 corridor

Table 4-1. Mn 220 Corridor Needs Continued

FHWA Purpose and Need Guidelines	Functional Area	Specific Needs Within Functional Area
Safety	Mn 220 at 10th Street NE	**o** There have been 7 crashes over the past 5 year study period. Four of these crashes were right angle or left turn related (57%). The crash rate (0.34) e**xceeds the state average (0.18) and severity rate (0.34) exceeds the state average (0.26)**. 75% of the right angles involved eastbound motorists failing to yield and colliding with westbound 10th Street motorists. 1 crash involved a southbound sideswipe at the lane drop.
	US 2 at Mn 220	**o** There have been 49 crashes during the past 5 year time period (2011-2015). Of these, 17 (35%) were right-angle or involved left-turns. 26 of the 49 crashes (53%) were rear-end crashes. Overall, the crash rate (1.27), severity rate (1.90) and K/A rate (2.6) **exceed the critical crash rate (0.83), critical severity rate (0.90) and statewide K/A average rate (0.42)**. Key observations: - 90% of the left turn crashes involved eastbound/westbound motorists - 50% of the right angle crashes involved southbound motorists failing to yield - 15% of the rear end crashes involved right turn motorists on the channelized islands. **o** Contributing intersection design issues include: - Intersection skew - Cross product of left turning motorists versus opposing through vehicles - lateral left turn lane alignment - high speed channelized right turn movements resulting in poor visibility - Signal timing and signal head placement
	Mn 220 at 14th Street	**o** There have been 18 crashes during the five year study period. Of these, the predominate crash types included 6 (33%) right-angle/left-turns and 6 rear end (33%). The crash rate (0.70) **exceeds the state average**. 50% of the right angle crashes involved eastbound motorists failing to yield.
	Mn 220 at 17th Street	**o** There have been 13 crashes during the 2011-2015 time period. Of these, 6 (46%) were right-angle or involved left-turns. Overall, the crash rate (0.71) and severity rate (0.81) **exceeds the critical crash rate (0.46) and critical severity rate (0.44)**. Key observations: - 66% of the right angle crashes involved eastbound motorists failing to yield - Two sideswipe (15% of total crashes) involved eastbound right turn motorists
	Mn 220 at 23rd Street	**o** There have been 6 crashes during the 2011-2015 study period. Of these, 5 (83%) were right-angle or involved left-turns. The crash rate (0.54) **exceeds the state average (0.18) and severity rate (0.80) exceeds the critical rate (0.50)** - 60% of the right angle/left turn crashes involved a westbound motorist failing to yield the right of way and turning into a southbound motorist. - 40% of the right angle/left turn crashes involved a southbound left turn motorist failing to yield the right of way to a northbound through vehicle.
Roadway Deficiencies	Mn 220 - 23rd Street NW to 140th Street SW	**o** Long term changes in land use north of 23rd Street NW and east of Mn 220 are anticipated to result in increased traffic demand along the Mn 220 corridor. The rural 2-lane segment of Mn 220 north of 23rd Street is expected to operate a LOS C. To maintain optimal mobility and safety of a two-lane rural design it is likely to warrant the addition of turn lanes at key locations.
	Mn 220 - US 2 to 140th St SW	**o** MnDOT evaluation of the Mn 220 corridor pavement conditions indicates a Ride Quality Index (RQI) of 2.8, which is given a “fair” rating. MnDOT has completed a full capital project assessment and found that over next 50 years this segment of highway will require a concrete rehabilitation in 2033 and concrete reconstruction in 2058.
	US 2 at Mn 220	**o** The traffic signal system is approximately 15 years old and can be expected to reach the end of their useful life by year 2030.
	Mn 220 at 14th Street	**o** The traffic signal system is approximately 15 years old and can be expected to reach the end of their useful life by year 2030.
	Mn 220 - 9th Street NE to 23rd Street	**o** Current spacing of public street full access intersections do not meet MnDOT access spacing guidelines for Category 5B roadway.
	Mn 220 - 23rd Street to 140th Street SW	**o** Direct private residential access to Mn 220. Future redevelopment of adjacent agricultural land will require access management guidance.



ROADWAY DEFICIENCIES



LEGEND

CAPACITY
- Movement Expected to Reach Unacceptable LOS by 2045

TRANSPORTATION DEMAND
- Potential Future Signal
- Illustrative Reconstruction Project (2045 MTP)

SOCIAL OR ECONOMIC DEMAND
- Key Land Use
- Significant Growth Area (Expected to Impact Corridor)

MODAL INTERRELATIONSHIPS
- Gaps in Sidewalk Connectivity
- Ped Ramp Doesn't Meet Current Standards
- Future Bike Route (Crossing Mn 220)
- Future Multiuse Trail (Along Mn 220)
- Preferred Crossing Point for Area Schools (currently uncomfortable crossing for bikes and peds)

ROADWAY DEFICIENCIES
- Signal System Expected to Reach End of Useful Life by 2030

SAFETY
- Crash Issue (Exceeds Statewide Average)
- Crash Issue (Exceeds Critical Rate)

Notes:

1. Previously identified project to provide right turn/merge modifications and signal timing improvements (*2045 MTP).*
2. Illustrative project to extend 4-lane to 2-lane transition to 23rd Street *(2045 MTP)*
3. Illustrative project to reconstruct DeMers Avenue *(2045 MTP). DeMers Avenue is on National Highway System. Greater Minnesota mobility has identified potential mobility concerns.*
4. Pedestrians must cross roadway to continue north/south connectivity
5. Gap in sidewalk network and accessibility.
6. Current spacing of intersections betwen 9th Street and 23rd Street do not meet MnDOT access spacing guidelines.
7. MnDOT project assessment indicates that this segment will require concrete rehabilitation in 2033 and reconstruction in 2058.
8. Increased traffic demand north of 23rd Street likely to warrant turn lanes at key locations between 23rd Street and 140th Street. Additionally, future redevelopment of adjacent agricultural land will require access management guidance.

Figure 4-1
Corridor Deficiencies and Transportation System Needs

5. Alternatives Analysis and Evaluation

The alternatives development identifies transportation ideas and concepts based upon input from stakeholders and a review of the purpose and needs. From this range of alternatives, a screening evaluation is completed to evaluate each idea against key objectives. This process identifies the alternatives that best meet the project goals and are carried forward for further evaluation. The goal is to arrive at feasible alternatives that best balance and meet the primary objectives of the study, stakeholders and community.

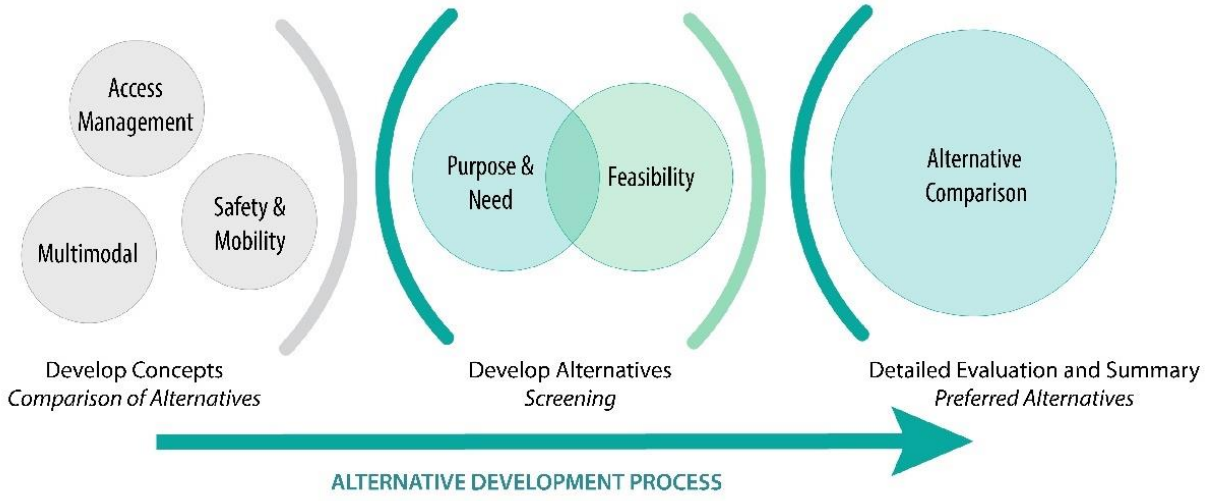


Figure 5-1. Alternatives Analysis Process

5.1 Alternative Identification and Evaluation Considerations

To address identified deficiencies and the purpose and needs for the Mn 220 corridor numerous improvement alternatives were identified to address four primary objectives of the study:

- Improve access control
- Improve safety
- Improve mobility/capacity; and
- Improve pedestrian crossings of Mn 220

The evaluation of the identified alternatives consists of a layered approach that includes:

- Assessing and comparing high level considerations such as key pros/cons, trade-offs and design considerations or fatal flaws;
- Technical analysis of intersection capacity, safety benefits, right of way needs, construction costs and economic viability as applicable (benefit/cost ratio); and
- Qualitative evaluation scoring of key metrics identified in the planning process that are consistent with the Purpose and Need statement and 2045 Metropolitan Transportation Plan (MTP) objectives and performance goals.

The ultimate selection of the preferred alternative(s) or maintaining the no build is the alternative that best meets the corridor objectives; including the combination of assessment of all the considerations, technical analysis, comparison evaluation metrics and public/stakeholder engagement.

5.2 Access / Traffic Control Device Considerations

Three primary forms of traffic control were evaluated at each of the key intersections: through-stop control with access management or geometric improvements, traffic signal, and roundabout. The following sub-sections provide the high-level pros and cons of the preliminary access/traffic control alternatives, as well as an outline of the any necessary capacity/warrant analysis procedures.

5.2.1 Access Management

Access management in most cases would consist of limiting a full-access intersection to a three-quarter access intersection with stop signs on the cross-street. Prohibiting cross-street through and left-turning movements would improve safety by decreasing the number of conflict points and potential for right angle crashes. Intersection operations would be expected to improve as well. The Mn 220 corridor intersections (15th Street NE and 20th Street NW) are good candidates for access management modifications due to the presence of frontage roads and a well-connected supporting street system. Motorists attempting to cross or turn left onto Mn 220 could re-route to a nearby full-access intersection via the closest frontage road. ¾ access configuration at these two locations are being considered for two primary reasons:

- There may be advantage with this design to improving pedestrian crossing treatments and reducing exposure for pedestrians (i.e. improved refuge median design).
- Restricting eastbound/westbound left turn and through movements relocates these motorists to 23rd Street and 17th Street the primary east/west through streets, thereby helping support justification for improved access control at those locations.

5.2.2 Traffic Signal

The two existing traffic signal systems (14th Street NW and US 2) are nearing the end of their useful life and will require replacement. The traffic signal control alternative considers either the full replacement of existing traffic signals, upgraded to present day standards, or the installation of a new signal system at currently stop controlled intersections. Installation of a traffic signal where one is not present may reduce overall crash frequency but may bear an increase in specific crash types such as rear-end and right angle. The benefit or impact of traffic signal installation takes into consideration the change in motor vehicle delays and change in safety performance derived from anticipated changes in crash characteristics. In some cases, the installation of a traffic signal system may provide improved peak hour traffic operation but could result in extra traffic delay during off peak periods. The true cost of a signal system involves a minimum of initial construction, Americans with Disability Act (ADA) pedestrian ramp improvements, ongoing maintenance, and electricity.

The intersections of Mn 220/US 2, 14th Street NW, 17th Street NW and 23rd Street NW are the four locations a traffic signal system may be a feasible alternative. The existing traffic signal systems at 14th Street NW and US 2 are warranted installations. For each intersection where a new traffic signal installation is considered (17th Street NW and 23rd Street NW), a warrant analysis was completed under existing 2018 volume and forecasted years 2030 and 2045 volumes. In addition, a warrant analysis was completed considering the potential for ¾ access configuration at 20th Street NW and 15th Street NE, where left turn and through motorists would be re-routed to these intersections. The warrant analysis was conducted in accordance with the *Minnesota Manual on Uniform Traffic Control Devices* (MnMUTCD)[9] and is summarized in **Table 5-1**.

The warrant analysis indicates that a traffic signal at Mn 220/17th Street NW does not meet warrants until year 2033 (Warrant 2) and year 2038 (Warrant 1) assuming the added left turn and through traffic using 17th Street as the result of the proposed ¾ access configurations at 20th Street NW and 15th Street. Without the proposed ¾ access configurations, a signal system is not expected to meet warrants at 17th Street NW. At 23rd Street, traffic signal warrants are also not satisfied until year 2045, regardless of access configuration at 20th Street.

[9] Minnesota Manual on Uniform Traffic Control Devices, February 2015

Table 5-1. Traffic Signal Warrant Analysis Summary

TH 220 and 17th Street

Scenario	Warrant 1 - Eight Hour Vehicle Volume				Warrant 2 - Four Hour Volume		Warrant 3 - Peak Hour Volume	
	1A (Hours)	1B (Hours)	1A&B (Hours)	Warrant Met / Not Met	Hours	Warrant Met / Not Met	3B (Hours)	Warrant Met / Not Met
Year 2018 Existing (Full Access)	0 Hour	0 Hour	0 Hour	Not Met	0 Hour	Not Met	0 Hour	Not Met
Year 2018 Existing (3/4 Access at Adjacent Intersections)	0 Hour	0 Hour	1 Hour	Not Met	0 Hour	Not Met	0 Hour	Not Met
Year 2030 Existing (Full Access)	0 Hour	0 Hour	0 Hour	Not Met	0 Hour	Not Met	0 Hour	Not Met
Year 2030 Existing (3/4 Access at Adjacent Intersections)	1 Hour	7 Hours	4 Hours	Not Met	2 Hour	Not Met	0 Hour	Not Met
Year 2045 Existing (Full Access)	0 Hour	0 Hour	0 Hour	Not Met	0 Hour	Not Met	0 Hour	Not Met
Year 2045 Existing (3/4 Access at Adjacent Intersections)	4 Hours	10 Hours	7 Hours	Met (1B)	6 Hours	Met	2 Hour	Met

Source: 2011 Minnesota Manual on Uniform Traffic Control Devices

Note: Warrant 2 (Four Hour Volume) expected to be met in year 2033 and Warrant 1B (Eight Hour Volume) is expected to be met in year 2038 with 3/4 access configuration at 20th Street

TH 220 and 23rd Street

Scenario	Warrant 1 - Eight Hour Vehicle Volume				Warrant 2 - Four Hour Volume		Warrant 3 - Peak Hour Volume	
	1A (Hours)	1B (Hours)	1A&B (Hours)	Warrant Met / Not Met	Hours	Warrant Met / Not Met	3B (Hours)	Warrant Met / Not Met
Year 2018 Existing (Full Access)	0 Hour	0 Hour	2 Hours	Not Met	0 Hour	Not Met	0 Hour	Not Met
Year 2018 Existing (3/4 Access at Adjacent Intersections)	0 Hour	0 Hour	2 Hours	Not Met	0 Hour	Not Met	0 Hour	Not Met
Year 2030 Existing (Full Access)	5 Hours	3 Hours	6 Hours	Not Met	2 Hours	Not Met	0 Hour	Not Met
Year 2030 Existing (3/4 Access at Adjacent Intersections)	6 Hours	2 Hours	5 Hours	Not met	3 Hours	Not Met	0 Hours	Not Met
Year 2045 Existing (Full Access)	8 Hours	9 Hours	11 Hours	Met (1A, B, C)	10 Hours	Met	4 Hours	Met
Year 2045 Existing (3/4 Access at Adjacent Intersections)	11 Hours	9 Hours	11 Hours	Met (1A, B, C)	10 Hours	Met	4 Hours	Met

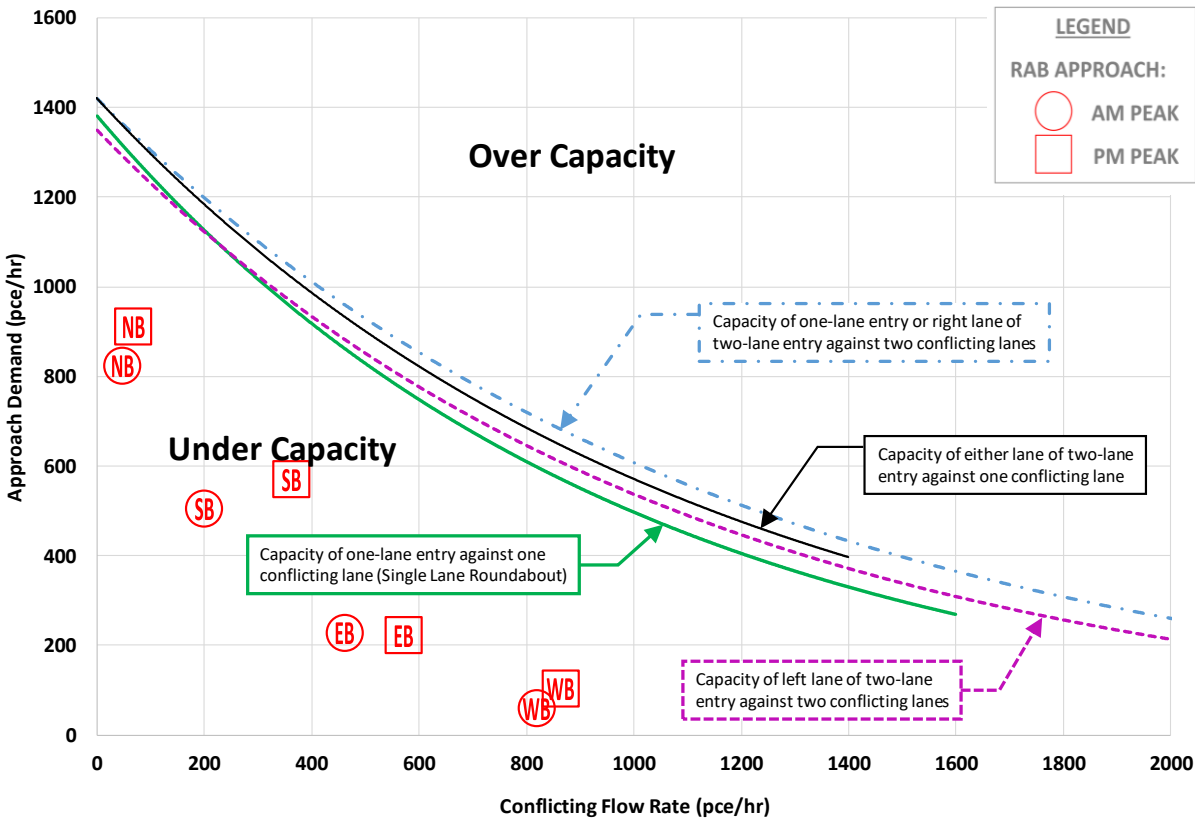
Source: 2011 Minnesota Manual on Uniform Traffic Control Devices

5.2.3 Roundabout

A roundabout would require full intersection reconstruction with a higher initial construction cost. Right of way acquisition may be necessary and may impact existing frontage roads.

Overall, a roundabout is expected to provide high intersection safety performance (minimizes the potential for severe crashes) and with optimal lane configurations provides efficient traffic operations with low motorist delay during all time periods of the day.

For each intersection where a roundabout was considered, a planning-level roundabout capacity analysis was completed under forecasted year 2045 traffic volumes. The analysis was conducted in accordance with the *Highway Capacity Manual* (HCM)[10]. The purpose of the analysis was to determine whether a roundabout (multilane or single-lane) would be a suitable alternative for the intersection. The analysis indicated that a multilane roundabout is needed at US 2 and 14th Street NW, whereas a single lane roundabout is expected to provide sufficient capacity at 17th Street NW and 23rd Street NW. An example planning level roundabout capacity analysis is shown in **Figure 5-2**.



Note: Mn 220 at 17th Street – Forecast Year 2045

Figure 5-2. Planning Level Roundabout Capacity

[10] Highway Capacity Manual, 6th Edition, Transportation Research Board

5.3 Pedestrian Improvement Strategies

To improve pedestrian crossing safety, comfort, and environment, the strategies could range from establishing connections and improving accessibility, improving visibility, reducing exposure, enhancing awareness or providing protection. The implementation of such strategies is dependent upon intersection characteristics but are typically considered in the hierarchy of least restrictive measures first to the most restrictive measures only when warranted. Although there are many treatments that fit into each strategy category, **Table 5-2** illustrates and discusses a few treatments that might be most beneficial to Mn 220. As appropriate, pedestrian crossing treatments are included as part of the intersection improvement alternatives analysis. Truck and agricultural equipment are additional considerations that need to be made in determining the most appropriate improvements by location.

Table 5-2. Pedestrian Improvement Strategies

ADA Ramps

Description	Benefits	Considerations
When expanding/improving a pedestrian network, eliminating gaps in connectivity is recommended. If a sidewalk is added, a curb ramp will help provide an accessible route that people with disabilities can use to safely transition from a roadway to a curbed sidewalk and vice versa.	1. Will establish a connection for pedestrians between streets, schools, regional trails, and parks. 2. Improving pedestrian access to transit routes will improve a multimodal transportation environment.	1. There are currently 33 pedestrian ramps that are not compliant with ADA design standards. 2. It is often difficult or impossible for a person using a wheelchair, scooter, walker, or other mobility device to cross a street if the sidewalk on either side of the street ends without a curb ramp. If curb ramps are not provided, these individuals are forced to make a difficult choice. 3. Gaps in connectivity can be unsafe and reduce access for the elderly and disabled. 4. Follow Americans with Disabilities Act (ADA) design guidelines. 5. Texture patterns must be detectable to visually

High-Visibility Crosswalk Markings

Description	Benefits	Considerations
A marked crosswalk is a type of pavement marking that indicates to pedestrians the recommended location to cross the roadway and also alerts approaching motorists as to where pedestrians may be crossing the street.	1. Providing highly visible crosswalk locations can serve to bring greater attention to the motorist to expect pedestrian activity.	1. Pavement marking material type is important. 2. Design style (i.e., parallel bar, zebra, or other). 3. Note that at uncontrolled intersections without related enhancements, marked crosswalks are unlikely to statistically increase pedestrian safety, however awareness is improved. 4. Frequent maintenance required due to damage caused by snow plows.

Median Refuge Island

Description	Benefits	Considerations
Medians and crossing islands (also known as refuge islands or center islands) are raised areas that are constructed in the center portion of a roadway that can serve as a place of refuge for pedestrians who cross the road mid-block or at an intersection. After crossing to the center island, pedestrians wait for motorists to stop or for an adequate gap in traffic before crossing the second half of the street.	1. Provide a simplified crossing maneuver by allowing pedestrians to concentrate on only one direction of traffic at a time, creating the equivalent of two narrower one-way streets instead of one wide two-way street. 2. Crossing islands may also provide space for landscaping that can be used to change the visual cues of the roadway and reduce driver speeds.	1. Median islands along TH 220 generally exist at all intersections, but are of insufficient width to be considered a safe refuge. 2. Crossing islands may not be appropriate or physically possible at all locations. They may need to be weighed against other roadway features. 3. Crossing islands must be fully accessible by ramps or cut through, and should provide tactile cues for pedestrians with visual impairments to indicate the border between the pedestrian refuge area and the motorized vehicle roadway. 4. Winter maintenance should be considered to keep the pedestrian route clear of snow.

Curb Extensions

Description	Benefits	Considerations
Curb extensions narrow the roadway and reduce crossing distance/vehicle exposure for pedestrians.	1. Curb extensions can improve pedestrian safety by reducing the pedestrian crossing distance and reducing the time that pedestrians are in the street. 2. Drivers are encouraged to reduce speeds because of the restricted street width. 3. Tight curb radii result in slower running speeds. 4. The reduction in the street cross-section	1. The turning needs of larger vehicles such as trucks and school buses need to be considered in the design of curb extensions. 2. Applicable at most intersections along TH 220 since a wide shoulder space is currently provided. The curb extensions could fill in the existing shoulder space.

5.4 Alternatives Development

To address identified deficiencies and the purpose and needs for the Mn 220 corridor numerous improvement alternatives were identified for several key intersections and for key corridor segments. **Figure 5-3** illustrates the alternatives developed. Key categories include; sidewalk construction, pedestrian crossing, intersection improvements and control devices, and segment design alternatives. The improvement alternatives were identified to address four primary objectives of the study:

- Improve access control
- Improve safety
- Improve mobility/capacity; and
- Improve pedestrian crossings of Mn 220

For most intersection alternatives a technical analysis is completed to document the high-level design considerations, key pros/cons and trade-offs, mobility (LOS), estimated construction cost, safety (crash and severity rate) and economic viability (benefit/cost ratio). Further explanation of the benefit/cost analysis is provided in the following section.

5.4.1 Benefit / Cost Analysis

An economic benefit/cost analysis was completed in accordance with the MnDOT Office of Investment Management, Benefit/Cost Analysis for Transportation Projects procedures, and assumes a 20-year analysis period. The monetary benefit of the project is quantified in terms of reduced (or increased) vehicle hours traveled (VHT) or less delay (or added delay) at the intersection and the reduced number and/or severity of estimated crashes over the analysis period between the no build conditions and the proposed alternatives. The estimated 20-year monetary cost includes construction costs, expected operational and maintenance cost over this period (e.g., lighting, street signs), and contingency. Remaining capital values of the infrastructure features at the end of the 20-year analysis period are subtracted from the total cost of the alternative. The highest benefit/cost ratio represents the most economical solution. Benefit/cost ratios less than 1.0 might be considered less economically viable or be given less priority.

Estimated Safety Benefit

A safety analysis was completed for each alternative to help understand the anticipated level of improvement. The safety analysis includes investigating the change in crash types and computing a monetary annual crash cost for each preliminary alternative. Anticipated future roundabout crashes were estimated utilizing *A Study of the Traffic Safety at Single-Lane Roundabouts in Minnesota*[11] The study revealed significant reductions in severe crashes upon conversion of traditional intersections to roundabout control. Anticipated future traffic signal

[11] A Study of the Traffic Safety at Single Lane Roundabouts in Minnesota, MnDOT, December 16, 2014.

crashes were estimated utilizing the crash rates from the *MnDOT Intersection Green Sheets*[12]. The A 20-year, present value adjusted safety benefit is computed using the MnDOT fiscal year 2019 crash values listed below:

- Property Damage Only: $7,200
- Injury Type C: $87,000
- Injury Type B: $180,000
- Injury Type A: $600,000
- Fatal: $1,200,000 (two times Injury Type A).

Estimated Traffic Operation Benefit

The estimated traffic operation benefit is based on the total intersection vehicle delay for each intersection extrapolated over a 24-hour day compared to the no-build (either an increase or decrease in total VHT). The total vehicle delay, measured in hours, is converted to 20-year present worth monetary value based on MnDOT fiscal year 2019 value of time ($ per hour) for automobiles and trucks.

Estimated Construction Costs

Estimated construction costs are developed for key intersection alternatives. It should be noted that the cost estimates included a 30 percent contingency to account for risk or any unknowns that may not be identified without more detailed engineering. The cost estimates are also based on a high-level concept, without supporting base mapping engineering detail to accurately account for actual construction limits, grading, drainage or other design considerations. Therefore, are used for purpose of relative comparison within the study.

The following sub-sections discuss and evaluate the alternatives for each intersection and corridor segment.

5.4.2 Mn 220 at 23rd Street NW

The following alternatives were developed and evaluated:

- No build
- Alternative A: Install Traffic Signal System
- Alternative B: Install Single Lane Roundabout

The intersection improvement options, design considerations, pros and cons, and estimated cost for each alternative are summarized in **Table 5-5**.

[12] MnDOT Intersection Green Sheet. 2011 (Crash Severity Distribution) & 2015 (Crash Rates)

Traffic Operation Analysis

Results of the traffic operation analysis are detailed in **Table 5-3**. Although acceptable traffic operation is expected, the traffic operation analysis found that a traffic signal is expected to increase the overall intersection delay and would provide less efficient intersection operation during off-peak periods. The roundabout alternative, however, is expected to provide a continuous flow of traffic and improve efficiency – it would provide the most overall efficient 24-hour operation.

Table 5-3 Intersection Delay and LOS Summary – Mn 220 at 23rd Street NW

	Alternatives	AM Peak Hour		PM Peak Hour	
Year	Scenario	LOS	Delay (s)	LOS	Delay (s)
Year 2018	No Build	A / A	2.6 / 5.6	A / A	2.6 / 6.7
	ALT A	A / A	7.2 / 9.6	A / B	8.7 / 11.8
	ALT B	A / A	1.4 / 1.9	A / A	1.6 / 2.0
Year 2045	No Build	A / C	5.8 / 15.0	A / C	7.0 / 22.8
	ALT A	B / B	13.1 / 18.5	B / B	13.0 / 18.8
	ALT B	A / A	3.6 / 4.8	A / A	3.8 / 4.7

Overall Intersection LOS / Worst Approach LOS

Overall Intersection Delay / Worst Movement Delay

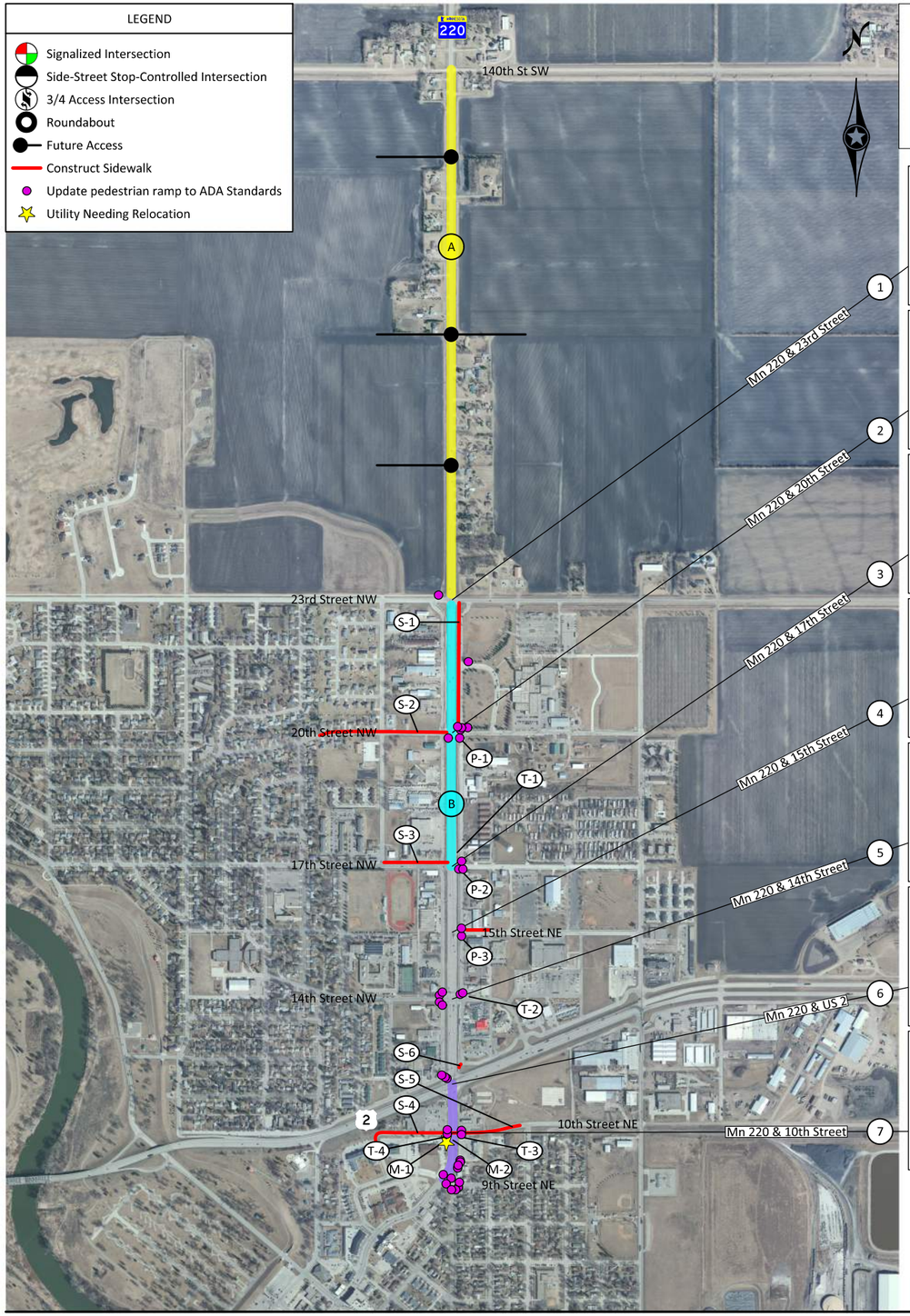
Safety Analysis

Table 5-4 summarizes the estimated change in intersection crash performance. Alternative A is expected to increase the overall intersection crash rate, and potentially increase crash severity. Alternative B is expected to reduce the overall intersection crash rate and crash severity.

Table 5-4. Intersection Safety Summary – Mn 220 at 23rd Street NW

	No Build	Alternative A Signal Installation	Alternative B Single-lane Roundabout
Observed/Estimated Crash Rate (Crashes/MEV)	0.54	0.59	0.32
Observed/Estimated Injury Crashes (Percent of Total Crashes)	33.3%	37.7%	24.7%
Observed/Estimated Crash Severity Rate (Crashes/MEV)	0.80	0.89	0.42
2045 Estimated Crash Cost (2018 Dollars)*	$135,715	$149,471	$56,250

* Crash cost is in dollar unit based on MnDOT OIM Fiscal Year 2019 Values

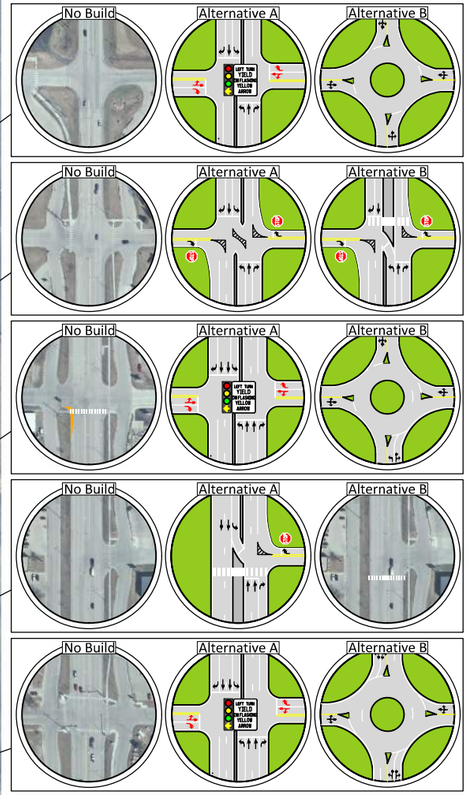


A 23rd Street - 140th Street Segment Alternatives

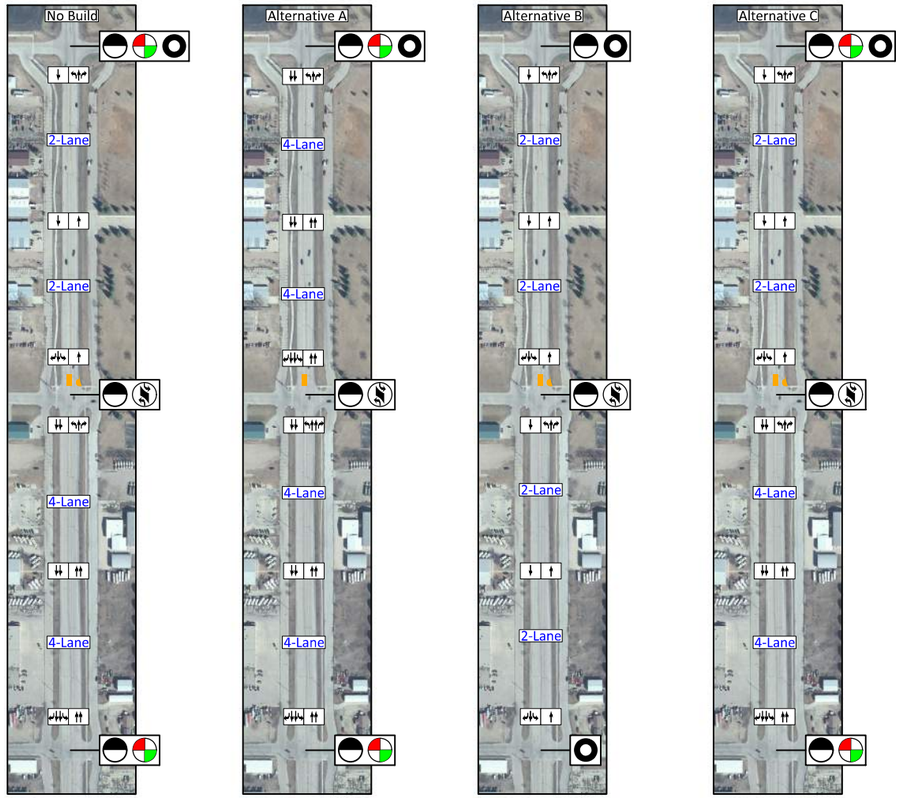
No Build

Alternative A 2-Lane with Left Turn Lanes

Alternative B 3-Lane with Two-Way Center Left Turn Lane



B 17th Street - 23rd Street Segment Alternatives



Miscellaneous

- M-1 Relocate utilities to improve sightlines
- M-2 Restripe lane drop and turn lane between 10th Street and 9th Street

Sidewalks

- S-1 Mn 220 - E Side (20th St to 23rd St)
- S-2 20th Street NW - Both Sides (5th Ave NW to Mn 220)
- S-3 17th Street NW - North Side (3rd Ave NW to Mn 220)
- S-4 10th Street NW - Both Sides (Terrace Dr to Mn 220)
- S-5 10th Street NE - Both Sides (Mn 220 to 2nd Ave NE)
- S-6 Mn 220 & US 2 - NW Corner (to Frontage Road

Pedestrian Cossing Improvements

- P-1 Improve Pedestrian Crossing *(see Intersection 2 Alternatives A and B)*
- P-2 Improve Pedestrian Corssing
  - Add curb extension
  - Upgrade ped pamps with ADA compliant directional ramps
- P-3 Improve Pedestrian Crossing *(see Intersection 4 Alternatives A and B)*

Transit

- T-1 Transit Shelter Improvement (17th Street)
- T-2 Transit Shelter Improvement (14th Street)
- T-3 Transit Shelter Improvement (10th Street - Northbound)
- T-4 Transit Shelter Improvement (10th Street - Southbound)

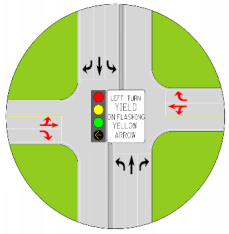
Mn 220 N Corridor Study

ALLIANT ENGINEERING

Figure 5-3
Intersection and Segment Alternatives Overview

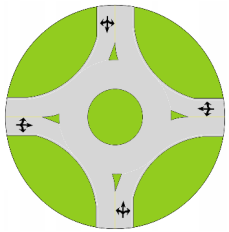
Table 5-5. Alternatives Comparison Matrix – Mn 220 at 23rd Street NW

Alternative A: Install Traffic Signal System



Description	Options and Considerations	Pros and Cons	Comparison Summary
Install traffic signal system	• Install FYA on all approaches o During AM and PM peak periods, operate westbound, northbound and southbound prot/perm (operate eastbound permissive only) o Outside of peak periods, both eastbound/westbound operate permissive only • Provide pedestrian crossing countdown timers, crosswalks and intersection lighting •Install lane eastbound/westbound lane designation and pavement markings (1-TH/LT, 1-RT)	Pros 1. Can be designed with minor impact to street width and curbs 2. Improves left turn access onto Mn 220 3. FYA can improve motorist safety and flexibility for intersection operation, including FYA omit funcationality with pedestrian actuation 4. Familiarity 5. Compatible with long term needs of TH 220 north of 23rd Street NW 6. Compatible with current 2045 MTP Cons 1. Ongoing operation, maintenance, and electricity costs 2. Signal warrants not met until 2045 3. Expected to increase the overall intersection delay and increase the overall intersecton crash rate. Statewide average severity rate indicates a potential increase in crash severity 4. Inefficient intersection operation during off peak periods	**Cost:** Approximately $500,000 with ADA Improvements **Mobility**: LOS B (2045) **Safety:** 10% Increase in crash and severity rate **R/W:** None **20-year Traffic Operation Benefit:** (-$3,050,616) **20-year Safety Benefit:** (-$171,503) **Benefit/Cost:** <0

Alternative B: Install Single Lane Roundabout



Description	Options and Considerations	Pros and Cons	Comparison Summary
Construct single lane roundabout	• Single lane is expected to operate acceptably through 2045 forecast • Special attention would be required in design for trucks and agricultural vehicles • Spacing to adjacent frontage roads may present design and/or operation challenges • Existing ditches, drainage design and storm sewer system needs	Pros 1. Greatly improves access to Mn 220 2. Provides continuous flow of traffic and improves efficiency 3. Provides traffic calming 4. Improves pedestrian crossing (reduced exposure, improved sightline) 5. Reduces overall intersection crash rate and intersection crash severity 6. Aesthetics 7. Compatible with long term needs of TH 220 north of 23rd Street NW 8. Intersection operations and delays are expectd to improve and provides the most overall efficient 24 hour operation. Cons 1. More expensive to install than a traffic signal (but may be less in long run) 2. Requires more space at intersection (but less space along road) 3. Familiarity	**Cost:** Approximately $2,950,000 **Mobility**: LOS A (2045) **Safety:** 40% reduction in crash rate. 47% reduction in severity rate **R/W:** None **20-year Traffic Operation Benefit:** $1,026,765 **20-year Safety Benefit:** $990,747 **Benefit/Cost:** 0.98

5.4.3 Mn 220 & 20th Street NW

The intersection of Mn 220 at 20th Street NW is located near Northland Community and Technical College. Currently it is at the 4-lane to 2-lane transition area and there is a pedestrian crosswalk, crossing the north leg of the intersection.

