Ward County

SE/SW CONNECTOR STUDY

Final Report

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Report Contents

Ward County

SE/SW CONNECTOR STUDY

Section 1

Existing Conditions Analysis

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Table of Contents

List of Figures

List of Tables

I. Introduction

The Ward County Southwest and Southeast Connector Corridor Study (Connector Corridor) was initiated by Ward County to lay the foundation for a future limited access connector route between US Highway 2/52 west of Minot to US 52 east of Minot. Continued population growth along with sustained energy, agricultural, and commercial freight demands in the region have challenged the regional roadway system for decades. South of Minot has seen limited development in the extraterritorial zone with largely agricultural land uses. A southern connection would provide an alternative route for freight and motorists to alleviate congestion in the urban core including US 2/52 and US 83/Broadway. With completed bypass routes in the northeast and northwest limits of Minot, a southern connection would complete a beltway around Minot to support regional vehicle movements.

The Ward County Southwest and Southeast Connector Corridor Study will:

- Establish a need for project improvements
- Evaluate functional, safety, economic, environmental, and social barriers
- Analyze potential routes and intersections
- Establish improvement recommendations
- Engage agency and public stakeholders
- Develop an implementation plan that can be phased in over time

The purpose of this chapter is to document existing and no-build conditions and to identify and confirm issues within the study area to quantify the overall benefits of a potential connector corridor. This information will guide the development of study goals and objectives and ultimately the identification of improvement alternatives for the Southwest and Southeast Connector Corridor.

Figure 1: Connector Corridor Study Process

Study Area Overview

Figure 4 depicts the Southwest/Southeast Connector Corridor study area. The primary existing routes traveling through southern Minot are three transcontinental US Highways 2, 52, and 83 as well as other minor existing corridors include county roads 14, 16, and 17.

US Highway 2

US Highway 2 (Figure 2) travels east-west through Minot as it connects the Great Lakes in Minnesota to the Pacific Northwest. It is primarily a four-lane, median divided, rural section with 70 mile per hour speed limits through North Dakota. In southern Minot, US 2 transitions to an urban, limited access expressway with 50 mile per hour speed limits. Beginning at the grade-separated interchange at Valley Street, US 2 travels concurrently with US 52. Other major grade-separated interchanges along US 2 include US 83/Broadway and 16th Street SW.

Figure 2: US Highway 2 is a four-lane roadway throughout the study area

US Highway 52

US Highway 52 (Figure 3) extends from the Atlantic Coast in South Carolina to Portal, North Dakota and enters the study area as a rural two-lane section, transitioning to four lanes southeast of Minot, eventually narrowing to a three-lane section at the US 2 interchange. Beginning at the interchange with US 2, US 52 travels concurrently through southern Minot.

Figure 3: US Highway 52 enters the study area as a two-lane section

Figure 4: Study Area

Southwest Southeast Connector Corridor Study

NDDOT/Ward County, ND

Study Area

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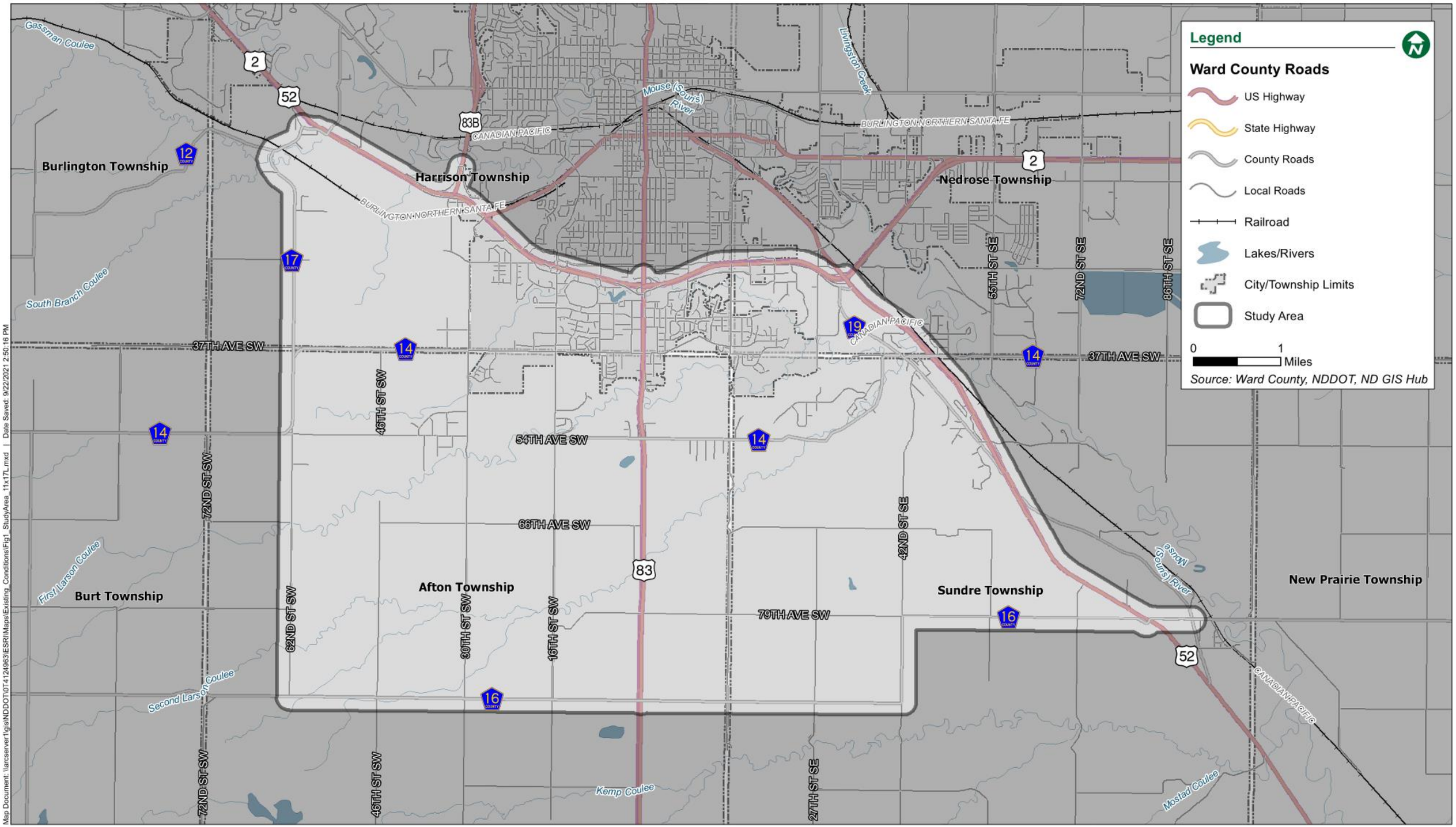

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US Highway 83

US Highway 83 (Figure 5) connects Mexico to Canada and bisects Minot as Broadway as it travels north-south through the Magic City. Entering the study area at County Road 16 this roadway is a rural four-lane section. As it enters the City of Minot the corridor transitions to an urban four-lane divided roadway that serves the region's highest traffic volumes.

Figure 5: US Highway 83 in the study area is primarily a four-lane, divided roadway

County Road 14

Traveling east-west through Ward County, County Road 14 (Figure 6) transitions from gravel to paved at County Road 9 in the west part of the study area. A two-lane paved rural section of this roadway provides efficient travel through the western reaches of Ward County, transitions to a five-lane configuration at 30th Street SW and enters Minot at 37th Avenue SW making vital connections to southwest Minot including the new Trinity Hospital, Dakota Square Mall, and other regional destinations. The corridor then travels south with a two-lane urban section serving Crystal Springs subdivision before turning east to US 83. Continuing east the roadway is primarily a low-speed, suburban section with limited right-of-way, numerous private accesses, and alignment and profile changes. Large rural subdivisions such as Meadowbrook, Eastside Estates, and Sunny Slope use County Road 14 as primary access before the roadway terminates at US Highway 2.

Figure 6: County Road 14 travels east-west through the study area as a two-lane, paved roadway

County Road 16

A mostly gravel, east-west route, County Road 16 (Figure 7) travels from County Road 23 in eastern Ward County and ends two miles beyond County Road 15 in Burt Township. A small, paved section in the unincorporated community of Logan represents the only suburban section of roadway. The rest of this corridor is a high-grade, gravel roadway. Recent improvements to the one-mile s-curve at 42nd Street SE have improved safety and mobility on this low volume roadway.

Figure 7: Improved radii and radial-T intersections have improved the safety of the County Road 16, an east-west gravel roadway

County Road 17

A gravel road in the northern stretches of Ward County, County Road 17 (Figure 8) is a paved, low speed, suburban two-lane roadway beginning at County Road 15. Traveling south next to the Minot Boy Scouts Big4 Camp gives this roadway its local "Boy Scout Road" nickname. As this roadway crosses US Highway 2 it runs concurrently with County Road 12 on a circuitous route through the famous Ward County Trestle Bridge. Crossing the Gassman Coulee the roadway climbs out of the river valley where the roadway transitions to a typical rural section with higher speeds eventually terminating at radial intersections with County Road 14.

Figure 8: Traveling under the famous Trestle Bridge and across the Gassman Coulee, County Road 17 climbs out of the valley and terminates at County Road 14

Previous Studies Overview

Several studies have been completed which provide direction for future transportation needs within and around the Connector Corridor. The key points in each study relevant to the corridor area are summarized below by plan title.

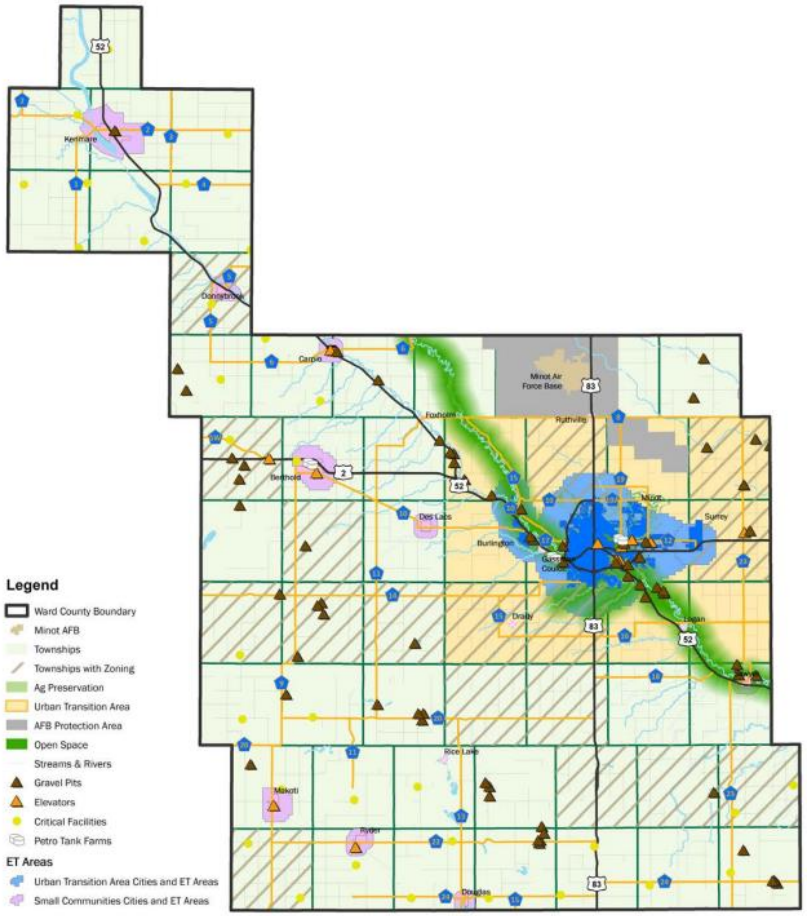
Ward County Comprehensive Plan (August 2019)

The Ward County Comprehensive Plan was developed by county staff, the County Commission, the Planning Commission, the Comprehensive Plan Steering Committee, and project stakeholders as a guiding document for planning over the next 20 years. The adopted Comprehensive Plan provided the framework for planning and zoning in Ward County as well as the management of growth specifically in areas outside of cities' jurisdictions. The plan included background and demographic context, development evaluation guidance, project prioritization, and strategic initiatives/implementation methods for the future.

The land use plan (Figure 9) designated the entirety of the Connector Corridor Study Area as either "Urban Core" or "Rural Concentration/Transition" character region. The urban core region was defined as the area within the corporate limits of Burlington, Minot, and Surrey in which most of the Connector Corridor study area lies. This region accommodates nearly 75 percent of Ward County's population with land use densities ranging from high impact industrial to low density residential throughout. A primary objective in this region was to reserve land for future urban development and to avoid future impacts and conflicts. The transition region outside of the urban core aims to maintain agricultural uses with limited rural residential development.

Transportation priorities in the Connector Corridor study area focus on access management, intergovernmental/jurisdictional

Figure 9: Future Land Use Plan (Ward County Comprehensive Plan)



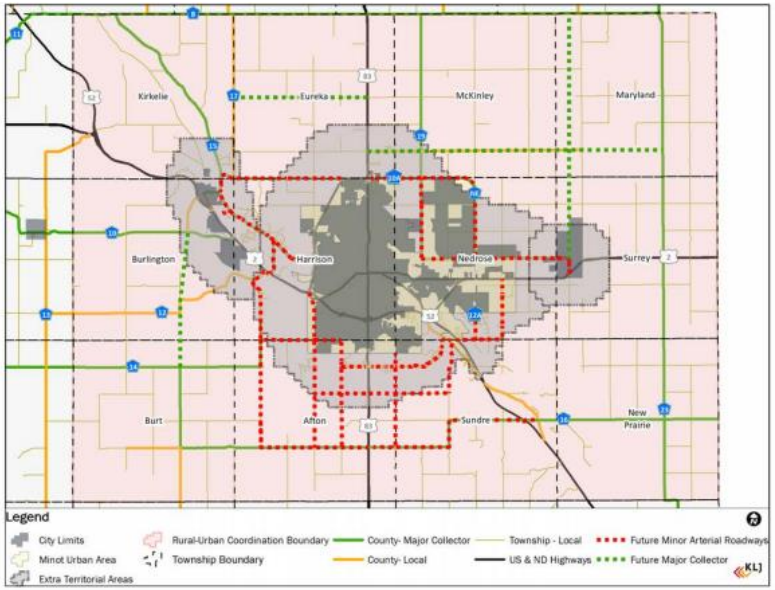
transfers, adherence to drainage and roadway standards, and improvements of public roadways to support the potential volumes associated with the future land use plan.

Ward County Transportation Plan (September 2019)

Ward County released the Transportation Plan in September 2019 as a sub-element of Ward County Comprehensive Plan. The plan identified current issues and needs as they related to transportation in the county, provided recommendations to enhance safety and mobility, and created a framework for decision-making for future transportation projects.

The Transportation Plan laid the groundwork for the Connector Corridor Study. A sub area analysis in the Transportation Plan provided background, existing conditions, and a preliminary framework for the Connector Corridor. It also provided the impetus for further examination through the Connector Corridor Study.