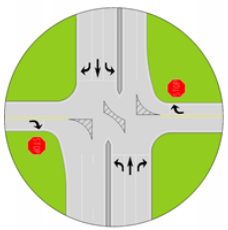
The following alternatives were identified to improve the pedestrian crossing and to improve quality of access at the adjacent intersections of 23rd Street NW and 17th Street NW:

- No build
- Alternative A: Convert to ¾ Access
- Alternative B: Convert to ¾ Access and Remove Southbound Left Turns

The intersection improvement options, design considerations, pros and cons, and estimated cost for each alternative are summarized in **Table 5-6.** It should be noted that a benefit/cost ratio was not computed for the 20th Street NW intersection, as the change in mobility and the benefit of improved pedestrian access associated with the proposed alternatives are mostly qualitative and not reliably quantifiable.

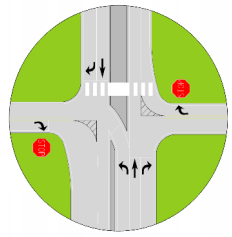
Table 5-6. Alternatives Comparison Matrix – Mn 220 at 20th Street NW

Alternative A: Convert to 3/4 Access



Description	Options and Considerations	Pros and Cons	Comparison Summary
Reconstruct to a 3/4 access configuration. Three-quarter intersections are an access management technique that limits cross street movements through an intersection. A median is installed in the middle of the intersection that permits all mainline through and turning movements but prevents cross-traffic through and left turn movements. **Options: Improve crosswalk on north side of intersection with markings and signing; or remove crosswalk with construction of sidewalk on east side of Mn 220 between 20th and 23rd**	• Minimal impact/inconvenience to travel routes/destinations due to connectedness of the urban network and the presence of frontage roads. • Consider curb extensions to minimize pedestrian crosswalk distance on the north leg • Consider installation of a sidewalk on the east side of Mn 220 to reduce need for pedestrians to cross at this intersection to continue north/south (could remove north leg crosswalk) • Redistributed left/through movements help satisfy traffic signal warrants at 23rd Street NW and 17th Street NW	Pros 1. Will improve safety by decreasing conflict points and removing right angle type crash occurrences currently being experienced 2. All work can be done within the existing ROW 3. Minimal ongoing maintenance 4. Improves overall quality of access along Mn 220 5. Expected to provide LOS A operation through forecast 2045 conditions Cons 1. Will increase the utilization of the frontage road system and could unnecessarily increase traffic volumes and turning movements on other minor roads 2. Public/business perception of reduced access	**Cost:** Approximately $350,000 **Mobility**: LOS A **Safety**: Reduced Crash Rate (Reduces Right Angle Crashes) **R/W:** None **20-year Traffic Operation Benefit:** NA **20-year Safety Benefit:** NA **Benefit/Cost:** NA

Alternative B: Convert to 3/4 Access and also Prohibit Southbound Left Turns



Description	Options and Considerations	Pros and Cons	Comparison Summary
3/4 access configuration, but also prevents the southbound left turning movement to provide for a wide pedestrian refuge median. **Improve crosswalk on north side of intersection with markings and signing.**	• Minimal impact/inconvenience to travel routes/destinations due to connectedness of the urban network and the presence of frontage roads. • Consider curb extensions to minimize pedestrian crosswalk distance on the north leg • Removing the southbound left turn allows for a wide median refuge island for pedestrians. Greatly reducing crossing exposure and potential conflicts. • Reduces need for the installation of a sidewalk on the east side of Mn 220 to reduce need for pedestrians to cross at this intersection to continue north/south. • Redistributed left/through movements help satisfy traffic signal warrants at 23rd Street NW and 17th Street NW • Best compatibility with 2-lane segment to the north of 20th Street, 2-lane or 4-lane (right turn lane drop) to the south	Pros 1. Will improve safety by decreasing conflict points and removing right angle type crash occurrences currently being experienced 2. All work can be done within the existing ROW 3. Greatly improves the pedestrian crossing 4. Minimal ongoing maintenance 5. Improves overall quality of access along Mn 220 6. Expected to operate at a LOS A through forecast 2045 conditions Cons 1. Expected ton increase utilization of the frontage roads and could unnecessarily increase traffic volumes and turning movements on other minor roads 2. Public/business perception of reduced access	**Cost:** Approximately $600,000 **Mobility**: LOS A **Safety**: Reduced Crash Rate (Reduces Right Angle Crashes) **R/W:** None **20-year Traffic Operation Benefit:** NA **20-year Safety Benefit:** NA **Benefit/Cost:** NA

5.4.4 Mn 220 at 17th Street NW

The intersection of Mn 220 and 17th Street NW is located near the East Grand Forks Senior High School and is the preferred crossing point for school-related pedestrians. The following alternatives were developed to improve intersection mobility, safety and pedestrian of Mn 220:

- No build: Pedestrian Crosswalk Improvement
- Alternative A: Install Traffic Signal System
- Alternative B: Install Single Lane Roundabout

The intersection improvement options, design considerations, pros and cons, and estimated cost for each alternative are summarized in **Table 5-8**. The No build (existing stop control) alternative highlights a potential short-term pedestrian crosswalk improvement strategy that includes constructing a small curb extension on the southwest corner to narrow the crossing distance, construct ADA compliant directional pedestrian ramps, reconstruct the median nose to provide refuge, and installing high visibility crosswalk markings and signing.

Traffic Operation Analysis

Results of the traffic operation analysis are detailed in **Table 5-7**. Although acceptable traffic operation is expected, the traffic operation analysis found that a traffic signal is expected to increase the overall intersection delay and would provide less efficient intersection operation during off-peak periods under existing conditions. Under future condition traffic volumes an operational benefit is expected. The roundabout alternative is expected to provide the most efficient intersection operations. However, longer PM peak hour northbound vehicle queues entering the roundabout are expected under the forecast year 2045 traffic demand.

Table 5-7. Intersection Delay and LOS Summary – Mn 220 at 17th Street NW

	Alternatives	AM Peak Hour		PM Peak Hour	
Year	Scenario	LOS	Delay (s)	LOS	Delay (s)
Year 2018	No Build	A / B	2.6 / 12.2	A / B	2.8 / 13.6
	ALT A	A / D	6.3 / 44.7	A / C	7.4 / 33.3
	ALT B	A / A	2.0 / 3.9	A / A	2.4 / 3.2
Year 2045	No Build	A / D	4.2 / 34.8	B / F	11.7 / 127.8
	ALT A	A / D	6.8 / 43.8	B / D	11.1 / 41.1
	ALT B	A / A	3.9 / 7.3	A / A	6.3 / 6.8

Overall Intersection LOS / Worst Approach LOS

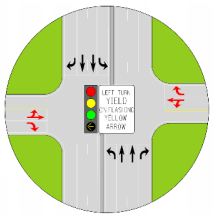
Overall Intersection Delay / Worst Movement Delay

Table 5-8. Alternatives Comparison Matrix – Mn 220 at 17th Street NW

No Build: Improve Pedestrian Crossing

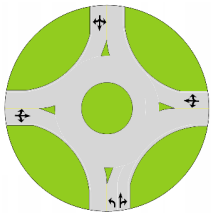
Description	Options and Considerations	Pros and Cons	Comparison Summary
Maintain existing through stop control and improve the existing pedestrian crosswalk on the south leg of intersection	•Construct curb extension on the southwest corner to narrow crosswalk exposure •Construct ADA compliant directional pedestrian ramps on both the southwest and southeast corners of the intersection •Reconstruct median nose to provide pedestrian crosswalk pass-through •Install high visibility continental pedestrian crosswalk markings and pedestrian crossing signs	Pros 1. Low cost 2. Improves pedestrian crosswalk, visibility and pedestrian exposure 3. Establishes and ADA compliant crossing of Mn 220 Cons 1. Short term intersection solution 2. Does not address long term intersection mobility or existing intersection safety concerns	**Cost:** Approximately $50,000 **Mobility**: LOS F (2045) **Safety:** No Change **R/W:** None **20-year Traffic Operation Benefit:** No Change **20-year Safety Benefit:** No Change **Benefit/Cost:** 0

Alternative A: Install Traffic Signal System



Description	Options and Considerations	Pros and Cons	Comparison Summary
Install traffic signal system	• Install FYA on all approaches o During AM and PM peak periods, operate westbound, northbound and southbound prot/perm (operate eastbound permissive only) o Outside of peak periods, both eastbound/westbound operate permissive only • Provide pedestrian crossing countdown timers, crosswalks and intersection lighting • Provide signal communication and operate coordinated with 14th Street • Install lane eastbound/westbound lane designation and pavement markings (1-TH/LT, 1-RT)	Pros 1. Can be designed with minor impact to street width and curbs 2. Improves left turn access onto Mn 220 3. FYA can improve motorist safety and flexibility for intersection operation, including FYA omit funcationality with pedestrian actuation 4. Familiarity 5. Compatible with long term needs of TH 220 north of 23rd Street NW 6. Efficient off peak traffic operations (low delays) 7. Compatible with current 2045 MTP 8. Expected to result in a reduction in total number of intersection crashes (reduced crash rate) and crash severity. Cons 1. Ongoing operation, maintenance, and electricity costs 2. Signal warrants not met until 2033 (warrant2) and 2038 (warrant 1) with 3/4 access configuration at 20th Street NW) 3. Expected to increase the overall intersection delay under existing conditions and provide slightly improved delays under 2045 conditions. 4. Inefficient intersection operation during off peak periods	**Cost:** Approximately $500,000 with ADA Improvements and Signal Communication **Mobility**: LOS B (2045) **Safety:** 18% reduction in crash rate and severity rate **R/W:** None **20-year Traffic Operation Benefit:** (-$1,777,272) **20-year Safety Benefit:** $219,027 **Benefit/Cost:** <0

Alternative B: Install Single Lane Roundabout



Description	Options and Considerations	Pros and Cons	Comparison Summary
Construct single lane roundabout	• Single lane is expected to operate acceptably through 2045 forecast • Special attention would be required in design for trucks and agricultural vehicles • Spacing to adjacent frontage roads requires careful attention to design for trucks. Evaluation indicates the design should be feasible. • Will eliminate the need to expand Mn 220 roadway width to the north and provides for more effective right turn lane design at 20th • Could consider R/W acquisition on the east side of the east frontage road to increase frontage road spacing with Mn 220 • North/South pedestrian accommodations are difficult due to narrow spacing between Mn 220 and Frontage Road. May require median closure of the frontage road on the east side, or routing pedestrian crossings on the far east and far west sides of the frontage roads resulting in less direct travel path.	Pros 1. Greatly improves access to Mn 220 2. Provides continuous flow of traffic and improves efficiency 3. Provides traffic calming 4. Improves pedestrian crossing (reduced exposure, improved sightline) 5. Reduces overall intersection crash rate and intersection crash severity 6. Aesthetics 7. Compatible with long term needs of TH 220 north of 23rd Street NW 8. Intersection operations and delays are expectd to improve and provides the most overall efficient 24 hour operation. Cons 1. More expensive to install than a traffic signal (but may be less in long run) 2. Requires more space at intersection (but less space along road) 3. Familiarity 4. To accommodate the two northbound lanes on Mn 220 and to not introduce a lane drop, the ideal northbound lane configuration is a 2-lane approach (1-left turn, 1-through/right). All other approaches would be 1 lane entry.	**Cost:** Approximately $2,700,000 **Mobility**: LOS A (2045) **Safety:** 55% reduction in crash rate and severity rate. **R/W:** None **20-year Traffic Operation Benefit:** $2,314,202 **20-year Safety Benefit:** $647,421 **Benefit/Cost:** 1.55

Safety Analysis

A safety analysis was completed for each alternative to help understand the anticipated level of improvement. The safety analysis includes investigating the change in crash types and/or the elimination in certain types of crashes and computing a monetary annual crash cost for each preliminary alternative. **Table 5-9** summarizes the estimated change in intersection crash performance. Both Alternative A and Alternative B is expected to reduce the overall intersection crash rate and crash severity rate.

Table 5-9. Intersection Safety Summary – Mn 220 at 17th Street NW

	No Build	Alternative A Signal Installation	Alternative B Single-lane Roundabout
Observed/Estimated Crash Rate (Crashes/MEV)	0.71	0.58	0.32
Observed/Estimated Injury Crashes (Percent of Total Crashes)*	15.4%	15.4%	15.4%
Observed/Estimated Crash Severity Rate (Crashes/MEV)	0.81	0.66	0.37
2045 Estimated Crash Cost (2018 Dollars)**	$83,145	$67,769	$37,694

* Severity proportions are assumed to be unchanged across No Build and alternatives due to the existing crash characteristics and high concentration of PDO crashes.

** Crash cost is in dollar unit based on MnDOT OIM Fiscal Year 2019 Values

5.4.5 Mn 220 at 15th Street NE

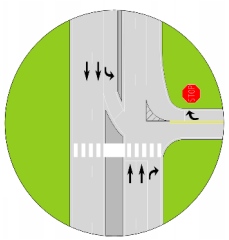
The intersection of Mn 220 at 15th Street NE is located near the East Grand Forks Senior High School. The following alternative was identified to improve the pedestrian crossing and to improve quality of access at the adjacent intersection of 17th Street NW:

- No build
- Alternative A: Convert to ¾ Access and Provide Pedestrian Crosswalk
- Alternative B: Maintain Full Access and Provide Pedestrian Crosswalk with Reconstructed Pedestrian Refuge Median

The intersection improvement options, design considerations, pros and cons, and estimated cost for this alternative is summarized in **Table 5-10.** It should be noted that a benefit/cost ratio was not computed for the 15th Street NE intersection, as the change in mobility and the benefit of improved pedestrian access associated with the proposed alternatives are mostly qualitative and not reliably quantifiable.

Table 5-10. Alternatives Comparison Matrix – Mn 220 at 15th Street NE

Alternative A: Convert to 3/4 Access



Description	Options and Considerations	Pros and Cons	Comparison Summary
Reconstruct intersection to a 3/4 access configuration. Three-quarter intersections are an access management technique that limits cross street movements through an intersection. A median is installed in the middle of the intersection that permits all mainline through and turning movements but prevents cross-traffic through and left turn movements. **Option: Establish crosswalk on south side of the intersection.**	• Minimal impact/inconvenience to travel routes/destinations due to connectedness of the urban network and the presence of frontage roads. • Consider curb extension on the west side (fill in shoulder) to minimize pedestrian crosswalk distance on the south leg • Reconstruct the median to provide for a wide median refuge island for pedestrians. Greatly reducing crossing exposure and potential conflicts. • Redistributed left movements help satisfy traffic signal warrants at 17th Street NW	Pros 1. Will improve safety by decreasing conflict points and removing right angle type crash occurrences currently being experienced 2. All work can be done within the existing ROW 3. Greatly improves the pedestrian crossing whether marked or unmarked 4. Minimal ongoing maintenance 5. Improves overall quality of access along Mn 220 Cons 1. Will increase the utilization of the frontage road and could unnecessarily increase traffic volumes and turning movements on other minor roads 2. Public/business perception of reduced access	**Cost:** Approximately $490,000 **Mobility**: LOS A (2045) **Safety**: Reduced Right Angle Crashes **R/W:** None **20-year Traffic Operation Benefit:** NA **20-year Safety Benefit:** NA **Benefit/Cost:** NA

Alternative B: Establish Crosswalk with Pedestrian Refuge

Description	Options and Considerations	Pros and Cons	Comparison Summary
Maintain full access intersection and add crosswalk with wide pedestrian median on south leg.	• Provide high visibility crosswalk markings and pedestrian crosswalk signing • Maintain full access if median closure of frontage road is necessary for the roundabout alternative at 17th Street to provide best network circulation • Consider curb extension on the west side (fill in shoulder) to minimize pedestrian crosswalk distance on the south leg • Reconstruct the median to provide for a wide median refuge island for pedestrians. Greatly reducing crossing exposure and potential conflicts.	Pros 1. All work can be done within the existing ROW 2. Establihes pedestrian crosswalk and improves the pedestrian crossing distance and reduces exposure 3. Minimal ongoing maintenance Cons 1. Does not meet 1/4 mile full access spacing guidelines	**Cost:** Approximately $350,000 **Mobility:** LOS C (2045) **Safety:** No Change **R/W:** None **20-year Traffic Operation Benefit:** NA **20-year Safety Benefit:** NA **Benefit/Cost:** NA

5.4.6 Mn 220 at 14th Street NW

The intersection of Mn 220 at 14th Street NW is located less than ¼ of a mile north of US 2. It is currently signalized and serves as a primary intersection along the Mn 220 corridor. The following alternatives are developed to improve mobility and intersection safety:

- No build
- Alternative A: Rebuild Signal System and Signal Coordination with US 2
- Alternative B: Construct Multi-Lane Roundabout (2 Mainline Entry Lanes x 1 Cross-Street Entry Lane)

The intersection improvement options, design considerations, pros and cons, and estimated cost for each alternative are summarized in **Table 5-12**.

Traffic Operation Analysis

Results of the traffic operation analysis are detailed in **Table 5-11.** The traffic operation analysis found that an improved traffic signal system is expected to improve intersection delay. A multilane roundabout is expected to provide the most efficient intersection operations.

Table 5-11. Intersection Delay and LOS Summary – Mn 220 at 14th Street NW

	Alternatives	AM Peak Hour		PM Peak Hour	
Year	Scenario	LOS	Delay (s)	LOS	Delay (s)
Year 2018	No Build	B / B	10.3 / 15.5	B / B	11.3 / 15.4
	ALT A	A / C	9.7 / 32.8	B / C	11.6 / 33.6
	ALT B	A / A	1.7 / 3.2	A / A	1.9 / 3.6
Year 2045	No Build	A / B	9.2 / 17.3	B / B	11.6 / 19.5
	ALT A	A / C	8.3 / 32.4	B / C	10.9 / 34.9
	ALT B	A / A	2.1 / 4.4	A / A	2.4 / 5.6

Overall Intersection LOS / Worst Approach LOS

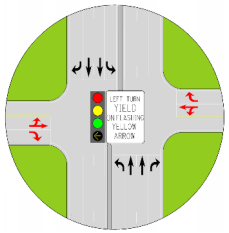
Overall Intersection Delay / Worst Movement Delay

Safety Analysis

A safety analysis was completed for each alternative to help understand the anticipated level of improvement. The safety analysis includes investigating the change in crash types and/or the elimination in certain types of crashes and computing a monetary annual crash cost for each preliminary alternative. **Table 5-13** summarizes the estimated change in intersection crash performance. The installation of flashing yellow arrow (FYA), a westbound left turn arrow and signal coordination is expected to reduce intersection crashes by approximately 28 percent. It should be noted that multilane roundabouts typically experience higher crash rates than single lane entries. In other words, the total number of crashes at a multilane roundabout is expected to increase compared to traffic signal control. However, the percentage of injury related crashes (specifically Type A and Type B) is typically reduced as illustrated for Alternative B.

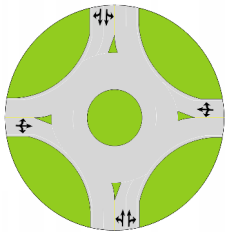
Table 5-12. Alternatives Comparison Matrix – Mn 220 at 14th Street NW

Alternative A: Rebuild Signal System



Description	Options and Considerations	Pros and Cons	Comparison Summary
Rebuild the existing traffic signal system to current design standards	• Install FYA on all approaches o During AM and PM peak periods, operate westbound, northbound and southbound protected/permissive (operate eastbound permissive only) o Outside of peak periods, operate both eastbound/westbound permissive only • Install signal communication and coordinated signal timing with US 2 • Install pedestrian countdown timers • Update the pedestrian and vehicle clearance intervals • Install eastbound/westbound lane designation signs and pavement markings (1-TH/LT, 1-RT)	Pros 1. Can be designed with minor to no impact to street width and curbs 2. The addition of FYA and the westbound left turn arrow Improves left turn access onto Mn 220 and separates the conflicts which is expected to result in a reduction of intersection crashes 3. Signal coordination is expected to greatly reduce the potential for rear end crashes and improve overall corridor operation 3. FYA can improve motorist safety and intersection operation and provides flexibility to change left turn operation to improve safety 4. Pedestrian countdown timers can provide pedestrian safety 5. Familiarity Cons 1. Ongoing operation, maintenance, and electricity costs 2. Overall is not the most efficient intersection operation over a full 24-hour day (higher off peak delays)	**Cost:** Approximately $300,000 with Traffic Signal Interconnection to US 2 **Mobility**: LOS B (2045) **Safety:** 29% reduction in crash rate and 33% reduction in crash severity rate. **R/W:** None **20-year Traffic Operation Benefit:** $371,482 **20-year Safety Benefit:** $1,955,479 **Benefit/Cost:** 9.50

Alternative B: Install Multilane (2 x 1) Roundabout



Description	Options and Considerations	Pros and Cons	Comparison Summary
Construct a Multilane (hybrid 2 mainline by 1 cross-street entry) roundabout	• Multilane roundabout is expected necessary to accommodate existing and forecast 2045 traffic demands • Special attention would be required in design for trucks and agricultural vehicles • Spacing to adjacent frontage roads will likely be problematic with a multilane roundabout footprint	Pros 1. Provides continuous flow of traffic and improves efficiency 2. Provides traffic calming 3. Improves pedestrian crossing (reduced exposure, improved sightline) 4. Reduces intersection crash severity 5. Aesthetics 6. Overall most efficient intersection operations during both the AM and PM peak periods and off peak traffic operations (low delays) Cons 1. Overall crash rate is expected to increase and will be much higher than compared to the rebuilt traffic signal system. However, the crash severity is expected to be less making the safety consideration fairly comparable. 2. More expensive to install than rebuilding the traffic signal 3. Requires more space at intersection (but less space along road) 4. Familiarity 5. May not be feasible due to the spacing of the frontage roads and desitination access of motorists needing to make a U-turn onto the frontage roads.	**Cost:** Approximately $3,000,000 **Mobility**: LOS A (2045) **Safety:** 9% increase in crash rate. 1% reduction in crash severity rate (large reduction in Type A, Type B) **R/W:** None **20-year Traffic Operation Benefit:** $8,805,855 **20-year Safety Benefit:** $1,803,378 **Benefit/Cost:** 5.20

Table 5-13. Intersection Safety Summary – Mn 220 at 14th Street NW

	No Build	Alternative A Signal Improvements	Alternative B 2x1 Roundabout
Observed/Estimated Crash Rate (Crashes/MEV)	0.70	0.50	0.76
Observed/Estimated Injury Crashes (Percent of Total Crashes)	22.2%	19.7%	18.5%
Observed/Estimated Crash Severity Rate (Crashes/MEV)	0.94	0.63	0.93
2045 Estimated Crash Cost (2018 Dollars)	$239,070	$117,745	$127,210

* Crash cost is in dollar unit based on MnDOT OIM Fiscal Year 2019 Values

5.4.7 Mn 220 at US 2

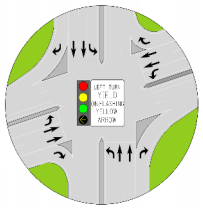
The intersection of Mn 220 and US 2 is an existing signalized intersection of two major arterial roadways. The intersection crash rate and severity rate are above critical rates and the intersection mobility is expected to reach unacceptable LOS by 2045. The following alternatives are developed to address intersection deficiencies, improve mobility and improve safety for all modes:

- No build
- Alternative A: Rebuild Signal System
  - Alternative A-0: Rebuild Signal System with Offset Eastbound/Westbound Left Turn Lanes
  - Alternative A-1: Rebuild Signal System with Dual Eastbound Left Turn Lanes
  - Alternative A-2: Rebuild Signal System with Right Turn Channelization Improvements
  - Alternative A-3: Rebuild Signal System with Offset Eastbound/Westbound Left Turn Lanes and Right Turn Channelization Improvements
- Alternative B: Install Multi-Lane Roundabout
- Alternative C: Construct a Displaced Eastbound Left Turn
- Alternative D: Grade Separated Tight Diamond Interchange
- Alternative D-2: Grade Separated Partial Interchange
- Alternative D-3: Grade Separated Westbound Overpass
- Alternative E: System Improvements - 5th Avenue NW Access

The intersection improvement options, design considerations, pros and cons, and estimated cost for each alternative are summarized in **Table 5-14**.

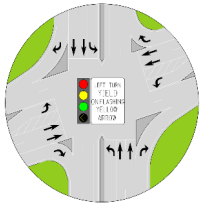
Table 5-14. Alternatives Comparison Matrix – Mn 220 at US 2

Alternative A: Rebuild Signal System



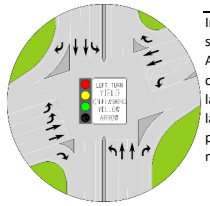
Description	Options and Considerations	Pros and Cons	Comparison Summary
Rebuild the traffic signal system to current standards. Alternative assumes no changes to the intersection geometric design. All safety and capacity improvements are operational or signal system related.	• Install FYA on all approaches o Operate eastbound/westbound protected only 11 am to 6 pm and northbound protected/permissive all day o Implement FYA Omit logic for pedestrian actuations • Install communication and coordinate signal timing with 14th Street NW and 5th Avenue NE • Implement a southbound right turn overlap (concurrent with the eastbound left turn) • Install pedestrian countdown timers • Update the pedestrian and vehicle clearance intervals to current standards • Add an additional overhead signal indication for each approach to improve visibility and provide yellow backplate for FYA left turn indications	Pros 1. Can be designed with no impact to street width and curbs 2. Improves left turn access onto Mn 220 3. FYA provides operational flexibility and is expected to improve motorist safety and intersection operation 4. Low cost 5. Familiarity 6. Expected to reduce the overall intersection crash rate and provide an improvement to the overall intersection crash severity Cons 1. Ongoing operation, maintenance, and electricity costs 2. Operational improvement is minimal. LOS D is expected in 2045 3. Does not address the right turn related crashes or pedestrian comfort of crossing the intersection.	**Cost:** Approximately $350,000 including communication to US 2/5th Avenue NE **Mobility**: LOS D (2045) **Safety:** 25% decrease in crash rate. 23% decrease in severity rate. **R/W:** None **20-year Traffic Operation Benefit:** (-$1,922,257) **20-year Safety Benefit:** $2,111,426 **Benefit/Cost:** 0.66

Alternative A-0: Rebuild Signal System with Offset EB/WB Left Turn Lanes



Description	Options and Considerations	Pros and Cons	Comparison Summary
In addition to rebuilding the signal system as described in Alternative A, Alternative A-0 involves the realignment of left turn lanes on US 2 to provide a positive lateral offset for improved motorist sight lines and visibility.	• Turn lanes may be tapered or parallel • Can be achieved with striping a buffer if no new median is desired • A pedestrian refuge could be provided if roadway is widened significantly • Implement a southbound right turn overlap (concurrent with the eastbound left turn) • Install FYA on all approaches o Operate eastbound/westbound protected only 11 am to 6 pm and northbound prot/perm all day o Implement FYA Omit logic for pedestrian actuations • Install communication and coordinate signal timing with 14th Street NW and 5th Avenue NE • Install pedestrian countdown timers • Update the pedestrian and vehicle clearance intervals to current standards • Add an additional overhead signal indication for each approach to improve visibility and provide yellow backplate for FYA left turn indications	Pros 1. Can be designed with minor impact to street width and curbs 2. Improves left turn access onto Mn 220 3. FYA provides operational flexibility and with the offset left turn lanes is expected to improve motorist safety and intersection operation 4. Low cost 5. Familiarity 6. Expected to reduce the overall intersection crash rate and provide an improvement to the overall intersection crash severity Cons 1. Ongoing operation, maintenance, and electricity costs 2. Operational improvement is minimal. LOS D is expected in 2045 3. Does not address the right turn related crashes or pedestrian comfort of crossing the intersection.	**Cost:** Approximately $2,350,000 **Mobility**: LOS D (2045) **Safety:** 31% decrease in crash rate. 28% decrease in severity rate. **R/W:** None **20-year Traffic Operation Benefit:** (-$1,922,257) **20-year Safety Benefit**: $2,721,822 **Benefit/Cost:** 0.48

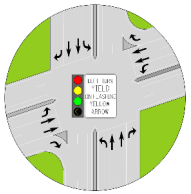
Alternative A-1: Rebuild Signal System with Dual EB Left Turn Lanes



Description	Options and Considerations	Pros and Cons	Comparison Summary
In addition to rebuilding the signal system as described in Alternative A, Alternative A-1 involves the construction of dual eastbound left turn lanes on US 2. The westbound left turn lane would be offset to provide a positive lateral offset for improved motorist sight lines and visibility.	• A pedestrian refuge could be provided if roadway is widened significantly • Install FYA on all approaches o Operate eastbound/westbound protected only 6 am to 10 pm and northbound prot/perm all day o Implement FYA Omit logic for pedestrian actuations • Install communication and coordinate signal timing with 14th Street NW and 5th Avenue NE • Implement a southbound right turn overlap (concurrent with the eastbound left turn) • Install pedestrian countdown timers • Update the pedestrian and vehicle clearance intervals to current standards • Add an additional overhead signal indication for each approach to improve visibility and provide yellow backplate for FYA left turn indications	Pros 1. Expected to operate at a LOS C in year 2045. Provides the greatest operational benefit while maintaining the signalized intersection control 2. Expected to provide sufficient capacity to minimize the need for the 5th Avenue NW full access intersection with US 2 3. FYA provides operational flexibility and with the offset left turn lanes is expected to improve motorist safety and intersection operation 4. Familiarity 5. Expected to reduce the overall intersection crash rate and provide an improvement to the overall intersection crash severity Cons 1. Vehicles may not evenly distribute between lanes 2. Requires additional roadway width 3. Dual lanes tend to result in increased crashes as the intersection becomes wider 4. Does not address the right turn related crashes or pedestrian comfort of crossing the intersection.	**Cost:** Approximately $2,350,000 **Mobility**: LOS C (2045) or LOS D if No Connection at 5th Ave **Safety:** 27% decrease in crash rate. 25% decrease in severity rate. **R/W:** None **20-year Traffic Operation Benefit:** $5,095,230 **20-year Safety Benefit:** $2,363,174 **Benefit/Cost:** 4.47

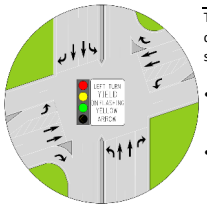
Table 5-14. Alternatives Comparison Matrix – Mn 220 at US 2 Continued

Alternative A-2: Rebuild Signal System with Right Turn Channelization Improvements



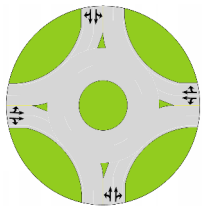
Description	Options and Considerations	Pros and Cons	Comparison Summary
In addition to rebuilding the signal system as described in Alternative A, Alternative A-2 involves the reconstruction of the northwest and southeast corners to remove the channelized right turn pork chop islands. Providing traditional right turn lane design will improve the intersection skew and vehicle angle of approach to the intersection resulting in better visibility.	• Install FYA on all approaches ○ Operate eastbound/westbound protected only 11 am to 6 pm and northbound prot/perm all day ○ Implement FYA Omit logic for pedestrian actuations • Implement a southbound right turn overlap (concurrent with the eastbound left turn) • Install communication and coordinate signal timing with 14th Street NW and 5th Avenue NE • Install pedestrian countdown timers • Update the pedestrian and vehicle clearance intervals to current standards • Add an additional overhead signal indication for each approach to improve visibility and provide yellow backplate for FYA left turn indications	Pros 1. Can be designed with overall minor impact to street width and curbs 2. FYA provides operational flexibility and with the offset left turn lanes is expected to improve motorist safety and intersection operation 3. Moderate cost 4. Improved right turn sightlines is expected to improve the intersection safety and pedestrian crossing safety 5. Familiarity 6. Expected to reduce the overall intersection crash rate and provide an improvement to the overall intersection crash severity Cons 1. Ongoing operation, maintenance, and electricity costs 2. Operational improvement is minimal. LOS D is expected in 2045	**Cost:** Approximately $875,000 **Mobility**: LOS D (2045) **Safety:** 26% decrease in crash rate. 23% reduction in severity rate. **R/W:** None **20-year Traffic Operation Benefit:** (-$2,038,918) **20-year Safety Benefit:** $2,085,539 **Benefit/Cost:** 0.07

Alternative A-3: Rebuild Signal System with Offset Eastbound/Westbound Left Turn Lanes and Right Turn Channelization Improvements



Description	Options and Considerations	Pros and Cons	Comparison Summary
This alternative involves the combination of previously mentioned strategies: • Rebuild Signal System, with Offset Left Turn Lanes - Alternative A-0 • Rebuild Signal System, with Right Turn Channelization Improvements - Alternative A-2	Refer to previously mentioned strategies	Pros 1. Can be designed with overall minor impact to street width and curbs 2. FYA provides operational flexibility and with the offset left turn lanes is expected to improve motorist safety and intersection operation 3. Moderate/High cost 4. Improved right turn sightlines is expected to improve the intersection safety and pedestrian crossing safety 5. Familiarity 6. Expected to reduce the overall intersection crash rate and provide an improvement to the overall intersection crash severity Cons 1. Ongoing operation, maintenance, and electricity costs 2. Operational improvement is minimal. LOS C/D is expected in 2045	**Cost:** Approximately $2,650,000 **Mobility**: LOS D (2045) or LOS E if No Connection at 5th Ave **Safety:** 32% decrease in crash rate. 29% reduction in severity rate. **R/W:** None **20-year Traffic Operation Benefit:** (-$2,038,918) **20-year Safety Benefit:** $2,746,728 **Benefit/Cost:** 0.38

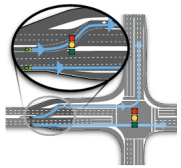
Alternative B: Install Roundabout



Description	Options and Considerations	Pros and Cons	Comparison Summary
Construct full multilane roundabout with two-lane entry on all four approaches	• Multilane roundabout is expected necessary to accommodate existing and forecast 2045 traffic demands • Special attention would be required in design for trucks and agricultural vehicles	Pros 1. Provides continuous flow of traffic and improves efficiency 2. Provides traffic calming 3. Improves pedestrian crossing (reduced exposure, improved sightline) 4. Greatly reduces crash severity 5. Aesthetics 6. Most efficient traffic operations during both AM and PM peak periods, and the off peak periods (low delays) 7. Overall intersection size is not expected to increase due to size of current pavement area. Fits within R/W and current intersection footprint Cons 1. Multilane roundabouts have high crash rates (3 times that of a traditional signalized intersection control) and severity rate. Increased crashes are expected; however the percentage of injury crashes is expected to be significantly reduced resulting in an overall best expected safety benefit. 2. More expensive to install than rebuilding the traffic signal as all four approaches will require full reconstruction. 3. Requires more space at intersection (but less space along road) 4. Familiarity	**Cost:** Approximately $3,600,000 **Mobility**: LOS A (2045) or LOS C if No Connection at 5th Ave **Safety:** 71% increase in crash rate. 35% increase in severity rate. **R/W:** None **20-year Traffic Operation Benefit:** $38,510,513 **20-year Safety Benefit:** $4,255,888 **Benefit/Cost:** 17.34

Table 5-14. Alternatives Comparison Matrix – Mn 220 at US 2 Continued

Alternative C: Displaced EB Left Turn



Description	Options and Considerations	Pros and Cons	Comparison Summary
A displaced left turn (DLT) will move the eastbound left-turn movement from US 2/Mn 220 to an upstream signalized location. Traffic that would turn left at Mn 220 in a conventional design now has to cross opposing through lanes at a signal-controlled intersection several hundred feet upstream and then travel on a new roadway parallel to the opposing lanes. This traffic is now able to execute the left turn simultaneously with the westbound through traffic at the US 2/Mn 220 intersection.	• Overall roadway typical section width is expected to impact the frontage road. • An additional traffic signal system located approximately mid way between Mn 220 and 5th Avenue is needed to facilitate the displaced left turn cross over. The traffic signal systems will need to be coordinated • Eastbound left turn storage length needs to balanced to ensure compatibility for a potential future 5th Avenue 3/4 or full access intersection • The southbound right turn lane would need to be designed as a free operating movement to avoid conflicting at the intersection with the displaced left turn.	Pros 1. Improves intersection capacity by removing a high volume conflicting movement at the US 2/Mn 220 intersection 2. FYA provides operational flexibility and with the offset left turn lanes is expected to improve motorist safety and intersection operation 3. Expected to improve intersection safety by improving sightlines and providing an improved level of left turn control. Anticipated the crash performance will be similar to Alternative A-0. Cons 1. Ongoing operation, maintenance, and electricity costs. Snow removal will be much more difficult 2. High construction cost 3. Adds an additional traffic signal system to the network 4. Requires substantial cross-sectional roadway space, adds effectively 1 more travel lane and 2 more raised median islands. Expected to have R/W and frontage road impacts 5. Familiarity. Likely result in motorist confusion	**Cost:** Approximately $2,900,000 **Mobility:** LOS C (2045) **Safety:** 25% decrease in crash rate. 23% reduction in severity rate. **R/W:** Frontage Road Impact **20-year Traffic Operation Benefit:** $9,010,428 **20-year Safety Benefit:** $2,111,426 **Benefit/Cost:** 5.41

Alternative D: Grade Separated Tight Diamond Interchange

Description	Options and Considerations	Pros and Cons	Comparison Summary
A compressed diamond interchange with either US 2 or Mn 220 grade separated over the top	• Traffic signals would be provided at the ramp terminal intersections • Traffic signal coordination will be required • Tight diamond interchanges require significant retaining wall construction to reduce space and R/W acquisition footprint. This however, greatly increases the construction cost	Pros: 1. Effectively separates volumes from conflicting movements 2. Provide long term efficient traffic operation 3. Reduces vehicle conflicts and is expected to improve overall intersection safety Cons: 1. Significant cost and Right of Way acquisition 2. Will impact businesses and local resident properties 3. Will disrupt the frontage road connections 4. May require closure or reroute of neighboring roads 5. Significant cost and impacts for comparable benefit to other alternatives 6. A grade separated interchange will significantly impact the visibility and presence of remaining businesses near this intersection.	**Cost:** High. > $15,000,000 to 20M excluding R/W and property acquisition costs **Mobility:** NA **Safety:** NA **R/W:** Significant Impact **20-year Traffic Operation Benefit:** NA **20-year Safety Benefit:** NA **Benefit/Cost:** NA

Alternative D-2: Grade Separated Partial Interchange

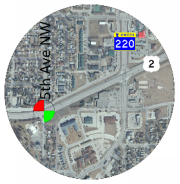
Description	Options and Considerations	Pros and Cons	Comparison Summary
A non-traditional interchange with US 2 overpass with ramps in the southeast corner and combined frontage road/ramp access on the north side of US 2	• Traffic signals would be necessary at Mn 220/10th Street NE intersection. May require signalized control at the new Mn 220/North Frontage Road intersection • Traffic signal coordination between 10th Street NE and 14th Street NW should be provided • The existing access via the frontage road system is preserved while additional traffic are routed through select frontage roads • The overpass would require significant retaining wall construction to reduce space and R/W acquisition footprint. This however, greatly increases the construction cost	Pros: 1. Effectively separates volumes from conflicting movements 2. Provide long term efficient traffic operation 3. Reduces vehicle conflicts and is expected to improve overall intersection safety Cons: 1. Significant cost and Right of Way acquisition 2. Will impact businesses on the southeast side of the interchange 3. Additional traffic on frontage roads and combined business access may introduce additional conflicts and design issues 4. Significant cost and impacts for comparable benefit to other alternatives 5. A grade separated interchange will significantly impact the visibility and presence of remaining businesses near this intersection.	**Cost:** High. > $15,000,000 to 20M excluding R/W and property acquisition costs **Mobility:** NA **Safety:** NA **R/W:** Significant Impact **20-year Traffic Operation Benefit:** NA **20-year Safety Benefit:** NA **Benefit/Cost:** NA

Table 5-14. Alternatives Comparison Matrix – Mn 220 at US 2 Continued

Alternative D-3: Grade Separated Westbound Overpass

Description	Options and Considerations	Pros and Cons	Comparison Summary
 A westbound US 2 overpass with ramp access via the existing MN220/14th St intersection	• Traffic signals would be maintained at the MN220/14th St and Mn 220/US 2 intersection • Traffic signal coordination should be provided • The existing frontage road system is preserved while additional traffic are routed along 14th Street NE • Overpass require significant retaining wall construction to reduce space and R/W acquisition footprint. This however, greatly increases the construction cost • The southbound right turn movement may alternatively need to be located under the overpass and access westbound US 2 via a left side merge	Pros: 1. Effectively separates volumes from some conflicting movements 2. Provide more efficient traffic operation than existing 3. Reduces vehicle conflicts and is expected to improve overall intersection safety 4. Maintains the existing frontage road system and significantly reduces property impacts Cons: 1. Does not separates all existing conflicting movements - existing traffic signal at MN220/US2 must be preserved and modified 2. Significant cost 3. Additional traffic on neighboring roads 4. Significant cost and impacts for comparable benefit to other alternatives 5. A grade separated interchange will significantly impact the visibility and presence of remaining businesses near this intersection.	**Cost:** High. > $15,000,000 to 20M **Mobility:** NA **Safety:** NA **R/W:** Significant Impact **20-year Traffic Operation Benefit:** NA **20-year Safety Benefit:** NA **Benefit/Cost:** NA

Alternative E: System Improvements - 5th Avenue NW Access

Description	Options and Considerations	Pros and Cons	Comparison Summary
 The current 2045 MTP identifies a full access signalized intersection at the US 2/5th Avenue NW intersection (Currently RI/RO on the south side). Full access will provide additional connectivity to the neighborhood reducing traffic demand at the US 2/Mn 220 intersection. Alternative E-1: Couple with Alt A-1 Alternative E-2: Couple with Alt A-3 Alternative E-3: Couple with Alt B	• Provide full access intersection with traffic signal system operating in coordination with the US 2/Mn 220 intersection • Maintaining the existing 5th Avenue NW intersection configuration results in an approximate 1,900 ADT increase to Mn 220 • Streetlight Origin-Destination analysis found the existing eastbound left turn at the US 2/Mn 220 intersection would decrease by 95 (33%) and 50 (18%) vehicles during the AM and PM peak hours, respectively • North of 14th Street, a marginal change in overall ADT on Mn 220 is expected.	Pros: 1. Provides improved access to the neighborhood 2. Reduces vehicle demand at the US 2/Mn 220 intersection 3. Can be designed to provide acceptable safety and traffic operations into forecast year 2045 Cons: 1. High cost 2. Will impact businesses and local resident properties and will increase traffic circulating on neighborhood streets that currently experience low traffic volumes 3. May not be funded or approved for construction **Key Conclusion:** 1. 3/4 Access or full access signalized intersection overall provides a positive benefit to the transportation system and should be considered a viable long term alternative 2. Without the 5th Avenue NW access, the single eastbound left turn lane alternatives at US 2/Mn 220 may not be feasible alternatives due to intersection capacity constraint	NA

Traffic Operation Analysis

Results of the traffic operation analysis are detailed in **Table 5-15.** All alternatives were evaluated with consideration of the 2045 MTP illustrative project to provide signalized full access at the 5th Avenue NW intersection with US 2. Under this assumption, the traffic operation analysis found that the roundabout alternative is expected to provide the most overall efficient 24-hour operation and Alternative A-1 (dual left turn) is expected to operate at a LOS C. The analysis indicates that additional capacity is needed for the eastbound left turn movement (dual left). Alternative C (displaced left turn) is expected to operate very similar to Alternative A-1. Three alternatives were evaluated with consideration that the 5th Avenue NW full access is not constructed (Alternative E-1, E-2 and E-3). Further discussion of Alternative E is provided in a following section.

Table 5-15. Intersection Delay and LOS Summary – Mn 220 at US 2

	Alternatives	AM Peak Hour		PM Peak Hour	
Year	Scenario	LOS	Delay (s)	LOS	Delay (s)
Year 2018	No Build	B / C	19.3 / 25.4	C / C	20.2 / 23.6
	ALT A	C / D	24.7 / 41.5	C / D	25.9 / 40.9
	ALT A-0	C / D	24.7 / 41.5	C / D	25.9 / 40.9
	ALT A-1	C / D	24.4 / 40.7	C / D	25.8 / 39.3
	ALT A-2	C / D	24.9 / 41.6	C / D	26.8 / 41.6
	ALT A-3	C / D	24.9 / 41.6	C / D	26.8 / 41.6
	ALT B	A / A	2.5 / 4.6	A / A	3.0 / 4.8
	ALT C	C / C	21.2 / 24.6	C / C	21.8 / 28.6
Year 2045	No Build	D / D	37.9 / 48.4	D / E	44.8 / 66.2
	ALT A	D / D	38.6 / 54.3	D / E	39.7 / 58.2
	ALT A-0	D / D	38.6 / 54.3	D / E	39.7 / 58.2
	ALT A-1	C / D	29.4 / 45.9	C / D	31.1 / 45.4
	ALT E-1	C / D	33.9 / 46.7	D / D	35.9 / 44.7
	ALT A-2	D / D	39.6 / 54.8	D / D	38.4 / 53.8
	ALT A-3	D / D	39.6 / 54.8	D / D	38.4 / 53.8
	ALT E-2	D / D	41.3 / 52.5	E / F	68.2 / 177.6
	ALT B	A / B	8.2 / 13.9	A / C	8.9 / 16.9
	ALT E-3	B / D	13.0 / 28.3	C / E	15.4 / 39.8
	ALT C	C / C	27.0 / 29.9	C / C	30.1 / 34.7

Overall Intersection LOS / Worst Approach LOS
Overall Intersection Delay / Worst Movement Delay

Safety Analysis

A safety analysis was completed for each alternative to help understand the anticipated level of improvement. The safety analysis includes investigating the change in crash types and/or the elimination in certain types of crashes and computing a monetary annual crash cost for each preliminary alternative. For each alternative, Crash Modification Factors (CMF) were developed and applied to specific correctable crashes based on the various safety improvement measures. Key safety improvements include FYA operation with protected only arrows by time of day, improved visibility of traffic signal indications, improved sight lines with offset left turn lanes, improved right turn lane geometrics and traffic signal coordination. It should be noted that multilane roundabouts typically experience higher crash rates than single lane entries. In other words, the total number of crashes at a multilane roundabout is expected to increase compared to traffic signal control. However, the percentage of injury related crashes (specifically Type A and Type B) is typically reduced, even though the severity rate is increased (skewed high due to significant increase of PDO crashes) as illustrated for Alternative B. **Table 5-16** summarizes the estimated change in intersection crash performance.

Table 5-16. Intersection Safety Summary – Mn 220 at US 2

	No Build	Alternative A Signal Improvements	Alternative A-0 Alternative A + Offset EB/WB LT Lanes	Alternative A-1 Alternative A + Dual EB LT Lanes	Alternative A-2 Alternative A + RT Channelization Improvements	Alternative A-3 Alternative A + Offset EB/WB LT Lanes + RT Channelization	Alternative B 2-lane Roundabout	Alternative C Displaced EB LT
Observed/Estimated Crash Rate (Crashes/MEV)	1.27	0.95	0.88	0.93	0.94	0.87	2.18	0.95
Observed/Estimated Injury Crashes (Percent of Total Crashes)	28.6%	30.1%	29.9%	29.7%	30.5%	30.2%	14.4%	30.1%
Observed/Estimated Crash Severity Rate (Crashes/MEV)	1.90	1.47	1.36	1.43	1.46	1.35	2.56	1.47
2045 Estimated Crash Cost (2018 Dollars)*	$895,801	$746,416	$706,534	$729,992	$751,386	$703,712	$596,976	$746,416

* Crash cost is in dollar unit based on MnDOT OIM Fiscal Year 2019 Values

Note: Alternative B: Although the injury rate is reduced, and the severity profile is reduced (less Type A and Type B), the severity rate is still significant given the overall total increase in property damage crashes expected.

US 2 at 5th Avenue NW Intersection Impact

An illustrative project identified in the 2045 MTP involves constructing a full access intersection (with a traffic signal) at the US 2/5th Avenue NW intersection. This intersection, which currently is right-in right-out on the south leg only, is located about ¼ of a mile to the west of the Mn 220 corridor. Due to the proximity of this intersection and the large volume of eastbound left turns at the Mn 220/US 2 study intersection, this project would be expected to have a minor impact on the southern half of the Mn 220 study corridor. The Regional Travel Demand model indicates

that the ADT on Mn 220, north of US, without the 5th Avenue NW access increases by approximately 1,900 vehicles (i.e., approximately 190 total vehicles during the PM peak hour). Observations were made to understand how many of the current eastbound left turns at Mn 220/US 2 access the neighborhood via 14th Street and 17th Street. It is these motorists that are likely to use the future 5th Avenue NW connection. **Figure 5-4** illustrates the estimated origin/destination. It should also be noted that a similar project was identified in the 2045 MTP at US 2 & 2nd Avenue NE, less than ¼ of a mile to the east of the study corridor. This project was also taken into consideration but is expected to have a negligible effect on Mn 220 or the Mn 220/US 2 intersection demand.

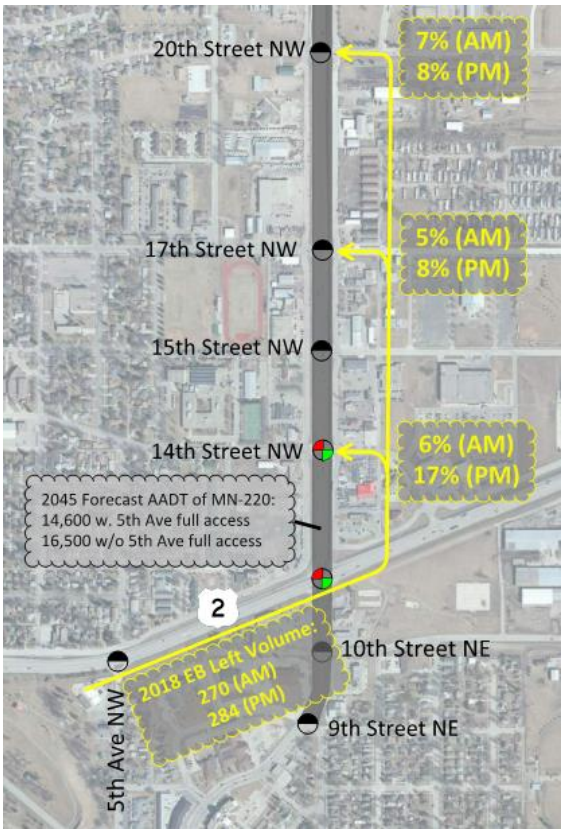


Figure 5-4. 5th Avenue NW Intersection Origin-Destination Demand

The analysis indicates there is operational value of the 5th Avenue NW intersection and it should continue to be considered a viable future project (specifically as it relates to providing an eastbound left turn off of US 2 onto northbound 5th Avenue NW). Whether or not there is a future access to neighborhood at 5th Avenue NW may have implications on potential intersection alternatives at Mn 220/US 2. Without the future 5th Avenue NW access, the analysis indicates that the single eastbound left turn lane concepts at the US 2/Mn 220 intersection may still have capacity concern during the peak hours under forecast year 2045 traffic volumes.

5.4.8 DeMers Avenue at 10th Street NE

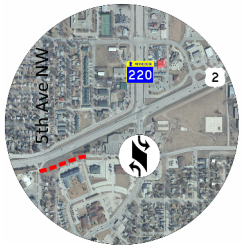
The intersection of DeMers Avenue at 10th Street is located less than 1/8 of a mile south of US 2 and the location where DeMers Avenue transitions from a four-lane roadway to a three-lane roadway. One potential intersection improvement alternative was developed to address future stop control motorist delay and intersection safety.

- No build
- Alternative A: Convert to ¾ Access
- Alternative B: Traffic Control Device Change

The intersection improvement options, design considerations, pros and cons, and estimated cost for each alternative are summarized in **Table 5-17**. In review of the supporting street network and business accesses, the feasibility of a ¾ access configuration at this location may require alternative access to US 2, via extension of 10th Street NW to 5th Avenue NW.

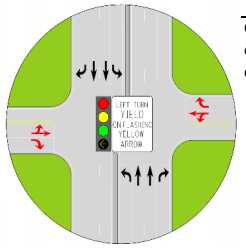
Table 5-17. Alternatives Comparison Matrix – Mn 220 at 10th Street NE

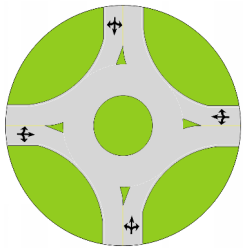
Convert to 3/4 Access or Access Management



Description	Options and Considerations	Pros and Cons	Comparison Summary
Reconstruct to a 3/4 access configuration. Three-quarter intersections are an access management technique that limits cross street movements through an intersection. A median is installed in the middle of the intersection that permits all mainline through and turning movements but prevents cross-traffic through and left turn movements.	• Business access will potentially be significantly impacted. • Would likely necessitate the extension of 10th St NW to 5th Ave NW to provide reasonable service to all movements. **May be a very high cost or alternatively high impact alternative for small improvement return. Further crash report monitoring and potential future intersection study should be considered**	Pros 1. Will improve safety by decreasing conflict points 2. All work can be done within the existing ROW 3. Minimal ongoing maintenance 4. Will improve the overall intersection operation (reduce delays) Cons 1. Could unnecessarily increase traffic volumes and turning movements on other minor roads 2. Potential for increased U-turn related crashes 3. Public/business perception of reduced access	**Cost:** NA **Mobility:** LOS A **Safety:** Reduced Right Angle Crashes **R/W:** None **20-year Traffic Operation Benefit:** NA **20-year Safety Benefit:** NA **Benefit/Cost:** NA

Traffic Control Device





Description	Options and Considerations	Pros and Cons	Comparison Summary
Consideration of a traffic control device change, including a traffic signal system or a roundabout configuration	• Traffic signal system will not meet MUTCD Warrants for installation under existing or future traffic volumes • Spacing to US 2 is of concern under either traffic control device option. Queuing from US 2 may affect operations at 10th Street • Major transmission tower on the southwest corner is expected to be impacted by a roundabout intersection footprint. High cost and potentially infeasible to relocate • A roundabout footprint would have significant property or R/W impact and associated costs, potentially on all four corners. Further preliminary engineering is needed to investigate impact • Distance from US 2 may require two southbound circulating lanes in order to provide enough space for lane transition to 1 southbound lane, south of 10th Street. This will serve to increase the roundabout diameter need. • Current intersection history has 0% injury rate and a crash rate (0.34) slightly above statewide average rate (0.18) and is less than the critical rate (0.45). A typical single lane roundabout performs at a crash rate of 0.32 and a traffic signal system is >0.50. A change in traffic control may in fact increase crashes at this location, and potentially increase the crash injury rate. May be a very high cost or alternatively high impact alternative	Pros 1. May address existing eastbound/westbound crash occurrences 2. A roundabout may reduce intersection delay, though minimal improvement is expected 3. Minimal ongoing maintenance 4. May improve the overall intersection operation (reduce delays) Cons 1. Traffic signal system is expected to increase intersection delay and increase crashes 2. High cost improvmeent for negligble safety or operational benefit. 3. Anticipated high cost impact/infeasible impact with transmission tower, R/W impact and property impacts	**Cost:** NA (High) **Mobility:** LOS A (Existing LOS A) **Safety:** Negligible. Possible increase in crashes and injury rate expected (0% injury in last 5 years) **R/W:** Potential impact **20-year Traffic Operation Benefit:** NA **20-year Safety Benefit:** NA **Benefit/Cost:** NA

5.5 Identification of Segment Alternatives

To address identified deficiencies, the purpose and needs for the Mn 220 corridor, and planning for future growth north of 23rd Street NW, alternatives for two key roadway segments were developed:

- Segment A: 23rd Street NW to 140th Street SW
- Segment B: 17th Street NW to 23rd Street NW

5.5.1 Segment A: 23rd Street NW to 140th Street SW

The following alternatives are proposed to add long term roadway capacity and safety at future development access along the corridor:

- Alternative A: Two-Lane Roadway with Left Turn Lanes
- Alternative B: Convert to Three-Lane Cross-Section with Two Way Center Left Turn Lane

Figure 5-5 illustrates the anticipated roadway typical section under existing conditions and widening to accommodate left turn and/or right turn lanes at future accesses. As shown, the future pavement width need is approximately 53 feet (Alternative A or Alternative B) or 57 feet if a right turn lane is also provided. In any of the alternatives, the existing 150 feet right of way is expected to be enough in accommodating the future roadway width and rural roadway design. The proposed alternatives do not preclude the provision of future backage roads (identified in previous planning studies) along Mn 220, as a long-term strategy to accommodate land use changes.

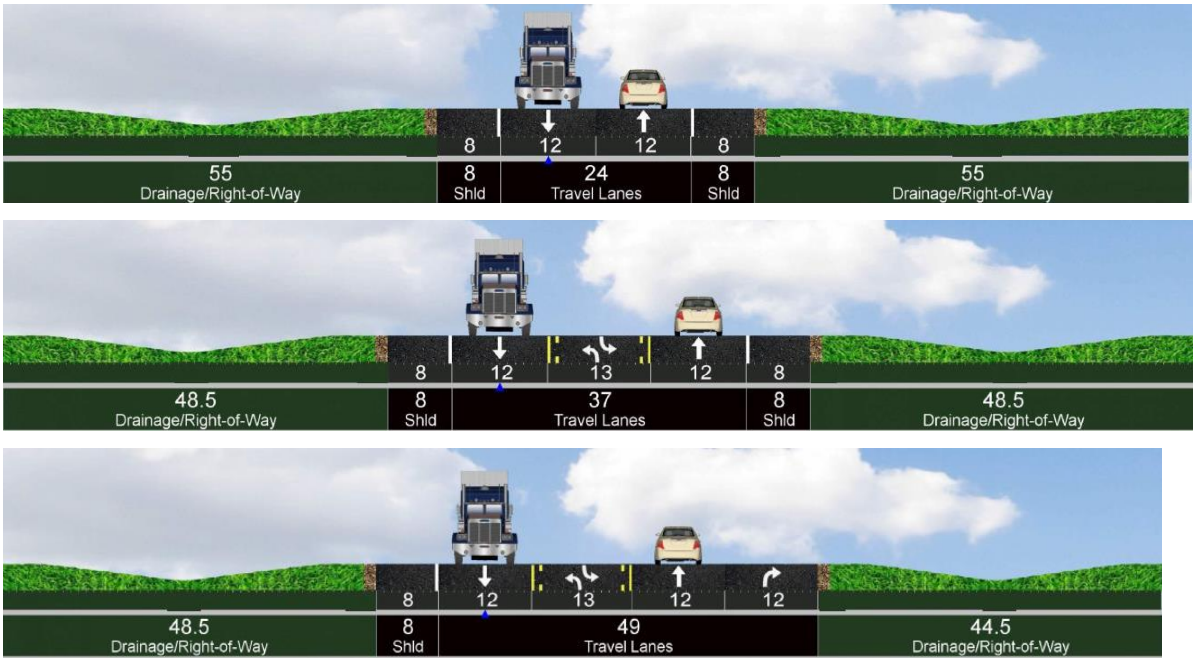


Figure 5-5. Roadway Typical Section Comparison – 23rd Street NW to 140th Street SW

The considerations, pros and cons for each segment alternative are summarized in **Table 5-18.**

5.5.2 Segment B: 17th Street NW to 23rd Street NW

The 2045 MTP identified an illustrative project to extend the existing four lane roadway (currently transitions to two lanes at 17th Street NW) to 23rd Street NW. The various traffic control device, intersection improvement options, and pedestrian crossing considerations may influence the potential typical section alternatives for this segment of Mn 220. The following alternatives were developed:

- Alternative A: Extend 4-Lane Roadway Segment to 23rd Street NW
- Alternative B: Convert 17th Street NW to 23rd Street NW Segment to 2-Lane Roadway
- Alternative C: Extend 4-Lane Roadway Segment to 20th Street NW

Figure 5-6 shows each of these alternatives and details the compatibility with applicable intersection control alternatives. The pros and cons for each segment alternative are summarized in **Table 5-19**.

Figure 5-6. 17th Street to 23rd Street Segment Alternatives Traffic Control Compatibility Comparison

Table 5-18. Alternatives Comparison Matrix – Segment A - 23rd Street NW to 140th Street SW

No Build

Description	Compatibility	Pros and Cons
Maintain 2-lane roadway between 23rd Street NW and 140th Street SW. No turn lanes into driveways or at future intersections.	Compatible with any proposed intersection alternatives.	Pros 1. Does not have property, drainage or residential driveway impacts 2. Does not require roadway widening 3. Maintains LOS C or better through forecast year 2045 projection 4. Consistent corridor typical section and treatment of residential driveways. Cons 1. Left turn movements at future development access intersections may degrade traffic operation and safety of the corridor

Alternative A: Two-Lane Roadway with Left Turn Pockets

Description	Compatibility	Pros and Cons
Maintain 2-lane roadway, and add left turn pockets at future intersections.	Compatible with any proposed intersection alternatives.	Pros 1. Expected to provide more efficient traffic operations along segment and at future development access intersections 2. Left turn lanes will improve the corridor safety with the introduction of increased left turning vehicles 3. Provides opportunity for residents accessing private driveways to move out of traffic lane. 4. Can easily be constructed one access at a time as development occurs. Does not depend upon a full segment reconstruction to develop the roadway typical section 5. Overall, would only require about 50% of the segment between 23rd Street NW and 140th Street SW to be reconstructed. 6. Estimated to fit within the existing R/W Cons 1. Requires roadway widening on both sides of access with left turn lanes. Corridor would be widened to transition in and out of left turn bays 2. May provide inconsistent message for motorists accessing private driveways. In some cases turns can be made from turn lane, but other driveways not the case. Could cause confusion. 3. Widening for left turn lanes will impact residential driveways and drainage ditches. Approximately 7-9 feet of additional widening on each side of the road

Alternative B: Convert to 3-Lane Cross-Section

Description	Compatibility	Pros and Cons
Widen roadway between 23rd Street NW and 140th Street SW to 3-lane cross-section (2-lane with two-way center left turn lane along entire segment).	Compatible with any proposed intersection alternatives.	Pros 1. Expected to provide most efficient traffic operations along segment and at future development access intersections 2. Left turn lanes will improve the corridor safety with the introduction of increased left turning vehicles 3. Most consistent design to accommodate private residential driveways and future development access. 4. Estimated to fit within the existing R/W Cons 1. Requires roadway reconstruction and widening the full length of the corridor. High Cost for low residential driveway left turn movements. 2. Widening for left turn lanes will impact residential driveways and drainage ditches. Approximately 7-9 feet of additional widening on each side of the road 3. Not as easily implemented with stage construction that may be necessary with varying timeline for new land development access

Table 5-19. Alternatives Comparison Matrix – Segment B - 17th Street NW to 23rd Street NW

No Build

Description	Compatibility	Pros and Cons
Maintain existing Mn 220 roadway cross-section and existing lane transition point. Make intersection improvements only.	• At 23rd Street NW o No Build o Alternative A: Install Signal System • At 20th Street NW o No Build o Alternative A: Convert to 3/4 Access o Alternative B: Convert to 3/4 Access and also Prohibit Southbound Left Turns • At 17th Street NW o No Build o Alternative A: Install Signal System	Pros 1. Compatibility with a variety of intersection alternatives 2. Low cost. Minimal to no roadway reconstruction 3. Maintains existing and projected future segment LOS C or better. Added capacity is not necessary Cons 1. Does not address lane utilization and motorists driving in the shoulder north of 17th Street NE to make right turn at 20th Street NE 2. Wide roadway and higher roadway speeds reduce pedestrian comfort and make pedestrian crossings more difficult

Alternative A: Extend 4-Lane Roadway Segment to 23rd Street NW

Description	Compatibility	Pros and Cons
Extend 4-lane roadway segment to 23rd Street NW. Northbound right lane would terminate as right turn only lane at 23rd Street NW	• At 23rd Street NW o No Build o Alternative A: Install Signal System • At 20th Street NW o No Build o Alternative A: Convert to 3/4 Access o Alternative B: Convert to 3/4 Access and also Prohibit Southbound Left Turns • At 17th Street NW o No Build o Alternative A: Install Signal System	Pros 1. Currently an illustrative project identified in the 2045 MTP 2. Most compatible with the long term consideration of traffic signal installations at 17th Street NW and 23rd Street NW Cons 1. Requires substantial roadway widening. High Cost 2. Wide roadway and higher roadway speeds reduce pedestrian comfort and make pedestrian crossings more difficult, specifically at the 20th Street NW pedestrian crossing. 3. Adds roadway capacity that isn't needed.

Alternative B: Convert 17th Street NW to 23rd Street NW Segment to 2-Lane Roadway

Description	Compatibility	Pros and Cons
Convert the entire segment to a 2-lane roadway between 17th Street NW and 23rd Street NW. Maintain right and left turn lanes at non-roundabout intersections	• At 23rd Street NW o No Build o Alternative A: Install Traffic Signal o Alternative B: Install Single-Lane Roundabout • At 20th Street NW o No Build o Alternative A: Convert to 3/4 Access o Alternative B: Convert to 3/4 Access and also Prohibit Southbound Left Turns • At 17th Street NW o Alternative A: Install Traffic Signal o Alternative B: Install Single-Lane Roundabout	Pros 1. Best compatibility with roundabout alternative at 17th Street NW and 23rd Street NW. However, could also be compatible with traffic signal installations at both locations. 2. Improves pedestrian comfort, reduces intersection pedestrian crossing distances. Provides best opportunity to improve the pedestrian crosswalk at 20th Street NW 3. Could increase distance between Mn 220 and the frontage roads 4. Reduces feel of wide roadway and likely could result in reduced vehicle travel speeds, supporting a future speed zone reduction between 17th Street NW and 23rd Street NW 5. Addresses the northbound motorist lane utilization and driving within the existing shoulder issue. If traffic signal installed at 17th Street NW, the northeast corner could be curb extended to reduce pedestrian crossing distance, improving pedestrian safety. Cons 1. Low to Moderate reconstruction cost. Require some curb and pavement work north of 17th Street NW to be most effective 2. Reducing travel lanes may not be perceived acceptable by area businesses.

Alternative C: Extend 4-Lane Roadway Segment to 20th Street NW

Description	Compatibility	Pros and Cons
Extend the 4-lane roadway to 20th Street NW. Northbound right lane would terminate as right turn only lane 20th Street NW. Maintain the existing 2-lane roadway segment between 20th Street NW and 23rd Street NW.	• At 23rd Street NW o No Build o Alternative A: Install Traffic Signal o Alternative B: Install Single-Lane Roundabout • At 20th Street NW o No Build o Alternative A: Convert to 3/4 Access o Alternative B: Convert to 3/4 Access and also Prohibit Southbound Left Turns • At 17th Street NW o Alternative A: Install Traffic Signal	Pros 1. Currently an illustrative project identified in the 2045 MTP involves shifting 4-lane to 2-lane transition north 2. Improves pedestrian comfort, reduces intersection pedestrian crossing distances, and provides opportunity to improve the pedestrian crosswalk at 20th Street NW 3. Compatibility with a variety of intersection alternatives 4. Low reconstruction cost. Minimal curb work and widening is needed in the northbound direction between 17th Street NW and 20th Street NW 5. Addresses the northbound motorist lane utilization and driving within the existing shoulder issue Cons 1. Requires roadway widening on one block 2. Maintains wide intersection at 17th Street NW conducive to only the existing stop or potential traffic signal control.

5.6 Identification of Other Improvement Alternatives

In addition to the intersection and segment alternatives, several additional improvements have been identified, as previously illustrated on **Figure 5-3**. These include:

- **Establishing sidewalk connections.** Six potential sidewalk connections were identified to address system gaps and to make connection between Mn 220 and adjoining businesses and neighborhoods.
- **Relocation of above ground utility boxes**. One location on the southwest corner of DeMers Avenue/10th Street NE was identified as being problematic in obstructing stopped motorist sight lines of approaching traffic.
- **10th Street NE to 9th Street NE lane transition**. One potential option to improve the lane drop and southbound left turn lane alignment at 9th Street NE, as illustrated in **Figure 5-7** below.

Figure 5-7. Lane Drop and Left Turn Lane Striping Improvement – 10th Street NE to 9th Street NE

- **Improve Transit Access.** Improving pedestrian accessibility to transit service is an important consideration with the long-term growth of the Mn 220 corridor. In the short term, improving existing bus stops through stop identification (signs) along with concrete pads and associated access to sidewalks, bus benches or shelters should be considered. Four potential bus stop locations have been identified for potential improvement. In the long-term coordination with Cities Area Transit (CAT) is needed to identify potential transit route options to connect future land use growth north of 23rd Street. Route improvements and alternatives are dependent upon the timeline and phasing of future growth, which is unknown at this time. Also, bus stops north of 17th Street will need to be identified and designed to provide accessibility to the sidewalk network.

5.7 Evaluation of Intersection Alternatives

Nine qualitative and quantitative evaluation metric categories were reviewed as part of the screening process, as summarized in **Table 5-20**. The key evaluation metrics used to compare each alternative are consistent with the 2045 MTP objectives and performance targets.

Table 5-20. Mn 220 Corridor Evaluation Metrics

Purpose and Need	**Modal Interrelationships**
• Compatible with project purpose and needs	• Pedestrian network compatibility • Ease of pedestrian crossing • Bicycle network compatibility • Transit service impacts
Intersection Capacity	**Safety**
• Intersection level of service • Worst approach level of service • Delay Benefit	• Crash rate • Injury Crash Percentage • Crash Reduction or Impact
Transportation Demand/System Linkage	**Roadway Deficiencies**
• Side-street accessibility • Connectivity within the study area • Connectivity to the greater region • Dependence on 5th Ave NW or 2nd St NE connections • Ability to accommodate future corridor volumes	• Infrastructure lifetime • Public street and driveway spacing
Social or Economic Demand	**Roadway Design and Complexity**
• Compatibility with future land development • Existing business impact • Ability to accommodate harvest season heavy commercial traffic volumes and movements • Ability to accommodate year-round heavy commercial traffic movements • Farmland impact • Corridor visual quality impact • Environmental impacts	• Addresses known roadway deficiencies • Easiness to navigate / driver familiarity • Coordination with planned project • Favorable construction timeline • Right-of-way impact area • Number of potential property acquisitions
	Cost
	• Estimated design & construction cost • Cost/benefit ratio

The evaluation criteria are intended to provide for a quantitative and qualitative evaluation of each of the alternatives, supplementing the selection and refinement of intersection

recommendations. For each evaluation criteria, the alternative is subjectively scored based on how well it meets the objective; ranging from, 1 – does not meet objective (impact), to 3-neutral (no change), to 5- meets the objective well (improvement).

The evaluation criteria categories were evaluated in two ways: 1) given equal weight to each of the nine evaluation categories, and 2) weighted categories based on priorities heard through the stakeholder engagement process and consistency with other MPO studies completed in the area. The prioritized categories are (weight denoted in parenthesis):

- Purpose and Need (1)
- Safety (1.5)
- Intersection Capacity (1.25)
- Cost / Economical (1.25)
- Social or Economic Demand (1.1)
- Roadway Design and Complexity (1.1)
- Modal Interrelationships (1.1)
- Transportation Demand/System Linkage (1.05)
- Roadway Deficiencies (Access Spacing) (1)

Table 5-21 and **Table 5-22** detail the evaluation of the intersection alternatives developed with equal category weight. **Table 5-23** and **Table 5-24** detail the evaluation of the intersection alternatives developed with prioritized categories.

Table 5-21. Preliminary Alternatives Evaluation Matrix – Mn 220 at US 2

MN-220 Preliminary Alternatives Evaluation Matrix		Mn 220 at US 2																	
		No Build		**Alternative A** Signal Improvements *(Intersection-level analysis)*		**Alternative A-0** Alternative A + Offset EB/WB LT Lanes		**Alternative A-1** Alternative A + Dual EB LT Lanes		**Alternative A-2** Alternative A + RT Channelization Improvements		**Alternative A-3** Alternative A + Offset EB/WB LT Lanes + RT Channelization		**Alternative B** 2-lane Roundabout		**Alternative C** Displaced EB LT		**Alternative D** Grade Separation (Tight Diamond)	
		Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score
Purpose and Need			1.0		4.0		4.0		4.0		4.0		4.0		4.0		4.0		4.0
1	Compatible with project purpose and needs	--	1	--	4	--	4	--	4	--	4	--	4	--	4	--	4	--	4
Intersection Capacity			2.3		2.0		2.0		3.0		2.0		2.0		4.7		3.3		4.7
1	Intersection level of service (2045 AM/PM)	D/D	2	D/D	2	D/D	2	C/C	3	D/D	2	D/D	2	A/A	5	C/C	3	NA	5
2	Worst approach level of service (2045 AM/PM)	D/E	2	D/E	2	D/E	2	D/D	2	D/D	2	D/D	2	B/C	4	C/C	3	NA	4
3	Delay Benefit (Million $; 20 Years Present Value)	$ -	3	$ (1.92)	2	$ (1.92)	2	$ 5.10	4	$ (2.04)	2	$ (2.04)	2	$ 38.51	5	$ 9.01	4	Large	5
Transportation Demand/System Linkage			2.4		2.6		2.6		3.2		2.6		2.6		3.6		3.2		3.6
1	Side-street accessibility	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
2	Connectivity within the study area	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
3	Connectivity to the greater region	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
4	Dependence on 5th Ave NW or 2nd St NE connections	NA	1	NA	1	NA	1	C/D	3	NA	1	D/E	1	B/C	4	A-1	3	NA	4
5	Ability to accommodate future corridor volumes	--	2	--	3	--	3	--	4	--	3	--	3	--	5	--	4	--	5
Social or Economic Demand			3.0		3.0		3.0		2.9		3.1		2.9		3.4		2.7		2.1
1	Compatibility with future land development	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
2	Existing business impact	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	2	--	1
3	Ability to accommodate harvest season heavy commercial traffic volumes and movements	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
4	Ability to accommodate year-round heavy commercial traffic movements	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
5	Farmland impact	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
6	Corridor visual quality impact	--	3	--	3	--	3	--	3	--	3	--	3	--	5	--	3	--	1
7	Environmental impacts	--	3	--	3	--	3	--	2	--	4	--	2	--	4	--	2	--	1
Modal Interrelationships			2.8		3.3		3.3		3.3		3.3		3.3		2.5		2.8		1.8
1	Pedestrian network compatibility	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	1
2	Ease of pedestrian crossing	--	2	--	4	--	4	--	4	--	4	--	4	--	2	--	2	--	2
3	Bicycle network compatibility	--	3	--	3	--	3	--	3	--	3	--	3	--	2	--	3	--	1
4	Transit service impacts	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
Safety			3.0		3.7		4.0		3.7		3.7		4.0		3.7		3.7		3.7
1	Crash rate (crashes / million entering vehicles)	1.27	3	0.95	4	0.88	5	0.93	4	0.94	4	0.87	5	2.18	1	0.95	4	NA	4
2	Injury Crash Percentage	29%	3	30%	3	30%	3	30%	3	31%	3	30%	3	14%	5	30%	3	NA	3
3	Crash benefit (Million $; 20 Years Present Value)	$ -	3	$ 2.11	4	$ 2.72	4	$ 2.36	4	$ 2.09	4	$ 2.75	4	$ 4.26	5	$ 2.11	4	NA	4
Roadway Deficiencies			2.0		3.0		3.0		3.0		3.0		3.0		4.0		2.5		3.0
1	Infrastructure lifetime	--	1	--	3	--	3	--	3	--	3	--	3	--	5	--	3	--	4
2	Public street and driveway spacing	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	2	--	2
Roadway Design and Complexity			3.8		4.3		4.2		4.2		4.3		4.2		3.7		2.2		2.5
1	Addresses known roadway deficiencies	None	1	Signal	4	Signal	4	Signal	4	Signal	4	Signal	4	gnal/Paveme	5	Signal	4	gnal/Paveme	5
2	Easiness to navigate / driver familiarity	Comfort	5	Familiar	4	Familiar	4	Familiar	4	Familiar	4	Familiar	4	Unfamiliar	2	ery Unfamili	1	Comfort	5
3	Coordination with planned project	--	2	--	5	--	4	--	4	--	5	--	4	--	3	--	2	--	2
4	Favorable construction timeline	--	5	--	3	--	3	--	3	--	3	--	3	--	2	--	2	--	1
5	Right-of-way impact area	0	5	0	5	0	5	0	5	0	5	0	5	0	5	Some	2	Large	1
6	Number of potential property acquisitions	0	5	0	5	0	5	0	5	0	5	0	5	0	5	Some	2	Large	1
Cost			4.0		3.0		2.0		3.0		3.0		2.0		3.5		3.0		1.0
1	Estimated construction cost (Million $)	$ -	5	$ 0.35	4	$ 2.35	2	$ 2.35	2	$ 0.88	4	$ 2.65	2	$ 3.60	2	$ 2.90	2	>$15m	1
2	Benefit/cost ratio	NA	3	0.66	2	0.48	2	4.47	4	0.07	2	0.38	2	17.34	5	5.41	4	NA	1
	TOTAL (Sum of Individual Scores)		96.0		106.0		104.0		110.0		107.0		103.0		118.0		95.0		92.0