Figure 10: Future Roadway Functional Classifications (Ward County Transportation Plan)



The Transportation Plan also provided guidance and recommendations for future projects (Figure 10). The initial alignment of the Connector Corridor was designated a Future Minor Arterial Roadway and a Regionally Significant Corridor. These designations require focus on accommodating agricultural and freight needs as well as linkages to the larger state transportation network. The plan also provided the road standards and right-of-way requirements for these roadways.

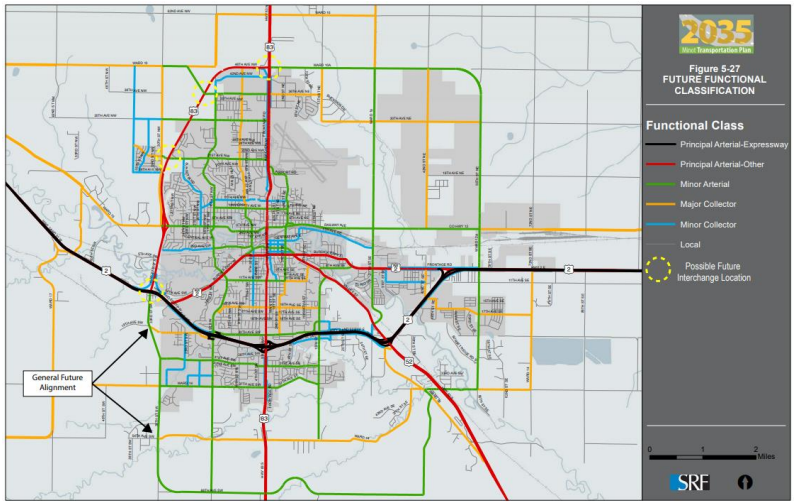
Minot 2035 Transportation Plan (January 2015)

The City of Minot approved the Minot 2035 Transportation Plan in 2015 to guide the next 20 years of transportation investments. The plan identified goals, projects, implementation strategies, and a series of sub area and corridor studies. The plan also provided a framework for future transportation improvements including design and access guidance along with right-of-way guidance (Figure 11).

A high-level examination of a future southwest bypass/arterial roadway was conducted. Travelshed analysis was completed to determine that a new connection in the southwest area of Minot will support the demand between the northwest and southwest areas of Minot. The proposed minor arterial began as four lanes as it travels south from the US 2/52 – US 83 Bypass intersection. Continuing along 30th Street SW, the bypass transitioned to two lanes at 37th Avenue SW and turned east at 66th Avenue SW to

connect to US 83. Expected traffic on this route was estimated to be 6,800 vehicles per day in 2035 at the northern end and 1,600 AADT at the US 83 terminus. A subarea study examined the US 2/52 – US 83 Bypass intersection to accommodate this southwest bypass.

Figure 11: Future Roadway Functional Classification (Minot Transportation Plan)

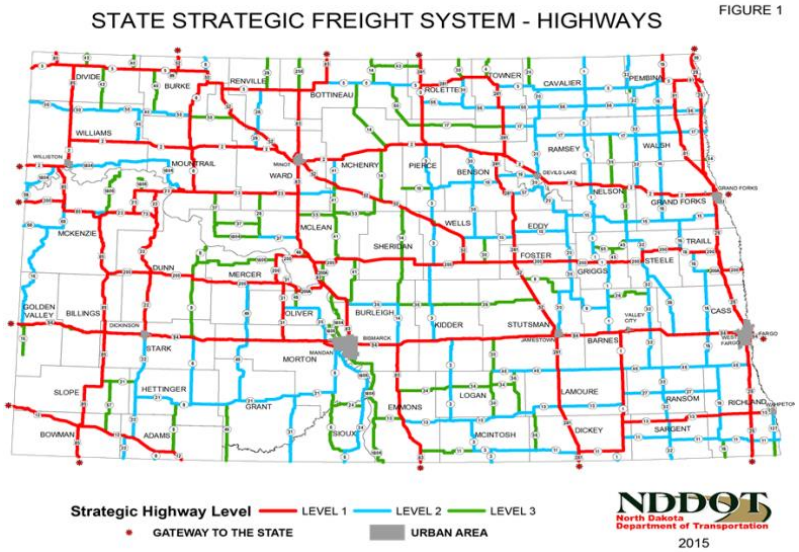


Another subarea study impacting the Connector Corridor was an examination of the US 2/52 - 16th Street SW interchange that is not anticipated to accommodate future traffic volumes. High-level alternatives were developed as options to accommodate future travel. Also described was an industrial node impacting the southern connections in the Port of North Dakota Expansion Plan in the northeast Minot area. A recently completed Ward County Northeast Bypass serves an area of 3,200 acres of undeveloped land for future industrial and manufacturing. Industrial expansion in this area may be served by a completed beltway in the southern Minot metro area.

North Dakota State Freight Plan (April 2015)

With goals originally outlined in the statewide strategic transportation plan in 2012, the North Dakota Department of Transportation published the State Freight Plan to focus on providing a safe, reliable, and sustainable freight network (Figure 12). This plan examined roads, rails, air, and pipelines as a means of freight transportation. The Minot area is a regional hub for all these freight networks. The Strategic Freight System Index from this plan states that US 2, US 52, and US 83 in the study area are all "Level One" Critical Rural Freight Corridors. The Burlington Northern Santa Fe and Canadian Pacific railroads that travel through the study area are designated as Class I Mainlines that serve areas nationally and internationally.

Figure 12: North Dakota Strategic Freight Corridors (State Freight Plan)



As it pertains to the Connector Corridor, freight safety, reliability, and sustainability should be considered in all proposed alternatives. Among other fundamental values from the plan, the dependability and predictability should be promoted and routes that provide consistent levels of service should be prioritized. Providing consistent weight and height restrictions, travel speeds, and accessibility for all users should be implemented in all freight routes.

Minot Broadway Corridor Study (August 2021)

The Minot Broadway Corridor Study completed a multimodal transportation analysis for the Broadway/US 83 corridor through the entire length of the city. This study focused on safety and operational improvements throughout the corridor and improving bicycle and pedestrian mobility. As it relates to the Connector Corridor, this study prioritized improvements on the southern segment from the US 2/52 – Broadway/US 83 interchange to the southern city limits to be completed as soon as feasible, likely before 2027. These improvements would address safety issues at the intersections and frontage roads, add medians at unsignalized locations, and improve reliability throughout the study.

Recent and Planned Projects

Various projects are completed, planned, or programmed within and around the study area. The North Dakota Department of Transportation's 2021-2024 Statewide Transportation Improvement Program (STIP), Ward County 2020-2022 Capital Improvement Plan, City of Minot 2020-2024 Capital Improvement Plan identify projects in the study area. The projects include:

- Ward County, Northeast Bypass, Constructed 2012
- Ward County, County Road 16 radius improvements, Constructed 2019
- Ward County, County Road 14 Sliver-widening from 30th St SW to CR 17, Planned 2022
- NDDOT, US 83B – US 2/52 Intersection Improvements, Constructed 2013
- NDDOT, US 2 ADA Curb Ramps 16th St SW - US 83, 16th St SE - 27th St SE, 2021
- NDDOT, US 83 Rehabilitation from State 23 to Minot Urban Limits, Planned 2022-2024
- NDDOT, US 52 Rehabilitation from US 2 to County Line/Sawyer, Planned 2022-2024
- City of Minot, Landfill Transfer Station and Cell 7, 2021
- City of Minot, SW Water Tower, 2021

Demographics and Trends

An understanding of existing and projected demographics is necessary to demonstrate how growth has and will impact demand for transportation facilities.

Population and Households

Ward County has experienced significant and steady growth since 2000. Between 2000 and 2020, the population of the County increased by 18.1 percent. Based on forecasts developed by the County in the 2019 Ward County Comprehensive Plan, the population is expected to continue growing and increase 22 percent by 2040. This growth rate is higher than that of North Dakota. Table 1 shows the population, number of households, and persons per household for Ward County.

Growth rates equivalent to those seen in Ward County have important implications on local transportation systems, including Principal Arterial roadways and local roads. Rapid regional growth adds vehicles to expressways like US 2/52 as local traffic avoids city minor and major collectors that fail to meet demand. Increased vehicular traffic can slow freight movements, increase travel times, and negatively impact safety.

Age

Like population, age distribution (Figure 13) has the capacity to affect transportation usage and demand. In 2019, the median age in Ward County was approximately 32 years old. This is younger than the State of North Dakota (35 years). In 2019, the largest population cohort in Ward County was between 20-24 years old, followed by the other young adult groups of 25-29 and 30-34. This

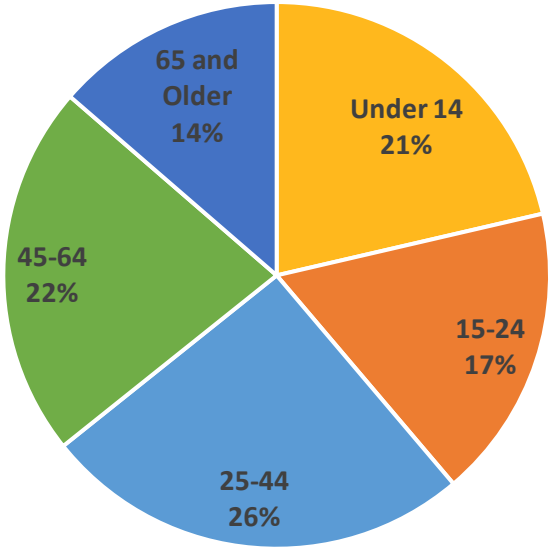
Table 1: Population and Households

	Population	Households	Household Size
2000	58,975[1]	23,027[1]	2.46[1]
2010	61,675[1]	25,029[1]	2.36[1]
2020	69,641[1]	33,171[1]	2.42[1]
2040	84,924[2]	22,560[2]	2.47[2]
% Change (2000-2020)	18.1%	31.4%	~0%

[1]*Source: U.S. Census Bureau*

[2]*Source: Ward County Comprehensive Plan (2019)*

Figure 13: Age Distribution



is likely partially due to Minot State University, the Minot Air Force Base, as well as economic opportunities the region provides for younger workers. According to the Minot Long Range Transportation Plan, these age cohorts are more likely to commute using diverse transportation modes including walking and bicycling. It is important to consider the demands of these large age groups in future transportation plans.

Employment

The North Dakota Job Service's Labor Market Information 2021 Report estimates a labor force of approximately 32,022 in Ward County as of June 2021. The average weekly earnings are $953 per week. The largest industries are government; health care and social assistance; retail trade; and accommodation and food services (Figure 14). The American Community Survey (ACS) estimates approximately 2,043 total employer establishments in the county.

In 2019, the majority of Ward County employees either drove alone or carpooled to work (Figure 15). This high reliance on driving single-occupancy vehicles could mean greater numbers of automobile trips as population in the County increases, placing greater demand on the existing transportation infrastructure. Currently, only 2.6 percent of employees rely on public transportation, bike, or walk to work. This share could increase if Ward County executes various plans to improve multimodal transportation in the region.

Figure 14: Largest Industries by Employment (2021)

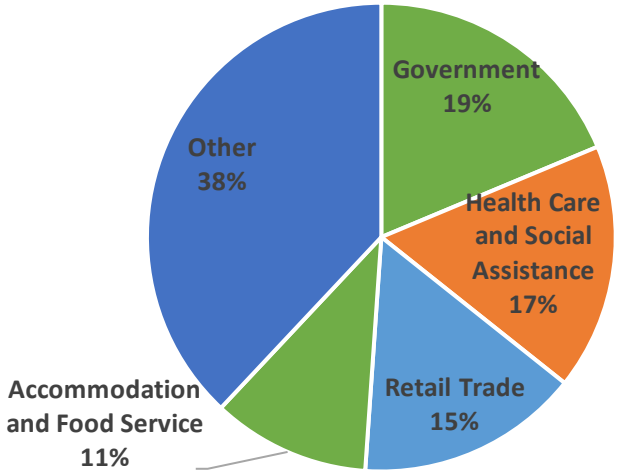
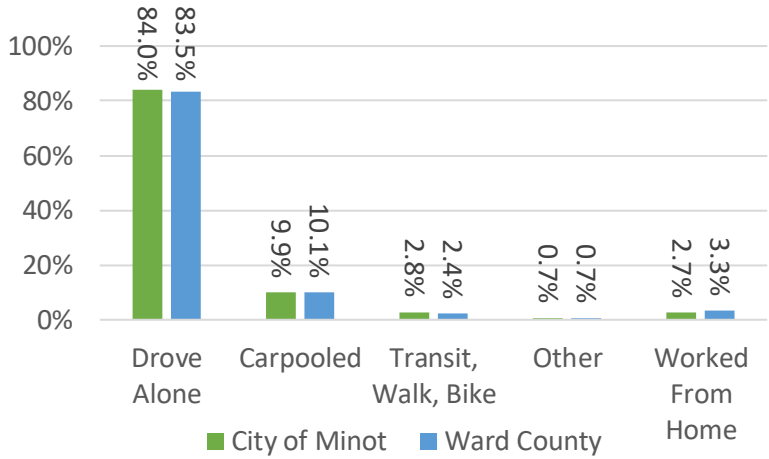


Figure 15: Means of Transportation to Work



Source: US Census Bureau – ACS 5-year Estimates (2015-2019)

II. Transportation System Characteristics

This section describes elements of the existing transportation network, information related to land use, traffic operations, safety, access, and non-motorized connections. Typical sources of data are called out where applicable.

Functional Classification

The functional classification system is used to create a roadway network that efficiently collects and distributes traffic from farms, rural subdivisions, and neighborhoods to the state highway system. A successful system coordinates and manages mobility, roadway design, and route alignment as well as seeks to match current and future access and land use with the adjacent roadway's purpose, speeds, and spacing. The functional classification system is comprised of principal arterials, minor arterials, major and minor collectors, and local roadways. Roadways classified as urban minor collectors or rural major collectors and arterials are eligible for federal transportation funds. Figure 16 shows the relationship between access and mobility/traffic speeds.

Within the study area extents, the US Highway System comprised of US 52, US 2, and US 83 are designated as Principal Arterials with applicable rural and urban sub-designations.

Figure 16: Functional Classification Relation to Access and Speed

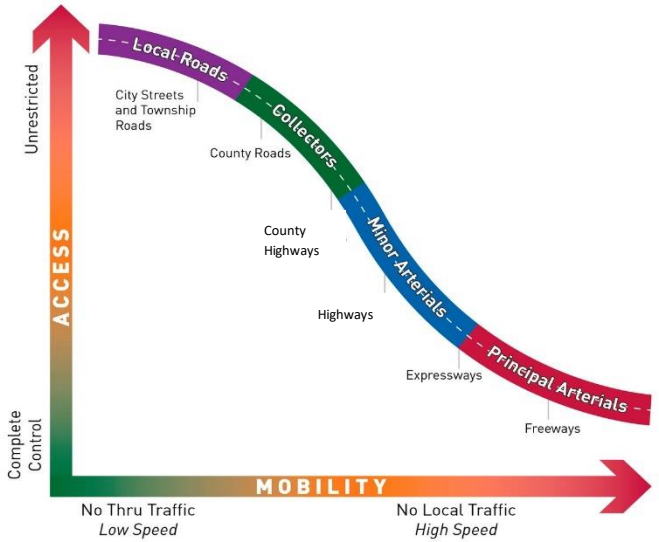


Figure 17 shows the functional class network in the study area along with 2020 traffic counts. The county road network in the study area is limited to two Major Collector classified roadways.