Table 5-22. Preliminary Alternatives Evaluation Matrix – All Other Intersections

	MN-220 Preliminary Alternatives Evaluation Matrix	Mn 220 at 10th				Mn 220 at 14th						Mn 220 at 15th						Mn 220 at 17th						Mn 220 at 20th						Mn 220 at 23rd					
		No Build		**Alternative A** 3/4 Access		**No Build**		**Alternative A** Signal Improvements *(Intersection-level analysis)*		**Alternative B** 2x1 Roundabout		**No Build**		**Alternative A** 3/4 Access		**Alternative B** Establish Crosswalk with Pedestrian Refuge		**No Build**		**Alternative A** Signal Installation *(Intersection-level analysis)*		**Alternative B** Single-lane Roundabout		**No Build**		**Alternative A** 3/4 Access		**Alternative B** 3/4 Access + no SB LT		**No Build**		**Alternative A** Signal Installation *(Intersection-level analysis)*		**Alternative B** Single-lane Roundabout	
		Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score
Purpose and Need			2.0		4.0		2.0		4.0		4.0		1.0		3.0		3.0		2.0		4.0		4.0		1.0		3.0		3.0		2.0		4.0		4.0
1	Compatible with project purpose and needs	--	2	--	4	--	2	--	4	--	4	--	1	--	3	--	3	--	2	--	4	--	4	--	1	--	3	--	3	--	2	--	4	--	4
Intersection Capacity			3.7		4.3		4.0		3.7		4.7		4.3		4.3		4.3		3.0		3.0		4.7		4.0		4.3		4.3		3.7		3.0		4.7
1	Intersection level of service (2045 AM/PM)	A/A	5	NA	5	A/B	5	A/B	5	A/A	5	A/A	5	NA	5	NA	5	A/B	5	A/B	5	A/A	5	A/A	5	NA	5	NA	5	A/A	5	B/B	4	A/A	5
2	Worst approach level of service (2045 AM/PM)	C/D	3	NA	5	B/B	4	C/C	3	A/A	5	A/A	5	NA	5	NA	5	D/F	1	D/D	2	A/A	5	B/C	4	NA	5	NA	5	C/C	3	B/B	4	A/A	5
3	Delay Benefit (Million $; 20 Years Present Value)	$ -	3	$ -	3	$ -	3	$ 0.37	3	$ 8.81	4	$ -	3	$ -	3	$ -	3	$ -	3	$ (1.78)	2	$ 2.31	4	$ -	3	$ -	3	$ -	3	$ -	3	$ (3.05)	1	$ 1.03	4
Transportation Demand/System Linkage			3.2		2.6		3.4		3.6		3.2		3.4		3.2		3.4		3.0		3.6		3.2		3.4		3.2		3.2		3.2		3.6		3.8
1	Side-street accessibility	--	3	--	2	--	3	--	4	--	2	--	3	--	2	--	3	--	3	--	4	--	2	--	3	--	2	--	2	--	3	--	4	--	5
2	Connectivity within the study area	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
3	Connectivity to the greater region	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
4	Dependence on 5th Ave NW or 2nd St NE connections	OK	3	needed	1	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3
5	Ability to accommodate future corridor volumes	--	4	--	4	--	5	--	5	--	5	--	5	--	5	--	5	--	3	--	5	--	5	--	5	--	5	--	5	--	4	--	5	--	5
Social or Economic Demand			3.3		2.7		3.0		3.0		3.4		3.0		2.9		3.0		3.0		3.0		3.4		3.0		2.9		2.9		3.0		3.1		3.6
1	Compatibility with future land development	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	4
2	Existing business impact	--	5	--	1	--	3	--	3	--	3	--	3	--	2	--	3	--	3	--	3	--	3	--	3	--	2	--	2	--	3	--	3	--	3
3	Ability to accommodate harvest season heavy commercial traffic volumes and movements	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
4	Ability to accommodate year-round heavy commercial traffic movements	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
5	Farmland impact	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
6	Corridor visual quality impact	--	3	--	3	--	3	--	3	--	5	--	3	--	3	--	3	--	3	--	3	--	5	--	3	--	3	--	3	--	3	--	3	--	5
7	Environmental impacts	--	3	--	3	--	3	--	3	--	4	--	3	--	3	--	3	--	3	--	3	--	4	--	3	--	3	--	3	--	3	--	3	--	4
Modal Interrelationships			2.3		2.3		2.8		2.8		2.5		2.3		3.5		3.5		2.0		3.5		2.8		2.3		2.5		3.8		3.0		3.3		3.0
1	Pedestrian network compatibility	--	2	--	2	--	2	--	2	--	2	--	1	--	4	--	4	--	1	--	4	--	3	--	2	--	3	--	5	--	3	--	3	--	3
2	Ease of pedestrian crossing	--	2	--	2	--	3	--	3	--	3	--	2	--	4	--	4	--	1	--	4	--	3	--	2	--	3	--	5	--	4	--	4	--	4
3	Bicycle network compatibility	--	2	--	2	--	3	--	3	--	2	--	3	--	3	--	3	--	3	--	3	--	2	--	2	--	3	--	3	--	3	--	3	--	2
4	Transit service impacts	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	2	--	2	--	3	--	3	--	3
Safety			3.0		4.0		3.0		4.0		3.3		3.0		3.7		3.7		3.0		3.3		4.0		3.0		3.7		3.7		3.0		2.3		4.0
1	Crash rate (crashes / million entering vehicles)	0.34	3	Reduced	4	0.70	3	0.50	4	0.76	2	0.11	3	reduced	4	reduced	4	0.71	3	0.58	4	0.32	5	0.15	3	reduced	4	reduced	4	0.54	3	0.59	3	0.32	4
2	Injury Crash Percentage	0%	3	Reduced	4	22%	3	20%	4	19%	4	0%	3	reduced	4	reduced	4	15%	3	15%	3	15%	3	0%	3	reduced	4	reduced	4	33%	3	38%	2	25%	4
3	Crash benefit (Million $; 20 Years Present Value)	$ -	3	$ -	4	$ -	3	$ 1.96	4	$ 1.80	4	$ -	3	$ -	3	$ -	3	$ -	3	$ 0.22	3	$ 0.65	4	$ -	3	$ -	3	$ -	3	$ -	3	$ (0.17)	2	$ 0.99	4
Roadway Deficiencies			2.5		3.5		2.0		3.0		3.5		3.0		3.0		3.0		2.5		3.0		4.0		3.0		3.0		3.0		2.5		3.0		4.0
1	Infrastructure lifetime	--	3	--	3	--	1	--	3	--	5	--	3	--	3	--	3	--	2	--	3	--	5	--	3	--	3	--	3	--	2	--	3	--	5
2	Public street and driveway spacing	--	2	--	4	--	3	--	3	--	2	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
Roadway Design and Complexity			4.0		3.7		3.8		4.2		3.7		4.2		4.2		4.2		4.0		4.3		3.8		4.2		4.2		4.2		3.8		4.5		3.5
1	Addresses known roadway deficiencies	none	1	me paveme	3	None	1	Signal	3	nal/Paveme	5	none	3	ccess spacin	4	none	3	None	1	me paveme	4	nal/Paveme	5	none	3	me paveme	4	me paveme	3	None	1	me paveme	4	nal/Paveme	5
2	Easiness to navigate / driver familiarity	Comfort	5	Familiar	4	Comfort	5	Comfort	5	Unfamiliar	2	Comfort	4	Familiar	4	familiar	4	Comfort	5	Comfort	5	Unfamiliar	2	Comfort	5	Familiar	4	Familiar	4	Comfort	5	Comfort	5	Unfamiliar	2
3	Coordination with planned project	--	3	--	2	--	2	--	3	--	3	--	3	--	3	--	3	--	3	--	4	--	4	--	2	--	5	--	5	--	2	--	5	--	2
4	Favorable construction timeline	--	5	--	3	--	5	--	4	--	2	--	5	--	4	--	5	--	5	--	3	--	2	--	5	--	3	--	3	--	5	--	3	--	2
5	Right-of-way impact area	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5
6	Number of potential property acquisitions	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5
Cost			4.0		2.5		4.0		4.0		3.0		4.0		3.5		3.5		3.5		2.5		2.5		4.0		3.5		3.5		4.0		2.5		2.0
1	Estimated construction cost (Million $)	$ -	5	NA	2	$ -	5	$ 0.30	4	$ 3.00	2	$ -	5	$ 0.49	4	$ 0.35	4	$ 0.05	4	$ 0.50	4	$ 2.70	2	$ -	5	$ 0.35	4	$ 0.60	4	$ -	5	$ 0.50	4	$ 2.95	2
2	Benefit/cost ratio	NA	3	NA	3	NA	3	9.50	4	5.20	4	NA	3	NA	3	NA	3	NA	3	<0	1	1.55	3	NA	3	NA	3	NA	3	NA	3	<0	1	0.98	2
	TOTAL (Sum of Individual Scores)	107.0		104.0		107.0		116.0		113.0		109.0		115.0		117.0		100.0		113.0		117.0		108.0		111.0		116.0		107.0		111.0		119.0	

Table 5-23. Prioritized Preliminary Alternatives Evaluation Matrix – Mn 220 at US 2

MN-220 Preliminary Alternatives Evaluation Matrix		Mn 220 at US 2																	
		No Build		**Alternative A** Signal Improvements *(Intersection-level analysis)*		**Alternative A-0** Alternative A + Offset EB/WB LT Lanes		**Alternative A-1** Alternative A + Dual EB LT Lanes		**Alternative A-2** Alternative A + RT Channelization Improvements		**Alternative A-3** Alternative A + Offset EB/WB LT Lanes + RT Channelization		**Alternative B** 2-lane Roundabout		**Alternative C** Displaced EB LT		**Alternative D** Grade Separation (Tight Diamond)	
		Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score
Purpose and Need			1.0		4.0		4.0		4.0		4.0		4.0		4.0		4.0		4.0
1	Compatible with project purpose and needs	--	1	--	4	--	4	--	4	--	4	--	4	--	4	--	4	--	4
Intersection Capacity			2.3		2.0		2.0		3.0		2.0		2.0		4.7		3.3		4.7
1	Intersection level of service (2045 AM/PM)	D/D	2	D/D	2	D/D	2	C/C	3	D/D	2	D/D	2	A/A	5	C/C	3	NA	5
2	Worst approach level of service (2045 AM/PM)	D/E	2	D/E	2	D/E	2	D/D	2	D/D	2	D/D	2	B/C	4	C/C	3	NA	4
3	Delay Benefit (Million $; 20 Years Present Value)	$ -	3	$ (1.92)	2	$ (1.92)	2	$ 5.10	4	$ (2.04)	2	$ (2.04)	2	$ 38.51	5	$ 9.01	4	Large	5
Transportation Demand/System Linkage			2.4		2.6		2.6		3.2		2.6		2.6		3.6		3.2		3.6
1	Side-street accessibility	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
2	Connectivity within the study area	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
3	Connectivity to the greater region	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
4	Dependence on 5th Ave NW or 2nd St NE connections	NA	1	NA	1	NA	1	C/D	3	NA	1	D/E	1	B/C	4	A-1	3	NA	4
5	Ability to accommodate future corridor volumes	--	2	--	3	--	3	--	4	--	3	--	3	--	5	--	4	--	5
Social or Economic Demand			3.0		3.0		3.0		2.9		3.1		2.9		3.4		2.7		2.1
1	Compatibility with future land development	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
2	Existing business impact	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	2	--	1
3	Ability to accommodate harvest season heavy commercial traffic volumes and movements	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
4	Ability to accommodate year-round heavy commercial traffic movements	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
5	Farmland impact	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
6	Corridor visual quality impact	--	3	--	3	--	3	--	3	--	3	--	3	--	5	--	3	--	1
7	Environmental impacts	--	3	--	3	--	3	--	2	--	4	--	2	--	4	--	2	--	1
Modal Interrelationships			2.8		3.3		3.3		3.3		3.3		3.3		2.5		2.8		1.8
1	Pedestrian network compatibility	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	1
2	Ease of pedestrian crossing	--	2	--	4	--	4	--	4	--	4	--	4	--	2	--	2	--	2
3	Bicycle network compatibility	--	3	--	3	--	3	--	3	--	3	--	3	--	2	--	3	--	1
4	Transit service impacts	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
Safety			3.0		3.7		4.0		3.7		3.7		4.0		3.7		3.7		3.7
1	Crash rate (crashes / million entering vehicles)	1.27	3	0.95	4	0.88	5	0.93	4	0.94	4	0.87	5	2.18	1	0.95	4	NA	4
2	Injury Crash Percentage	29%	3	30%	3	30%	3	30%	3	31%	3	30%	3	14%	5	30%	3	NA	3
3	Crash benefit (Million $; 20 Years Present Value)	$ -	3	$ 2.11	4	$ 2.72	4	$ 2.36	4	$ 2.09	4	$ 2.75	4	$ 4.26	5	$ 2.11	4	NA	4
Roadway Deficiencies			2.0		3.0		3.0		3.0		3.0		3.0		4.0		2.5		3.0
1	Infrastructure lifetime	--	1	--	3	--	3	--	3	--	3	--	3	--	5	--	3	--	4
2	Public street and driveway spacing	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	2	--	2
Roadway Design and Complexity			3.8		4.3		4.2		4.2		4.3		4.2		3.7		2.2		2.5
1	Addresses known roadway deficiencies	None	1	Signal	4	Signal	4	Signal	4	Signal	4	Signal	4	gnal/Paveme	5	Signal	4	gnal/Paveme	5
2	Easiness to navigate / driver familiarity	Comfort	5	Familiar	4	Familiar	4	Familiar	4	Familiar	4	Familiar	4	Unfamiliar	2	ery Unfamili	1	Comfort	5
3	Coordination with planned project	--	2	--	5	--	4	--	4	--	5	--	4	--	3	--	2	--	2
4	Favorable construction timeline	--	5	--	3	--	3	--	3	--	3	--	3	--	2	--	2	--	1
5	Right-of-way impact area	0	5	0	5	0	5	0	5	0	5	0	5	0	5	Some	2	Large	1
6	Number of potential property acquisitions	0	5	0	5	0	5	0	5	0	5	0	5	0	5	Some	2	Large	1
Cost			4.0		3.0		2.0		3.0		3.0		2.0		3.5		3.0		1.0
1	Estimated construction cost (Million $)	$ -	5	$ 0.35	4	$ 2.35	2	$ 2.35	2	$ 0.88	4	$ 2.65	2	$ 3.60	2	$ 2.90	2	>$15m	1
2	Benefit/cost ratio	NA	3	0.66	2	0.48	2	4.47	4	0.07	2	0.38	2	17.34	5	5.41	4	NA	1
	TOTAL (Weighted Sum of Individual Scores)	110.4		121.2		119.1		125.9		122.3		118.0		135.3		109.6		106.1	

Table 5-24. Prioritized Preliminary Alternatives Evaluation Matrix – All Other Intersections

MN-220 Preliminary Alternatives Evaluation Matrix		Mn 220 at 10th				Mn 220 at 14th						Mn 220 at 15th					
		No Build		**Alternative A** 3/4 Access		**No Build**		**Alternative A** Signal Improvements *(Intersection-level analysis)*		**Alternative B** 2x1 Roundabout		**No Build**		**Alternative A** 3/4 Access		**Alternative B** Establish Crosswalk with Pedestrian Refuge	
		Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score
Purpose and Need			2.0		4.0		2.0		4.0		4.0		1.0		3.0		3.0
1	Compatible with project purpose and needs	--	2	--	4	--	2	--	4	--	4	--	1	--	3	--	3
Intersection Capacity			3.7		4.3		4.0		3.7		4.7		4.3		4.3		4.3
1	Intersection level of service (2045 AM/PM)	A/A	5	NA	5	A/B	5	A/B	5	A/A	5	A/A	5	NA	5	NA	5
2	Worst approach level of service (2045 AM/PM)	C/D	3	NA	5	B/B	4	C/C	3	A/A	5	A/A	5	NA	5	NA	5
3	Delay Benefit (Million $; 20 Years Present Value)	$ -	3	$ -	3	$ -	3	$ 0.37	3	$ 8.81	4	$ -	3	$ -	3	$ -	3
Transportation Demand/System Linkage			3.2		2.6		3.4		3.6		3.2		3.4		3.2		3.4
1	Side-street accessibility	--	3	--	2	--	3	--	4	--	2	--	3	--	2	--	3
2	Connectivity within the study area	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
3	Connectivity to the greater region	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
4	Dependence on 5th Ave NW or 2nd St NE connections	OK	3	needed	1	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3
5	Ability to accommodate future corridor volumes	--	4	--	4	--	5	--	5	--	5	--	5	--	5	--	5
Social or Economic Demand			3.3		2.7		3.0		3.0		3.4		3.0		2.9		3.0
1	Compatibility with future land development	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
2	Existing business impact	--	5	--	1	--	3	--	3	--	3	--	3	--	2	--	3
3	Ability to accommodate harvest season heavy commercial traffic volumes and movements	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
4	Ability to accommodate year-round heavy commercial traffic movements	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
5	Farmland impact	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
6	Corridor visual quality impact	--	3	--	3	--	3	--	3	--	5	--	3	--	3	--	3
7	Environmental impacts	--	3	--	3	--	3	--	3	--	4	--	3	--	3	--	3
Modal Interrelationships			2.3		2.3		2.8		2.8		2.5		2.3		3.5		3.5
1	Pedestrian network compatibility	--	2	--	2	--	2	--	2	--	2	--	1	--	4	--	4
2	Ease of pedestrian crossing	--	2	--	2	--	3	--	3	--	3	--	2	--	4	--	4
3	Bicycle network compatibility	--	2	--	2	--	3	--	3	--	2	--	3	--	3	--	3
4	Transit service impacts	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
Safety			3.0		4.0		3.0		4.0		3.3		3.0		3.7		3.7
1	Crash rate (crashes / million entering vehicles)	0.34	3	Reduced	4	0.70	3	0.50	4	0.76	2	0.11	3	reduced	4	reduced	4
2	Injury Crash Percentage	0%	3	Reduced	4	22%	3	20%	4	19%	4	0%	3	reduced	4	reduced	4
3	Crash benefit (Million $; 20 Years Present Value)	$ -	3	$ -	4	$ -	3	$ 1.96	4	$ 1.80	4	$ -	3	$ -	3	$ -	3
Roadway Deficiencies			2.5		3.5		2.0		3.0		3.5		3.0		3.0		3.0
1	Infrastructure lifetime	--	3	--	3	--	1	--	3	--	5	--	3	--	3	--	3
2	Public street and driveway spacing	--	2	--	4	--	3	--	3	--	2	--	3	--	3	--	3
Roadway Design and Complexity			4.0		3.7		3.8		4.2		3.7		4.2		4.2		4.2
1	Addresses known roadway deficiencies	none	1	me paveme	3	None	1	Signal	3	nal/Paveme	5	none	3	ccess spacin	4	none	3
2	Easiness to navigate / driver familiarity	Comfort	5	Familiar	4	Comfort	5	Comfort	5	Unfamiliar	2	Comfort	4	Familiar	4	familiar	4
3	Coordination with planned project	--	3	--	2	--	2	--	3	--	3	--	3	--	3	--	3
4	Favorable construction timeline	--	5	--	3	--	5	--	4	--	2	--	5	--	4	--	5
5	Right-of-way impact area	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5
6	Number of potential property acquisitions	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5
Cost			4.0		2.5		4.0		4.0		3.0		4.0		3.5		3.5
1	Estimated construction cost (Million $)	$ -	5	NA	2	$ -	5	$ 0.30	4	$ 3.00	2	$ -	5	$ 0.49	4	$ 0.35	4
2	Benefit/cost ratio	NA	3	NA	3	NA	3	9.50	4	5.20	4	NA	3	NA	3	NA	3
	TOTAL (Weighted Sum of Individual Scores)		122.7		120.2		122.9		133.4		129.4		125.1		132.2		134.4

MN-220 Preliminary Alternatives Evaluation Matrix		Mn 220 at 17th						Mn 220 at 20th						Mn 220 at 23rd			
		No Build		**Alternative A** Signal Installation *(Intersection-level analysis)*		**Alternative B** Single-lane Roundabout		**No Build**		**Alternative A** 3/4 Access		**Alternative B** 3/4 Access + no SB LT		**No Build**		**Alternative A** Signal Installation *(Intersection-level analysis)*		**Alternative B** Single-lane Roundabout	
		Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score
Purpose and Need			2.0		4.0		4.0		1.0		3.0		3.0		2.0		4.0		4.0
1	Compatible with project purpose and needs	--	2	--	4	--	4	--	1	--	3	--	3	--	2	--	4	--	4
Intersection Capacity			3.0		3.0		4.7		4.0		4.3		4.3		3.7		3.0		4.7
1	Intersection level of service (2045 AM/PM)	A/B	5	A/B	5	A/A	5	A/A	5	NA	5	NA	5	A/A	5	B/B	4	A/A	5
2	Worst approach level of service (2045 AM/PM)	D/F	1	D/D	2	A/A	5	B/C	4	NA	5	NA	5	C/C	3	B/B	4	A/A	5
3	Delay Benefit (Million $; 20 Years Present Value)	$ -	3	$ (1.78)	2	$ 2.31	4	$ -	3	$ -	3	$ -	3	$ -	3	$ (3.05)	1	$ 1.03	4
Transportation Demand/System Linkage			3.0		3.6		3.2		3.4		3.2		3.2		3.2		3.6		3.8
1	Side-street accessibility	--	3	--	4	--	2	--	3	--	2	--	2	--	3	--	4	--	5
2	Connectivity within the study area	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
3	Connectivity to the greater region	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
4	Dependence on 5th Ave NW or 2nd St NE connections	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3
5	Ability to accommodate future corridor volumes	--	3	--	5	--	5	--	5	--	5	--	5	--	4	--	5	--	5
Social or Economic Demand			3.0		3.4		3.4		3.0		2.9		2.9		3.0		3.1		3.6
1	Compatibility with future land development	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	4	--	4
2	Existing business impact	--	3	--	3	--	3	--	3	--	2	--	2	--	3	--	3	--	3
3	Ability to accommodate harvest season heavy commercial traffic volumes and movements	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
4	Ability to accommodate year-round heavy commercial traffic movements	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
5	Farmland impact	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
6	Corridor visual quality impact	--	3	--	3	--	5	--	3	--	3	--	3	--	3	--	3	--	5
7	Environmental impacts	--	3	--	3	--	4	--	3	--	3	--	3	--	3	--	3	--	4
Modal Interrelationships			2.0		3.5		2.8		2.3		2.5		3.8		3.0		3.3		3.0
1	Pedestrian network compatibility	--	1	--	4	--	3	--	2	--	3	--	5	--	3	--	3	--	3
2	Ease of pedestrian crossing	--	1	--	4	--	3	--	2	--	3	--	5	--	3	--	4	--	4
3	Bicycle network compatibility	--	3	--	3	--	2	--	2	--	2	--	3	--	3	--	3	--	2
4	Transit service impacts	--	3	--	3	--	3	--	3	--	2	--	2	--	3	--	3	--	3
Safety			3.0		3.3		4.0		3.0		3.7		3.7		3.0		2.3		4.0
1	Crash rate (crashes / million entering vehicles)	0.71	3	0.58	4	0.32	5	0.15	3	reduced	4	reduced	4	0.54	3	0.59	3	0.32	4
2	Injury Crash Percentage	15%	3	15%	3	15%	3	0%	3	reduced	4	reduced	4	33%	3	38%	2	25%	4
3	Crash benefit (Million $; 20 Years Present Value)	$ -	3	$ 0.22	3	$ 0.65	4	$ -	3	$ -	3	$ -	3	$ -	3	$ (0.17)	2	$ 0.99	4
Roadway Deficiencies			2.5		3.0		4.0		3.0		3.0		3.0		2.5		3.0		4.0
1	Infrastructure lifetime	--	2	--	3	--	5	--	3	--	3	--	3	--	2	--	3	--	5
2	Public street and driveway spacing	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
Roadway Design and Complexity			4.0		4.3		3.8		4.2		4.2		4.2		3.8		4.5		3.5
1	Addresses known roadway deficiencies	None	1	me paveme	4	gnal/Paveme	5	none	3	me paveme	3	me paveme	3	None	1	me paveme	4	gnal/Paveme	5
2	Easiness to navigate / driver familiarity	Comfort	5	Comfort	5	Unfamiliar	2	Comfort	5	Familiar	4	Familiar	4	Comfort	5	Comfort	5	Unfamiliar	2
3	Coordination with planned project	--	3	--	4	--	4	--	2	--	5	--	5	--	2	--	5	--	2
4	Favorable construction timeline	--	5	--	3	--	2	--	5	--	3	--	3	--	5	--	3	--	2
5	Right-of-way impact area	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5
6	Number of potential property acquisitions	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5
Cost			3.5		2.5		2.5		4.0		3.5		3.5		4.0		2.5		2.0
1	Estimated construction cost (Million $)	$ 0.05	4	$ 0.50	4	$ 2.70	2	$ -	5	$ 0.35	4	$ 0.60	4	$ -	5	$ 0.50	4	$ 2.95	2
2	Benefit/cost ratio	NA	3	<0	1	1.55	3	NA	3	NA	3	NA	3	NA	3	<0	1	0.98	2
	TOTAL (Weighted Sum of Individual Scores)		114.6		128.5		134.4		123.9		127.8		133.3		122.7		125.1		136.3

6. Highest Ranked Improvement Alternatives

From the range of alternatives identified in the previous Section 5, a screening evaluation was completed to evaluate each idea against key objectives. This process identifies the alternatives that best meet the project goals. The goal is to arrive at a set of feasible alternatives that best balance and meet the primary objectives of the stakeholders and community. Improvement alternatives were identified to address four primary objectives of the study:

- Improve access control
- Improve safety
- Improve mobility/capacity; and
- Improve pedestrian crossings of Mn 220

The evaluation of the identified alternatives consists of a layered approach that included:

- Assessing and comparing high level considerations such as key pros/cons, trade-offs and design considerations or fatal flaws;
- Technical analysis of intersection capacity, safety benefits, right of way needs, construction costs and economic viability as applicable (benefit/cost ratio); and
- Qualitative evaluation scoring of key metrics identified in the planning process that are consistent with the Purpose and Need statement and 2045 Metropolitan Transportation Plan (MTP) objectives and performance goals.

The highest ranked alternatives considered all the factors and were identified based on input from the SRC, public participation process, requirements of the purpose and need, the results of the technical analysis and evaluation matrices completed herein. In some cases (e.g., US 2) the alternatives with the best benefit/cost or highest performance metric measurements were determined infeasible or not viable. The highest ranked alternatives are anticipated to be feasible, consistent with the MTP, and met the stated purposed and need. The following sections present the alternative concept layouts, the traffic operation and safety analysis, and a cost/benefit analysis. **Figure 6-1** illustrates the highest ranked alternatives, and the associated concept layouts are illustrated in **Figure 6-2** through **Figure 6-7**. The highest ranked alternatives are summarized below, along with correlating technically feasible alternatives to be carried forward through the environmental process:

Intersection Control, Safety and Mobility

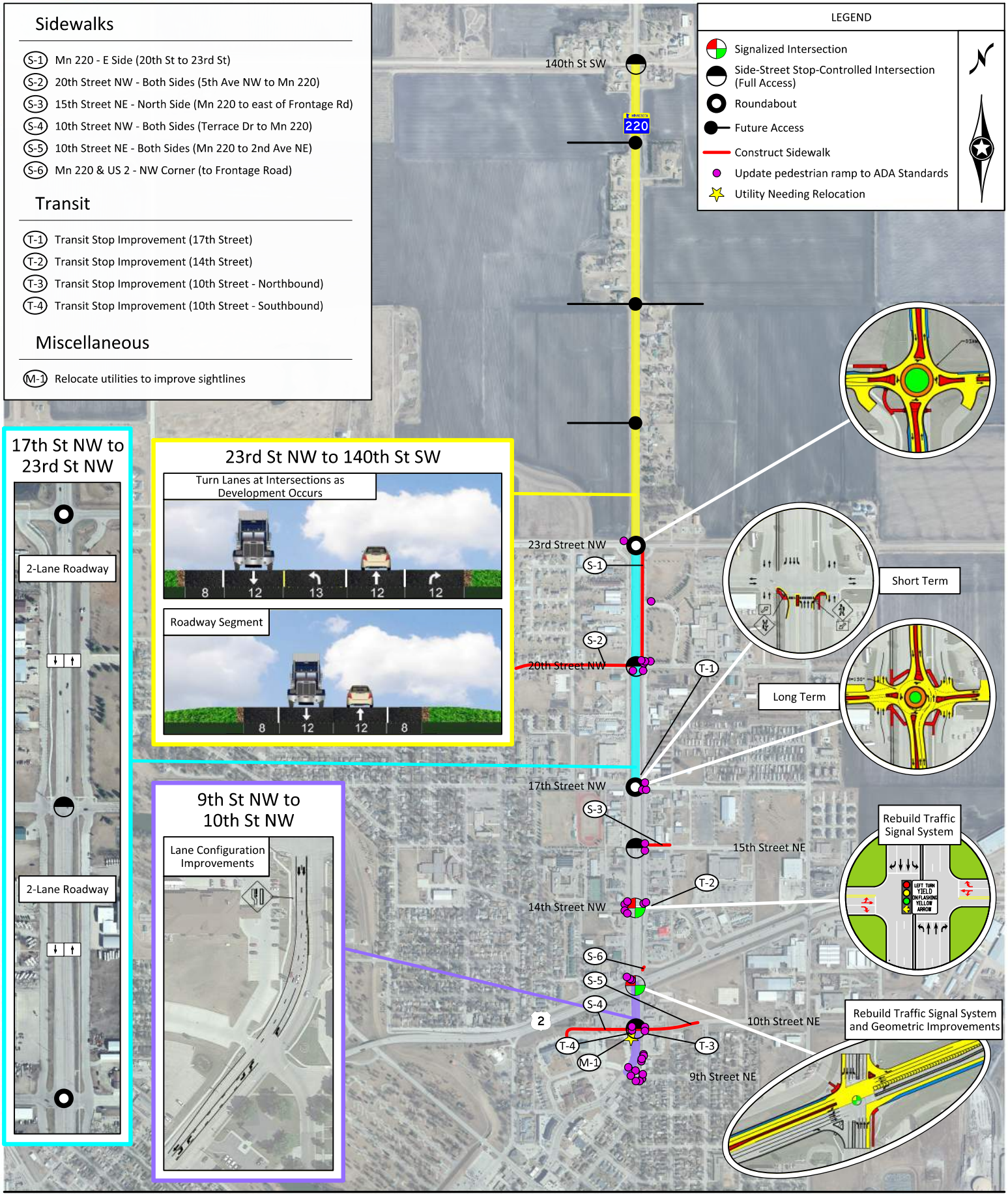
- 23rd Street NW:
  - Highest ranked: roundabout (refer to Section 6.6 for further discussion on design)
  - No other feasible alternative. The traffic signal system alternative does not meet the purpose and need.
- 20th Street NW:
  - Highest ranked: maintain existing intersection control, traffic lanes and access configuration with roundabouts at 17th Street NW and 23rd Street NW
  - Feasible alternative: convert to ¾ Access configuration if a traffic signal system were to ultimately be installed at 17th Street NW following detailed evaluation during preliminary design.
- 17th Street NW:

  - Highest ranked: roundabout (refer to Section 6.6 for further discussion on design)
  - Feasible alternative: traffic signal system
- 15th Street NE:
  - Highest ranked: maintain existing intersection control, traffic lanes and access configuration
  - No other feasible alternatives. Alternatives identified did not meet the purpose and need.
- 14th Street NW:
  - Highest ranked: replace traffic signal system
  - No other feasible alternatives. The roundabout alternative was determined to be infeasible due to footprint size requirement and spacing of frontage roads.
- US 2:
  - Highest ranked: replace traffic signal system and improve intersection lane geometrics
  - Feasible alternatives: roundabout and eastbound displaced left turn. The interchange alternatives were discarded due to fiscal constraint.
- 10th Street NE:
  - Highest ranked: maintain existing intersection control and access configuration and relocate utility boxes on the southwest corner to improve visibility. Continue to monitor intersection and reevaluate the intersection with longer source of crash history.
  - Feasible alternative: convert to ¾ access configuration or other access management strategy. Property access and area circulation is challenging to effectively serve the business needs. Potential solutions may be high cost, or high impact for less return. Further evaluation of alternatives, including potential traffic control device options should be explored in the future should the crash experience at this intersection increase.
- 9th Street NE:
  - Highest ranked: maintain existing intersection control, traffic lanes and access configuration and relocate the lane drop to the south and improve the left turn lane alignment and definition.
  - No other feasible alternatives
- 17th Street NW to 23rd Street NW segment:
  - Highest ranked: two lane divided roadway cross-section with roundabout alternatives
  - Feasible alternative: 2-lane segment between 20th Street and 23rd Street and four-lane segment between 17th Street and 20th Street with traffic signal system at 17th Street
- 23rd Street NW to 140th Street SW segment:
  - Highest ranked alternative: two lane rural roadway cross-section with turn lanes added at future development access intersections.

Pedestrian Accessibility and Transit

- 17th Street NW: improve crosswalk on south leg and ADA accessibility

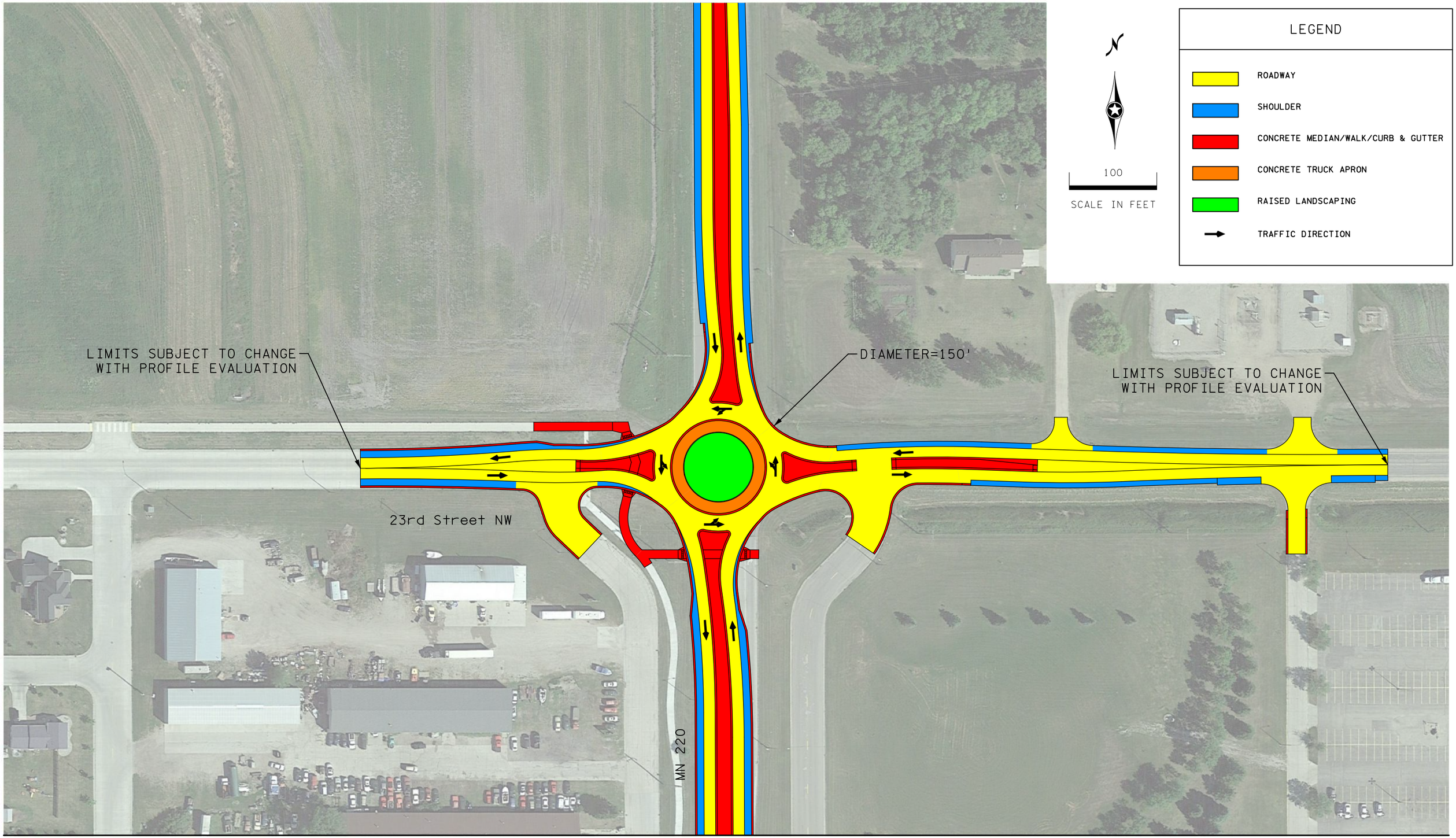
- Neighborhood connections: establish sidewalk connections at the six locations where connection gaps exist
- Transit accessibility:
    - Provide transit stop signing, concrete pad and bench at four existing transit stops
    - Coordinate with Cities Area Transit (CAT) to reevaluate transit routes and service as future development occurs north of 23rd Street NW.

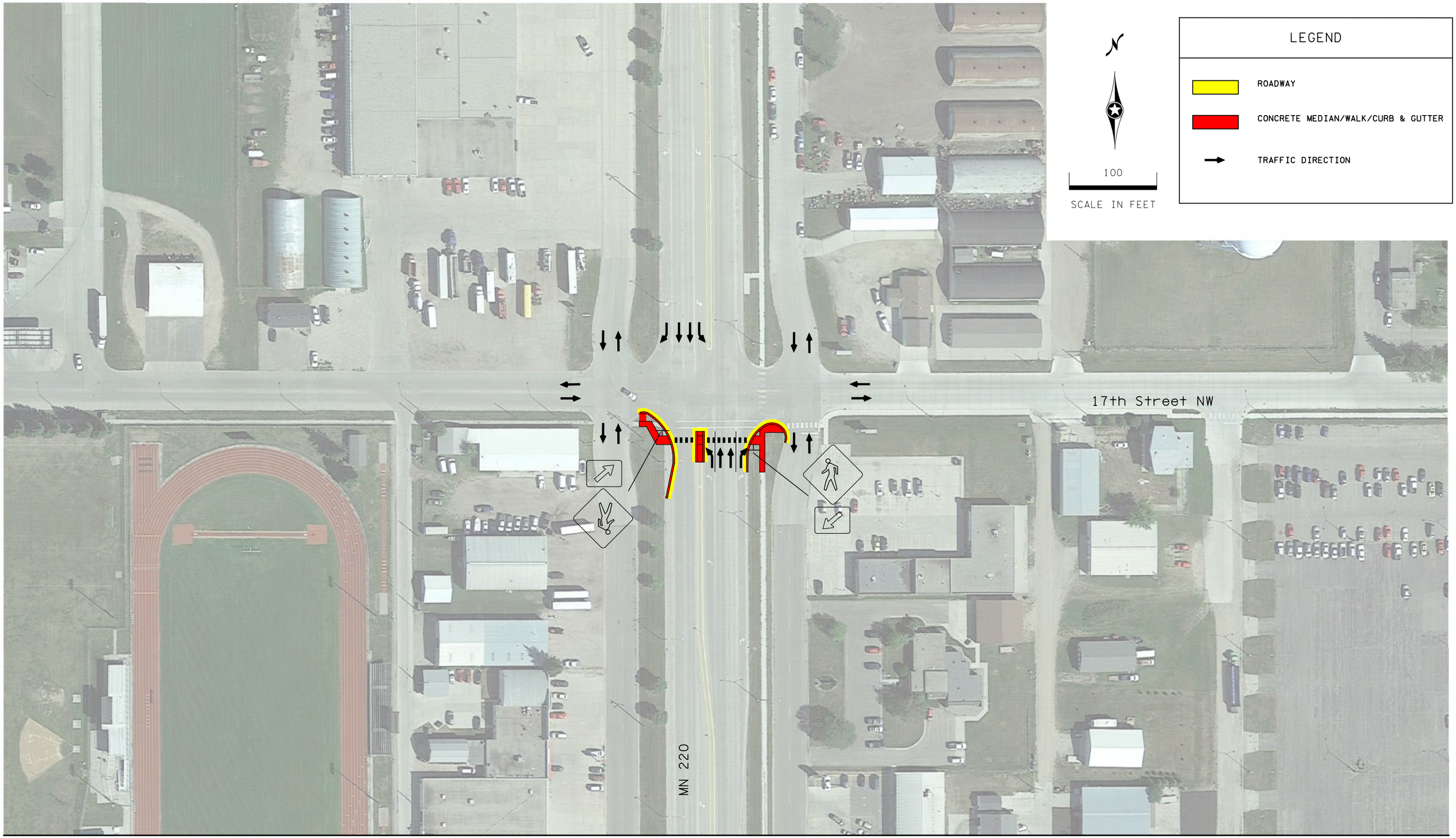


Mn 220 N Corridor Study

Figure 6-1
Highest Ranked Alternatives

ALLIANT ENGINEERING


LIMITS SUBJECT TO CHANGE
WITH PROFILE EVALUATION
DIAMETER=150'
LIMITS SUBJECT TO CHANGE
WITH PROFILE EVALUATION
23rd Street NW
MN 220
N
100
SCALE IN FEET
LEGEND
ROADWAY
SHOULDER
CONCRETE MEDIAN/WALK/CURB & GUTTER
CONCRETE TRUCK APRON
RAISED LANDSCAPING
TRAFFIC DIRECTION

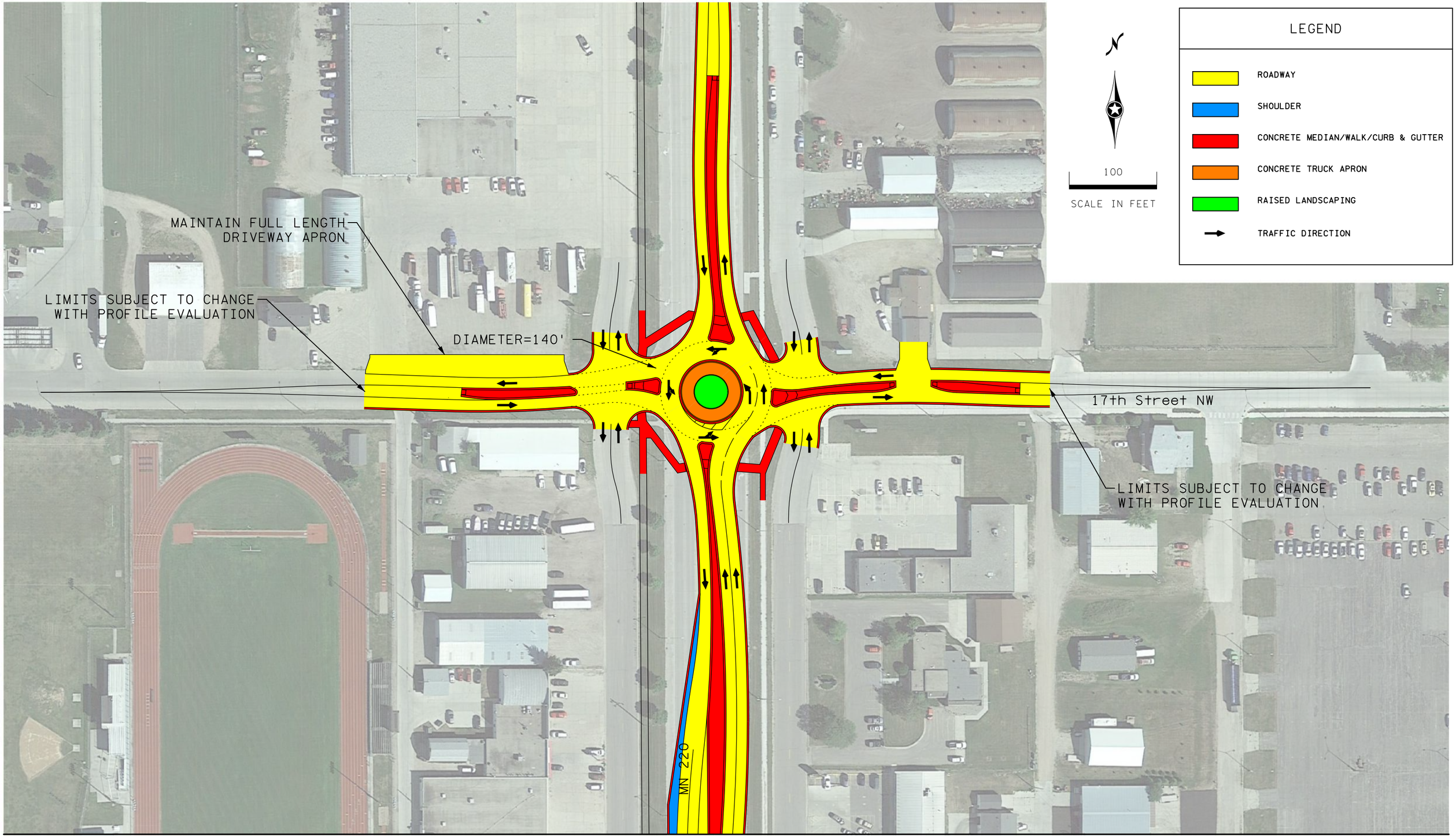


MN 220N Corridor Study

ALLIANT ENGINEERING

MN 220/17th Street NW

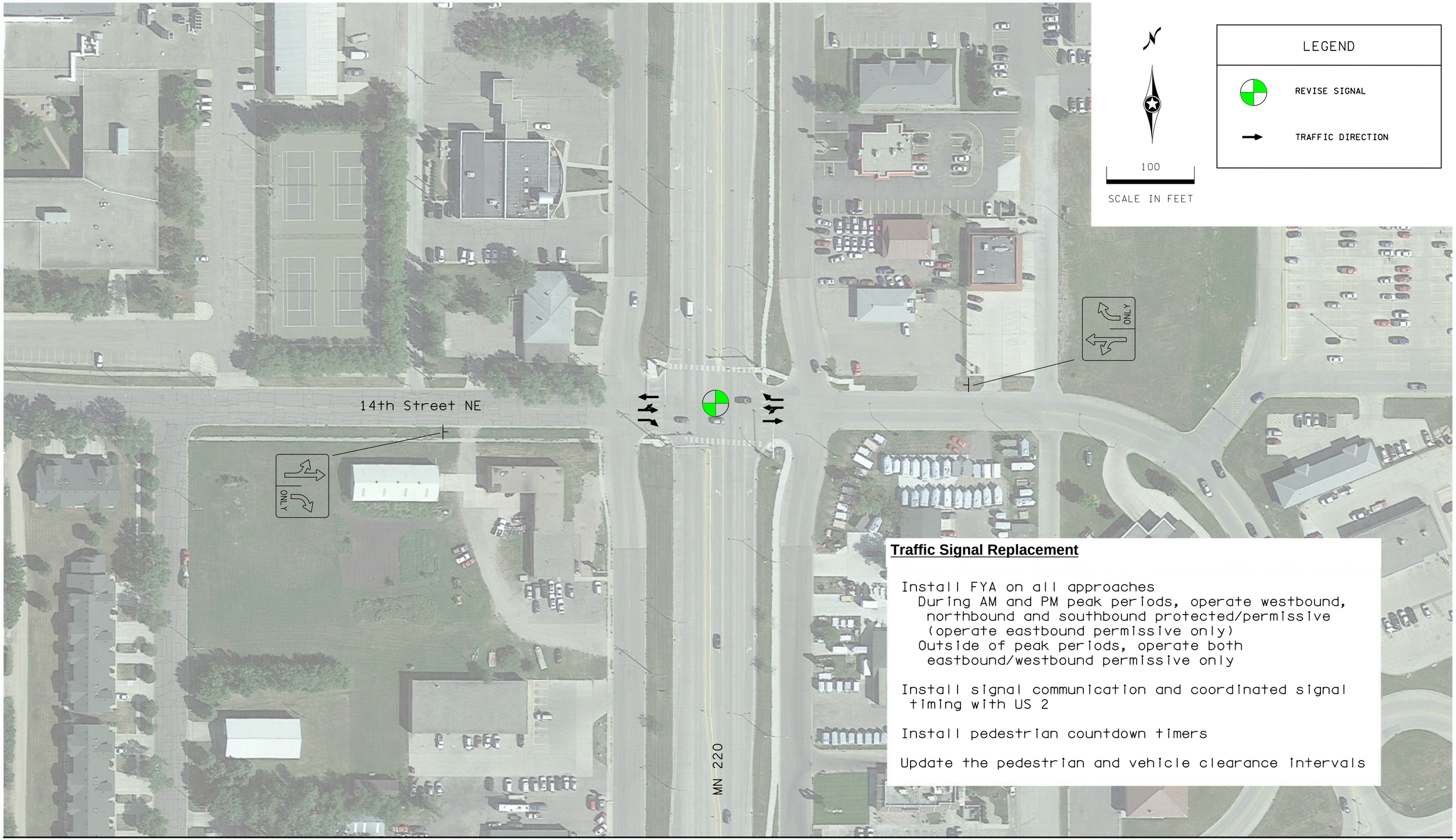
Figure 6-3. 17th Street NW Short Term Improvement - Improve Crosswalk



ALLIANT ENGINEERING

MN 220/17th Street NW

Figure 6-4. 17th Street NW Long Term Improvement - Roundabout



Traffic Signal Replacement

Install FYA on all approaches
- During AM and PM peak periods, operate westbound, northbound and southbound protected/permissive (operate eastbound permissive only)
- Outside of peak periods, operate both eastbound/westbound permissive only

Install signal communication and coordinated signal timing with US 2

Install pedestrian countdown timers

Update the pedestrian and vehicle clearance intervals

MN 220/14th Street NE

Figure 6-5. 14th Street NW - Traffic Signal Replacement

LEGEND

- ROADWAY
- SHOULDER
- CONCRETE MEDIAN/WALK/CURB & GUTTER
- REVISE SIGNAL
- TRAFFIC DIRECTION

N

100

SCALE IN FEET

MN 220

US HWY 2

LIMITS SUBJECT TO CHANGE
WITH PROFILE EVALUATION

LIMITS SUBJECT TO CHANGE
WITH PROFILE EVALUATION

Traffic Signal Replacement

Install FYA on all approaches
Operate eastbound/westbound protected only 6 am to 10 pm and northbound prot/perm all day
Implement FYA Omit logic for pedestrian actuations

Install communication and coordinate signal timing with 14th Street NW and 5th Avenue NE

Implement a southbound right turn overlap (concurrent with the eastbound left turn)

Install pedestrian countdown timers

Update the pedestrian and vehicle clearance intervals to current standards

Add an additional overhead signal indication for each approach to improve visibility and provide yellow back plate for FYA left turn indications

Figure 6-6. US 2 - Traffic Signal Replacement and Geometric Improvements

MN 220N Corridor Study

ALLIANT ENGINEERING

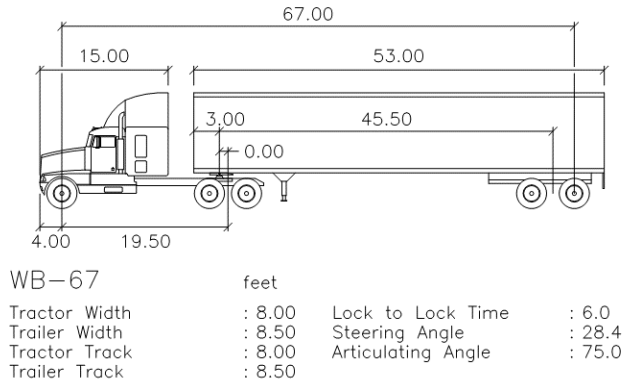
9th Street NE/10th Street NE

Figure 6-7. 9th Street NE - Lane Configuration Improvement

6.1 Consistency with Study Goals

The previous Section 5 detailed a range of alternatives to address the study goals and issues raised through the technical and public participation process. The following provides a brief discussion of the highest ranked alternatives for the Mn 220 corridor as it relates to the primary study goals.

- **Goal 1: Examine traffic operations at key intersections and develop potential options to improve mobility, access, and safety. Evaluate the current locations of lane drops (at 20th Street and north of 17th Street) and evaluate current plans to extend the four-lane to 23rd Street and to expand to a three-lane segment north of 23rd Street to 140th Street.**
    - The alternatives analysis evaluated traffic signals, access management strategies, and roundabout intersection designs to improve mobility, access, and safety. Based on the evaluation, traffic signal replacement and associated design/operation improvements were found highest ranked at existing signals (14th Street and US 2), and roundabouts are highest ranked at two key study intersections (17th Street and 23rd Street).
    - At US 2 and at 14th Street NW, traffic signal replacement and design/operation improvements—which include Flashing Yellow Arrow (FYA) installation, phasing improvements, signal head placement, visibility, pedestrian accommodations and signal coordination—are expected to improve intersection operation and motorist safety. Construction of a second eastbound left turn lane and removal of channelized northbound and southbound right turns at US 2 are expected to further improve intersection operation and motorist safety.
    - At 17th Street NW and at 20th Street NW, a roundabout provides the most efficient long-term traffic control device (least overall delay when considering a 24-hour day); and are expected to have the greatest safety improvement. The intersections can be designed for continuous flow at a low operating speed, which may result in the opportunity to for reduced motorist speeds north of 17th Street. Improved pedestrian access and safety is accomplished by providing wide median refuge islands and marked crosswalks. In addition, overall speed control and effective vehicle speed zone management is expected to be improved with roundabout intersections.
    - The roundabouts at 17th Street and 23rd Street will allow for conversion to 2-lane divided roadway along this segment greatly improving the boulevard space, greening potential and separation to the frontage roads. The 17th Street roundabout (with two northbound lanes) will allow for a smooth 4-lane to 2-lane transition. The roundabouts are expected to be feasible in accommodating large truck traffic, including common agricultural equipment (e.g., 120-foot planter implement and tractor) and WB-67 (or 75 length) vehicle turning radius for key travel routes. Truck and agriculture turning movement exhibits are provided in **Appendix C**. However, further design evaluation, preliminary engineering and public outreach will need to be completed before project development occurs at a future date. See further discussion later in this document. A WB 67 vehicle is illustrated in **Figure 6-8**.



WB-67 Tractor Trailer
Source: AASHTO

120 Foot Planter Implement
Source: AASHTO

Figure 6-8. Truck and Agriculture Vehicle Specifications

- North of 23rd Street NW, the two-lane roadway is expected to provide acceptable capacity into the future and accommodate long term land use changes. Three future intersection accesses compatible with MnDOT Access Management Guidelines have been identified. Due to the unknown phasing of redevelopment, the most effective and economical design for this segment is to maintain the existing two-lane rural roadway design and construct right and left turn lanes (with turn lane pockets and transition tapers) at accesses as development occurs.

- **Goal 2: Review past study recommendations and develop potential improvements to access management strategies.**
  - Previous studies recommended changes to the frontage roads as access management strategies. The consideration of a backage road was suggested to improve intersection spacing and reduce conflicts a the current closely spaced configuration. Although the City may consider this long term, the highest ranked

alternatives are compatible with the existing frontage road system and street widths.
    - Intersection-level access management strategies were also considered but are not recommended. Three-Quarter Access alternatives were considered at 20th Street, 15th Street, and 10th Street, but are recommended to be maintained as full access intersections with through-stop control, provided roundabouts are to be implemented at 17th Street and 23rd Street.

- **Goal 3: Improve pedestrian crossing opportunities, accessibility, and safety at key locations along the corridor.**
    - A sidewalk is proposed on the east side of Mn 220 N between 20th Street and 23rd Street. This will eliminate the need for pedestrians using the trail to cross at 20th Street to continue along Mn 220 N.
    - Sidewalks are proposed to be constructed along some cross streets to provide better connection between Mn 220 N and adjacent land uses.
    - Updated pedestrian ramps are recommended to be constructed at numerous locations along the corridor, or concurrent with associated intersection improvements to meet current ADA standards.
    - A concept alternative at 17th Street NW includes a short-term plan to improve the pedestrian crossing. This crossing is used by several students at the nearby school on a daily basis. Installing a refuge island, curb bump-outs, and high-visibility markings and signage will be low cost strategy to improve pedestrian crossing comfort, safety, and visibility in advance of the long-term intersection improvement.
    - In the short term, improving existing bus stops through stop identification (signs) along with concrete pads (if applicable) and associated access to sidewalks. If applicable bus benches should be considered. The four existing bus stop locations have been identified for proposed potential improvement. In the long-term, coordination with Cities Area Transit (CAT) is needed to identify potential transit route and bus stop options to connect future land use growth north of 23rd Street.

6.2 Traffic Operation Analysis

A traffic operation analysis of the recommended intersection alternatives was conducted to consider any design modifications from the preliminary alternatives developed originally and to evaluate the interaction between intersection alternatives. Results of the traffic operations analysis are summarized in **Table 6-1** and **Table 6-2**. As shown, all intersections are expected to operate at a LOS C or better through forecast year 2045 with the implementation of the highest ranked alternatives.

Table 6-1. Highest Ranked Alternatives Intersection Delay and LOS Summary – AM Peak Hour

	Alternatives	US 2		14th Street		17th Street		23rd Street	
		Dual Left + Right Turn Geometrics		FYA + Signal Improvement		Roundabout		Roundabout	
Year	Scenario	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)
Year 2018	No Build	B / C	19.3 / 25.4	B / B	10.3 / 15.5	A / B	2.6 / 12.2	A / A	2.6 / 5.6
	Long-Term Alternative	C / D	24.3 / 40.3	A / C	9.7 / 32.8	A / A	1.6 / 3.4	A / A	1.4 / 1.9
Year 2045	No Build	D / D	37.9 / 48.4	A / B	9.2 / 17.3	A / D	4.2 / 34.8	A / C	5.8 / 15.0
	Long-Term Alternative	C / D	29.2 / 44.9	A / C	8.3 / 32.4	A / A	3.2 / 6.6	A / A	3.6 / 4.8

Overall Intersection LOS / Worst Approach LOS
Overall Intersection Delay / Worst Movement Delay

Table 6-2. Highest Ranked Alternatives Intersection Delay and LOS Summary – PM Peak Hour

	Alternatives	US 2		14th Street		17th Street		23rd Street	
		Dual Left + Right Turn Geometrics		FYA + Signal Improvement		Roundabout		Roundabout	
Year	Scenario	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)
Year 2018	No Build	C / C	20.2 / 23.6	B / B	11.3 / 15.4	A / B	2.8 / 13.6	A / A	2.6 / 6.7
	Long-Term Alternative	C / D	25.9 / 40.7	B / C	11.6 / 33.6	A / A	1.9 / 4.5	A / A	1.6 / 2.0
Year 2045	No Build	D / E	44.8 / 66.2	B / B	11.6 / 19.5	B / F	11.7 / 127.8	A / C	7.0 / 22.8
	Long-Term Alternative	C / D	31.2 / 43.8	B / C	10.9 / 34.9	A / A	4.0 / 6.8	A / A	3.8 / 4.7

Overall Intersection LOS / Worst Approach LOS
Overall Intersection Delay / Worst Movement Delay

6.3 Safety Analysis

A safety analysis was completed for each of the recommended alternatives to investigate the anticipated change in crash type, severity and frequency. **Table 6-3** summarizes the estimated safety improvements.

Table 6-3. Highest Ranked Alternatives Intersection Safety Analysis

	US 2		14th Street		17th Street		23rd Street	
	No Build	Long-term: Dual Left + Right Turn Geometrics	No Build	FYA + Signal Improvement	No Build	Roundabout (1)	No Build	Roundabout (1)
Observed/Estimated Crash Rate (Crashes/MEV)	1.27	0.92	0.70	0.50	0.71	0.32	0.54	0.32
Observed/Estimated Crash Severity Rate (Crashes/MEV)	1.90	1.42	0.94	0.63	0.81	0.37	0.80	0.42
Estimated Safety Improvement	--	**28% decrease in crash rate 25% decrease in crash severity**	--	**28% decrease in crash rate 33% decrease in crash severity**	--	**55% decrease in crash rate 55% decrease in crash severity**	--	**40% decrease in crash rate 47% decrease in crash severity**

(1) Minnesota Statewide Average for single lane roundabouts (MnDOT Study of Traffic Safety at Roundabouts, October 2017)

6.4 Construction Cost

Estimated construction costs were developed for the recommended intersection alternatives based upon the conceptual layouts. **Table 6-4** summarizes the construction cost estimates, project design and administration costs. It should be noted that the cost estimates included a 30 percent contingency to account for risk or any unknowns that may not be identified without more detailed engineering. The cost estimates are also based on a high-level conceptual layout, without supporting base mapping engineering detail to accurately account for actual construction limits, grading, drainage or other design considerations. Further preliminary engineering is necessary to refine the construction cost estimates suitable for project development.

Table 6-4. Highest Ranked Alternatives Cost Estimate

Intersection	Improvement Description	Construction Cost	Engineering, Admin, Utilities and Inspection	Total Cost
Mn 220 at 23rd Street NW	Roundabout	$2,932,850	$733,000	$3,665,850
Mn 220 at 17th Street NW	Short-Term: Crosswalk Improvements	$52,440	$13,000	$65,440
	Long-Term: Roundabout	$2,726,400	$682,000	$3,408,400
Mn 220 at 14th Street NW	Traffic Signal Replacement and Design Improvements	$300,000	$75,000	$375,000
Mn 220 at US 2	Traffic Signal Replacement and Geometric Improvements	$2,999,576	$750,000	$3,749,576
Mn 220 at 9th to 10th Street NE	Lane Configuration Improvement	$18,540	$4,600	$23,140

(1) Construction costs are estimated year of estimate 2018

(2) Engineering, Administration, Utilities and Inspection are assumed to be 25% of the construction cost.

6.5 Benefit / Cost Analysis

An economic benefit/cost analysis was completed in accordance with the MnDOT Office of Investment Management, Benefit/Cost Analysis for Transportation Projects procedures, and assumes a 20-year analysis period. The monetary benefit of the project is quantified in terms of reduced (or increased) vehicle hours traveled (VHT) or less delay (or added delay) at the intersection and the reduced number and/or severity of estimated crashes over the analysis period between the no build conditions and the proposed alternatives. The estimated 20-year monetary cost includes construction costs, expected operational and maintenance cost over this period (e.g., lighting, street signs), and contingency. Remaining capital values of the infrastructure features at the end of the 20-year analysis period are subtracted from the total cost of the alternative. A summary of economic analysis for the recommended alternatives are presented in **Table 6-5**.

Table 6-5. Benefit/Cost Analysis

	US 2	14th Street	17th Street		23rd Street
	Dual Left + Right Turn Geometrics	FYA + Signal Improvement	Short Term: Pedestrian Crosswalk Improvement	Long Term: Roundabout	Roundabout
Total Traffic Operation Benefit	$ 5,067,945	$ 371,482	$ -	$ 2,314,202	$ 1,026,765
Total Safety Benefit	$ 2,385,018	$ 1,955,479	$ -	$ 647,421	$ 990,747
Total Cost [(1)]	$ 2,172,444	$ 244,993	$ 61,000	$ 1,906,927	$ 2,050,835
Benefit to Cost Ratio	**3.4**	**9.5**	**NA**	**1.6**	**1.0**

(1) Total cost is a 20 year estimate (2020-2040) that includes the discounted construction cost minus the remaining capital value at the end of the analysis period.

6.6 Further Design and Evaluation Need

The SRC, technical analysis and public engagement process has identified the importance of accommodating large truck traffic, motor coach vehicles and agricultural equipment that utilize the corridor. It is also recognized that future intersection design, safety, and multimodal considerations of an urbanizing corridor are of equal importance to Mn 220 and a balance must be met. Roundabouts were identified as the highest ranked intersection control at both 17th Street NW and 23rd Street NW as these designs best meet the purpose and need, improve intersections safety, provide the most efficient overall intersection mobility (considering 24-hour day and full calendar year), improve boulevard spacing between frontage roads, improve pedestrian accommodations and result in the best benefit to cost ratios. However, accommodating large trucks and agricultural equipment is necessary and key challenge for the roundabout design. Expected large trucks WB-67 (or 75-foot combination) and common agricultural equipment were evaluated within the roundabout concepts for key travel routes as shown in **Appendix C**. The evaluation is completed at a conceptual level for known vehicles and routes at the time of this study. Based on this evaluation the roundabouts are expected to be feasible intersection designs to program for; however, further preliminary engineering is needed to fully vet the final

design, utilities, and vehicle type accommodations that otherwise cannot be fully evaluated at the conceptual planning level. Recommended future steps and anticipated design refinements for the roundabout alternatives are recommended:

- Undertake an intersection preliminary engineering design study in advance of the programmed construction year for both the 17th Street and 23rd Street intersection improvements to develop a staff approved design layout and final intersection control recommendations.
- Conduct further property and stakeholder outreach to ensure all the key truck vehicle types, agricultural equipment and primary travel routes are evaluated and designed for.

23rd Street NW

Expected design considerations that will be better evaluated during preliminary and final design may include:

- Curb to curb widths for approach and exiting lanes of sufficient width to fit the largest expected wheel bases.
- Refine curb radii, splitter islands, entry and exit angles.
- Based on available right of way and frontage road separation, it is anticipated that the roundabout diameter could be increased at this location as necessary to accommodate the expected vehicle types.
- Right size the truck apron and central island for tractor tracking and vehicle mounting as appropriate.
- Maintain vertical clearance and roadway set-backs of roadway signing, lighting or other boulevard items to accommodate oversized agricultural equipment. Keep signing and other vertical elements out of splitter islands to the extent feasible.
- Consider mountable curb on splitter islands or corners as necessary to accommodate the design vehicles.

17th Street NW

Expected design considerations that will be better evaluated during preliminary and final design may include:

- Continue the engagement with area property owners to fully address and develop options and vehicle circulation routes for the southbound west frontage road to southbound Mn 220 right turn movement (only movement that cannot accommodate large trucks) and the through movement restriction on the east frontage road with the splitter island. This may include identifying alternative circulation routes, utilization of other street access, or consideration of constructing alternative right turn access to/from Mn 220
- Curb to curb widths for approach and exiting lanes of sufficient width to fit the largest expected wheel bases.
- Explore additional options to maximize the roundabout diameter as necessary to accommodate the expected vehicle types.
- Right size the truck apron and central island for tractor tracking and vehicle mounting as appropriate.

- Maintain vertical clearance and roadway set-backs of roadway signing, lighting or other boulevard items to accommodate oversized agricultural equipment. Keep signing and other vertical elements out of splitter islands to the extent feasible.
- Consider mountable curb on splitter islands or corners as necessary to accommodate the design vehicles.

Although lower ranked, a traffic signal system to a lesser degree meets the project purpose and need and may be a feasible long-term alternative solution should preliminary engineering and further stakeholder/community engagement determine that to ultimately be the best control.

7. Implementation Plan

The implementation plan for the Mn 220 N Corridor Study is intended to assist with the identification of key infrastructure improvements and prioritization timeline to address needs within the study area. In most cases, implementation of individual improvement strategies is mutually exclusive; individual strategies could be constructed at any time. All improvements identified should be further evaluated during the design development phase and are subject to further environmental analysis and design requirements. To address the critical needs of the corridor, the implementation plan has been developed to prioritize the recommendations over near term (within 5 years), mid-term (2025 to 2034) and long term (2035-2045+) horizons. **Figure 7-1** illustrates the recommended components (highest ranked alternatives) of the near-term implementation plan. **Figure 7-2** illustrates the recommended components (highest ranked alternatives) of the mid-term and long-term implementation plan. It is noted, the implementation plan could be subject to change based on unforeseen traffic changes or funding sources that may unfold post the development of this plan.

7.1 Implementation Plan Cost

Table 7-1 through **Table 7-3** document the estimated construction and project design and administration costs for each recommended improvement. The costs have been estimated for the average year (mid-point of the timeframe) of expenditure and include a 3 percent per year inflation factor. The City of East Grand Forks and Polk County will be responsible for cost participation, concerning the proposed alternatives. Depending upon the funding source, the cost participation could be 80 / 20 or 90 / 10 (HSIP) with the cost further split equal to the number of approach legs of roadway ownership. A few cost participation examples include:

- 17th Street NW crosswalk improvements: 100% State cost
- 14th Street NW traffic signal replacement: 50% State/50% City
- Mn 220 at US 2 traffic signal replacement and geometric improvements: 90% State/10% City (City is responsible for 25% of signal and street improvements on Demers Avenue leg)
- Mn 220 at 17th Street NW intersection control improvements: 80% State/20% City (City is responsible for improvements on the local streets approaching the circle)

It is anticipated that several of the projects may require additional local resources to advance projects or to construct within the timeframe identified in the Mn 220 N Corridor Study.

7.2 Project Development

The next phase for each intersection improvement project identified in the implementation plan is to complete preliminary engineering, project scoping and environmental documentation (i.e., NEPA). The preliminary engineering and scoping reflect more detailed engineering and evaluation to determine project feasibility and to delineate any final alternatives. This phase also includes the transition into the development of relevant environmental documentation as appropriate. Once complete, the project will move to advanced project development involving actual final design and right of way acquisition as necessary. Smaller projects, such as sidewalks, pedestrian crosswalks, lane striping or traffic signal replacements could be advanced much quicker given they are expected to have minimal impacts.

Near Term Improvements (2019-2024)

Location 1: Mn 220 at 17th Street NW

Improve pedestrian crosswalk with curb bump-outs, median island, crosswalk pavement markings, and signage.
Total Cost: $71,600

Location 2: 10th St NE to 9th St NE

Improve southbound lane configuration. Relocate southbound lane drop south of 9th St NE beyond curve, and provide separated southbound left turn lane at 9th St NE.
Total Cost: $25,300

Location 3: Mn 220 at US 2

Install sidewalk from northeast corner to Frontage road and ADA accessible connection.
Total Cost: $8,200

Location 4: Mn 220 at 17th Street NE

Provide bus stop signage for bus stop on northeast corner.
Total Cost: $700

Location 5: Mn 220 at 14th Street NE

Provide bus stop signage for bus stop on northeast corner.
Total Cost: $700

Location 6: DeMers Avenue at 10th Street NE

Provide bus stop signage for bus stop on southeast corner.
Total Cost: $700

Location 7: DeMers Avenue at 10th Street NW

Provide bus stop signage for bus stop on northwest corner.
Total Cost: $700

Location 8: DeMers Avenue at 10th Street NW

Relocate utilities to improve corner visibility. Monitor crash rates and conduct intersection study if there is a safety issue.
Total Cost: unknown, coordinate with utility owner.

Note: Highest-Ranked Alternatives are illustrated.

Note:
Construction costs reflect the highest feasible alternative and are estimated year of expenditure (YOE) with an assumed 3% inflation rate. YOE is assumed to be mid-point of improvement range. Engineering, Administration, Utilities and Inspection are assumed to be 25% of the construction cost.

Mid Term Improvements (2025-2034)

Location 9: Mn 220 at 14th Street NW

Replace traffic signal system (install Flashing Yellow Arrows, improve phasing, coordination, etc.) and delineate eastbound/westbound lane configuration.
Total Cost: $519,100

Location 10: Mn 220 at US 2

Intersection control and geometric improvements.
Total Cost: $6,021,500

Location 11: 23rd Street NW to 140th Street SW

Construct left and right turn lanes as applicable at public street access as land develops.
Total Cost: TBD, construction scope and cost to be determined as part of development plan at future time.

Location 12: Upgrade Non-Compliant Pedestrian Ramps

Upgrade non-compliant pedestrian ramps (33 ramps on Mn 220 N Corridor).
Total Cost: ADA ramps are incorporated in full intersection improvements as applicable. Refer to the City of East Grand Forks ADA Transition plan for standalone pedestrian ramp upgrades.

Location 13: 20th Street NW (both sides) from 5th Avenue NW to Mn 220

Install sidewalks.
Total Cost: $207,700

Location 14: 15th Street NE (north side) from Mn 220 to East of Frontage Road

Install sidewalk.
Total Cost: $22,500

Long Term Improvements (2035-2045+)

Location 15: Mn 220 at 23rd Street NW

Intersection control improvements.
Total Cost: $6,819,600

Location 16: Mn 220 at 17th Street NW

Intersection control improvements.
Total Cost: $6,340,700

Location 17: 17th Street NW to 23rd Street NW

Rehabilitate pavement, convert to two-lane divided highway.
Total Cost: MnDOT maintenance and preservation.

Location 18: US 2 to 17th Street NW

Rehabilitate pavement, maintain four-lane divided highway.
Total Cost: MnDOT maintenance and preservation.

Location 19: Mn 220 (east side) from 20th Street NE to 23rd Street NE

Install sidewalks.
Total Cost: $145,400

Location 20: 10th Street NW (both sides) from Terrace Drive to DeMers Avenue

Install sidewalks.
Total Cost: $84,300

Location 21: 10th Street NW (both sides) from DeMers Avenue to 2nd Avenue NE

Install sidewalks.
Total Cost: $78,500

Location 22: Mn 220 at 17th Street NE

Provide bus bench at bus stop on northeast corner.
Total Cost: $7,000

Location 23: Mn 220 at 14th Street NE

Provide bus bench at bus stop on northeast corner.
Total Cost: $7,000

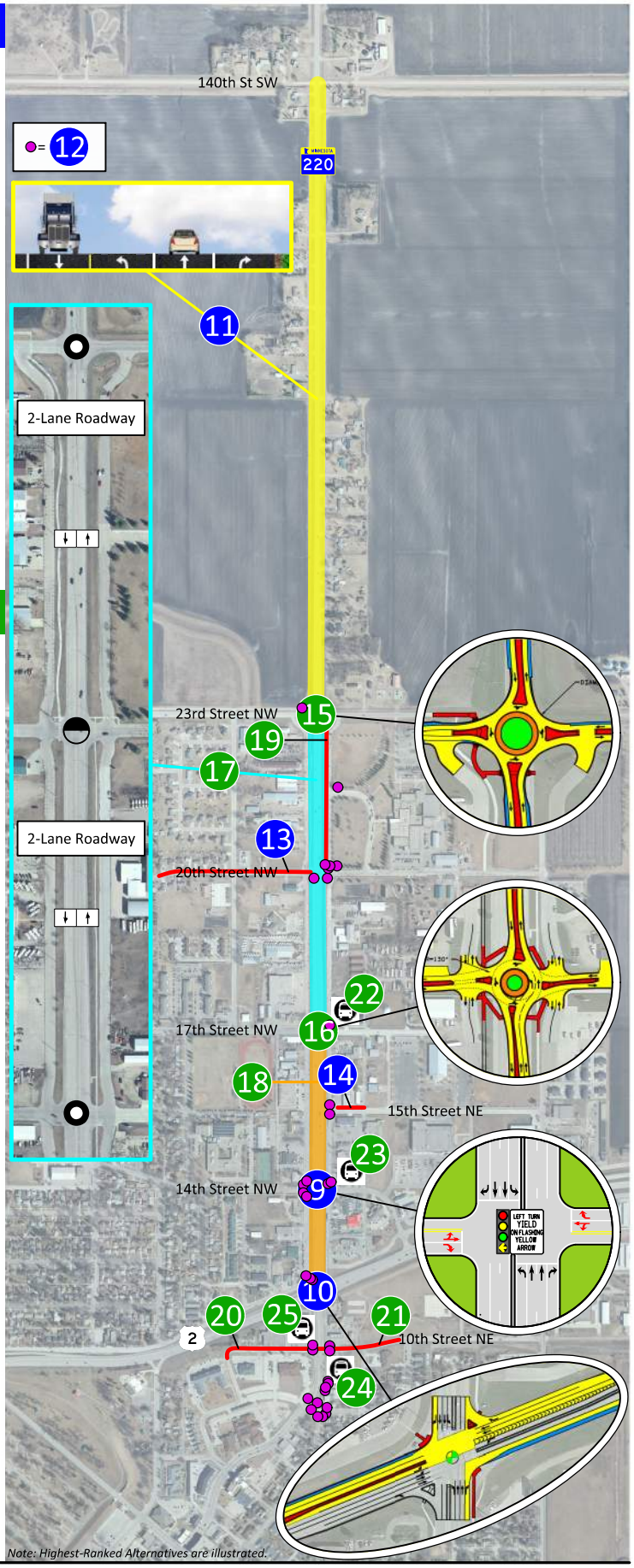
Location 24: DeMers Avenue at 10th Street NE

Provide concrete pad, sidewalk access, and bus bench at bus stop on southeast corner.
Total Cost: $8,700

Location 25: DeMers Avenue at 10th Street NW

Provide concrete pad, sidewalk access, and bus bench at bus stop on northwest corner.
Total Cost: $8,700

Note:
Construction costs reflect the highest feasible alternative and are estimated year of expenditure (YOE) with an assumed 3% inflation rate. YOE is assumed to be mid-point of improvement range. Engineering, Administration, Utilities and Inspection are assumed to be 25% of the construction cost.



Note: Highest-Ranked Alternatives are illustrated.

Mn 220 N Corridor Study

Figure 7-2

Mid Term (2025-2034) and Long Term (2035-2045+) Implementation Plan

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Table 7-1. Implementation Cost Summary – Near Term Improvements (2019 to 2024)

Project	Intersection / Roadway Segment / Project Identification	Improvement Description	Need	Construction Cost Year of Estimate (YOE) (1)	Administration, Engineering, Utilities, Inspection (2)	Total Cost (4)	Phasing
1	Mn 220 at 17th Street NW	Improve pedestrian crosswalk	Existing level of stress 4 (uncomfortable), school access and desired crossing location	$57,303	$14,205	**$71,508**	
2	DeMers Avenue - 10th Street NE to 9th Street NE	Southbound lane configuration improvements	Unclear lane designation and lane alignment along roadway curve	$20,259	$5,027	**$25,286**	
3	(S-6) Sidewalk	Mn 220 at US 2 - NE Corner to Frontage Road and ADA accessible connection	Pedestrian accessibliity and connection between Mn 220 and frontage road	$6,556	$1,639	**$8,195**	
4	(T-1) Transit Shelter	Provide Bus Stop Signing at 17th Street NE Bus Stop	Pedestrian accessibility and transit improvement	$500	$125	**$625**	
5	(T-2) Transit Shelter	Provide Bus Stop Signing at 14th Street NE Bus Stop	Pedestrian accessibility and transit improvement	$500	$125	**$625**	
6	(T-3) Transit Shelter	Provide Bus Stop Signing at 10th Street NE bus stop (northbound direction)	Pedestrian accessibility and transit improvement	$500	$125	**$625**	
7	(T-4) Transit Shelter	Provide Bus Stop Signing at 10th Street NE bus stop (southbound direction)	Pedestrian accessibility and transit improvement	$500	$125	**$625**	
8	(M-1) Utility	Relocate utilities to improve corner visibility (SW corner of 10th Street)	Intersection visibility and safety	(3)			Coordinate with utility owner
Total				**$86,118**	**$21,371**	**$107,489**	

(1) Construction costs reflect the highest feasible alternative and are estimated year of expenditure (YOE) with an assumed 3% inflation rate. YOE assumed to be mid-point of improvement range
(2) Engineering, Administration, Utilities and Inspection are assumed to be 25% of the construction cost.
(3) Utility relocation scope and cost to be determined in coordination with utility owner
(4) Cost participation split based on agency ownership of roadway leg. 17th Street crosswlk NW crosswalk improvement would be 100% MnDOT cost.

Table 7-2. Implementation Cost Summary – Mid Term Improvements (2025 to 2034)

Project	Intersection / Roadway Segment / Project Identification	Improvement Description	Need	Construction Cost Year of Estimate (YOE) (1)	Administration, Engineering, Utilities, Inspection (2)	Total Cost (5)	Phasing
9	Mn 220 at 14th Street NW	Traffic signal replacement and design/operation improvements	Crash rate exceeds statewide average, signal replacement needed by 2028	$415,270	$103,818	**$519,088**	
10	Mn 220 at US 2	Intersection Control and Geometric Improvements	Existing critical crash rate and mobility concern, traffic signal replacement needed by 2028	$4,983,242	$1,038,175	**$6,021,417**	
11	23rd Street NW to 140th Street SW	Construct left and right turn lanes as applicable at public street access	Land use changes	(3)			As redevelopment and access need to Mn 220 occurs
12	Non-compliant Pedestrian Ramps	Upgrade non-compliant pedestrian ramps (33 ramps)	Pedestrian accessibliity	(4)			Reconstruct in accordance with the East Grand Forks ADA transition plan (or concurrent with other related intersection improvements)
13	(S-2) Sidewalk	20th Street NW - both sides (5th Avenue NW to Mn 220)	Pedestrian accessibliity and connection between Mn 220 and neighborhood	$166,108	$41,527	**$207,635**	
14	(S-3) Sidewalk	15th Street NE - North side (Mn 220 to East of Frontage Road)	Pedestrian accessibliity and connection between Mn 220 and neighborhood	$17,995	$4,499	**$22,494**	
Total				**$5,582,615**	**$1,188,019**	**$6,770,634**	

(1) Construction costs reflect the highest feasible alternative and are estimated year of expenditure (YOE) with an assumed 3% inflation rate. YOE assumed to be mid-point of improvement range
(2) Engineering, Administration, Utilities and Inspection are assumed to be 25% of the construction cost.
(3) Construction scope and cost to be determined as part of development plan at future time
(4) ADA ramps are incorporated in full intersection improvements as applicable. Refer to the City of East Grand Forks ADA Transition plan for stand alone pedestrian ramp upgrades
(5) Cost participation split based on agency ownership of roadway leg. 14th Street traffic signal replacement would 50% MnDOT / 50% City cost. Mn 220 at US would be 90% Mn/DOT / 10% City
(City responsible for 25% of signal and street improvement costs on DeMers)

Table 7-3. Implementation Cost Summary – Long Term Improvements (2035 to 2045)

Project	Intersection / Roadway Segment / Project Identification	Improvement Description	Need	Construction Cost Year of Estimate (YOE) (1)	Administration, Engineering, Utilities, Inspection (2)	Total Cost (4)	Phasing
15	Mn 220 at 23rd Street NW	Intersection Control Improvements	Intersection safety. Existing crash and severity rate concern	$5,455,965	$1,363,596	**$6,819,561**	Coordinate with MnDOT pavement rehabilitation
16	Mn 220 at 17th Street NW	Intersection Control Improvements	Existing critical crash rate concern and mobility concern by 2045	$5,071,907	$1,268,721	**$6,340,628**	Coordinate with MnDOT pavement rehabilitation
17	17th Street NW to 23rd Street NW	Pavement rehabilitation - two lane divided highway	Rehabilitation needed by 2033 and reconstruction required by 2058	(3)			
18	US 2 to 17th Street NW	Pavement rehabilitation - four lane divided highway	Rehabilitation needed by 2033 and reconstruction required by 2058	(3)			
19	(S-1) Sidewalk	Mn 220 - East side (20th Street NE to 23rd Street NE)	Pedestrian accessibliity and connection between Mn 220 and neighborhood	$116,268	$29,067	**$145,336**	Coordinate with 23rd Street NW intersection improvements
20	(S-4) Sidewalk	10th Street NW - both sides (Terrace Drive to Mn 220	Pedestrian accessibliity and connection between Mn 220 and neighborhood	$67,436	$16,859	**$84,295**	
21	(S-5) Sidewalk	10th Street NE - both sides (Mn 220 to 2nd Avenue NE)	Pedestrian accessibliity and connection between Mn 220 and neighborhood	$62,785	$15,696	**$78,481**	
22	(T-1) Transit Stop	Provide bus bench at 17th Street NE bus stop	Pedestrian accessibility and transit improvement	$5,581	$1,395	**$6,976**	
23	(T-2) Transit Stop	Provide bus bench at 14th Street NE bus stop	Pedestrian accessibility and transit improvement	$5,581	$1,395	**$6,976**	
24	(T-3) Transit Stop	Provide concrete pad, sidewalk access and bus bench at 10th Street NE bus stop (northbound direction)	Pedestrian accessibility and transit improvement	$6,917	$1,729	**$8,646**	
25	(T-4) Transit Stop	Provide concrete pad, sidewalk access and bus bench at 10th Street NE bus stop (southbound direction)	Pedestrian accessibility and transit improvement	$6,917	$1,729	**$8,646**	
Total				**$10,799,356**	**$2,700,188**	**$13,499,544**	

(1) Construction costs reflect the highest feasible alternative and are estimated year of expenditure (YOE) with an assumed 3% inflation rate. YOE assumed to be mid-point of improvement range
(2) Engineering, Administration, Utilities and Inspection are assumed to be 25% of the construction cost.
(3) MnDOT maintenance and preservation
(4) Cost participation split based on agency ownership of roadway leg. 17th Street intersection control improvements would be 80% MnDOT / 20% City cost.
(City responsible for street improvements on 17th Street approaching the intersection)

7.3 Transportation Program and Funding

To support the implementation plan, MnDOT, Polk County, the City of East Grand Forks and the GF-EGF MPO will seek to incorporate improvement projects within the transportation programs, then seek to fund. The projects identified in the Mn 220 N Corridor Study should be considered for inclusion within local and state investment plans:

- **2045 Metropolitan Transportation Plan (MTP)**. The 2045 MTP identifies a range of transportation project investments that preserve existing roads in a "state of good repair" along with livability and safety improvements over the next 25 years. Improvements identified in the 220 N Corridor Study should be adopted into, or amend previously identified improvements within, the 2045 MTP.
- **Transportation Improvement Program (TIP).** The TIP for the Grand Forks -East Grand Forks area lists the significant transportation system improvements to be implemented during the next four-year period. This plan can be modified at any time, consistent with the transportation plan. Projects identified in the TIP, will also be identified in the State Transportation Improvement Program (STIP).
- **10-Year Capital Highway Investment Plan (CHIP).** The 10-year Capital Highway Investment Plan details MnDOT's capital highway investments for the next ten years on the state highway network. The CHIP is updated yearly to remove projects that are currently being constructed, adjust timing of existing planned projects, and add new planned projects. The CHIP is currently programmed through 2028. Mid and long-term intersection projects identified in the implementation plan may be potential future CHIP candidates.