- County Road 16 is a Major Collector gravel roadway that travels east/west through the study area from US 52 near Logan, crossing US 83 south of Minot, and leaves the study area in the west at 62nd Street SW.
- County Road 14/37th Avenue SW is a paved, Minor Arterial roadway within the City of Minot corporate limits and serves as a significant east-west route. County Road 14 provides a valuable connection to large areas of agricultural land and rural housing developments in the southwestern portion of Ward County.
- County Road 17 is classified as a local roadway.

Roadway Jurisdiction

Understanding the ownership and maintenance responsibilities is essential when planning for the future of the regional roadway network. Roadway jurisdiction in Ward County has continually evolved as the region's urbanized population grows and annexes new areas for development. As changes in roadway functions, traffic volumes, freight demands, route prioritization, and private infrastructure improvements have necessitated, Ward County has initiated discussions about jurisdictional transfers between cities and townships, detailed in Table 2. Changes in jurisdictional alignment intend to match existing conditions with the responsible agency that is best suited for that roadway use type. As potential Connector Corridor Routes are identified, further jurisdictional conversations are likely, depending on the preferred route. Figure 18 details the roadway jurisdiction and access.

Table 2: Jurisdictional Transfer Opportunities

Roadway	Length (mi)	Termini
Township Road to County Road		
16th Street SW	2	Halfway between 37th Avenue SW and 54th Avenue SW to halfway between 66th Avenue SW and 79th Avenue SW
30th Street SW	4	US 2 to 66th Avenue SW
62nd Street SW	3	County Road 14 to County Road 16
County Road to City Road		
Ward County 14	3	30th Street SW to County Road 17 and 16th Street SW to US 83

Speed Limits

Posted speed limits on roads vary depending on a variety of factors, including the width of the right-of-way, surrounding land use, landscaping, road material, and road classification. Since drivers tend to drive to their conditions rather than the posted speed limit, it is important to have a proper posted speed limit. The current posted speeds of the major roads within the study area are displayed below.

- **US Highway 2:** 70 miles per hour posted speeds on rural segments and 50 miles per hour posted speeds on the urban segment.
- **US Highway 52:** Speeds of 65 miles per hour transition to 45 miles per hour as traffic approaches US Highway 2 on the east side of Minot.
- **US Highway 83:** Posted speeds are 70 miles per hour as the road enters the study area from the south. This slowly transitions down to the 40 miles per hour urban speed limit in 10mph increments. Posted speeds become 60 miles per hour just south of 54th Avenue SW. It becomes 50 miles per hour halfway between 54th Avenue SW and 37th Avenue SW, and finally transitions to 40 miles per hour as the road crosses 37th Avenue SW.
- **County Road 14:** The rural section of County Road 14 is 65 miles per hour, and the five-lane suburban section is 40 miles per hour. The southern section of the road serving Crystal Springs is 45 miles per hour.
- **County Road 16:** The section of County Road 16 through the unincorporated town of Logan has posted speeds of 40 miles per hour, while the rest of the corridor is a high-grade gravel roadway with posted speeds of 55 miles per hour.
- **County Road 17:** Posted speeds are 35 miles per hour within the study area.

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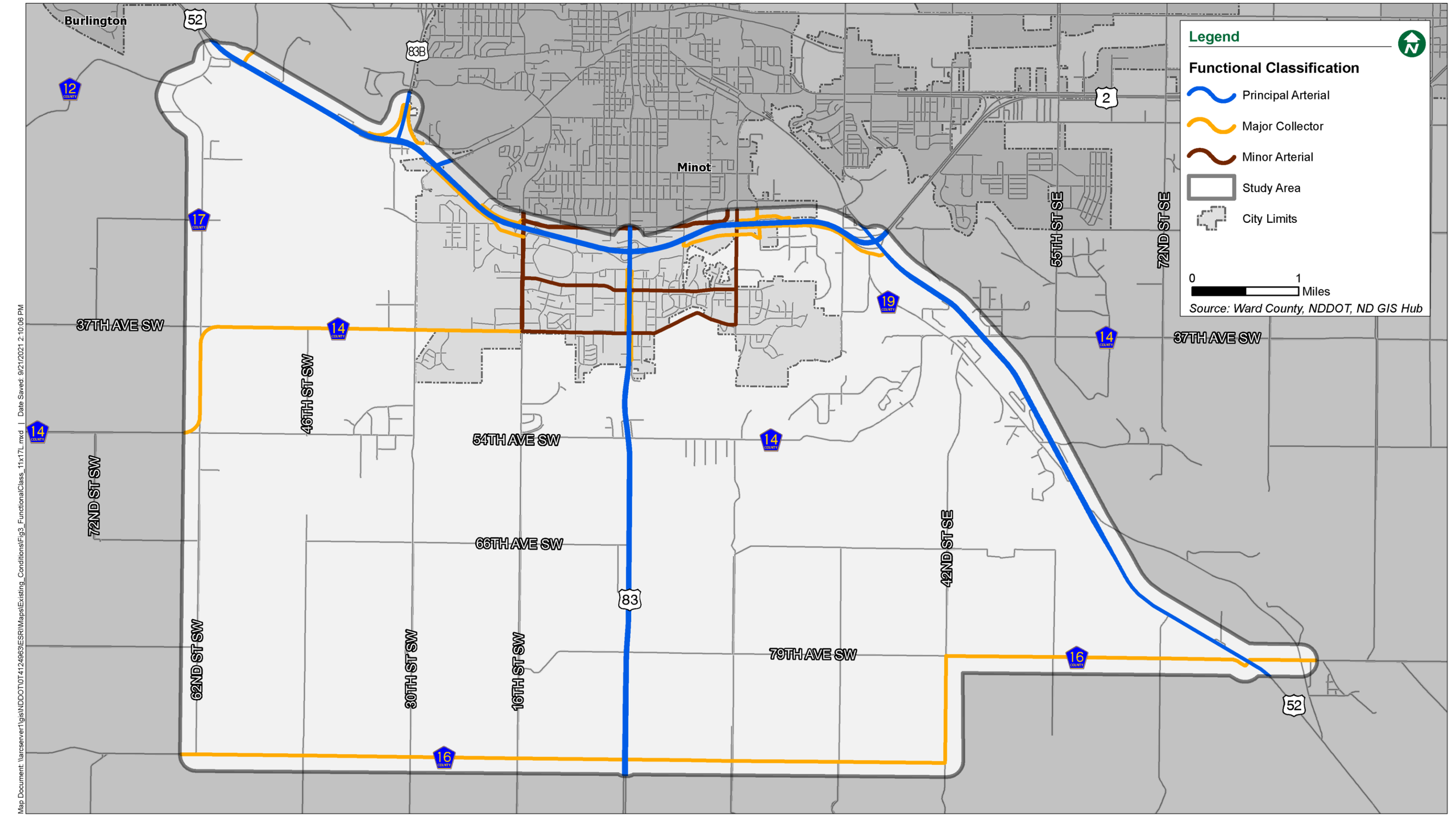

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Figure 18: Roadway Jurisdiction

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Roadway Jurisdiction
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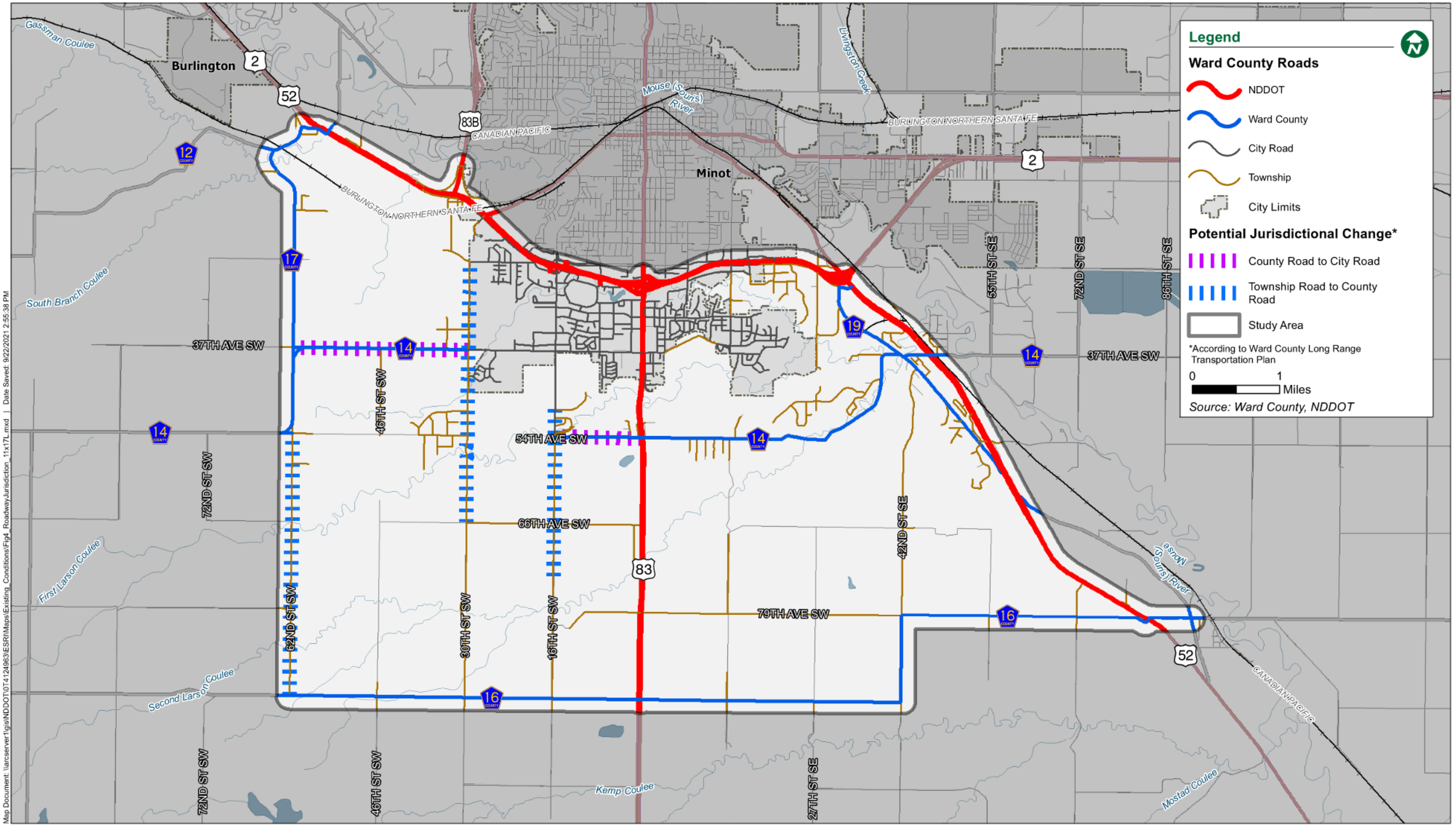

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Right-of-Way

Right-of-Way (ROW) is the available space owned by the jurisdiction on which the roadway and associated utilities are located. ROW is often a constraining factor in developing alternatives, because acquiring additional ROW can be costly, increase project delivery deadlines, or stop a project altogether. ROW widths for roads within the study area are described below.

- **US Highway 2:** Right-of-way through the urban section typically ranges from 300 to 400 feet.
- **US Highway 52:** Right-of-way through this stretch typically ranges from 300 to 400 feet.
- **US Highway 83:** Right-of-way is 250 feet in urban areas and nearly 400 feet in rural sections.
- **County Road 14:** Right-of-way is 150 feet in the rural section of County Road 14.
- **County Road 16:** There is limited right-of-way beyond the statutory requirements, or 66 feet.
- **County Road 17:** Right-of-way ranges from 75 feet to 105 feet.

Traffic Control

Selecting the appropriate traffic control device requires consideration of traffic safety, patterns and volumes, roadway geometry, lane configurations and multimodal aspects. The Manual of Uniform Traffic Control Devices (MUTCD) provides guidance and standards on the installation of traffic control methods which consider vehicular volume, pedestrian volumes, and crash frequency thresholds for multiple roadway contexts. Listed below are the traffic control devices on major roads within the study area.

- **US Highway 2:** Two signalized at-grade intersections are presently located at the intersections of 13th Street SE and the US 83 Bypass.
- **US Highway 52:** Two signalized at-grade intersections are presently located at the intersections of 13th Street SE and the US 83 Bypass, located in the stretch shared with US Highway 2.
- **US Highway 83:** This corridor is primarily traffic signal controlled, with some two-way stop control present for minor cross streets.
- **County Road 14:** There is one signalized intersection within the study area, at the intersection of 16th Street SW.
- **County Road 16:** There is two-way stop control (stopping County Road 16) at both US Highway 83 and US Highway 52.
- **County Road 17:** There is two-way stop control at the intersection of US Highway 2/52. There are no traffic signals on this road within the study area.