As the local agencies look to advance improvements identified in the Mn 220 Corridor study, key program funding sources may include:

- **Local Partnership Programs (LPP).** The LPP provides MnDOT trunk highway construction funding through a competitive selection process to local agencies for roadway improvement projects. The program selects projects that are initiated and administered by a local agency, involving a trunk highway, where MnDOT funds are utilized for part of the project to the mutual benefit of all partners. The program relies on the initiative of the local agencies and their commitment to making roadway improvements. Most projects, specifically the larger intersection improvement projects, identified in the implementation plan may be good candidates for the City of East Grand Forks to pursue through the LPP.
- **Northwest Area Wide Transportation Partnership (NWATP) City Sub-target Federal Funds.** This fund is awarded every 4 years (2018, 2022, etc.). Projects identified within the MTP are potential candidates for this funding. The City of East Grand Forks may elect to utilize a portion or all of these funds to projects identified in the implementation plan as available to help support the construction of larger intersection improvements. These funds are allocated at the time of this document; however, an amendment could be considered to reallocate funds to any projects identified herein.

- **City Local, Maintenance and Operation Funds**. The city currently expends resources through discretionary means to provide regular signing, pavement marking and other infrastructure improvements along the city streets. Components of the implementation plan, such as the transit stop signs, or sidewalk connections could be funded through this resource.
- **Transportation Alternatives Program (TAP)**. This program provides funding for non-traditional transportation improvement projects through a solicitation process. For Mn 220, this could include the construction of the crosswalk improvements at 17th Street NW.
- **Minnesota and Federal Safe Route to School (SRTS) Funds**. The city can submit eligible projects to compete for available SRTS funds through a solicitation process. Specific improvements may include the sidewalk connections and crosswalk improvements.
- **Highway Safety Improvement Program (HSIP).** This program provides funding for safety improvement projects through a solicitation process. Candidate projects need to address either systemic (proactive) or reactive (existing safety deficiencies). Projects that may qualify for this funding include the pedestrian improvement treatments such as the refuge islands or curb extensions, or larger scale intersection improvements (e.g., 17th Street NW or US 2 intersections exceeding critical crash rates) identified that are expected to improve the overall intersection safety for motorists and non-motorist users.
- **Other Minnesota and Federal Competitive Grant Programs**. Transportation improvement, bicycle, pedestrian and other multimodal grants can become available through MnDOT and Federal grant programs and solicitation processes. Depending on the grants available at the time, any of the recommended project components could be eligible for funding.

Appendix A:

Public Meeting Minutes

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ALLIANT PROJ. NO. 118-0184.0

PUBLIC MEETING MINUTES

DATE/TIME: Tuesday, December 18, 2018; 5:00 p.m.

LOC ATION: East Grand Forks City Hall Atrium

PROJECT: Mn 220 N Corridor Study

PURPOSE: **Public Meeting 1 –** Issues and Needs

MINUTES BY: Mike Anderson, Alliant Project Manager; (612-767-9340)

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1) **Attendees**
There were 3 attendees. See attached sign in sheet for list of meeting attendees

2) **Comments and Feedback**
Discussion with the meeting attendees revealed the following key issues and suggestions:
   - The utility boxes at the DeMers Avenue/10th Street NE intersection obstruct the view of eastbound stopped motorists. Felt to be a safety issue. Request this be relocated.
   - Variable vehicle speeds may be a factor in crashes at 17th Street (change in speed zone at intersection though motorists are speeding up prior). The speed zone changes may have been appropriate many years ago but have not kept up with the change in the corridor. Suggest extending a slower speed zone to 23rd Street
   - There is a worn path in the boulevard grass between US 2/Mn 220 and the frontage road by McDonalds. Suggest developing an actual sidewalk with accessible ramps at this location.
   - Indicated that many high school students cross Mn 220 at 15th Street to access Dairy Queen. Suggest improved crossing
   - A roundabout at 23rd Street makes some sense as a measure to reduce motorist speeds coming into the corridor. Also, the frontage roads are set back further. The drainage ditch was denoted as a potential concern.
   - Attendees noted that the study should clearly indicate the simple improvements that address issues be prioritized first and implemented, and then larger improvements be planned for.
   - The eastbound/westbound left turn movement is difficult because the visibility is often blocked by larger vehicles. Concurred with the safety findings at this intersection. Suggested a red arrow.

ALLIANT
ENGINEERING

ALLIANT PROJ. NO. 118-0184.0

PUBLIC MEETING MINUTES

DATE/TIME: Tuesday, April 16, 2019; 5:30 p.m.

LOC ATION: East Grand Forks City Hall Atrium

PROJECT: Mn 220 N Corridor Study

PURPOSE: **Public Meeting 2 –** Alternatives Evaluation

MINUTES BY: Mike Anderson, Alliant Project Manager; (612-767-9340)

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1) **Attendees**
There were 6 attendees. See attached sign in sheet for list of meeting attendees

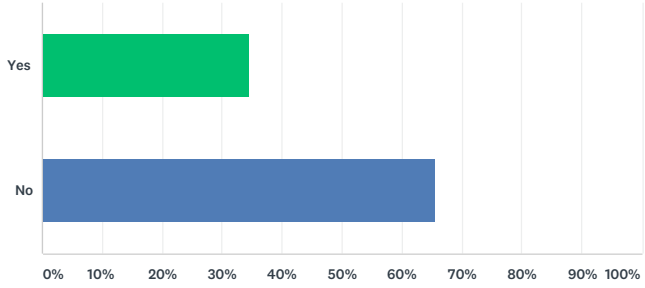
2) **Comments and Feedback**
No written comments were received. Discussion with the meeting attendees revealed the following key issues and concerns:
   - The primary concerned voiced by attendees was related to the perception that roundabouts at 23rd Street and 17th Street will not accommodate trucks or agricultural equipment. It was noted by attendees that the existing signal structures at 14th Street and US 2 can obstruct larger vehicles (vertical clearance).
   - Several attendees noted that roundabouts seem like good solutions but wonder if they are applicable to 220 due to the truck traffic. It was noted that roundabout design and truck traffic is not a unique design consideration and the characteristics of 220 are not unique compared to other areas throughout Minnesota that have roundabout intersections deployed.
   - Discussion of the design process to ensure trucks and agriculture equipment are account for was had. It was noted that conceptual designs developed for the study will be evaluated and further engineered at a later date. Large truck and ag equipment turning templates were reviewed to evaluate the feasibility of the potential intersection options. The concepts indicate the traffic control device is a feasible solution. More input in the final design would occur at that time and refined lane geometrics, lane widths, clearance zones, etc. will be developed to accommodate the design vehicles during the detailed design process.
   - Vehicle speeds on Mn 220 was brought up as a concern. It was acknowledged that the roadway environment influences the design speed. Future changes in traffic control devices along 220 may warrant opportunity to conduct speed rezoning.

Appendix B:

Public Opinion Survey

Q1 (Indicate the condition which applies to the location of the following activities within the MN 220 N Corridor Study Area. Please check all that apply).Do you live (resident) on the MN 220 N Corridor?

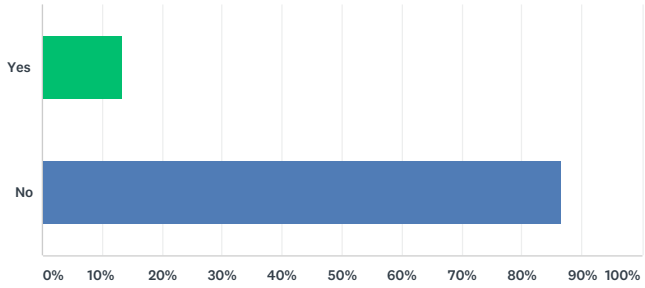
Answered: 52 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	34.62%	18
No	65.38%	34
Total Respondents: 52		

Q2 Do you work on the MN 220 N Corridor?

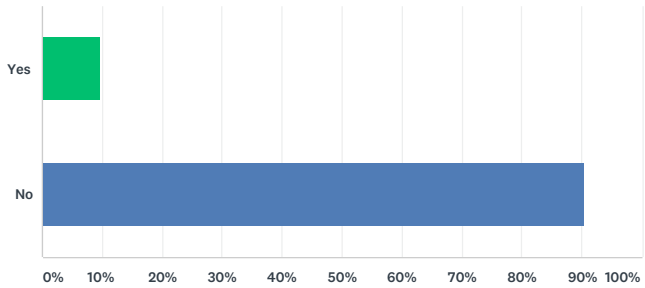
Answered: 52 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	13.46%	7
No	86.54%	45
Total Respondents: 52		

Q3 Do you attend school on the MN 220 N Corridor?

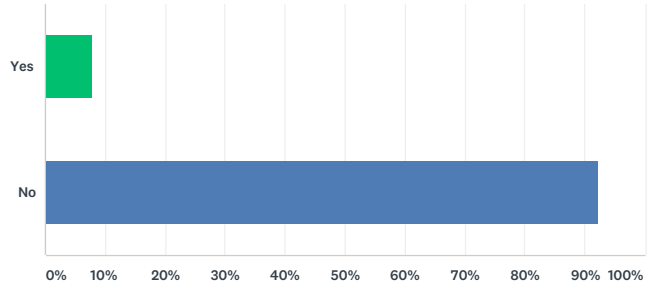
Answered: 52 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	9.62%	5
No	90.38%	47
Total Respondents: 52		

Q4 Do you own/operate a business on the MN 220 N Corridor?

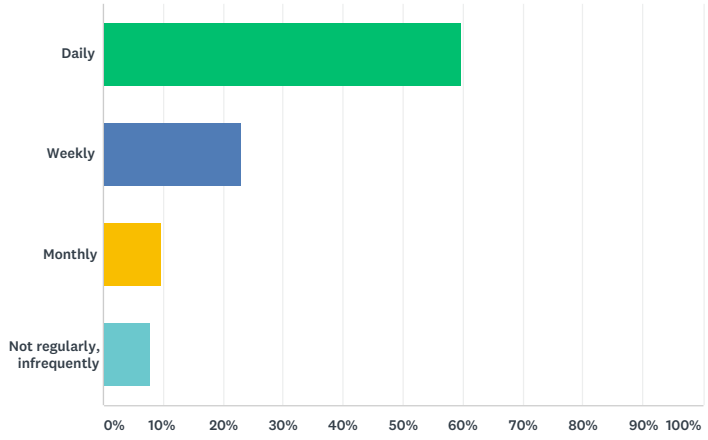
Answered: 51 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	7.84%	4
No	92.16%	47
Total Respondents: 51		

Q5 How often do you travel on the MN 220 N Corridor?

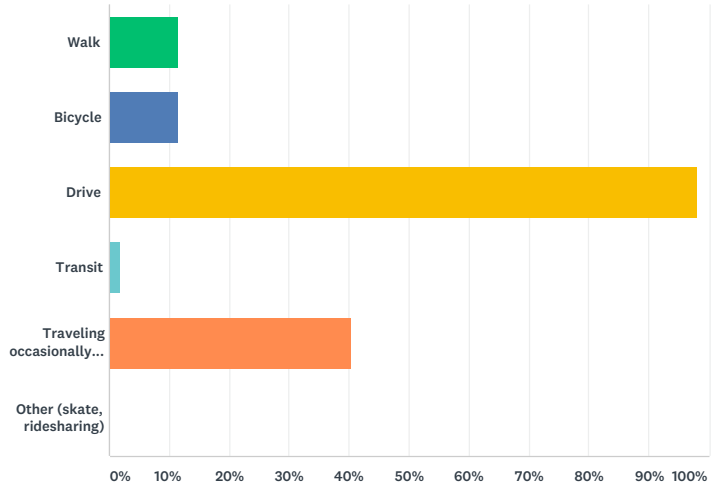
Answered: 52 Skipped: 0



ANSWER CHOICES	RESPONSES	
Daily	59.62%	31
Weekly	23.08%	12
Monthly	9.62%	5
Not regularly, infrequently	7.69%	4
TOTAL		52

Q6 How do you travel on the MN 220 N Corridor? (Pick your top 2. Mark only 2 options)

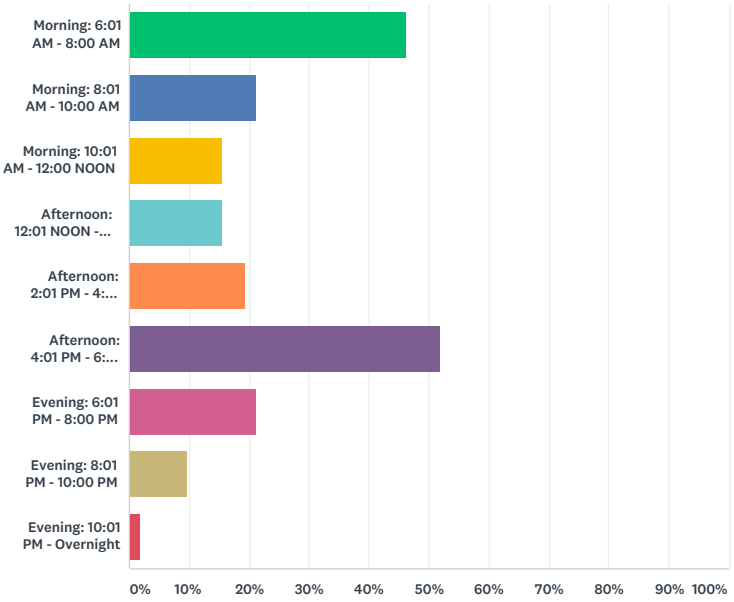
Answered: 52 Skipped: 0



ANSWER CHOICES	RESPONSES	
Walk	11.54%	6
Bicycle	11.54%	6
Drive	98.08%	51
Transit	1.92%	1
Traveling occasionally as a passenger/riding companion	40.38%	21
Other (skate, ridesharing)	0.00%	0
Total Respondents: 52		

Q7 What time of day do you typically travel this route? (Pick 2 time periods. Mark only 2 options)

Answered: 52 Skipped: 0

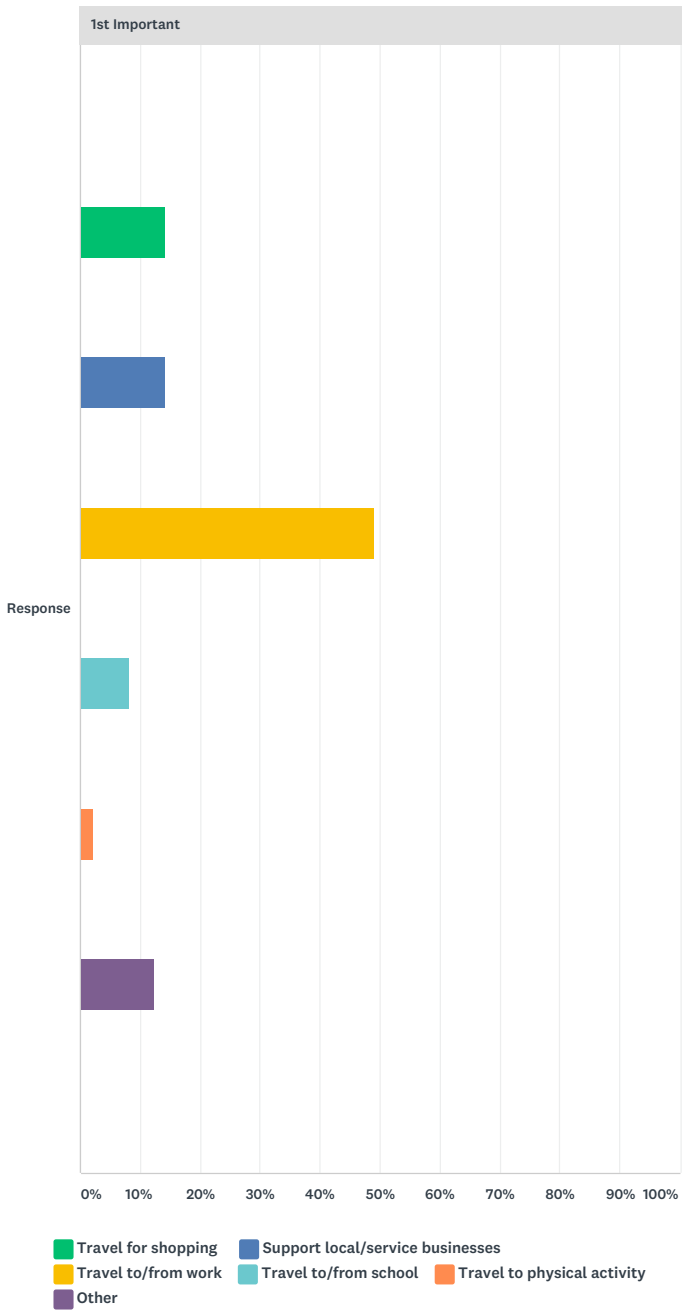


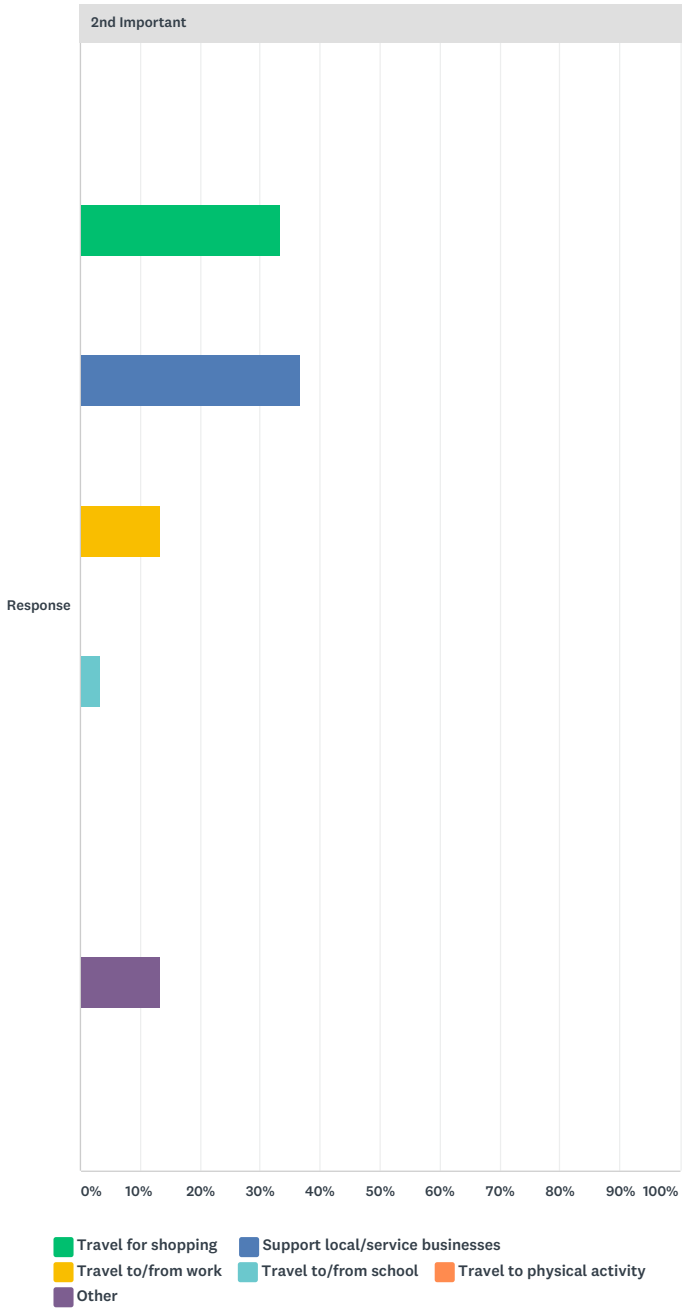
ANSWER CHOICES	RESPONSES	
Morning: 6:01 AM - 8:00 AM	46.15%	24
Morning: 8:01 AM - 10:00 AM	21.15%	11
Morning: 10:01 AM - 12:00 NOON	15.38%	8
Afternoon: 12:01 NOON - 2:00 PM	15.38%	8
Afternoon: 2:01 PM - 4:00 PM	19.23%	10
Afternoon: 4:01 PM - 6:00 PM	51.92%	27

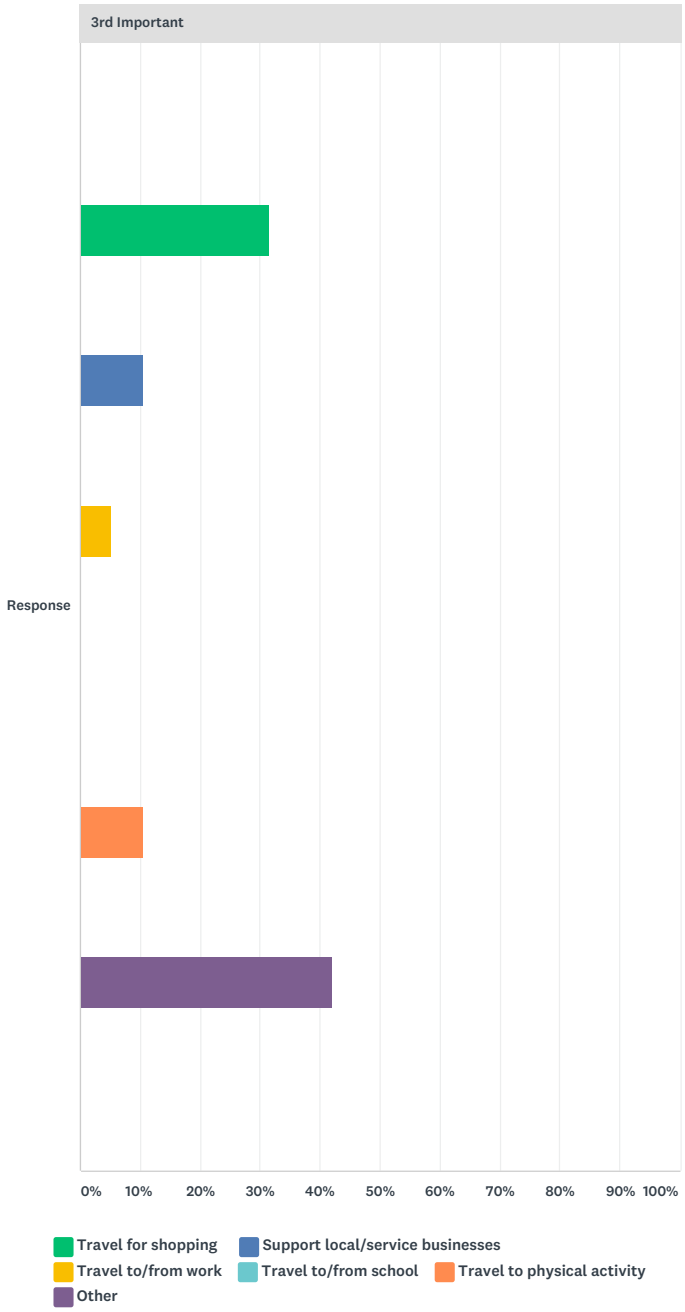
Evening: 6:01 PM - 8:00 PM	21.15%	11
Evening: 8:01 PM - 10:00 PM	9.62%	5
Evening: 10:01 PM - Overnight	1.92%	1
Total Respondents: 52		

Q8 Why do you travel on the Mn220 Corridor? (Pick your top 3 in order of importance, 1 being the most important).

Answered: 49 Skipped: 3




2nd Important
Response
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Travel for shopping
Support local/service businesses
Travel to/from work
Travel to/from school
Travel to physical activity
Other



1st Important

	TRAVEL FOR SHOPPING	SUPPORT LOCAL/SERVICE BUSINESSES	TRAVEL TO/FROM WORK	TRAVEL TO/FROM SCHOOL	TRAVEL TO PHYSICAL ACTIVITY	OTHER	TOTAL
Response	14.29% 7	14.29% 7	48.98% 24	8.16% 4	2.04% 1	12.24% 6	49

2nd Important

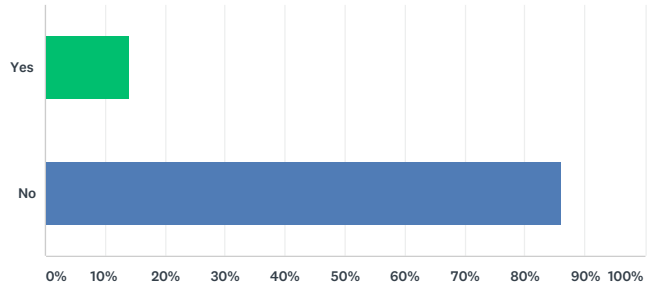
	TRAVEL FOR SHOPPING	SUPPORT LOCAL/SERVICE BUSINESSES	TRAVEL TO/FROM WORK	TRAVEL TO/FROM SCHOOL	TRAVEL TO PHYSICAL ACTIVITY	OTHER	TOTAL
Response	33.33% 10	36.67% 11	13.33% 4	3.33% 1	0.00% 0	13.33% 4	30

3rd Important

	TRAVEL FOR SHOPPING	SUPPORT LOCAL/SERVICE BUSINESSES	TRAVEL TO/FROM WORK	TRAVEL TO/FROM SCHOOL	TRAVEL TO PHYSICAL ACTIVITY	OTHER	TOTAL
Response	31.58% 6	10.53% 2	5.26% 1	0.00% 0	10.53% 2	42.11% 8	19

Q9 Do you, a friend, or a relative have a disability which could affect your/their safety in crossing any of the streets on the MN 220 Corridor?

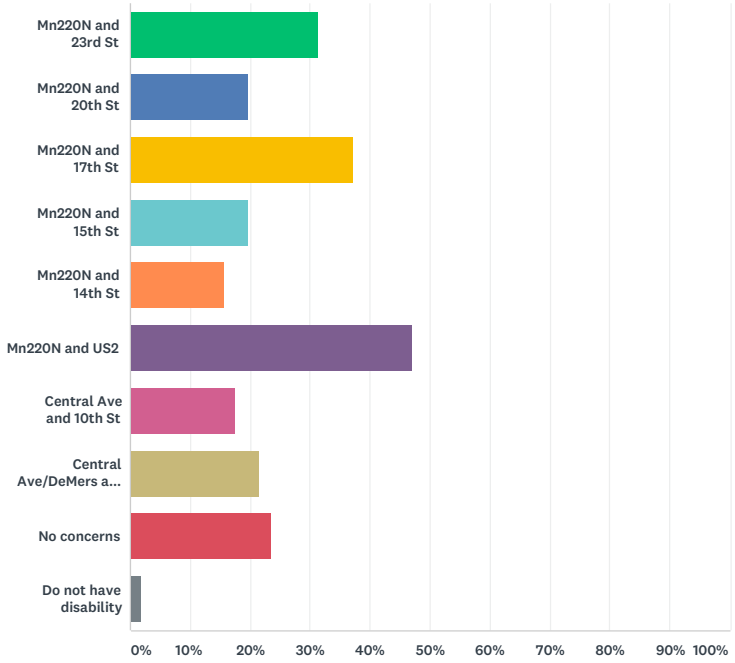
Answered: 50 Skipped: 2



ANSWER CHOICES	RESPONSES	
Yes	14.00%	7
No	86.00%	43
TOTAL		50

Q10 Please indicate the crossing intersection(s) which could affect your/their safety in crossing any of the streets on the MN 220 N Corridor (Central Avenue)? (Please check all that apply)

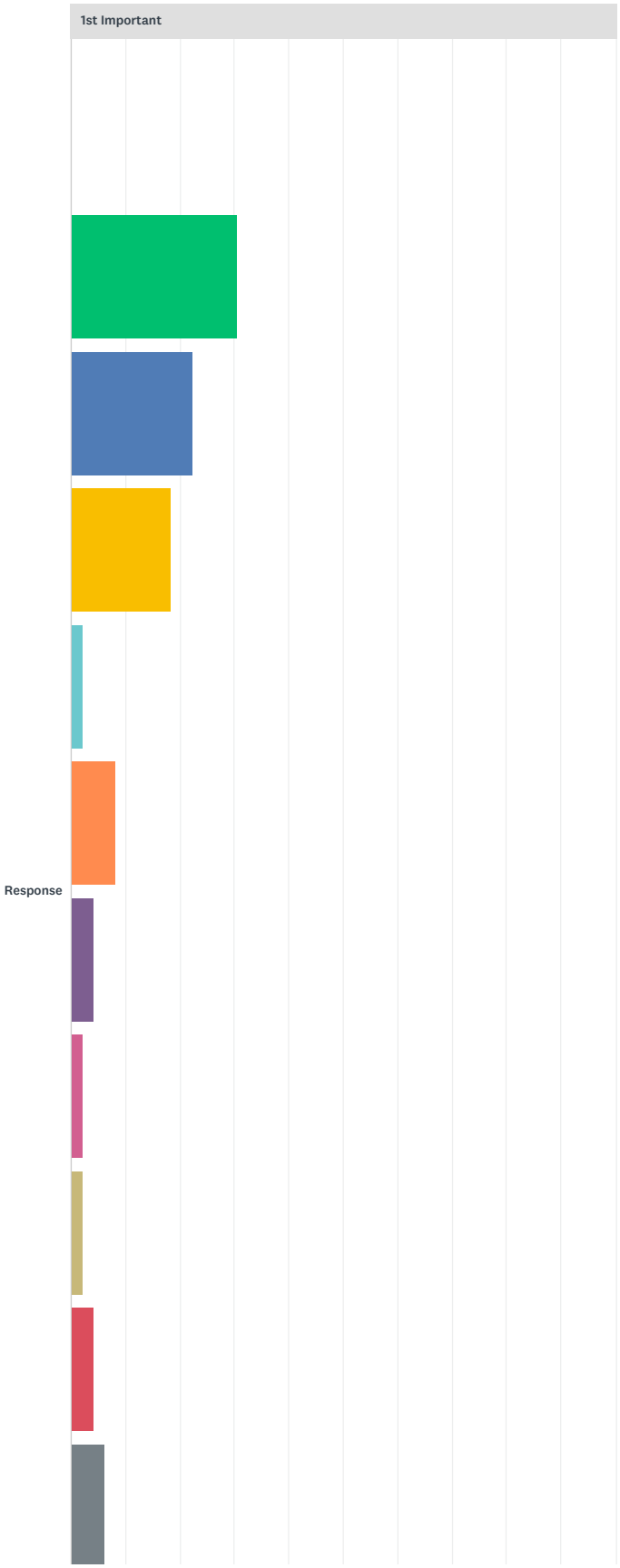
Answered: 51 Skipped: 1

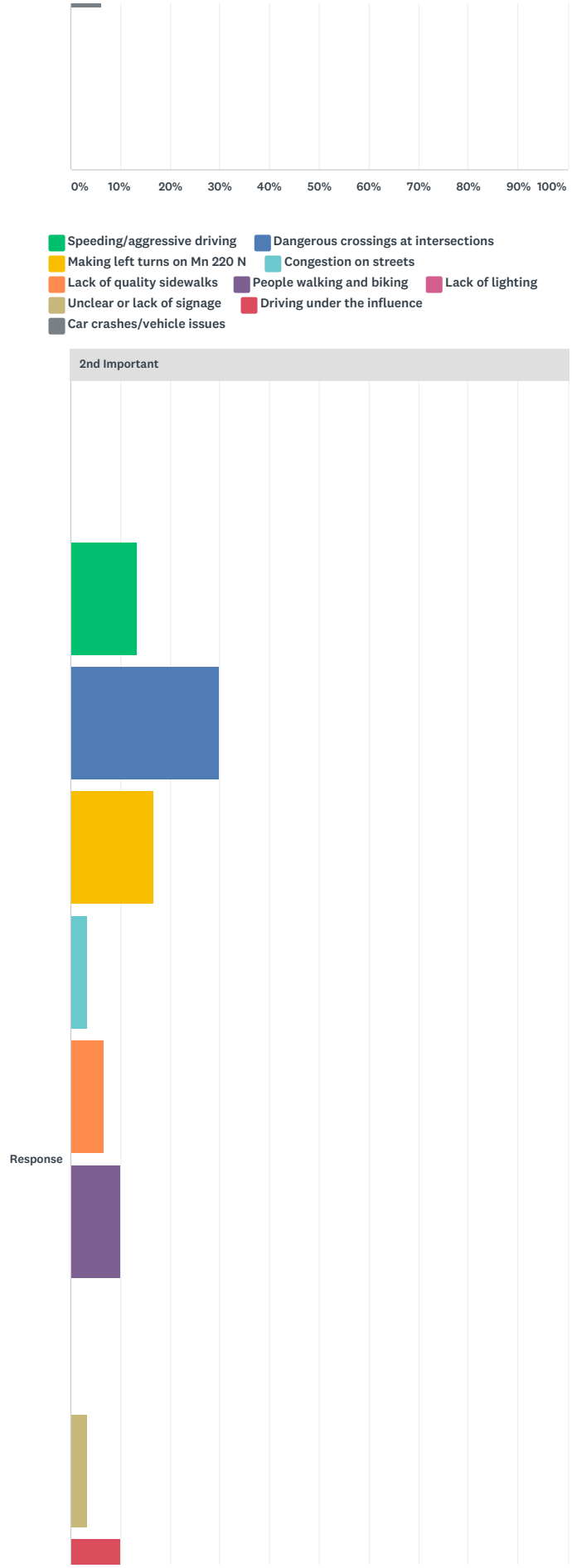


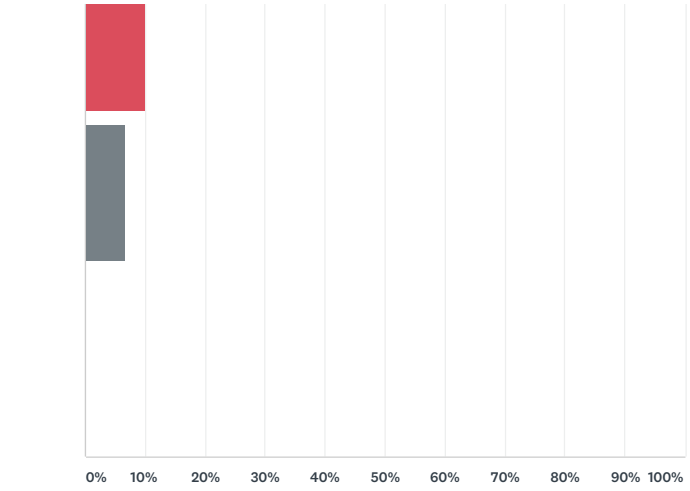
ANSWER CHOICES	RESPONSES	
Mn220N and 23rd St	31.37%	16
Mn220N and 20th St	19.61%	10
Mn220N and 17th St	37.25%	19
Mn220N and 15th St	19.61%	10
Mn220N and 14th St	15.69%	8
Mn220N and US2	47.06%	24
Central Ave and 10th St	17.65%	9
Central Ave/DeMers and 9th St	21.57%	11
No concerns	23.53%	12
Do not have disability	1.96%	1
Total Respondents: 51		

Q11 In your opinion, what are the biggest safety problem on the Mn220 Corridor (Central Ave)? (Pick three in order of importance).

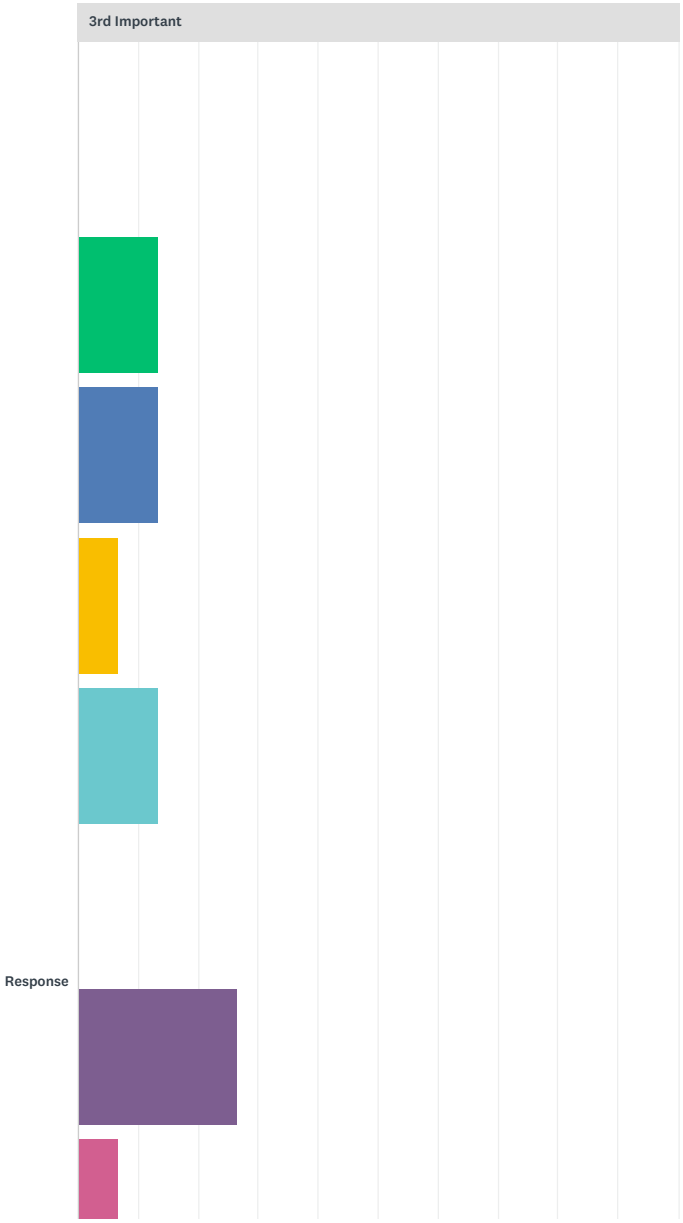
Answered: 49 Skipped: 3

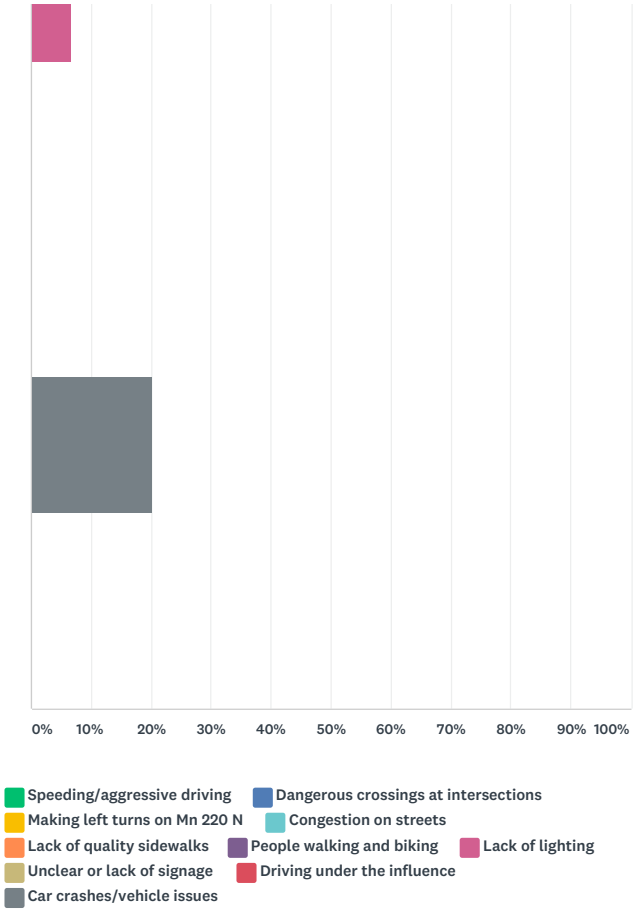



0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Speeding/aggressive driving
Dangerous crossings at intersections
Making left turns on Mn 220 N
Congestion on streets
Lack of quality sidewalks
People walking and biking
Lack of lighting
Unclear or lack of signage
Driving under the influence
Car crashes/vehicle issues
2nd Important
Response



Speeding/aggressive driving
Dangerous crossings at intersections
Making left turns on Mn 220 N
Congestion on streets
Lack of quality sidewalks
People walking and biking
Lack of lighting
Unclear or lack of signage
Driving under the influence
Car crashes/vehicle issues





1st Important

	SPEEDING/AGGRESSIVE DRIVING	DANGEROUS CROSSINGS AT INTERSECTIONS	MAKING LEFT TURNS ON MN 220 N	CONGESTION ON STREETS	LACK OF QUALITY SIDEWALKS	PEOPLE WALKING AND BIKING	LACK OF LIGHTING	UNCLEAR OR LACK OF SIGNAGE	DRIVING UNDER THE INFLUENCE	C. C IS
Response	30.61% 15	22.45% 11	18.37% 9	2.04% 1	8.16% 4	4.08% 2	2.04% 1	2.04% 1	4.08% 2	

2nd Important

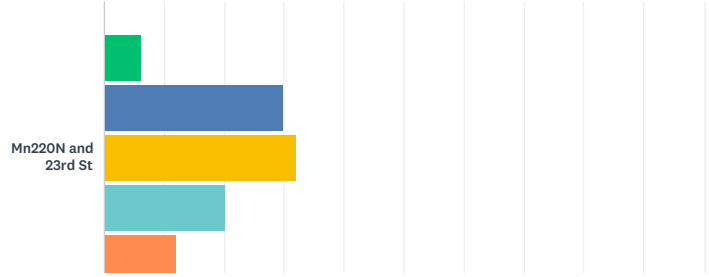
	SPEEDING/AGGRESSIVE DRIVING	DANGEROUS CROSSINGS AT INTERSECTIONS	MAKING LEFT TURNS ON MN 220 N	CONGESTION ON STREETS	LACK OF QUALITY SIDEWALKS	PEOPLE WALKING AND BIKING	LACK OF LIGHTING	UNCLEAR OR LACK OF SIGNAGE	DRIVING UNDER THE INFLUENCE	C. C IS
Response	13.33% 4	30.00% 9	16.67% 5	3.33% 1	6.67% 2	10.00% 3	0.00% 0	3.33% 1	10.00% 3	

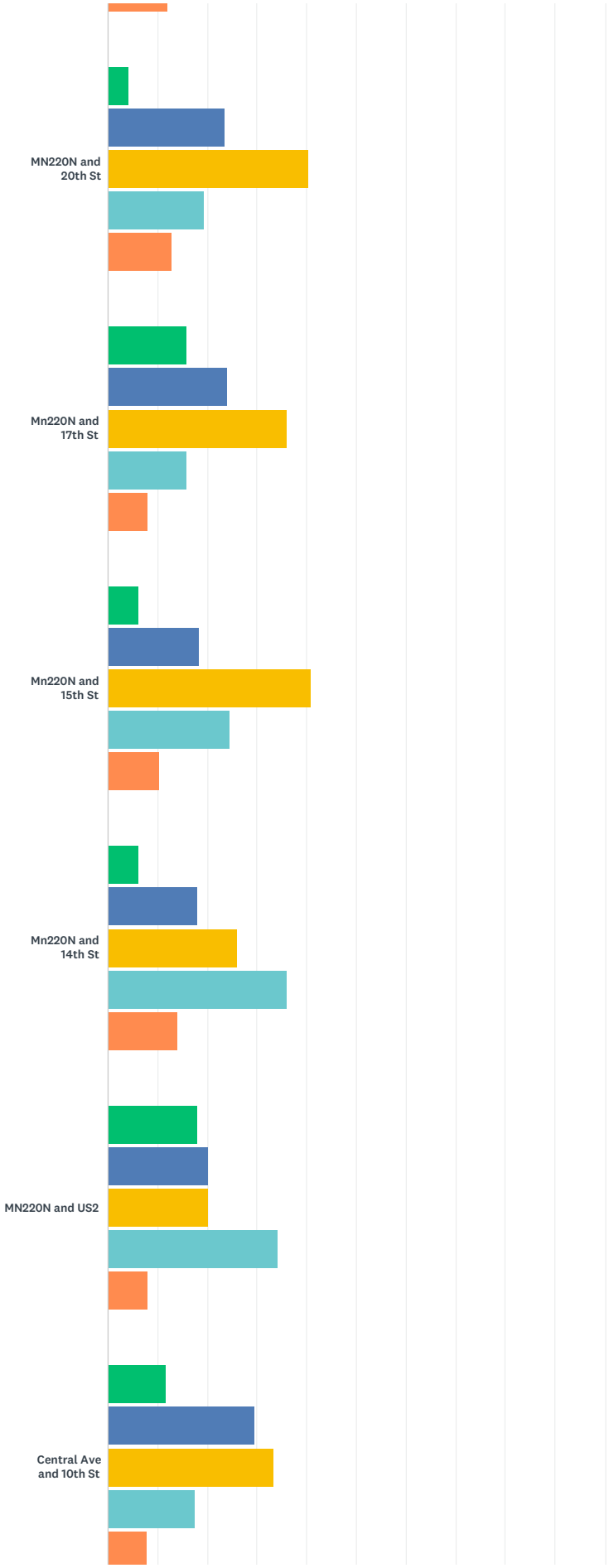
3rd Important

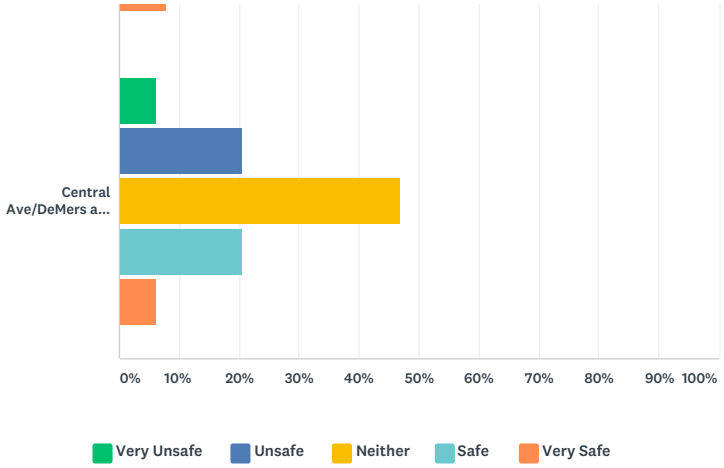
	SPEEDING/AGGRESSIVE DRIVING	DANGEROUS CROSSINGS AT INTERSECTIONS	MAKING LEFT TURNS ON MN 220 N	CONGESTION ON STREETS	LACK OF QUALITY SIDEWALKS	PEOPLE WALKING AND BIKING	LACK OF LIGHTING	UNCLEAR OR LACK OF SIGNAGE	DRIVING UNDER THE INFLUENCE	C. C IS
Response	13.33% 2	13.33% 2	6.67% 1	13.33% 2	0.00% 0	26.67% 4	6.67% 1	0.00% 0	0.00% 0	

Q12 How do you perceive SAFETY at any of the following intersections?

Answered: 51 Skipped: 1



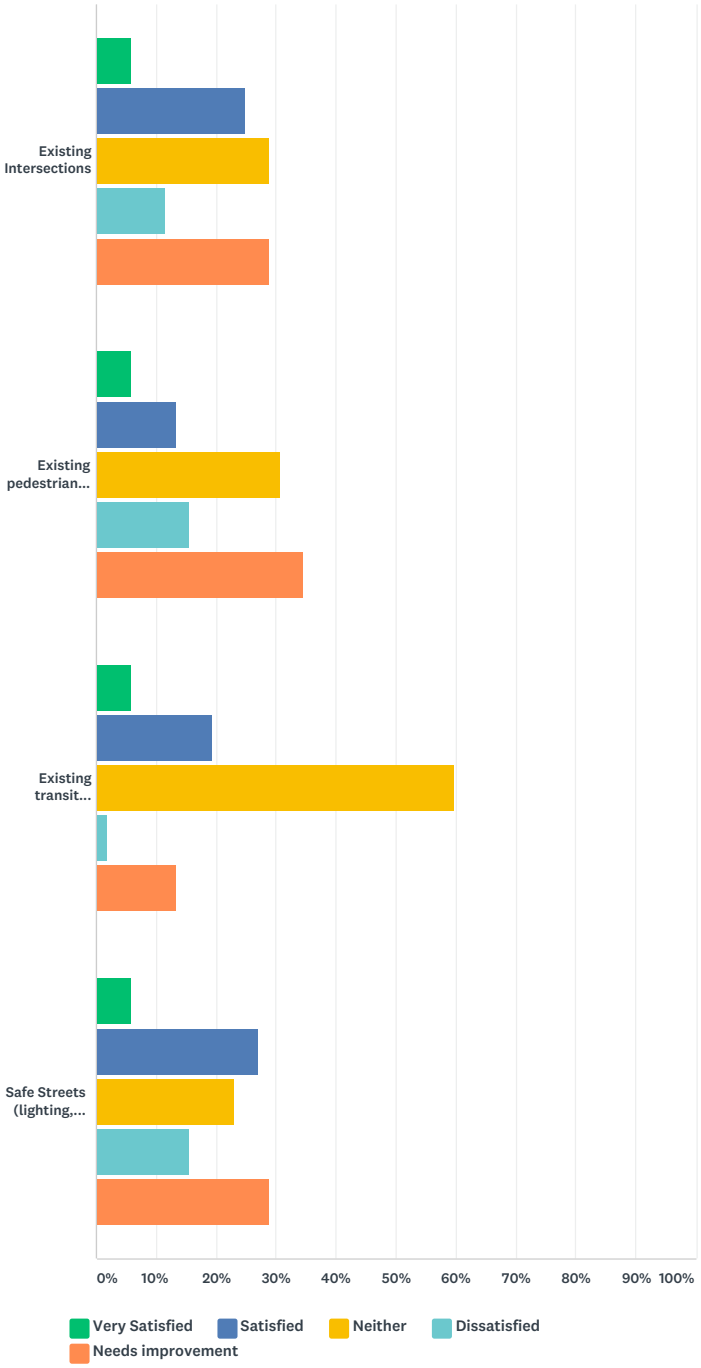

MN220N and 20th St
Mn220N and 17th St
Mn220N and 15th St
Mn220N and 14th St
MN220N and US2
Central Ave and 10th St



	VERY UNSAFE	UNSAFE	NEITHER	SAFE	VERY SAFE	TOTAL
Mn220N and 23rd St	6.00% 3	30.00% 15	32.00% 16	20.00% 10	12.00% 6	50
MN220N and 20th St	4.26% 2	23.40% 11	40.43% 19	19.15% 9	12.77% 6	47
Mn220N and 17th St	16.00% 8	24.00% 12	36.00% 18	16.00% 8	8.00% 4	50
Mn220N and 15th St	6.12% 3	18.37% 9	40.82% 20	24.49% 12	10.20% 5	49
Mn220N and 14th St	6.00% 3	18.00% 9	26.00% 13	36.00% 18	14.00% 7	50
MN220N and US2	18.00% 9	20.00% 10	20.00% 10	34.00% 17	8.00% 4	50
Central Ave and 10th St	11.76% 6	29.41% 15	33.33% 17	17.65% 9	7.84% 4	51
Central Ave/DeMers and 9th St	6.12% 3	20.41% 10	46.94% 23	20.41% 10	6.12% 3	49

Q13 What conditions existing on the MN 220 N Corridor (Central Avenue) would you like to improve?

Answered: 52 Skipped: 0



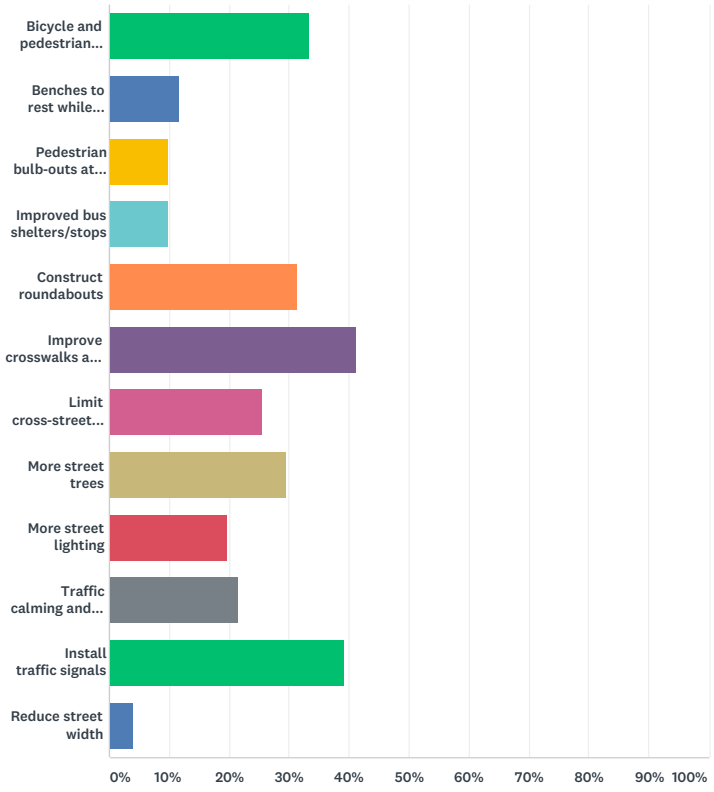
	VERY SATISFIED	SATISFIED	NEITHER	DISSATISFIED	NEEDS IMPROVEMENT	TOTAL	WEIGHTED AVERAGE
Existing Intersections	5.77% 3	25.00% 13	28.85% 15	11.54% 6	28.85% 15	52	3.33
Existing pedestrian crossings	5.77% 3	13.46% 7	30.77% 16	15.38% 8	34.62% 18	52	3.60
Existing transit facilities	5.77% 3	19.23% 10	59.62% 31	1.92% 1	13.46% 7	52	2.98
Safe Streets (lighting, crosswalks)	5.77% 3	26.92% 14	23.08% 12	15.38% 8	28.85% 15	52	3.35

Q14 If you describe the MN 220N Corridor - as it exists today - to someone from out of town, what would you say about the MN 220 N Corridor? Comments:

Answered: 32 Skipped: 20

Q15 What creative ideas or elements could be integrated into the long term vision of the MN 220 N Corridor? (Pick your top 3. Mark only 3 options)

Answered: 51 Skipped: 1



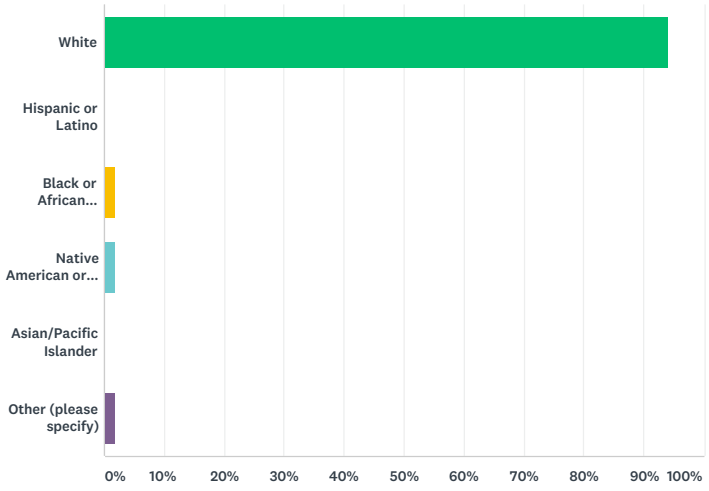
ANSWER CHOICES	RESPONSES	
Bicycle and pedestrian paths	33.33%	17
Benches to rest while walking	11.76%	6
Pedestrian bulb-outs at street crossings	9.80%	5
Improved bus shelters/stops	9.80%	5
Construct roundabouts	31.37%	16
Improve crosswalks at intersections with markings and signs	41.18%	21
Limit cross-street movements	25.49%	13
More street trees	29.41%	15
More street lighting	19.61%	10
Traffic calming and road diet strategies	21.57%	11
Install traffic signals	39.22%	20
Reduce street width	3.92%	2
Total Respondents: 51		

Q16 Other issues and observations:

Answered: 21 Skipped: 31

Q17 We want to be sure that we have spoken to a broad mix of people in your area. What race/ethnicity best describes you?

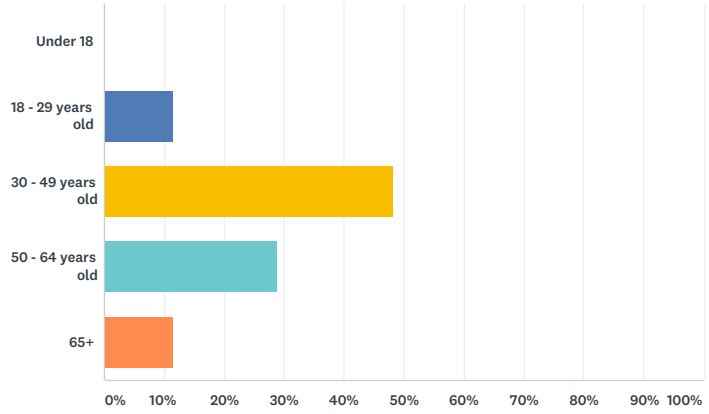
Answered: 51 Skipped: 1



ANSWER CHOICES	RESPONSES	
White	94.12%	48
Hispanic or Latino	0.00%	0
Black or African American	1.96%	1
Native American or American Indian	1.96%	1
Asian/Pacific Islander	0.00%	0
Other (please specify)	1.96%	1
TOTAL		51

Q18 Which category below includes you age?

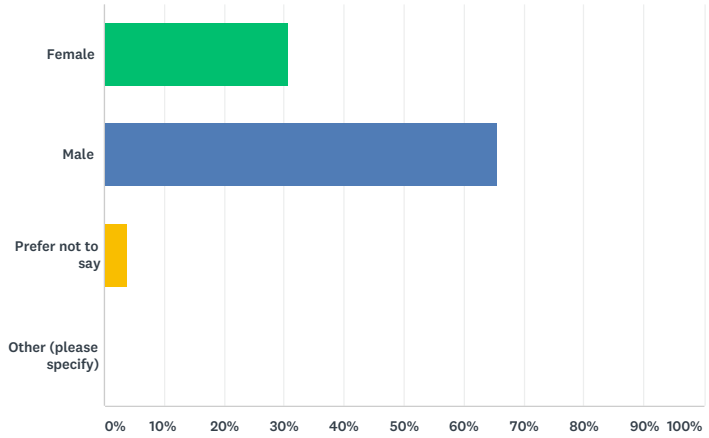
Answered: 52 Skipped: 0



ANSWER CHOICES	RESPONSES	
Under 18	0.00%	0
18 - 29 years old	11.54%	6
30 - 49 years old	48.08%	25
50 - 64 years old	28.85%	15
65+	11.54%	6
TOTAL		52

Q19 Which gender do you identify most with?

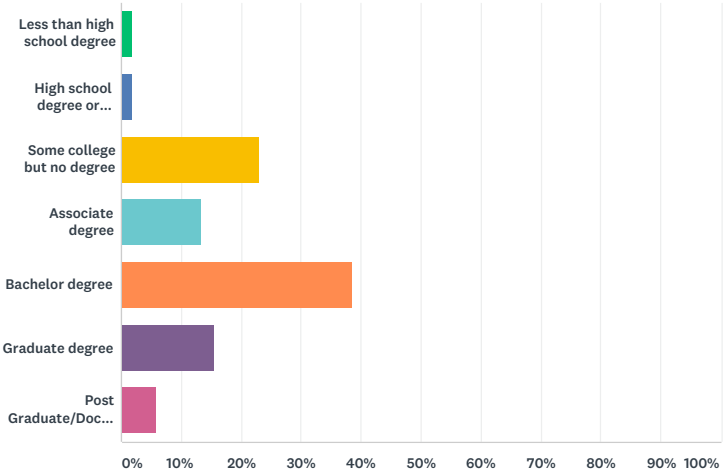
Answered: 52 Skipped: 0



ANSWER CHOICES	RESPONSES	
Female	30.77%	16
Male	65.38%	34
Prefer not to say	3.85%	2
Other (please specify)	0.00%	0
TOTAL		52

Q20 What is the highest level of school you have completed or the highest degree you have received?

Answered: 52 Skipped: 0



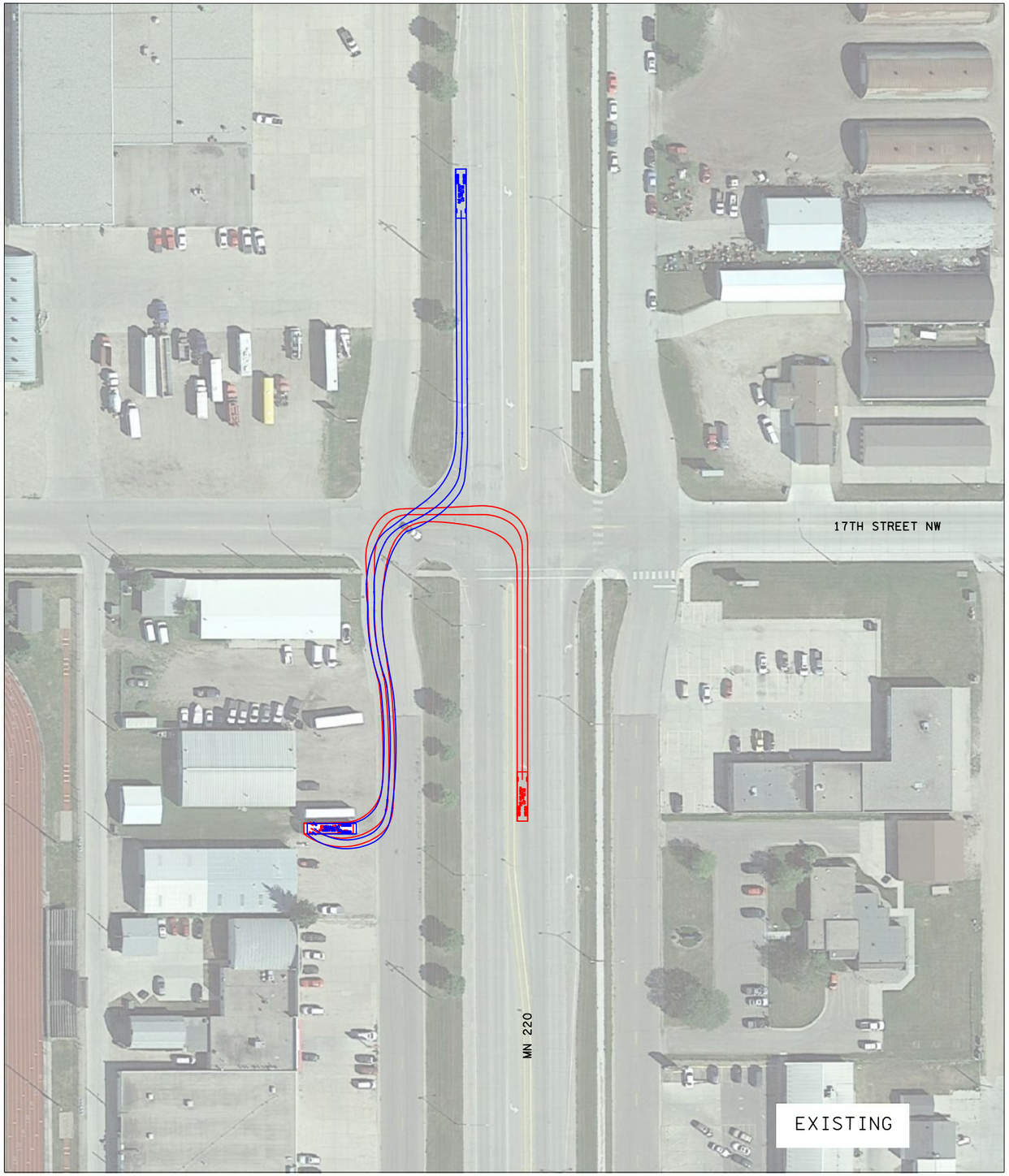
ANSWER CHOICES	RESPONSES	
Less than high school degree	1.92%	1
High school degree or equivalent (e.g., GED)	1.92%	1
Some college but no degree	23.08%	12
Associate degree	13.46%	7
Bachelor degree	38.46%	20
Graduate degree	15.38%	8
Post Graduate/Doctorate	5.77%	3
TOTAL		52

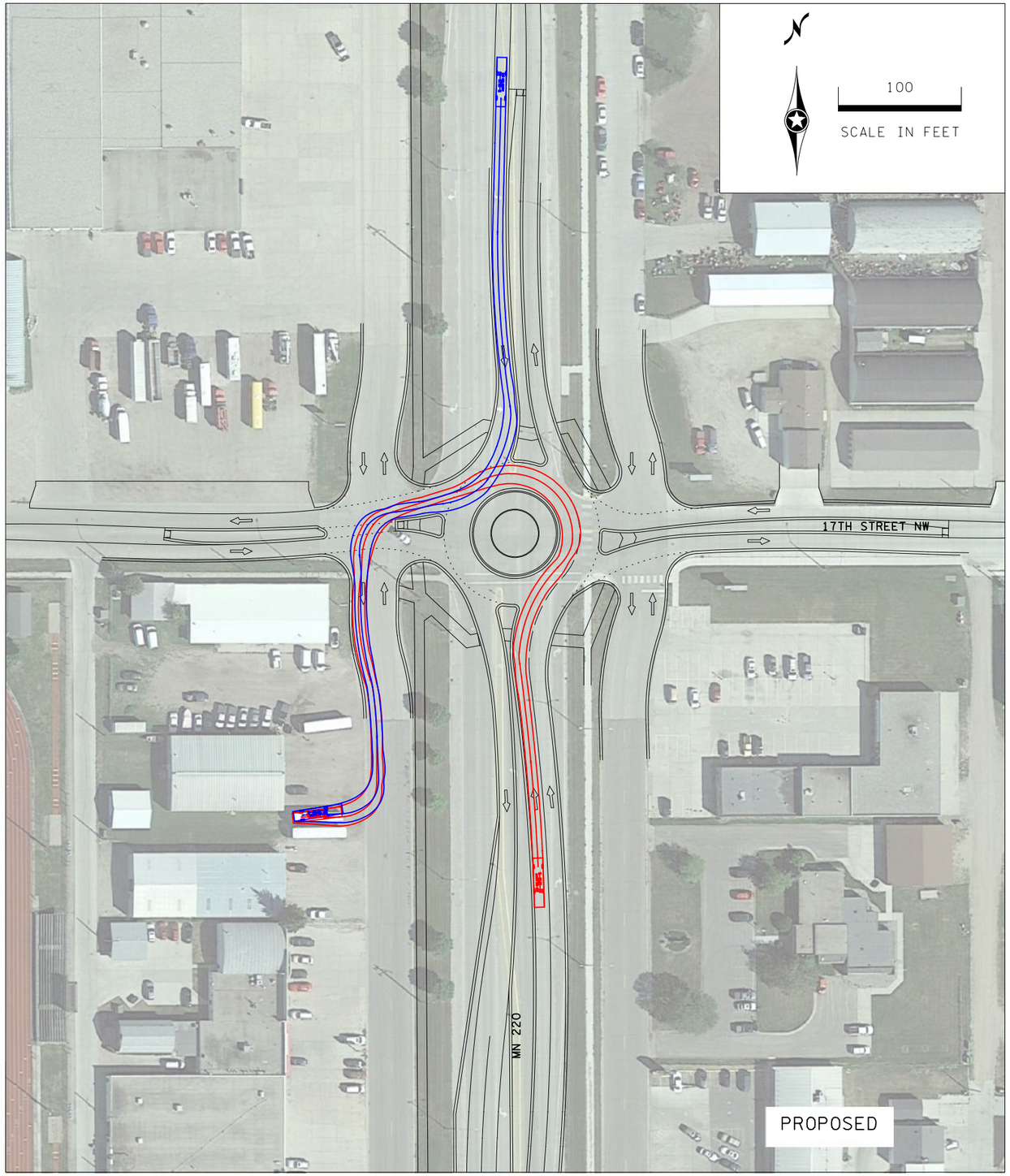
Q21 Provide your general comments, issues, and/or ideas which should be considered for the corridor. Thank you for your cooperation!

Answered: 18 Skipped: 34

Appendix C:

Truck Turning Movements

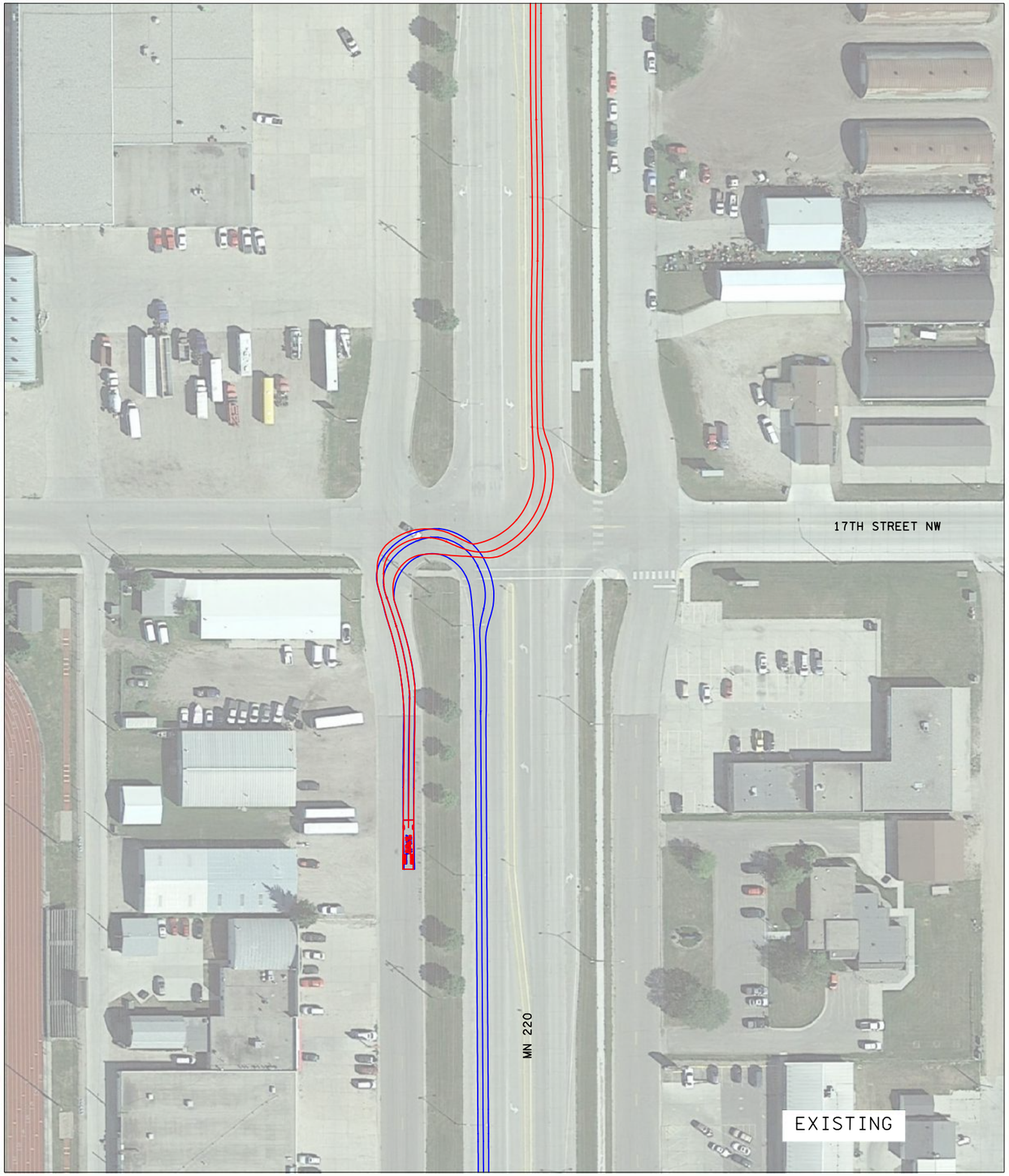


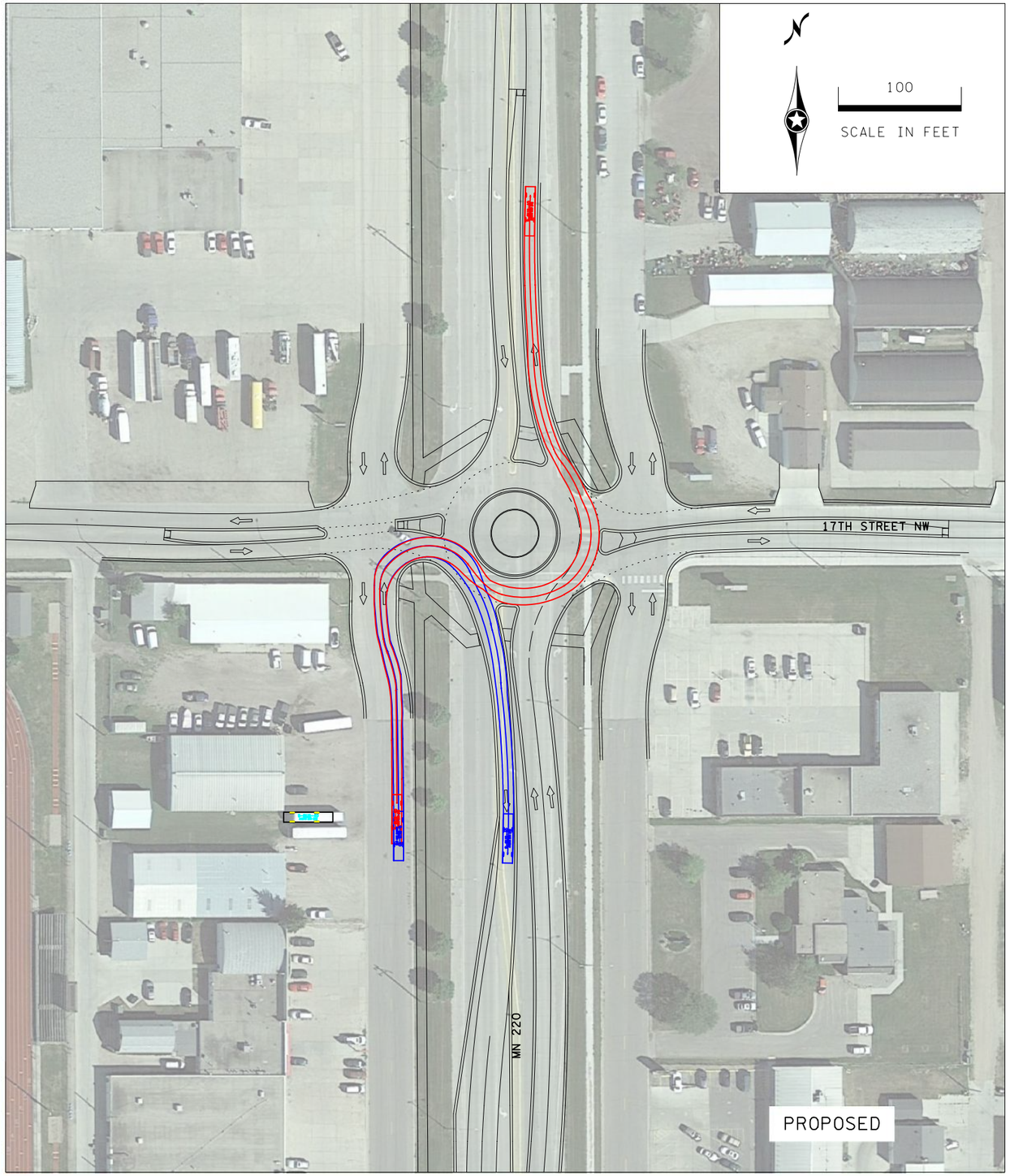


MN 220 Corridor Study

ALLIANT ENGINEERING

MN 220/17th Street NW
40' Bus Turn Movements Into Triangle Bus





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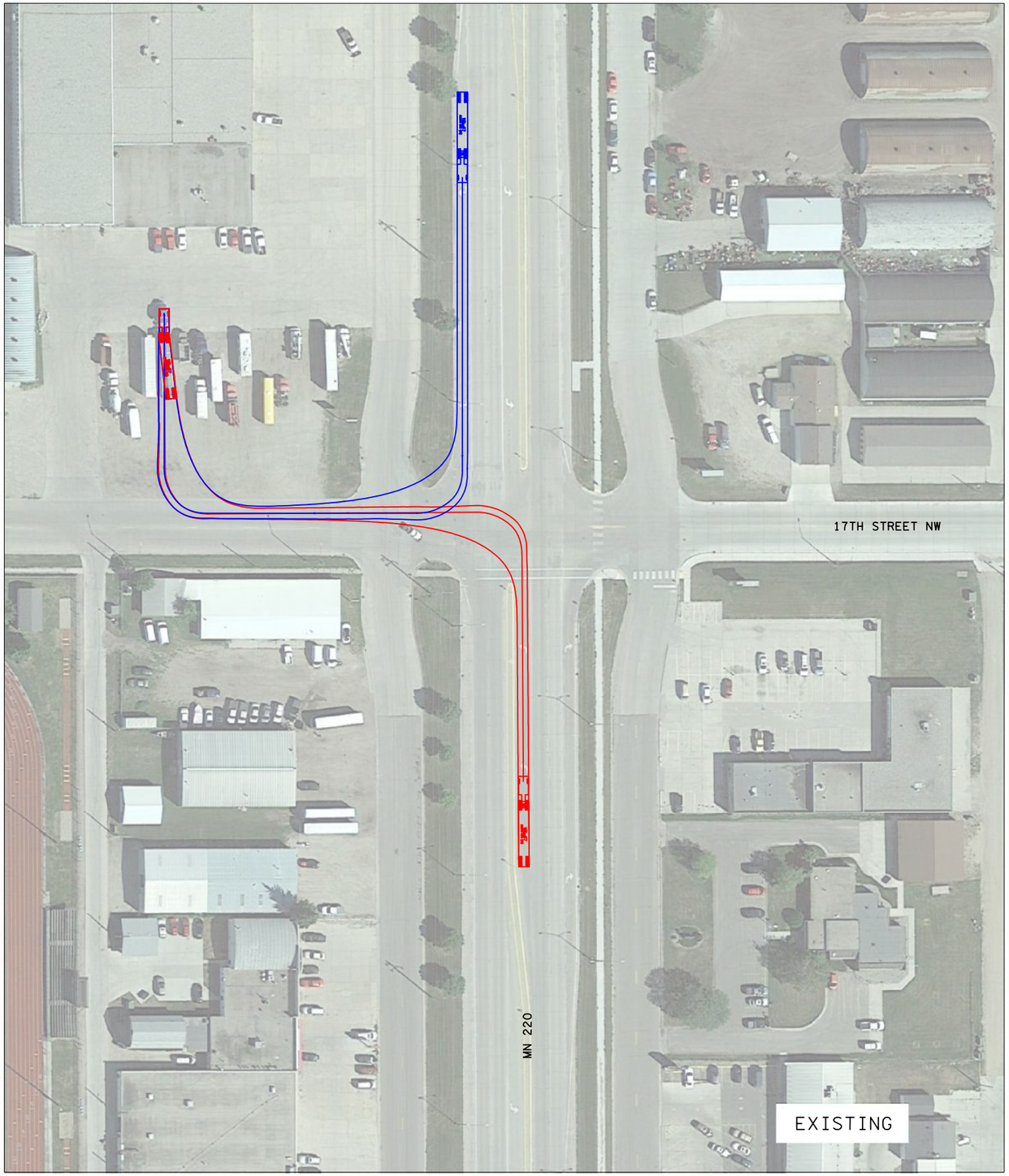
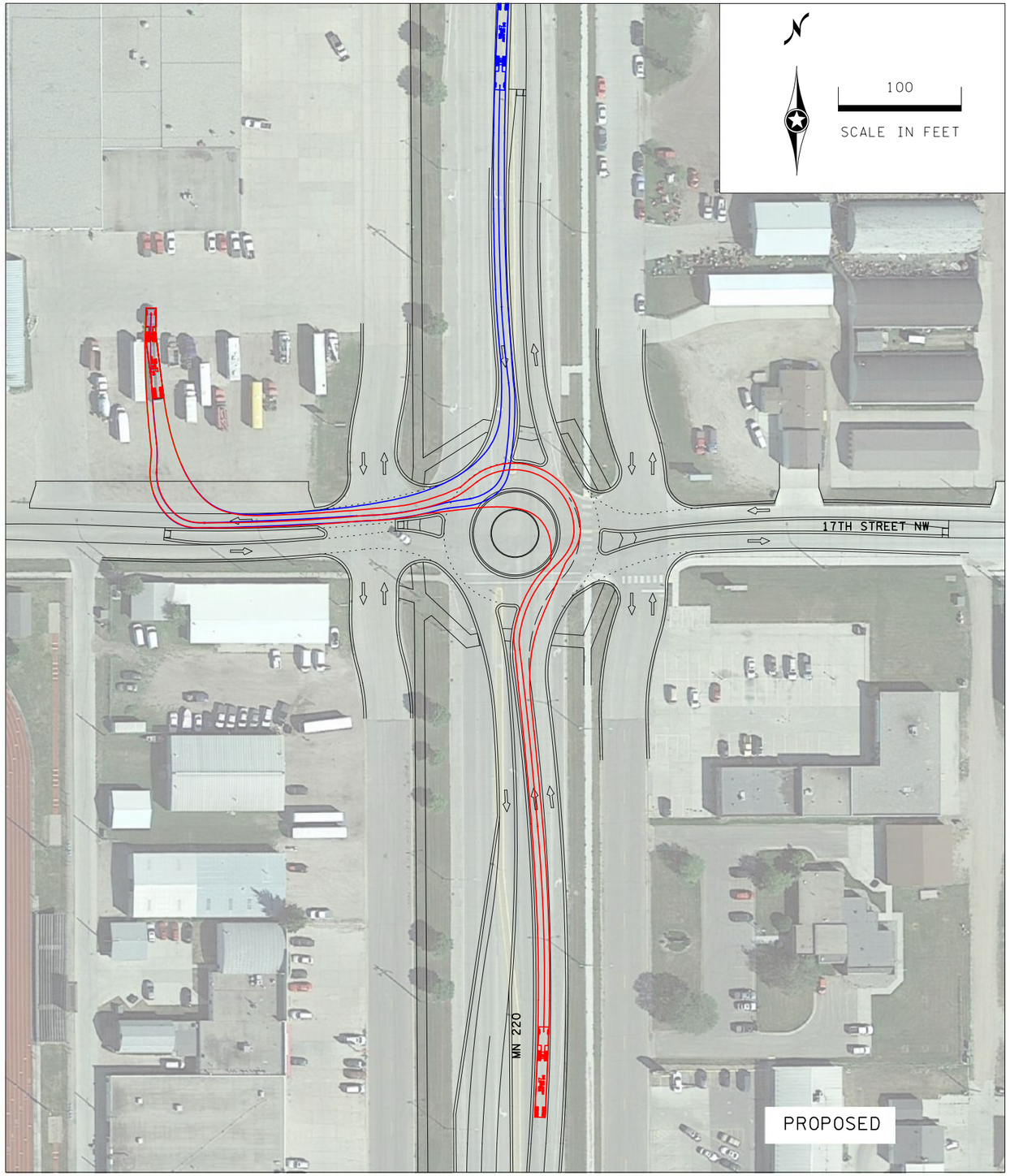
MN 220/17th Street NW
40' Bus Turn Movements Out of Triangle Bus