Figure 20: Speed Limits, Right-of-Way, and Traffic Control

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Speed Limits, Right-of-Way, Traffic Control

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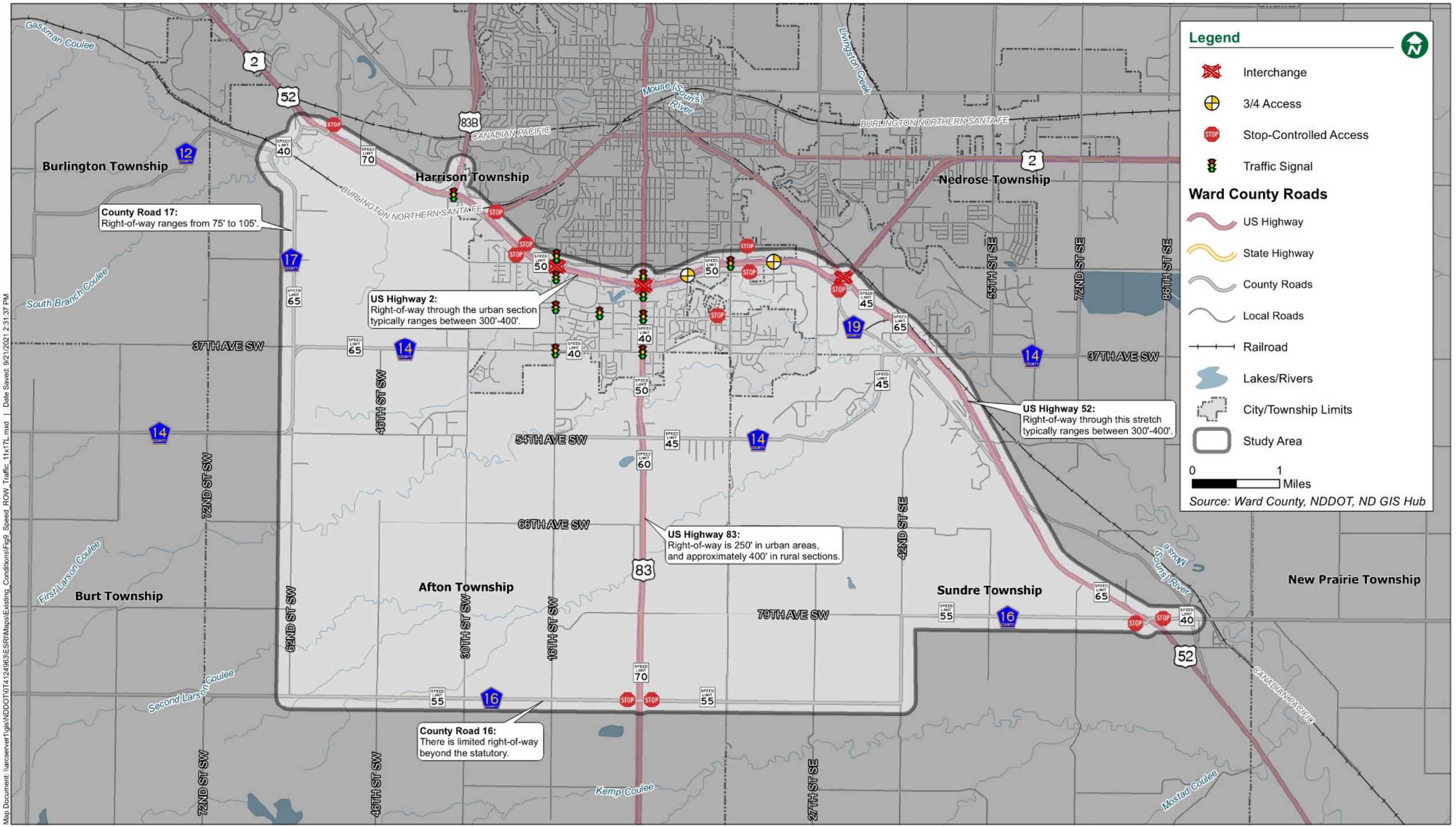

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Pavement Condition

Timely pavement rehabilitation has the potential to be six to 14 times more cost-effective than rebuilding a deteriorated road. Poor pavement conditions can add nearly $600 to the annual cost of car ownership due to damaged tires, suspension, reduced fuel efficiency, and accelerated vehicle depreciation. Two sets of pavement ratings are used in this study, NDDOT's pavement condition ratings (PCR) and Ward County's combined present serviceability rating (PSR), as shown below in Figure 22. NDDOT's PCR rating system assigns a value between one and 100, with numerical ratings grouped into categories: Good (86-100), Satisfactory (71-85), Fair (56-70), Poor (41-55), Very Poor (25-40), Serious (10-24), and Failed (less than 10). Ward County's PSR system is a scale of zero to five, with five being in best condition and lower numbers having lower quality pavement conditions.

- **US Highway 2:** The pavement of US Highway 2 is in good condition.
- **US Highway 52:** The pavement of US Highway 52 is in good condition.
- **US Highway 83:** The pavement of US Highway 83/Broadway is in good condition.
- **County Road 14:** Pavement conditions on County Road 14 are mostly Fair, with a PSR between 3.01-3.40. Some portions of the road are in Satisfactory condition, mostly within the first 1.5 miles east of US Highway 83/Broadway, having a PSR between 3.41 and 3.80.
- **County Road 16:** Gravel roadway throughout the study area.
- **County Road 17:** The PSR for County Road 17 is between 3.41 and 3.80.

Load Rating

Every road managed by Ward County and the North Dakota Department of Transportation is designed to carry a certain load weight (Figure 21). Many of Ward County's roadways are designed to carry vehicles up to 80,000 pounds while most of NDDOT's roadways in this study area are designed to carry up to 105,500 pounds. However, other roadways throughout Ward County see lower design weights and either are subject to spring load restrictions and/or overweight permitting. Ensuring the bypass can support the heaviest freight movements is an important component of its usefulness in attracting freight movements to the bypass and away from the urban core.

Figure 21: Spring load restrictions in the study area are primarily 7-ton per axle on county roads

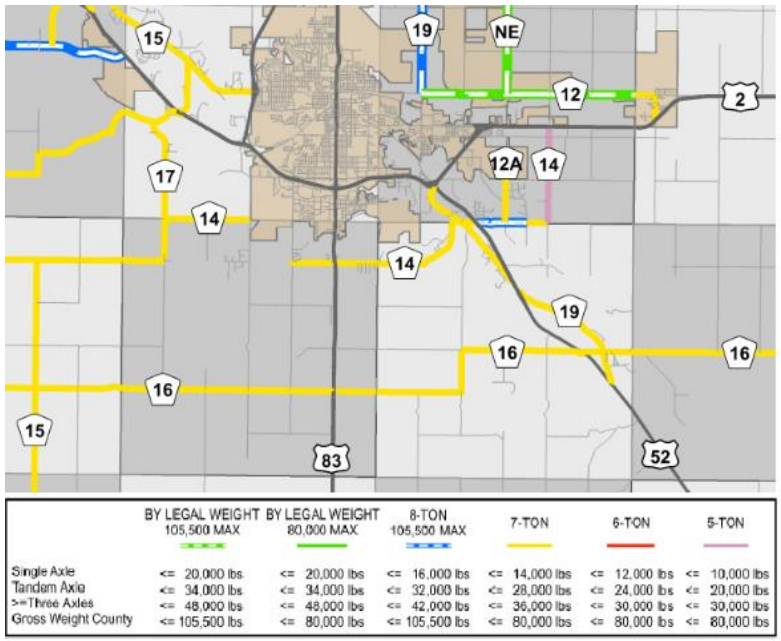

Figure 22: Pavement Conditions

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NDDOT/Ward County, ND

Pavement Conditions

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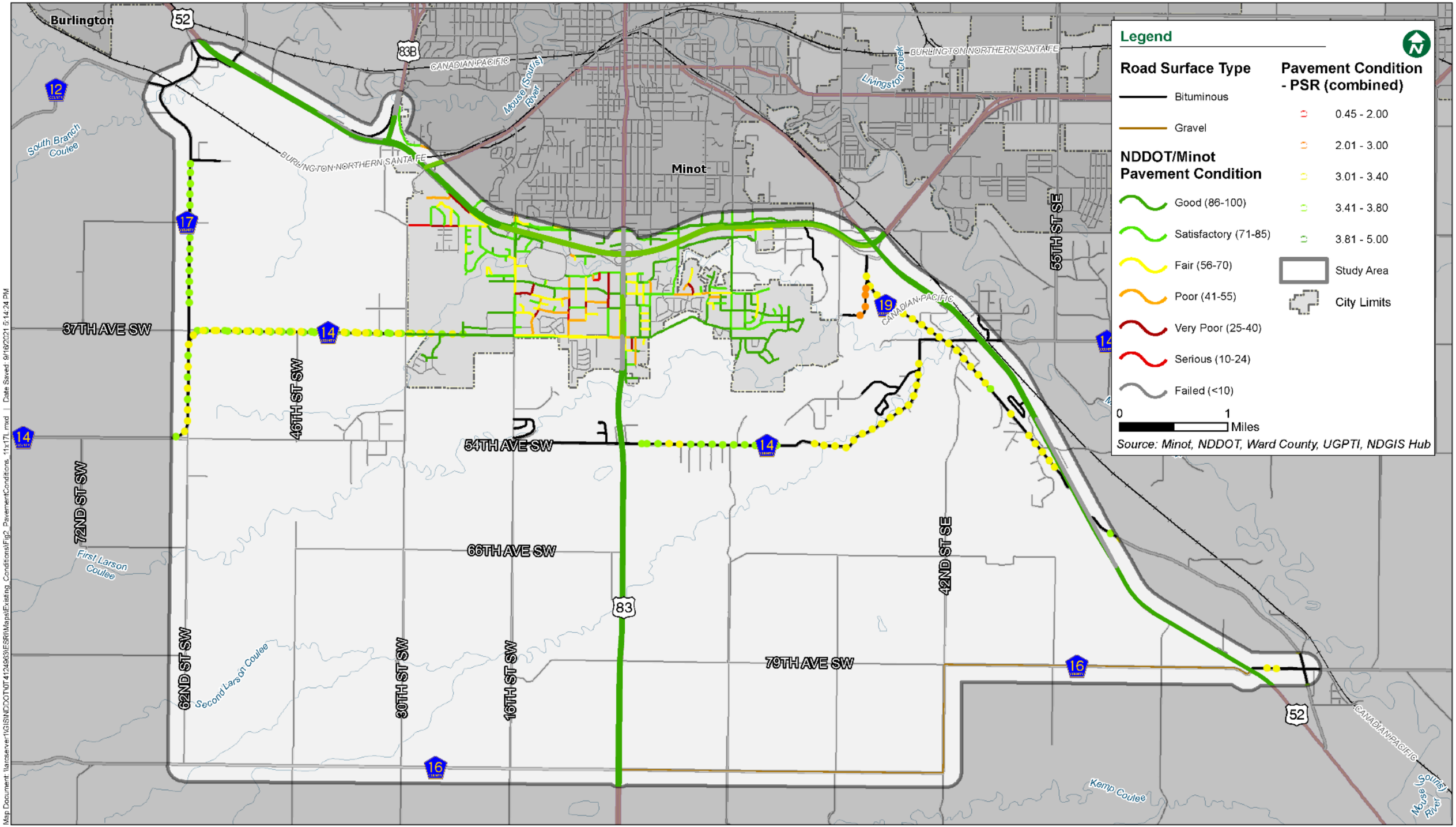

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III. Existing Traffic Trends and Patterns

Existing Traffic

Understanding the existing traffic demands and patterns can help evaluate the need for a new connector route and identify deficiencies on the existing system that may require improvements, with or without the new connector route. The existing traffic demands in the study area vary widely.

- **US 83/Broadway.** The greatest traffic demands in the study area are on US 83. US 83/Broadway in south Minot carries over 26,000 vehicles per day traveling through the corridor near the US 2/52 interchange, the highest in the region. As US 83 progresses south traffic decreases to 5,100 at the southern boundary of the study area.
- **US 2/52.** As an important east-west route through North Dakota, US 2/52 carries a significant volume of traffic. On the western and eastern ends of this study area, traffic approaches 18,700 vehicles per day, with volumes closer to 15,000 vehicles per day throughout Minot.
- **US 52.** After US 52 splits from US 2, traffic on US 52 declines significantly to around 7,000 vehicles per day.
- **County Road 16.** Existing travel demand on County Road 16 is relatively low, under 100 vehicles per day.
- **County Road 14.** As a minor arterial, CR 14 is a significant east-west route for rural housing development and agricultural activities. On the western end of CR 14, west of Minot, traffic volumes are around 1,700 vehicles per day, while east of Minot, traffic volumes are less than 1,000 vehicles per day.

Freight/Truck Activity

North Dakota is unique in that approximately 78 percent of its freight flows are outbound. Agricultural and Petroleum products that represent the majority of North Dakota outbound freight are traveling most frequently by rail with truck transportation representing approximately a quarter of outbound freight travel. A majority of inbound North Dakota freight demand is served by truck transportation. These freight movements are critical to the state and local economies and must be supported by the transportation network. Therefore, truck activity is a vital factor to consider when evaluating potential impacts from a connector route. While the movement of freight is a critical component of the local, state, and national economies, trucks have greater impacts to traffic flow, safety, and quality-of-life compared to passenger cars, especially in higher traffic urban areas.

- A higher percentage of trucks in the traffic stream can lower the effective capacity of a roadway, with FHWA data showing an approximate 0.5 percent reduction in capacity for every one percent increase in truck traffic on four-lane highways. This impact is exacerbated by traffic control at at-grade intersections due to the lower acceleration and deceleration rates of trucks when compared to passenger cars.
- Crashes involving trucks are more likely to result in severe injuries or fatalities, with national data showing that trucks made up 10 percent of all vehicles involved in fatal crashes while only being four percent of registered vehicles (National Safety Council, 2019).
- Trucks generate more vehicle emissions and more traffic noise than passenger cars, which can affect the quality-of-life for residents.

Existing Truck Traffic

While truck traffic is down from the peak of oil and gas activity in the early 2010s, there is still significant truck traffic in the Minot area.

- US 2
  - US 2 carries the highest truck traffic volumes of all study area roadways.
  - East of US 52, trucks make up around 10 percent of vehicles, with daily truck volumes ranging between 800 and 1,200 vehicles per day.
  - Between US 52 and the US 83 Northwest Bypass, trucks are 11 to 14 percent of the traffic stream, with daily truck volumes being between 2,000 and 2,200 per day.
  - West of the US 83 Northwest Bypass, truck traffic is around 15 percent of the traffic stream, with around 1,700 trucks per day.
- US 83
  - In the urbanized area just south of US 2, truck traffic is around four percent of traffic, with around 830 trucks per day.
  - Truck traffic is lower north of US 2, with around 320 trucks per day (around 1.5 percent of traffic).
  - Truck traffic is a more considerable percentage of the overall traffic stream south of Minot (13 to 15 percent of traffic), however the overall number of trucks is generally similar to the urbanized area, with around 1,000 trucks per day near 54th Avenue South and near County Road 16

- US 52
    - US 52 carries around 900 trucks per day between US 2 and County Road 16. Truck traffic is around 12 percent of the total traffic south of US 2 and around 19 percent of traffic near County Road 16

Major Traffic Generators

There are some major traffic generators within the Ward County study area, mainly falling in three categories: agricultural, commercial, and industrial. Many of the major traffic generators are industrial properties, mainly being either oil/gas production or gravel production.

- **Agricultural –** Minot Milling, CHS Sun Prairie, Wilbur Ellis, and Viterra Grain. These agricultural generators are all located north of the study area, with many of them located near the intersection of County Road 12 and 27th Street NE.
- **Commercial –** Downtown Minot, Dakota Square Mall, and Walmart. Both the Dakota Square Mall and the Walmart are within the study area, and are in close proximity to US Highway 2/52 and US Highway 83, respectively.
- **Industrial –** Cenex Pipeline , Gravel Products Pits 1, 2 and 3, Sundre Sand and Gravel, and Farstad Oil. Locations for these traffic generators vary, although most of them are located to the east of Minot. Both the Cenex Pipeline and Gravel Products Pit 1 are located directly adjacent to US Highway 2/52.
- **Additional Major Traffic Generators –** Additional major traffic generators include Minot International Airport, the State Fairgrounds, and Minot State University. Trinity hospital, once complete, will also be a major traffic generator. Completion is expected in late 2022.

Minot Air Force Base

As part of the Minot Air Force Base, the 91st Missile Wing employs 1,600 airmen and operates approximately 150 ICBM sites throughout an expansive territory that comprises approximately 12 percent of North Dakota's land including the majority of Ward County. The 91st Missile Wing requires a reliable network of roadways for its operation and supports the maintenance of its designated routes through the region. The Connector Corridor likely will support these operations either directly as a designated route or indirectly by reducing congestion through other routes. The connector corridor would provide an additional opportunity to avoid the urban core of Minot and the US 83/Broadway and US 2/52 interchange.

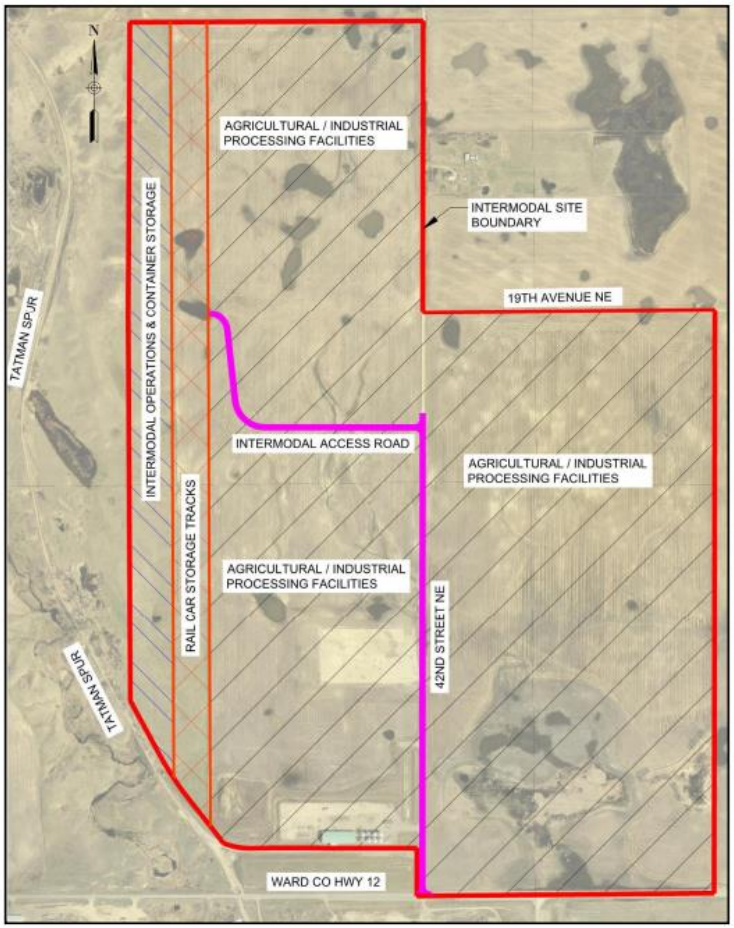
The United States Air Force is preparing to construct and renovate facilities related to the 91st Missile Wing over 10 years beginning as early as 2023 ending by 2036. The scope of this project is extreme and would require accommodating up to 1,200 construction workers and support personnel on a temporary basis. This project will see significant impacts to traffic in and around Minot and Ward County.

Port of North Dakota

Recently, the Port of North Dakota (located along CR 12 and 42nd Street in northeast Minot) began the first intermodal rail service in North Dakota, with the intent of reducing shipping costs for moving goods to international ports (Figure 23). They currently service more than 500 independent agricultural producers within a 150 mile radius and will begin hauling soybeans during the 2021 harvest.

The intermodal facility gets empty containers from large cities receiving international exports. The containers are then loaded with products and commodities and sent to international markets. Each unit train sent from the intermodal facility contains 220 to 330 cars. The success of the Port of North Dakota will simultaneously increase local and regional truck traffic to the Port but reduce the long haul truck traffic that has historically hauled these products.

Figure 23: General Site Layout of Port of North Dakota



Future Land Use Patterns

Future land use outside the Minot City Limits is primarily low density residential (Figure 25). Nodes of high and medium density residential follow key future corridor alignments proposed in the Minot 2035 Transportation Plan. These include the route along 30th Street SW and 66th Avenue SW identified as a potential bypass route in this report. These residential nodes follow the proposed prominent growth pattern to the southwest of the current city limits. An additional land use in this area is the Trinity Hospital expansion, which is currently under construction along County Road 14. This campus is currently slated to be completed at the end of 2022.

Commercial blocks at major intersections along US Highway 83/Broadway are planned, including at 54th Avenue SW and 66th Avenue SW. Other stretches of commercial usage are planned along the south side of US Highway 2. There is a small number of parks and open space planned, along 13th Avenue SE south of US Highway 2/52.

The two other major future land uses surrounding Minot are public/semi-public space and industrial usage. The public/semi-public space is concentrated south and west of the current city limits of Minot, some of which is located along the Southwest connector corridor study area on 30th Street SW. The other main public/semi-public space is also located on the Southwest Bypass corridor, and is located between 54th Avenue SW and 66th Avenue SW. This property is a research property owned by NDSU. Most of the future industrial land use is located to the west of Minot International Airport, outside of the study area. This includes the expansion of the Port of North Dakota. There are some future industrial parcels located south of US Highway 2/52 on the west side of Minot, next to the current Cenex Pipeline industrial site.

Southwest Southeast Connector Corridor Study

NDDOT/Ward County, ND

Existing ADT and Traffic Generators

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Burlington
Surrey
Minot
Gravel Products Pit3
Minot Downtown
Farstad Oil
Gravel Products Pit2
Viterra Grain AG
State Fairgrounds
Wilbur Ellis Ag
Minot Milling AG
Winfield Ag
CANADIAN PACIFIC
BURLINGTON NORTHERN SANTA FE
Cenex Pipeline Industrial
11,300 (1,700)
18,500 (2,040)
CHS SunPrairie AG
18,200 (165)
15,800
15,900
16,000 (2,180)
6,500
Dakota Square Mall
7,500 (910)
Gravel Products Pit
929
920
19,200 (830)
Trinity Hospital
Walmart
10,900
Sundre Sand and Gravel Industrial
37TH AVE SW
46TH ST SW
54TH AVE SW
7,940 (1,035)
5,300
72ND ST SW
66TH AVE SW
62ND ST SW
30TH ST SW
16TH ST SW
42ND ST SE
55TH ST SE
72ND ST SE
79TH AVE SW
4,800 (930)
60
70 (15)
350 (40)
96
90

Legend

Major Traffic Generators

- Agricultural
- Commercial
- Hospital
- Industrial
- Recreational
- Existing ADT (Truck ADT)
- Ward County Traffic Counts
- Planned Industrial Land Use
- Study Area
- City Limits

0 1 Miles

Source: Ward County, NDDOT, ND GIS Hub

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Southwest Southeast Connector Corridor Study

NDDOT/Ward County, ND

Future Land Use / Traffic Generators

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Burlington
Minot
Minot International Airport
Minot State University
Minot Downtown
Distribution Center
Gravel Products Pit3
Gravel Products Pit2
Farstad Oil
Viterra Grain AG
Minot Milling AG
Winfield Ag
Wilbur Ellis Ag
State Fairgrounds
Cenex Pipeline Industrial
CHS SunPrairie AG
Dakota Square Mall
Gravel Products Pit
Trinity Hospital
Walmart
Sundre Sand and Gravel Industrial
NDSU Research Property
CANADIAN PACIFIC
BURLINGTON NORTHERN SANTA FE
37TH AVE SW
46TH ST SW
54TH AVE SW
66TH AVE SW
79TH AVE SW
72ND ST SW
62ND ST SW
30TH ST SW
16TH ST SW
42ND ST SE
55TH ST SE
72ND ST SE
83RD ST SE

Legend

Major Traffic Generators

- Agricultural
- Airport
- Commercial
- Hospital
- Industrial
- Institutional
- Recreational
- Study Area
- City Limits

Minot Future Land Use

- Rural/Agricultural
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Neighborhood Commercial
- General Mixed Use
- Industrial
- Office Business Park
- Public/Semi-P...
- Hospital
- Parks and Open Space

0 1 Miles

Source: Minot, Ward County, ND GIS Hub

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Origin-Destination Analysis

Origin-destination analysis was performed to better understand regional traffic patterns. Origin-destination data can help provide information related to the amount of traffic that could be reasonably expected to utilize a future connector route instead of traveling on US 2 through the developed part of Minot.

Origin-destination analysis was performed using data obtained from StreetLight Data. StreetLight Data provides transportation data to transportation agencies and professionals that is collected via anonymized location data from mobile phones and navigation devices.

Origin-destination analysis focused on the following locations:

- US 2 – West of the US 83 Northwest Bypass
- US 83 Northwest Bypass – North of US 2
- US 83 – South of County Road 16
- US 52 – South of County Road 16
- US 2 – East of East Burdick Expressway

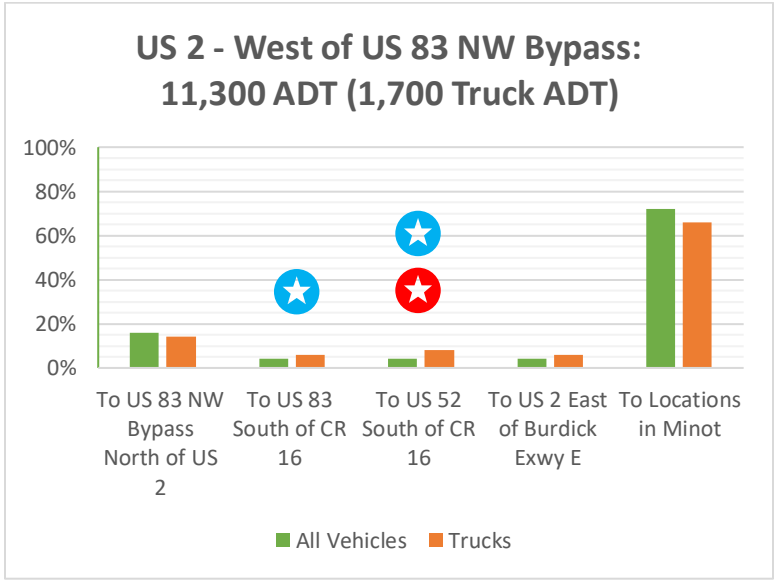
US 2 – West of the US 83 Northwest Bypass

Based on the origin-destination data for US 2 west of the US 83 northwest bypass, around 28 percent of traffic is destined for locations outside of Minot, with the remaining 72 percent of traffic having a destination somewhere in Minot (Figure 26). A similar trend is seen for truck traffic, however slightly more truck traffic is regional in nature, with around 34 percent of trucks having destinations somewhere outside of Minot.

The most common destination for regional traffic is the northwest bypass (16 percent of all vehicles and 14 percent of trucks).

The destinations that could benefit from a connector route (south US 83 and south US 52) have a combined total of around 14 percent of the truck traffic seen on US 2 to the west and have around 8 percent of overall traffic.

Figure 26: O-D Analysis – US 2 – West of US 83 NW Bypass



Traffic that could benefit from southeast portion of connector route

Traffic that could benefit from southwest portion of connector route

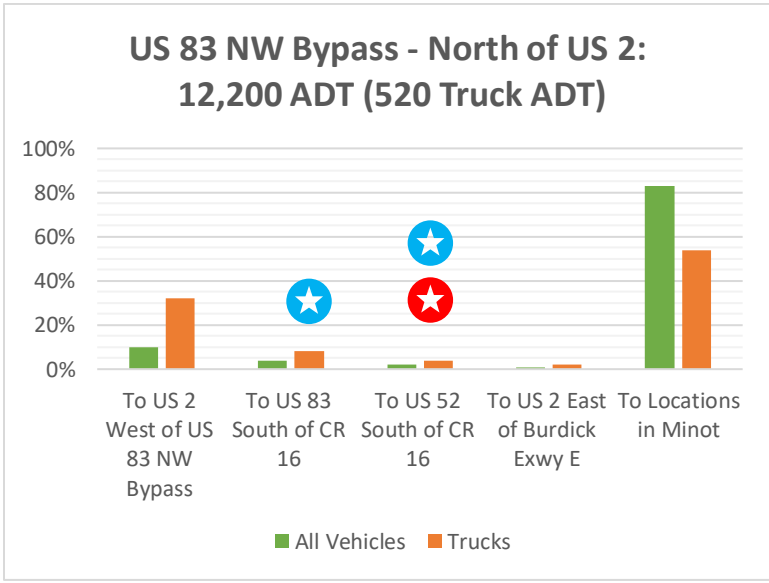
US 83 Northwest Bypass – North of US 2

Around 17 percent of overall traffic observed on the northwest bypass just north of US 2 has trip destinations outside the Minot area, however a much higher percentage of truck traffic is regional in nature, with around 46 percent of truck traffic having destinations outside Minot (Figure 27).

The highest regional traffic movement for both overall traffic and for truck traffic at this location is to US 2 to the west of Minot. Around 32 percent of truck and 10 percent of overall traffic observed on the northwest bypass is destined for locations west of Minot.

The destinations that could benefit from a connector route (south US 83 and south US 52) have a combined total of around 12 percent of the truck traffic seen on the northwest bypass and have around six percent of overall traffic.

Figure 27: O-D Analysis – US 83 NW Bypass – North of US 2



Traffic that could benefit from southeast portion of connector route

Traffic that could benefit from southwest portion of connector route

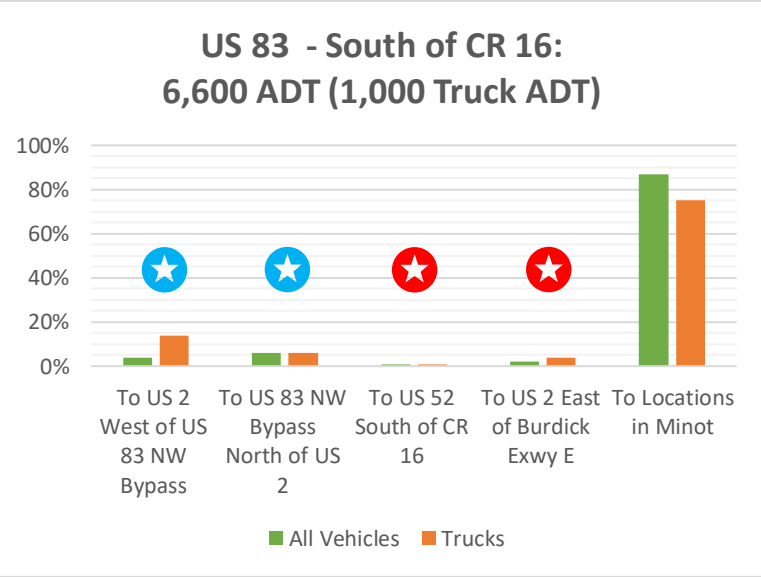
US 83 – South of County Road 16

Around 13 percent of overall traffic observed on US 83 south of County Road 16 is regional in nature with trip ends outside Minot. Truck traffic is comparatively more regional in nature, with around 25 percent of truck traffic being destined for locations outside Minot (Figure 28).

The most common regional destination for truck traffic is US 2 west of Minot (around 14 percent of truck traffic), with the most common regional destination for overall traffic being the US 83 northwest bypass (around six percent of overall traffic).

The destinations that could benefit from a connector route (west US 2 and the northwest US 83 bypass) have a combined total of around 20 percent of the truck traffic seen on south US 83 and have around 10 percent of overall traffic.