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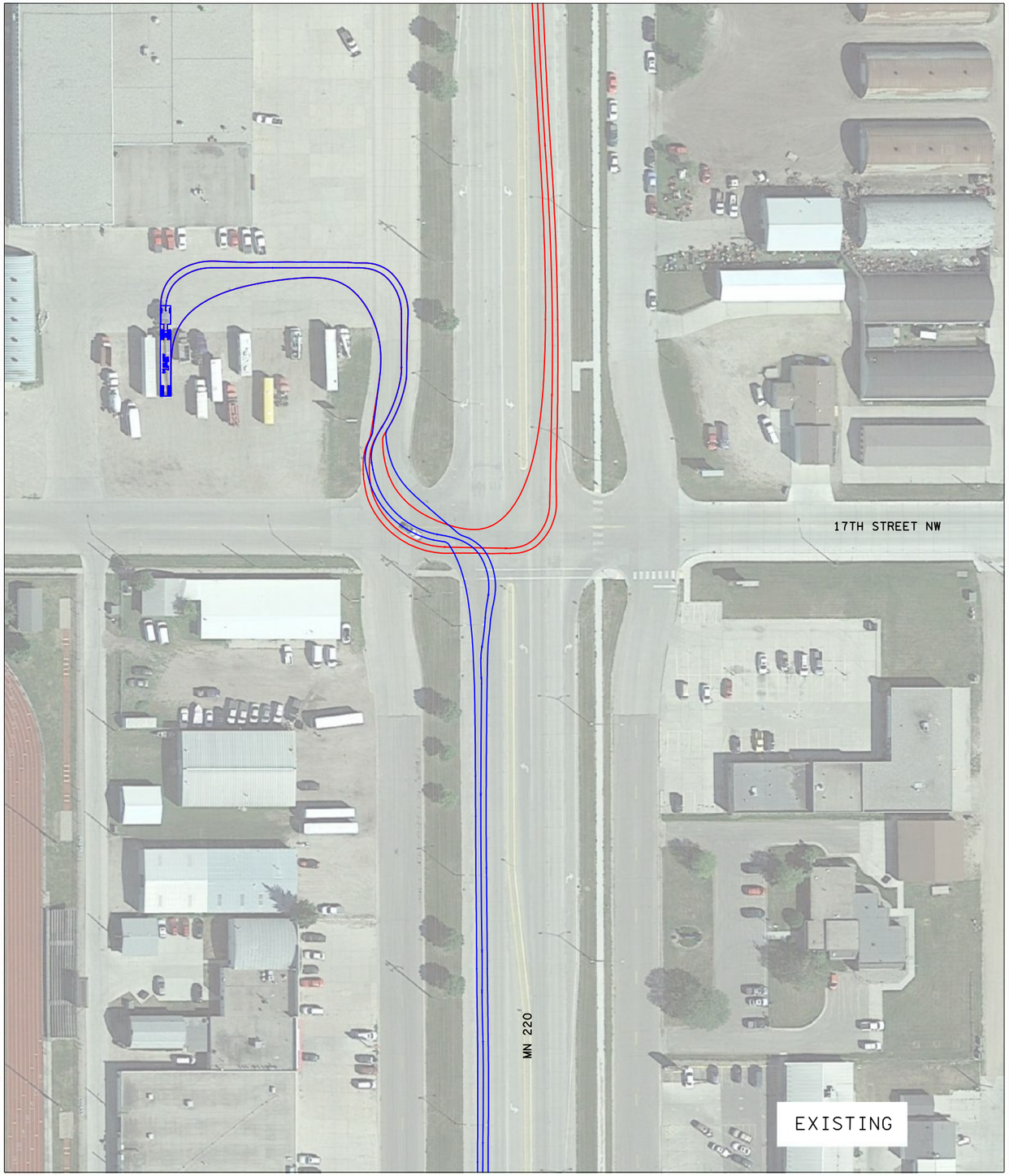
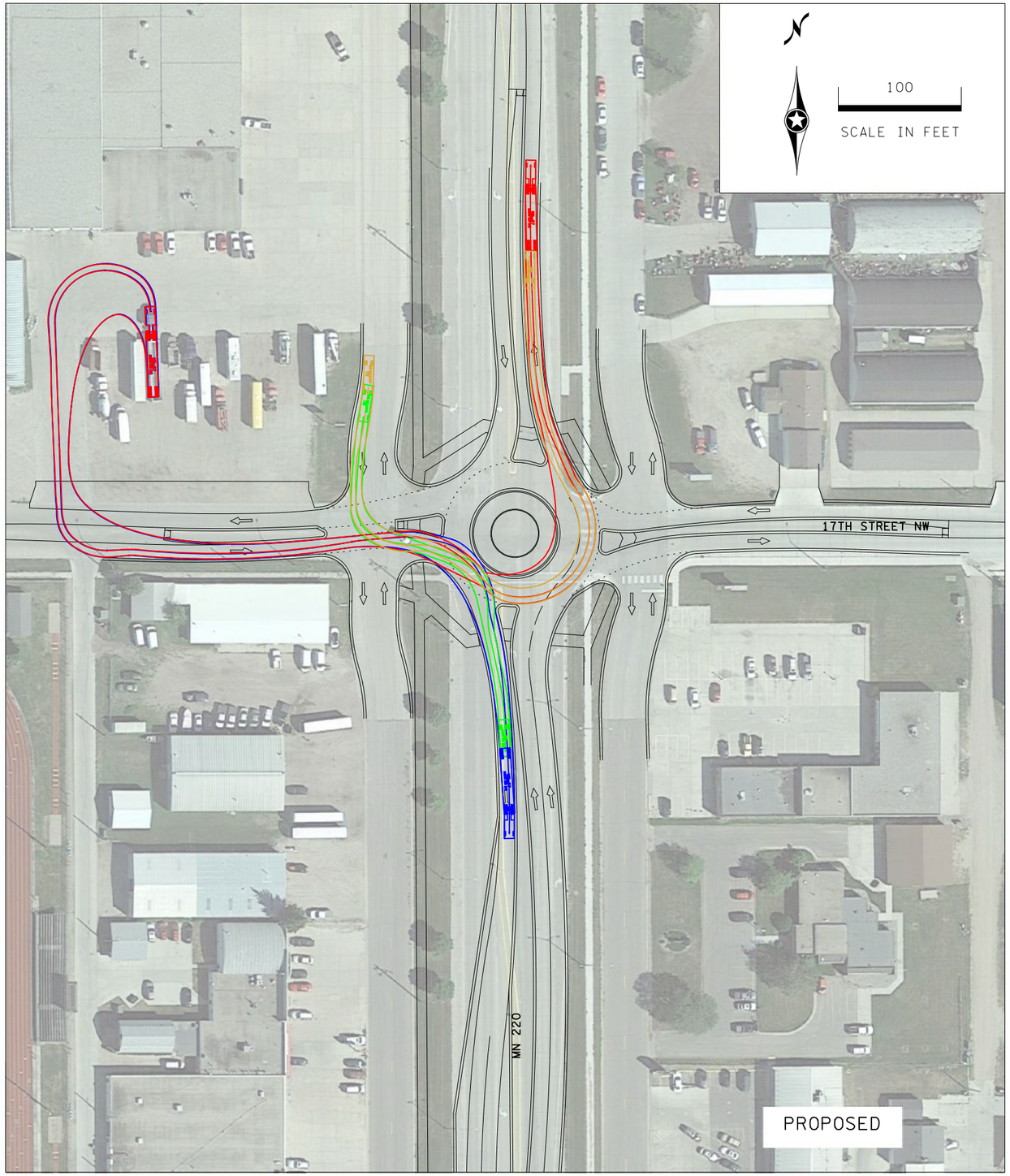
MN 220/17th Street NW
WB 67 Turn Movements Into Valley Truck





MN 220 Corridor Study

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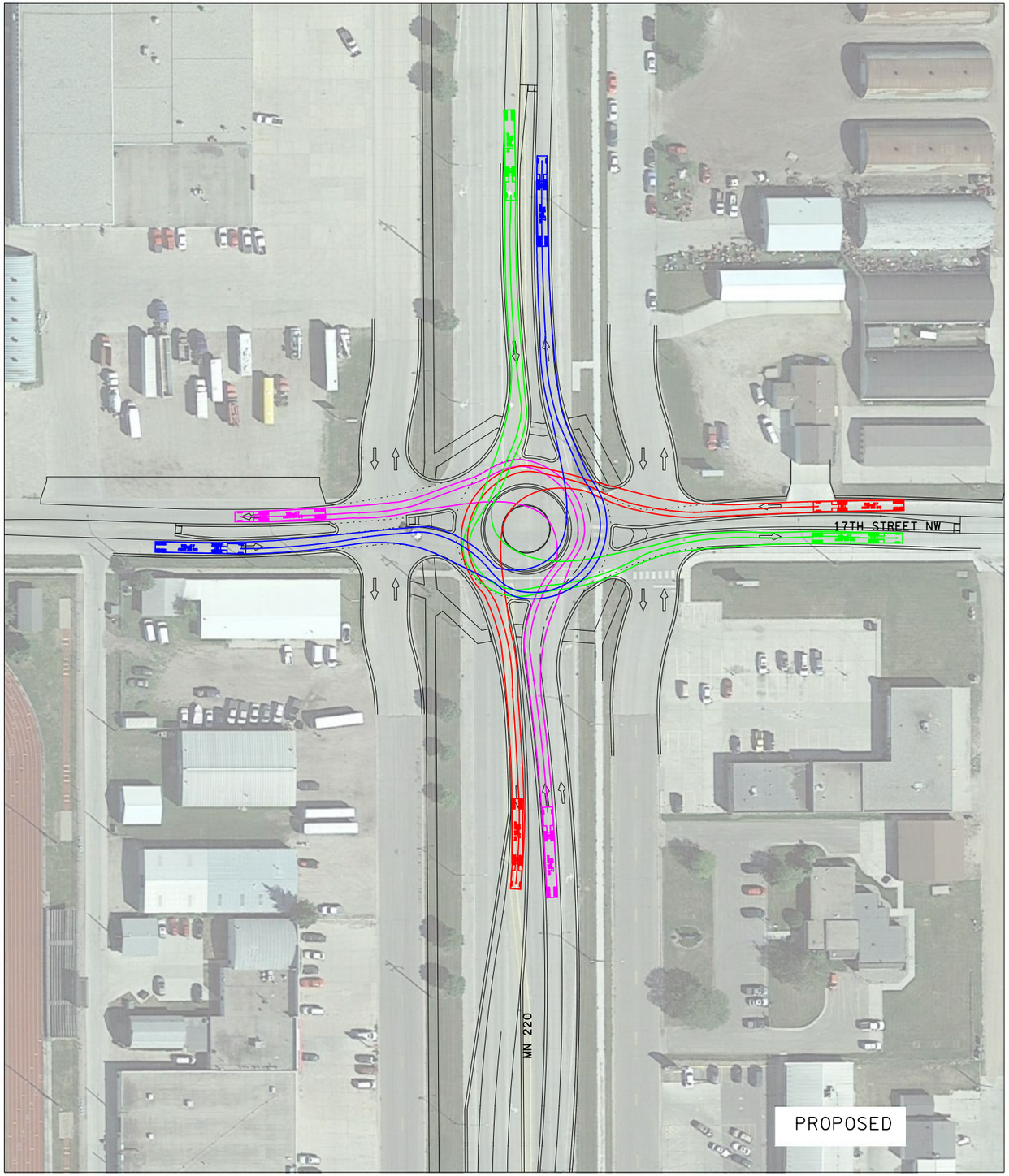
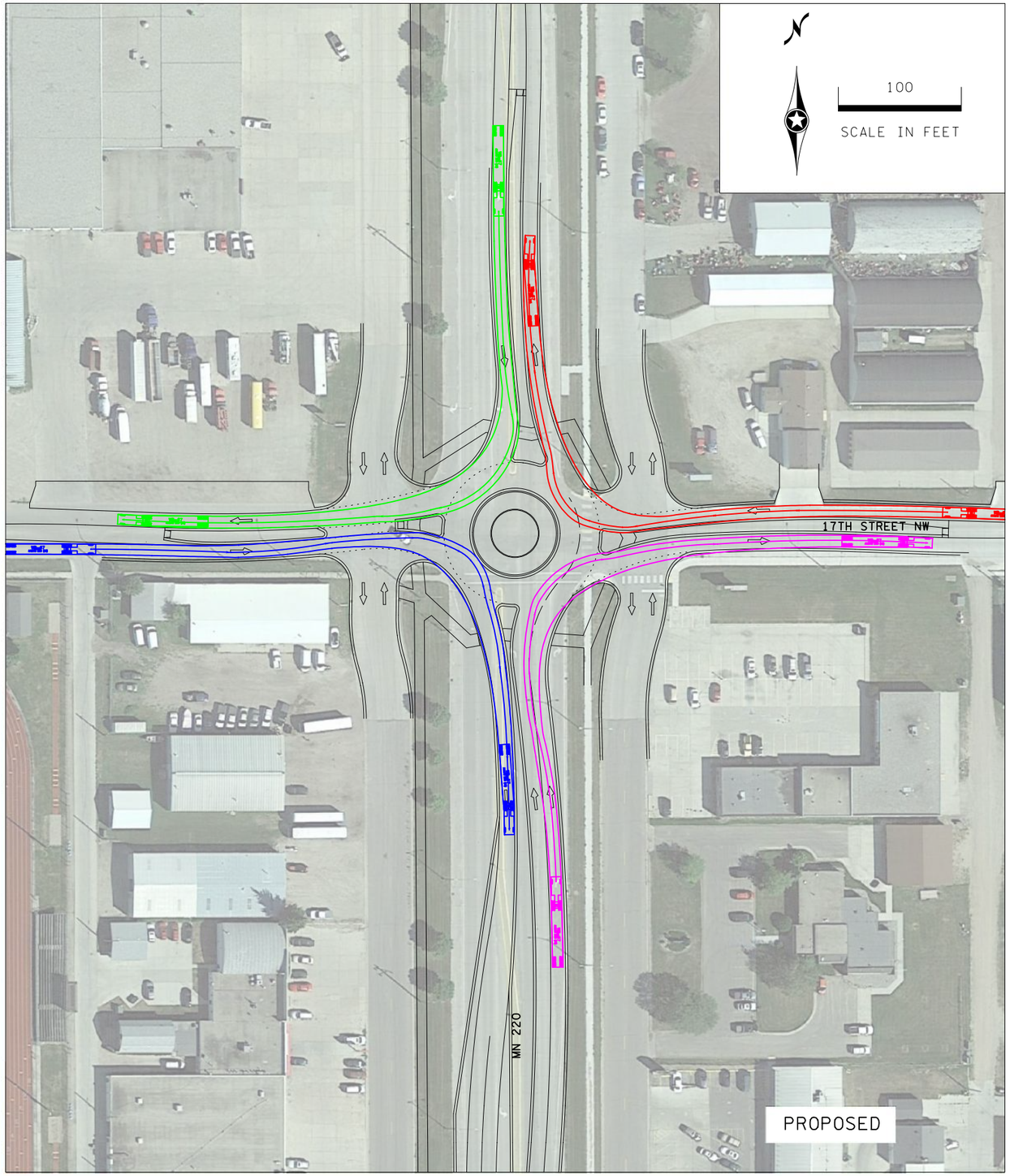
MN 220/17th Street NW
WB 67 Turn Movements Out of Valley Truck





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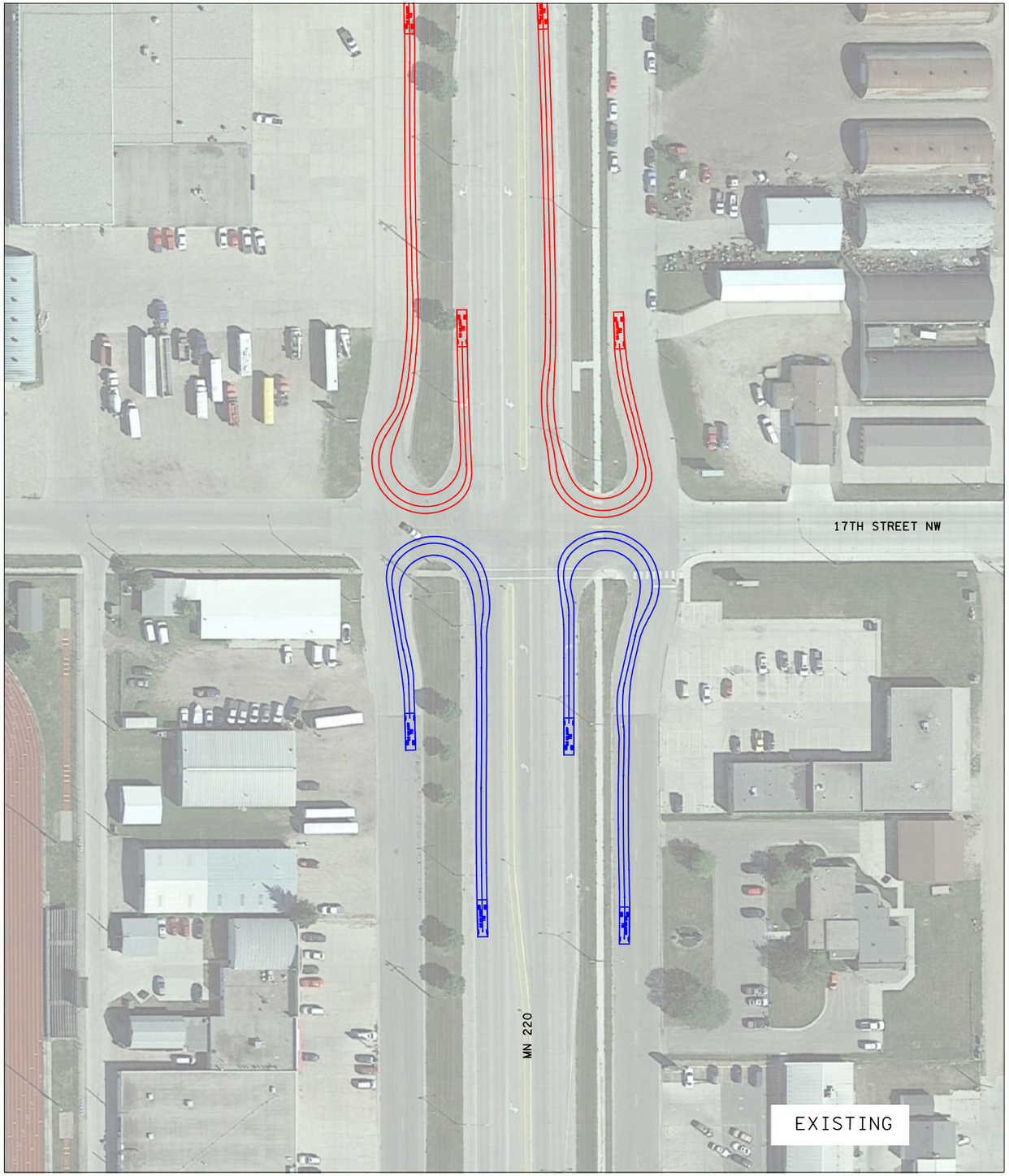
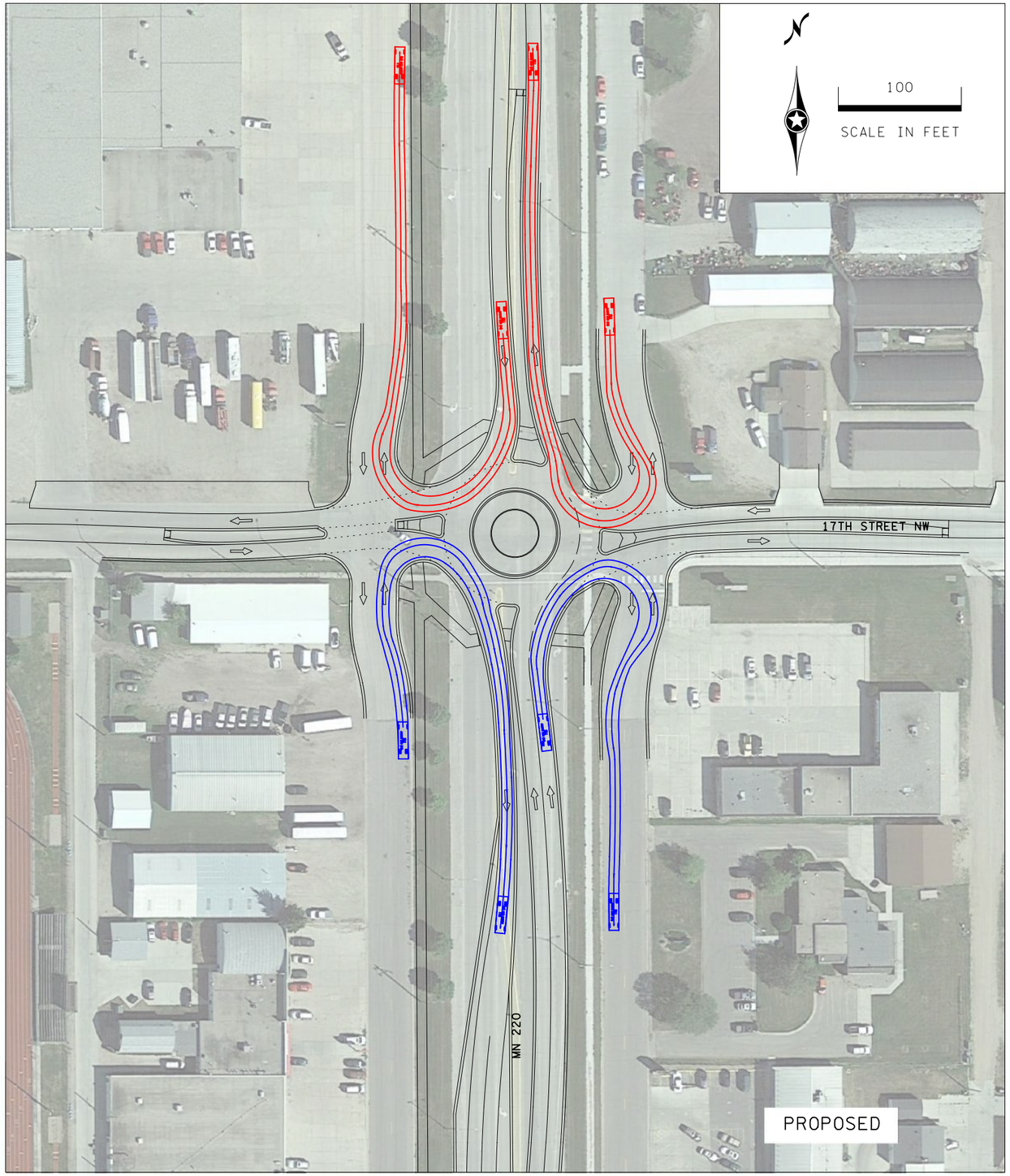
WB 67 Left Turn Movements

WB 67 Right Turn Movements

MN 220/17th Street NW
WB 67 Turn Movements





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MN 220/17th Street NW
SU Double Right Turn Movements

100

SCALE IN FEET

17TH STREET NW

MN 220

EXISTING

MN 220

PROPOSED

17TH STREET NW

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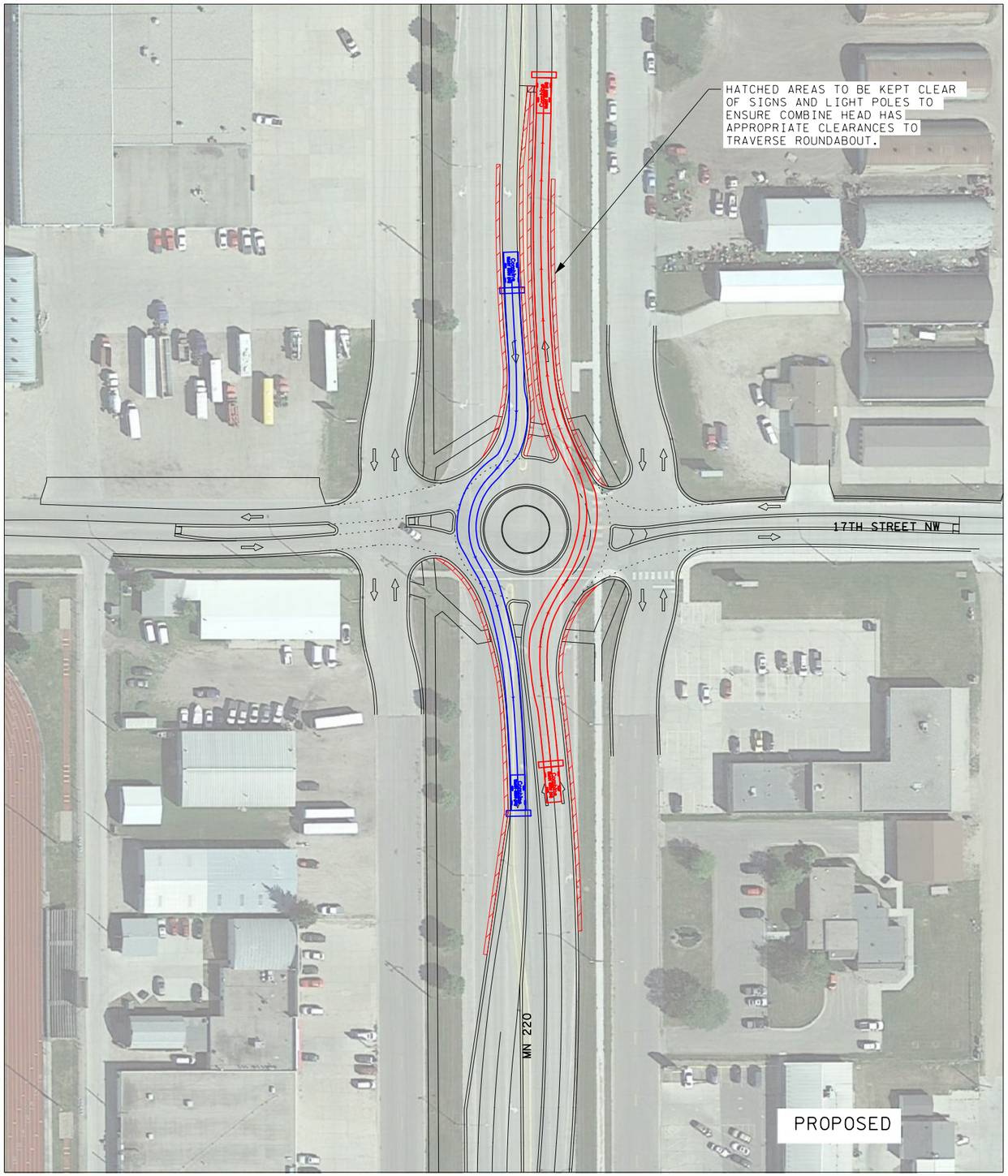
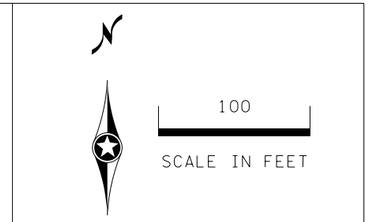
MN 220/17th Street NW
WB-67 Through Movement





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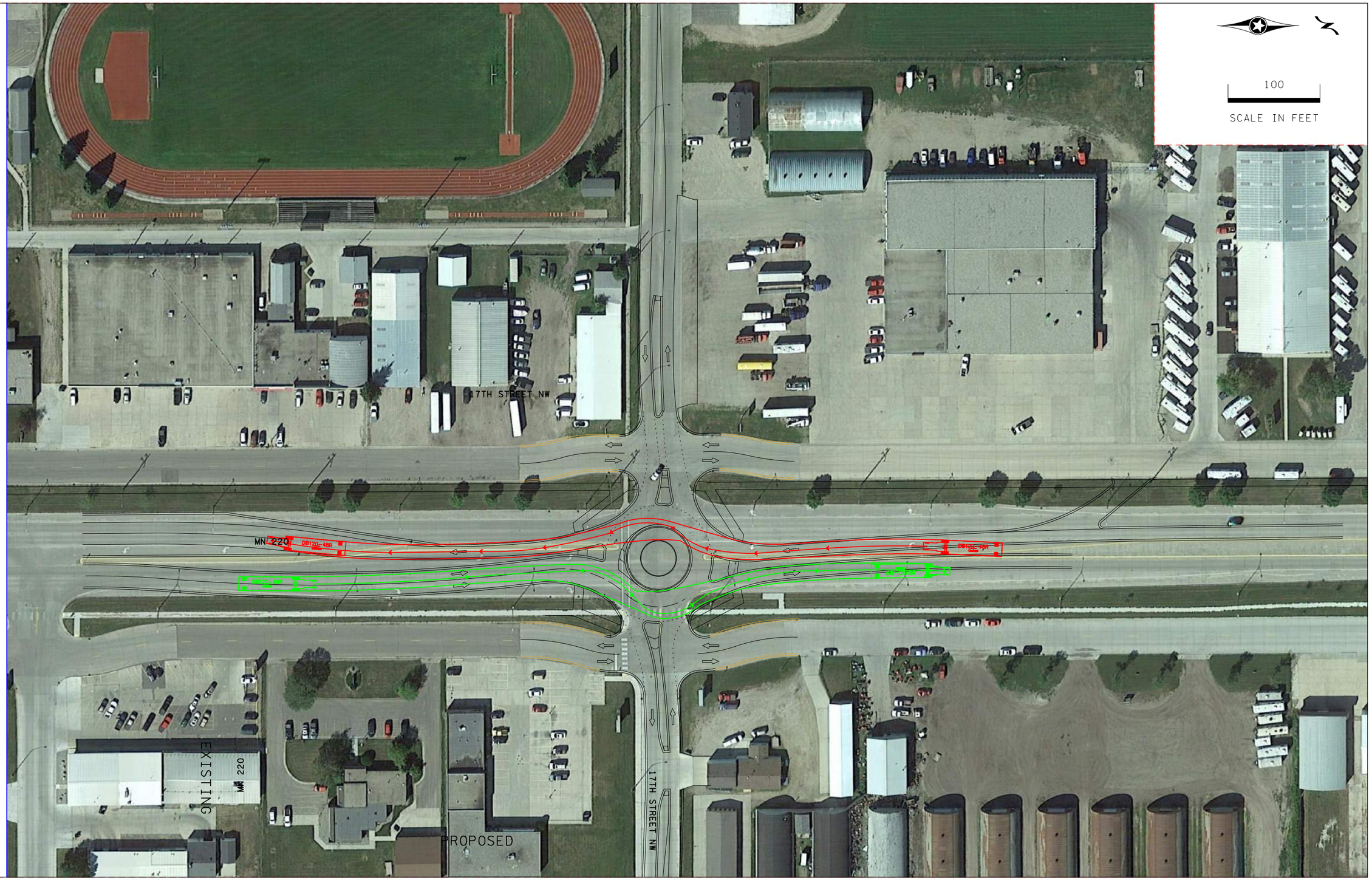
MN 220/17th Street NW
Combine Through Movements



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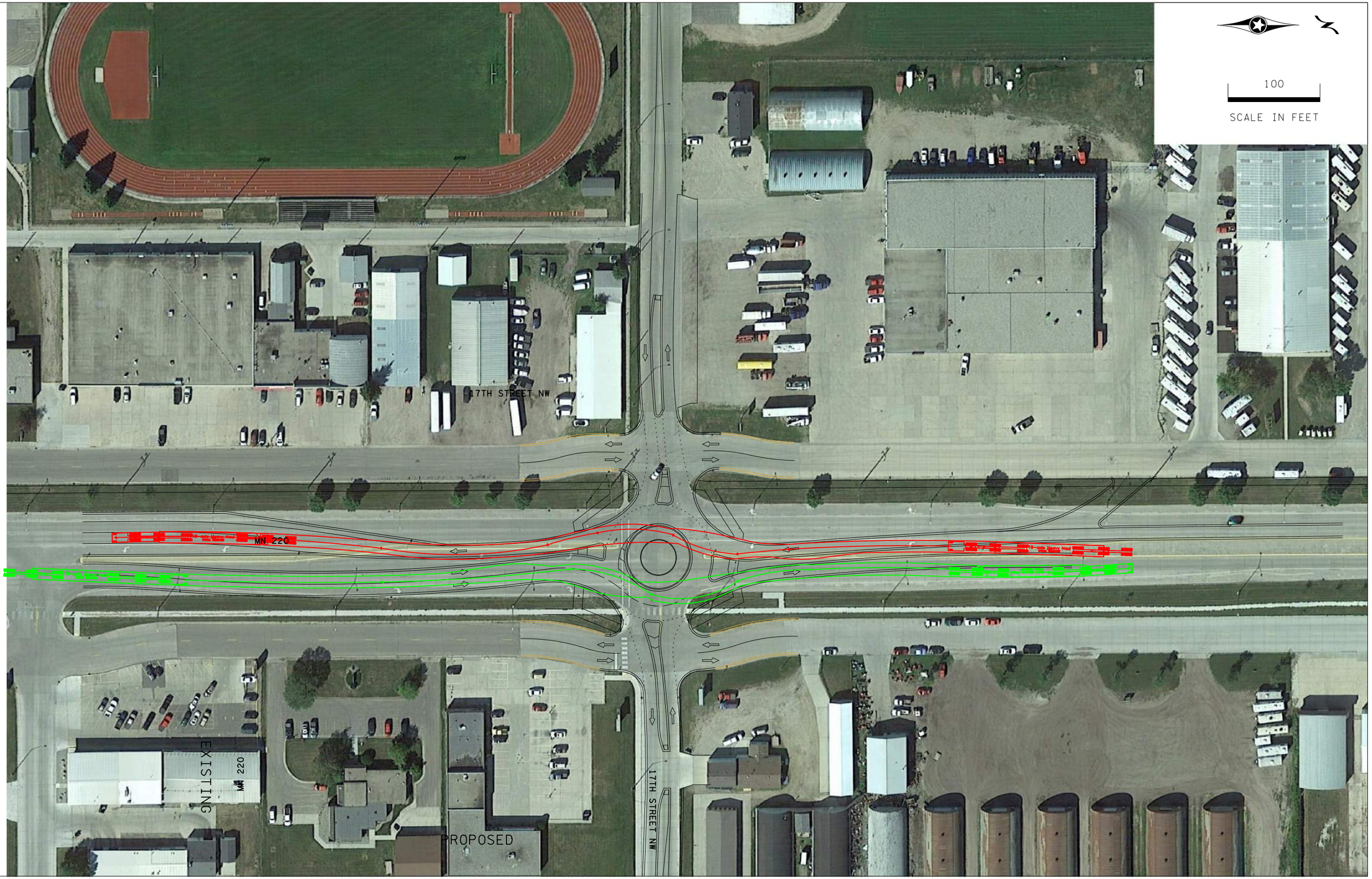
MN 220/17th Street NW
DB120-48R Through Movement



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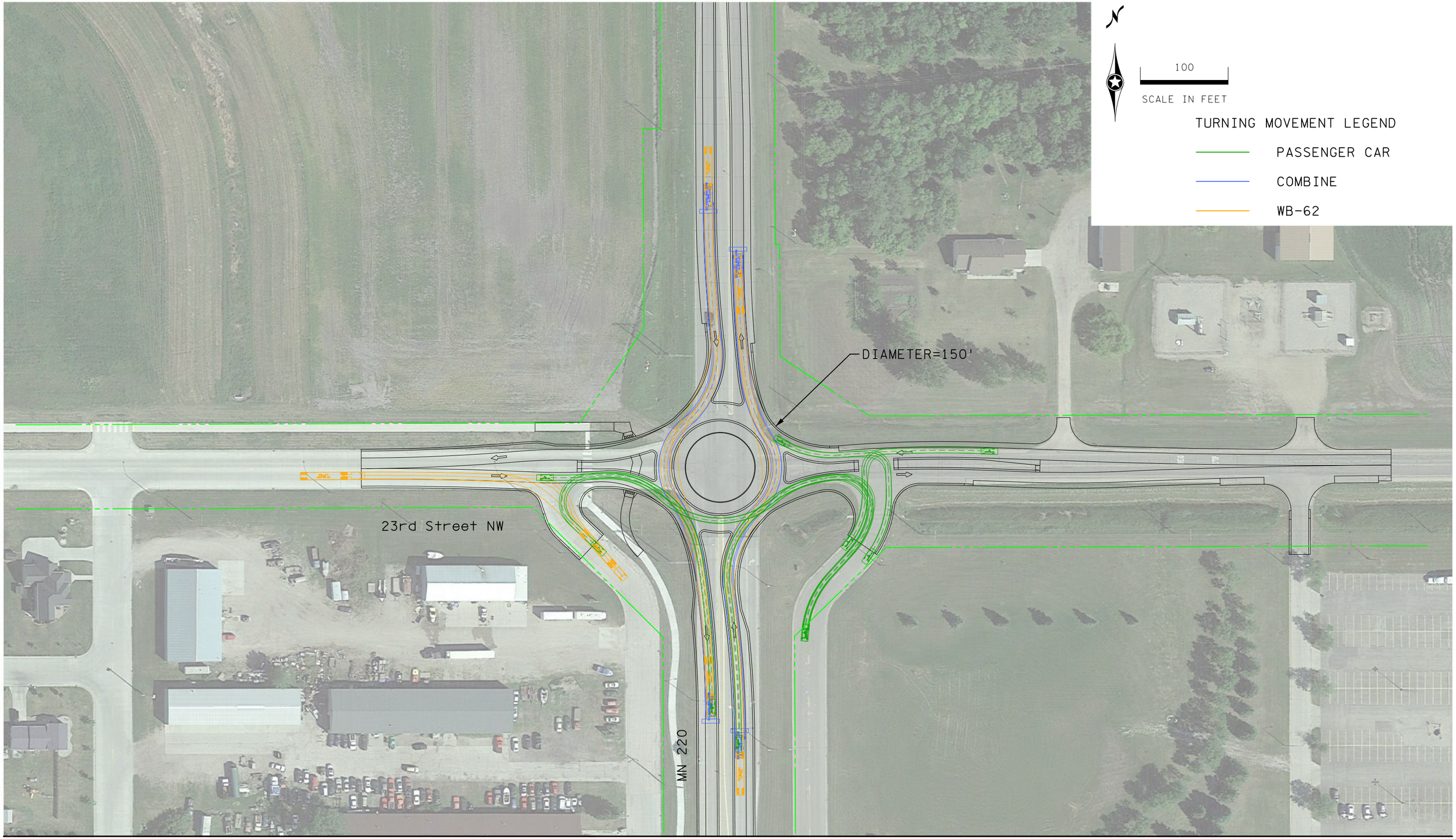
MN 220/17th Street NW
19 Axle Heavy Haul Through Movement



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MN 220/23rd Street NW
Alternative B - Single Lane Roundabout
Turning Movements