Figure 28: O-D Analysis – US 83– South of County Road 16



Traffic that could benefit from southeast portion of connector route

Traffic that could benefit from southwest portion of connector route

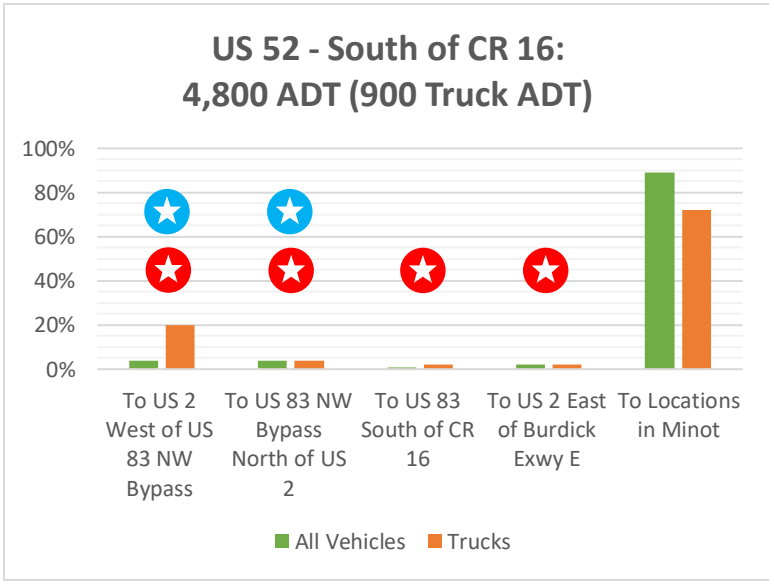
US 52 – South of County Road 16

Around 11 percent of overall traffic observed on US 52 south of Minot has destinations outside of Minot. Truck traffic has a higher percentage of regional trips, with around 28 percent of trucks having destinations outside of Minot.

The most common truck destination is US 2 west of Minot (around 20 percent of truck traffic). No regional destination has more than four percent of overall traffic (Figure 29).

The destinations that could benefit from a connector route (west US 2 and the northwest US 83 bypass) have a combined total of around 24 percent of the truck traffic seen on south US 52 and have around eight percent of overall traffic.

Figure 29: O-D Analysis – US 52 – South of County Road 16



Traffic that could benefit from southeast portion of connector route

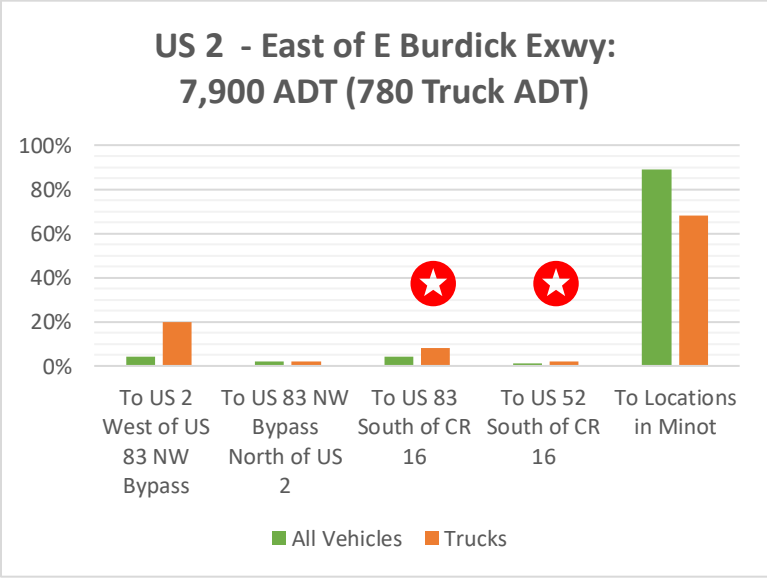
Traffic that could benefit from southwest portion of connector route

US 2 – East of Burdick Expressway

Around 11 percent of overall traffic observed on US 2 east of East Burdick Expressway has destinations outside of Minot. Like the other locations studied, truck traffic is more regional in nature, with around 32 percent of truck traffic having destinations outside of Minot.

The most common truck destination is west of Minot via US 2. Around four percent of overall traffic is destined for both US 2 west of Minot and for the US 83 northwest bypass (Figure 30).

Figure 30: O-D Analysis – US 2 – East of East Burdick Expressway



Traffic that could benefit from southeast portion of connector route

Summary of Origin-Destination Analysis

Based on available data under existing traffic conditions, it is expected that a connection route could draw the following traffic volumes, removing them from US 2/52 through the developed part of Minot:

- Southwest portion of connection route (west of US 83)
  - 1,300 total vehicles per day
  - 900 trucks per day
    - This is around half of the existing truck traffic on US 2 through the developed part of Minot
- Southeast portion of connection route (east of US 83)
  - 400 total vehicles per day
  - 300 trucks per day

It should be noted that there are origin-destination pairs with one trip end in the developed area of Minot that could benefit from a future connector route. These cases will be analyzed in more detail in subsequent phases of this study.

IV. Existing Traffic Operations

Existing traffic operations along the US 2/52 corridor through the study area were evaluated using transportation data obtained from StreetLight Data.

Traffic operations analysis is largely based on travel times between key locations, using this travel time data to infer delays. Travel time analysis was performed for the AM and PM peak periods, and this was done by comparing data from each peak period (7:00 to 9:00 AM and 4:00 to 6:00 PM) to free flow conditions (assumed to be 9:00 PM to 5:00 AM).

Estimated travel delays under AM and PM peak hour traffic conditions shown in Figure 31 and Figure 32, respectively, with discussion provided below.

Estimated Level of Service

Travel time data was used to estimate corridor levels of service (LOS) using concepts from the *Highway Capacity Manual*. Level of service is a letter grade that is used to describe the quality of traffic flow, with LOS A indicating near free-flow conditions with few days and LOS F indicating a breakdown of traffic flow with major delays.

Analysis in this report will consider operations at LOS E or LOS F deficient, in accordance with typical design standards in the region.

The following criteria was used when estimating corridor levels of service. Note that these criteria use travel speed and not travel time, but travel speeds were estimated using travel time data.

- **LOS A**: Travel speeds are at free flow speeds
- **LOS B**: Travel speeds are between 1 percent and 10 percent lower than free-flow speeds
- **LOS C**: Travel speeds are between 10 percent and 18 percent lower than free-flow speeds
- **LOS D**: Travel speeds are between 18 percent and 27 percent lower than free-flow speeds
- **LOS E**: Travel speeds are between 27 percent and 36 percent lower than free-flow speeds
- **LOS F**: Travel speeds are more than 36 percent lower than free-flow speeds.

AM Peak Traffic Operations

US 52 – US 2 to CR 16

Southeast-Bound

Delays on southeast-bound US 52 are minimal under existing conditions, with southeast-bound travel times in the AM peak hour being within 5 percent of free flow travel times. These travel times correspond to LOS B.

Northwest-Bound

With bedroom communities of Logan, Sawyer, Velva, Voltaire and rural subdivisions along the US Highway 52 corridor, delays are more substantial in the northwest-bound direction, particularly between 7:30 am and 8:30 am. Travel time data indicates northwest-bound travel times are around 23 percent higher when compared to free-flow conditions.

Most delays are concentrated between CR 14 and US 2, and estimated delays as are consistent with field observations of AM peak queues near the interchange with US Highway 2.

With the PM peak hour congestion, travel times correspond to operations at LOS D, which is still within design standards, but approaching deficient operations.

US 2 – CR 17 to US 52

Westbound

Delays on US 2 are most concentrated in the most developed parts of Minot. Westbound travel times are 15 percent to 20 percent higher compared to free flow conditions between US 52 and the US 83 northwest bypass, with few delays west of the bypass. Observed travel times correspond with westbound operations at LOS C.

Eastbound

Some eastbound delay is present as well, with eastbound travel times being 15 percent higher than free flow conditions between the US 83 northwest bypass and US 83. Delays begin to taper off east of US 83, returning to near free flow conditions east of 13th Street East. These travel times correspond to LOS C.

US 83 – CR 16 to US 2

Northbound

Northbound delays are minimal south of CR 14, with travel times being within 5 percent of free flow conditions. This corresponds to operations at LOS B.

Delays are however more considerable between CR 14 and US 2, with travel times 18 percent higher than free flow conditions. This corresponds to operations at LOS C.

Southbound

Southbound delays south of CR 14 are slightly higher than they are in the northbound direction, corresponding to operations at LOS C, with travel times being around 15 percent higher than free flow conditions.

Delays are minimal between US 2 and CR 14, with travel times only 6 percent higher than free flow conditions, corresponding to operations at LOS B.

PM Peak Traffic Operations

US 52 – US 2 to CR 16

Southeast-Bound

Travel time data indicates that traffic returning to bedroom communities of Minot has less congestion impacts in the evening when compared to the opposite traffic flow in the morning. Between CR 14 and US 2, southeast-bound travel times are 8 percent higher than free flow conditions, corresponding to operations at LOS B.

South of CR 14, operations are at LOS B, with travel times within 5 percent of free flow conditions.

Northwest-Bound

Northwest-bound travel times are 8 percent higher than free flow conditions, corresponding to operations at LOS B.

LOS B is also experienced south of CR 14, with travel times within 5 percent of free-flow travel times.

US 2 – CR 17 to US 52

PM peak hour delays are generally similar to AM peak hour delays, with congestion concentrated in the developed part of Minot between the US 83 northwest bypass and US 52.

Eastbound

Between the US 83 northwest bypass and US 83, travel times are 20 percent higher than free flow conditions, corresponding to operations at LOS C.

Delays taper off between US 83 and US 52, with travel times being around 7 percent higher than free-flow conditions, corresponding to operations at LOS B.

Westbound

Between the US 83 northwest bypass and US 83, westbound delays are more considerable than eastbound delays, with travel times being 35.4 percent higher than free flow conditions. These operations correspond to LOS D, which is approaching deficient operations.

Congestion is less pronounced between US 52 and US 83, with travel times being around 18 percent higher than free flow conditions, which corresponds with operations at LOS C.

US 83 – CR 16 to US 2

Northbound

Between US 2 and CR 14, northbound travel times are around 33 percent higher than free-flow conditions, which corresponds to operations at LOS D. It should be noted that the generalized approach of translating travel times to level of service does not perfectly capture intersection-related delays that can be experienced at the urban intersections in the south Minot business district.

South of CR 14, northbound PM peak hour travel times are within 5 percent of free flow conditions, corresponding to operations at LOS B.

Southbound

Southbound delays are less significant between US 2 and CR 14 when compared to the northbound direction, with travel times around 16 percent higher than free flow conditions, corresponding to operations at LOS C.

South of CR 14, travel times are within 5 percent of free-flow conditions, also operating at LOS C.

Traffic Operations Summary

Using the travel time-based approach described above, it appears that traffic operations are generally good in the less developed areas outside the Minot urbanized area (no worse than LOS C during peak hours), however operations are poorer within Minot city limits, with LOS D observed on US 52 in the AM peak hour and LOS D observed on US 83 and US 2 in the PM peak hour.

As this study progresses into future conditions analysis and alternatives development, intersection-level delays will be better quantified using traffic simulation.

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Southwest Southeast Connector Corridor Study

NDDOT/Ward County, ND

AM Peak Delay

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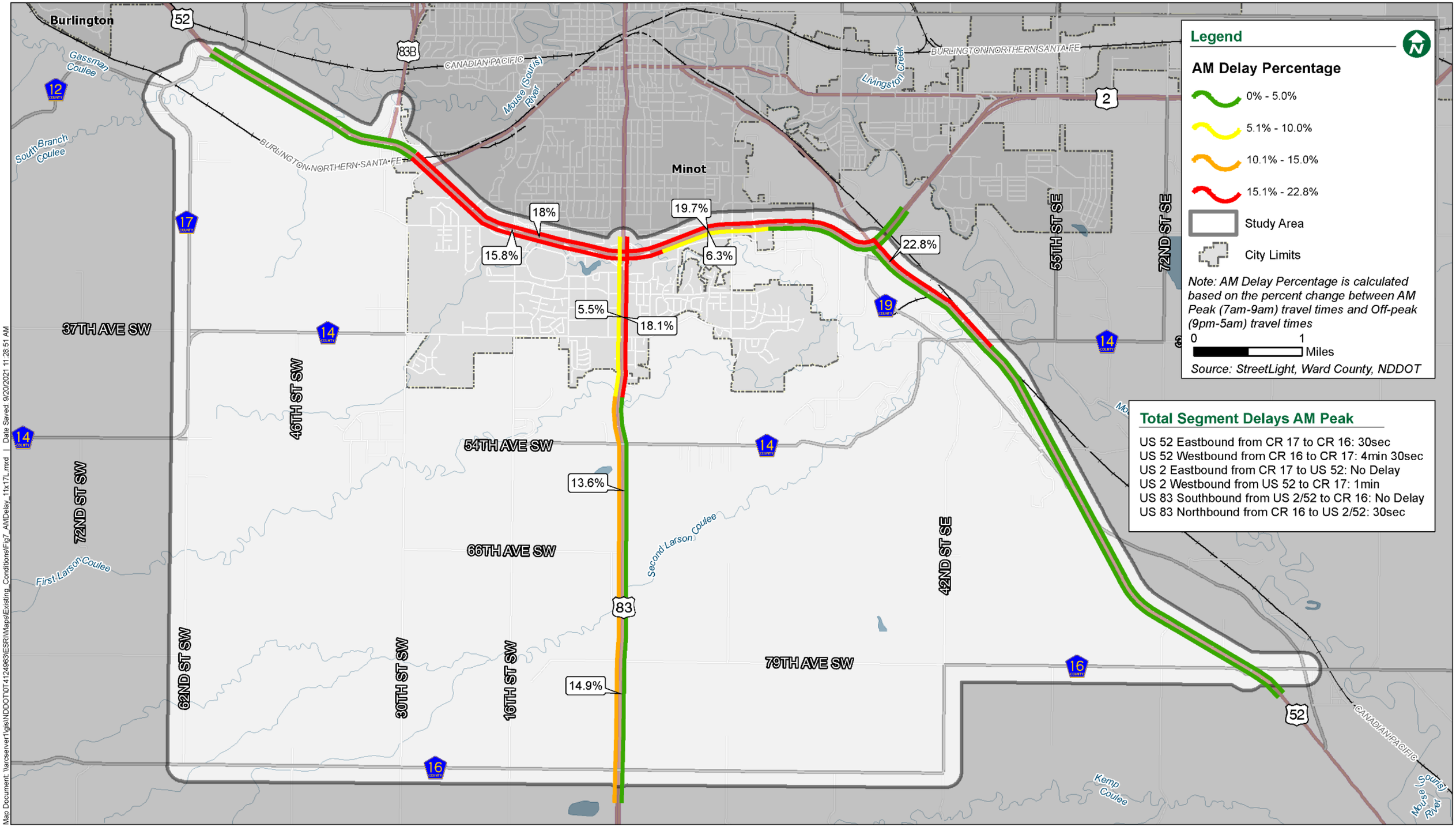

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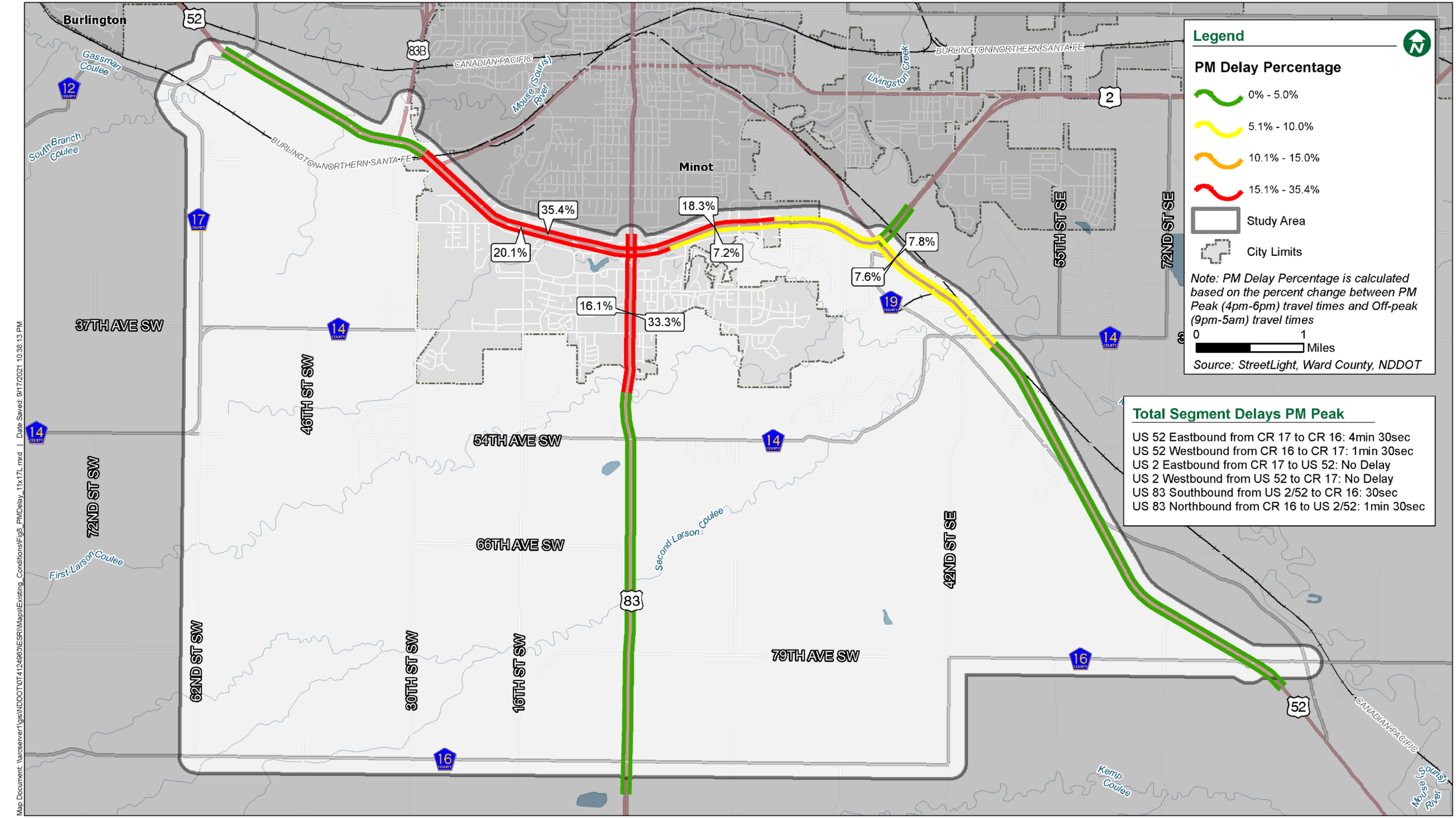
Figure 32: PM Peak Delay

Southwest Southeast Connector Corridor Study

NDDOT/Ward County, ND

PM Peak Delay

September 2021



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V. Crash History

Crash analysis was completed for the study area to understand the existing safety issues. Crash analysis was based on NDDOT crash data from 2016 to 2020. Crash analysis included both intersection-type crashes and non-intersection type crashes.

Crash Trends

Between 2016 and 2020, there were 675 crashes, including 92 crashes that resulted in an injury, including the possible injury classification. Existing crash locations is shown in Figure 33. Upon reviewing the data, multiple trends were identified.

US Highways

On the US highways (US 2/52, US 52, and US 83/Broadway):

- Property damage only crashes were 73 percent of all crashes.
- Injury crashes were 27 percent of all crashes.
- Intersection-related crashes made up 53 percent of all crashes. Of intersection crashes, angle crashes were the most frequent (42%) followed by rear end crashes (36%).
- More than six percent of crashes involved drugs and/or alcohol.
- Less than five percent of crashes involved heavy vehicles.
- There were three crashes that involved pedestrians (1) and bicyclists (2).

County Roads

On the county road system (CR 17, CR 14, CR 16):

- Property damage only crashes were 66 percent of all crashes.
- Injury crashes were 20 percent of all crashes.
- 75 percent of crashes on the county road system were single vehicle crashes
- Rear end crashes were 8 percent of crashes
- Angle crashes were 9 percent of crashes

Critical Crash Analysis

A significant component of crash analysis is the application of the critical crash analysis methodology. Critical crash analysis uses statistical analysis to determine if differences between observed crash rates and typical crash rates are statistically significant and likely attributable to roadway design or traffic control.

This method calculates location-specific crash rates, compares those rates against crash rates for similar facilities (using local data), and establishes the critical crash rate. If the observed crash rate is above the critical crash rate, it is likely that mitigation could reduce crash rates.

Through this analysis, five intersections and three segments were found to have critical crash rates. An additional nine intersections and four segments had crash rates higher than the typical crash rate, but below the critical rate. Intersections and roadway segments with crash rates above the critical crash rate or above the typical crash rate for similar facilities are shown in Figure 34.

Figure 33: Existing Crash Locations

Southwest Southeast Connector Corridor Study

NDDOT/Ward County, ND

Crash Density (2016-2020)

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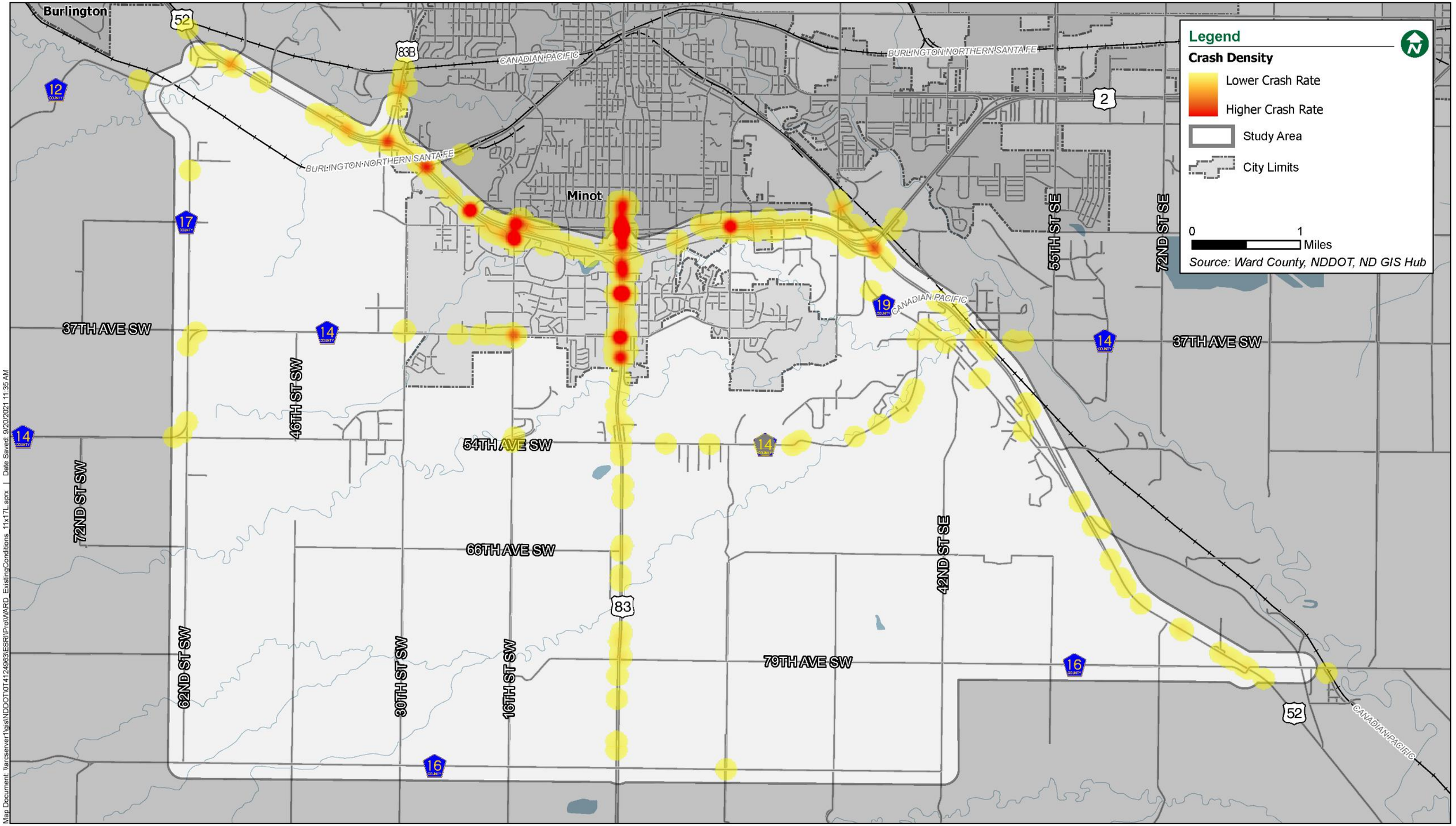

Southwest Southeast Connector Corridor Study

NDDOT/Ward County, ND

Crash History on State/County System (2016-2020)

September 2021

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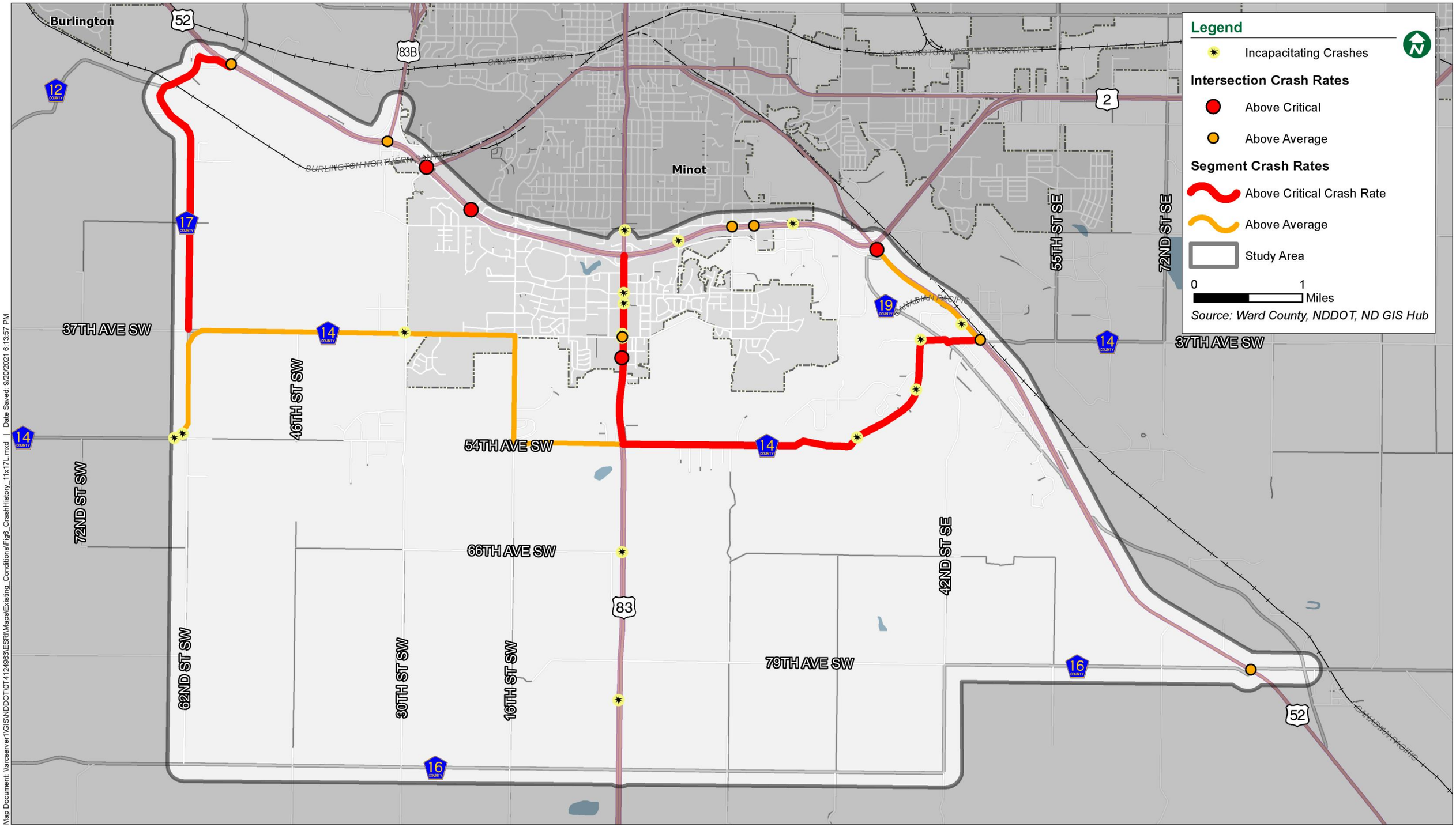


Map Document: \\arcserver1\GIS\NDDOT\0T4124983\ESRI\Maps\Existing_Conditions\Fig6_CrashHistory_11x17L.mxd | Date Saved: 9/20/2021 6:13:57 PM

Intersection Crashes

Of the 48 key intersections evaluated, five intersections were found to have critical crash rates with another nine found to have crash rates higher than the typical crash rate but below a critical rate. Crash details for these locations are shown in Table 3. Each of these intersections are discussed in detail to identify trends and site-specific issues.

US 2 and West Burdick Expressway

Several aspects of the intersection design contribute to the high rate of collisions: high traffic volume, aggressive skew of the intersection for southbound traffic coming from the east, limited sight lines due to changes in elevation, and proximity to a rail corridor. The driveway on the western edge of the intersection might present complications with future alignments. A near majority (48 percent) of crashes at the intersection were non-incapacitating injury collisions, with a similarly close split between rear-end and angle collisions.

US 2 and Evergreen Avenue

This intersection has the highest crash rate and frequency in the study area, with 33 crashes between 2016 and 2020. Several factors create these conditions: northbound traffic entering the intersection from Evergreen Avenue has limited sight lines due to changes in elevation, and southbound traffic has limited sight due to the horizontal curve to the east. The nearby frontage road serves as another conflict point for the intersection. Angle crashes accounted for slightly less than three quarters of crashes at the intersection, and 42 percent of crashes were injury crashes (two incapacitating injury crashes, 12 non-incapacitating injury crashes)

US 2 and East Burdick Expressway

The current intersection design has great deal more high-speed turns, crossovers, and merge locations when compared to traditional at-grade designs. This results in a very large number of conflict points for motorists. Most crashes (67 percent) were angle crashes, and while there were no fatal or incapacitating crashes logged, 40 percent of crashes resulted in non-incapacitating injuries.

US 83 and 40th Avenue Southwest

Most crashes occur as motorists make left turns out of the Walmart parking lot. The design of the intersection encourages risky turns, as limited gaps in the traffic patterns of US 83 give few opportunities to safely traverse the intersection, while the high speed of southbound traffic make judging distances between vehicles difficult. Three-quarters of crashes were angle crashes and 28 percent of crashes resulted in injuries, with one incapacitating injury.

US 2 and US 52 South Ramps

A rear end crash trend was observed on the westbound off ramp of the US 2/25 interchange, with 84 percent of crashes being rear end crashes. Of the 11 rear end crashes, 10 occurred on the eastbound off-ramp, with 8 involving eastbound right turning vehicles. A review of crash details reveals that most rear end crashes occurred during daylight conditions in normal weather, with most crashes being attributed to careless driving or following too close. While the crash data makes it difficult to identify discernible trends, rear end crash trends could potentially be attributable to high vehicle speeds coming off US 2 combined with the horizontal curvature of the ramp.

Table 3: Intersections With Crash Rates Above Typical Crash Rates

Intersection	Traffic Control	Total Crashes	Observed Crash Rate	Critical Index*	Injury Crashes	Angle Crashes	Rear End Crashes
Hwy 2 & Evergreen Ave	**Two-Way Stop Control**	**33**	**0.94**	**2.68**	**14**	**24**	**1**
Hwy 2 & 13th St SE	Signal	25	0.66	0.77	9	9	10
Hwy 83 & 37th Ave SW	Signal	23	0.83	0.91	5	8	5
Hwy 2 & US 83 NW Bypass	Signal	22	0.60	0.70	0	1	12
Hwy 2 & Burdick Expy W	**Two-Way Stop Control**	**21**	**0.60**	**1.73**	**10**	**10**	**11**
Hwy 83 & 40th Ave SW	**Two-Way Stop Control**	**21**	**0.90**	**1.76**	**6**	**16**	**1**
Hwy 2 & Burdick Expy E	**Two-Way Stop Control**	**15**	**0.86**	**1.99**	**6**	**10**	**0**
Hwy 2 & 14th Ave SE	Signal	14	0.65	0.68	8	8	3
Hwy 52 & S Ramps	**Two-Way Stop Control**	**13**	**0.85**	**1.88**	**1**	**1**	**11**
Hwy 2 & 54th St	Two-Way Stop Control	8	0.36	0.91	5	5	1
Hwy 52 & 37th Ave SE	Two-Way Stop Control	6	0.48	0.98	4	4	0
Hwy 2 & 17th St SE	Two-Way Stop Control	5	0.18	0.50	2	3	0
Hwy 52 & 79th Ave SE	Two-Way Stop Control	2	0.22	0.40	1	0	1
Hwy 52 & N Ramps	Two-Way Stop Control	2	0.17	0.34	0	1	1

Critical Index is the observed crash rate divided by the critical crash rate.* ***Any value above 1 indicates that the intersection has a crash rate above the critical crash rate.*

Segment Crashes

Of the 18 roadway segments that were studied (12 on the US highway system, six on county roads), four were found to have crash rates above the critical crash rate, and another two had crash rates above the typical crash rate. Crash details for these locations are shown in Table 4.

US 83 – 54th Avenue South to 37th Avenue South

The segment of US 83 from 54th Avenue S to 37th Avenue S experienced 30 total crashes, including 13 percent of crashes resulting in an injury. Of the 30 crashes, 46 percent of crashes were rear-end crashes, and 30 percent of crashes were sideswipe crashes

This segment of US 83 is in the transition area between rural areas south of Minot and the southern part of the Minot Urbanized area. As such, the speed limit begins its transition from 70 miles per hour to 50 miles per hour, creating speed differentials, a condition that creates potential for rear end collisions. Rear end crash potential is exacerbated by increased development density compared to areas south of 54th Avenue, creating more conflicts at higher-volume access points.

US 83 – 37th Avenue South to US 2

The segment of US 83 from 37th Avenue S to US 2 experienced 73 crashes between 2016 and 2020 and has the highest crash rate of all segments on the US Highway System in the study area. This included 11 crashes (22 percent) resulting in injuries). Rear end crashes made up 62 percent of crashes.

This segment is abutted by the south Minot commercial area, including significant traffic generators like Wal-Mart, Home Depot, fast food restaurants, and other businesses. This segment has the highest daily traffic volume of any segment being considered in this study, with maximum volumes approaching 30,000 vehicles per day. The trend of rear end crashes is a result of the combination of high-volume intersections with high numbers of turning vehicles, moderate speeds (40 mph speed limit), and dense signal spacing (four signals in less than a mile).

County Road 17 – South of US 2

There were nine crashes on CR 17, with five resulting in injuries. Seven of these crashes were single vehicle crashes and three occurred during poor road conditions due to weather.

While only nine crashes were reported in the study period, the low traffic volumes on this segment result in it having a crash rate above the critical crash rate. Most crashes are concentrated on the north end of the segment, where access density is higher and where terrain forces significant horizontal and vertical curvature. The combination of these factors appears to contribute to the observed crash history.

County Road 14 – East of US 83

This segment of CR 14 experienced 31 crashes, with 39 percent resulting in injuries. This segment has the highest crash rate of all segments in the study area.

Of the 31 crashes, 77 percent of crashes were single vehicle crashes – only four crashes were during poor conditions during the winter. Most crashes occur on rolling terrain that forces considerable horizontal alignment changes. Vertical and horizontal roadway geometry combined with dense access spacing and minimal shoulders likely contribute to the high number of single vehicle crashes.

Table 4: Segments With Crash Rates Above Typical Crash Rates

Segment	Typical Cross Section	Total Crashes	Injury Crashes	Observed Crash Rate	Critical Index*	Rear End	Side Swipe	Angle	Single Vehicle	Other
US 83 - 54th Ave S to 37th Ave S	**4-lane divided**	**30**	**6**	**1.8**	**1.3**	**3**	**2**	**13**	**9**	**3**
US 83 - 37th Ave S to US 2	**4-lane divided**	**73**	**16**	**2.5**	**1.9**	**45**	**17**	**7**	**13**	**0**
US 52 - CR 16 to US 2	4-lane divided	17	3	1.0	0.7	6	1	1	9	0
CR 17 - South of US 2	**2-lane undivided**	**9**	**5**	**2.9**	**1.1**	**1**	**0**	**0**	**7**	**1**
CR 14 - West of US 83	2-lane undivided	47	13	1.4	0.9	4	1	7	34	1
CR 14 - East of US 83	**2-lane undivided**	**31**	**12**	**4.4**	**2.1**	**2**	**0**	**1**	**24**	**4**

Critical Index is the observed crash rate divided by the critical crash rate. **Any value above 1 indicates the crash rate on that segment is above the critical crash rate.*

Corridor Access

Access management is the process of balancing the competing needs of traffic movement and land access. The number of access points on a roadway will influence its level of functionality, as access points introduce friction and conflict into the traffic stream.

For roadways under North Dakota Department of Transportation jurisdiction, access points should be spaced 500 feet apart, following the guidelines in the Design Manual. For roadways under Ward County jurisdiction, the preferred access spacing is one per one-quarter mile, but may be less so long as there is adequate stopping distance for the posted speed of the intersecting roadway.

Public and private accesses were reviewed on the primary corridors to evaluate access density and spacing (Figure 36). There were 211 access points along the corridors in the study area, which includes 41 primary intersections, 69 secondary intersections, and 101 private driveways. Table 5 shows the number of access points per mile for all segments in the study area.

Generally, access spacing on study area roadways is acceptable based on the relevant spacing guidelines. However, since access spacing guidelines on Ward County roads are more stringent, there are some County roads with access densities that exceed preferred thresholds. These roadways are:

- County Road 17 (US 2 to County Road 14)
- 62nd Street SW (County Road 14 to County Road 16)
- County Road 14 (US 83 to US 52)
- County Road 14 (US 83 to 16th Street SW)
- County Road 16 (16th Street SW to US 83)

Access spacing on county roads that may be considered as part of a future connector alignment should be considered to best preserve traffic flow on a potential route while minimizing crash potential and maintaining required property access.

Access Related Crashes

National research indicates that crash potential increases as a function of access density on a roadway. Using available study area data, crash rates along key roadway segments were plotted against access density on those respective roadways, which is shown in Figure 35. This comparison shows a clear relationship between crash trends and access density in the study area, matching expectations based on national data.

Figure 35: Crash Rate vs. Access Density on Study Area Roadways

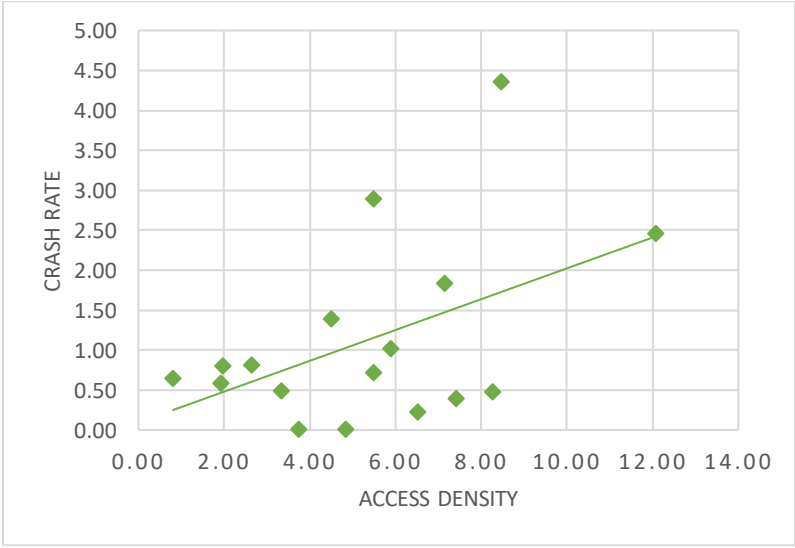
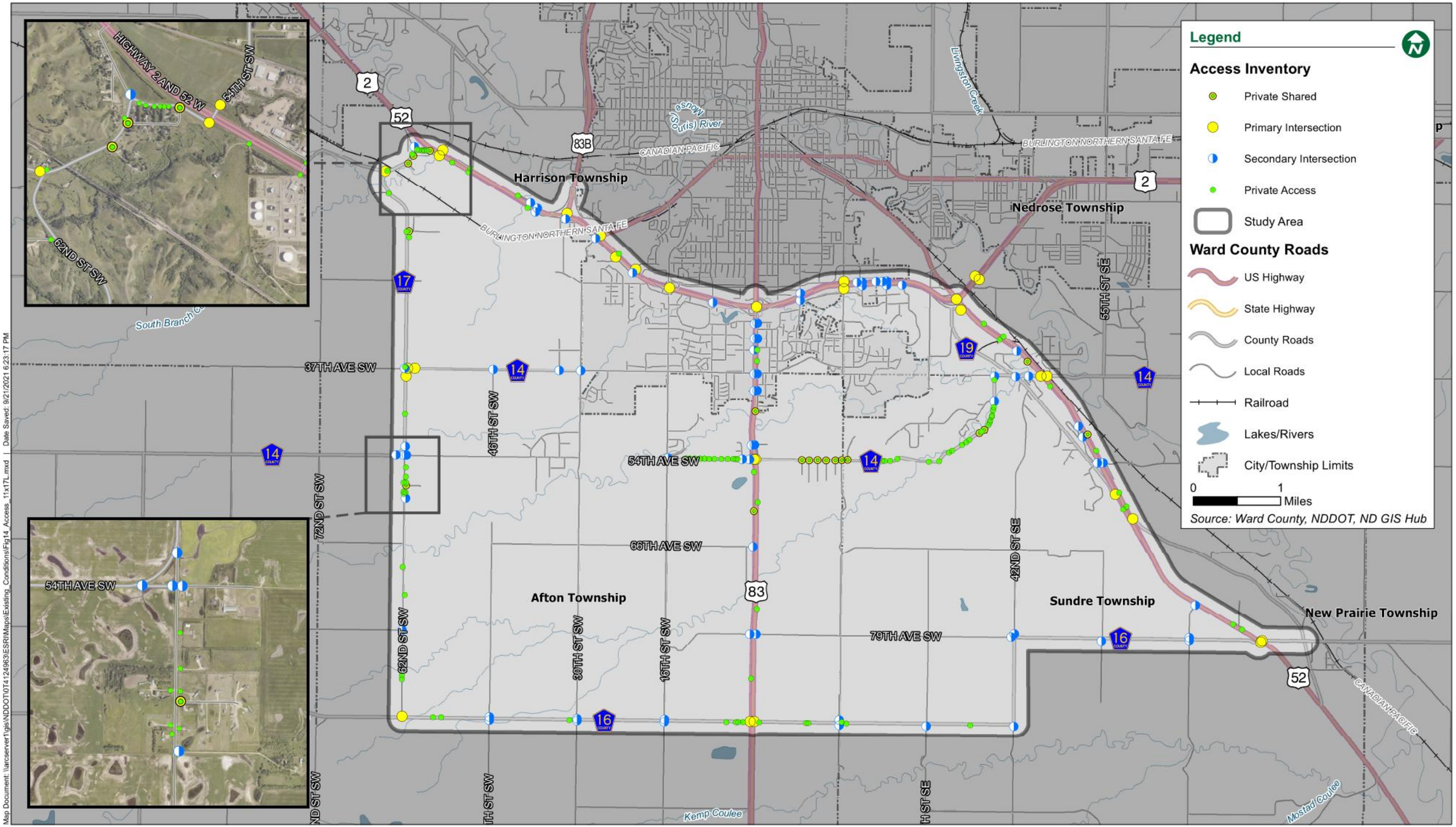


Table 5: Existing Access Spacing

Segment	Jurisdiction	Total Access Points	Segment Length (Mi.)	Existing Access Points per Mile	Recommended Access Points per Mile
US 2 (County Road 17 to US Hwy 83 BYP)	NDDOT	10	1.6	6.25	10.5
US 2 (US Hwy 83 BYP to 16th St SW)	NDDOT	10	1.4	7.14	10.5
US 2 (16th St SW to US 83/S Broadway)	NDDOT	6	1.0	6	10.5
US 2 (US 83/S Broadway to 13th St SE)	NDDOT	5	1.0	5	10.5
US 2 (13th St SE to US Hwy 52)	NDDOT	12	1.4	8.57	10.5
US 52 (US 2 to County Road 14)	NDDOT	8	1.3	6.15	10.5
US 52 (County Road 14 to County Rd 19 S)	NDDOT	9	1.6	5.63	10.5
US 52 (County Rd 19 S to County Road 16)	NDDOT	16	2.4	4.16	10.5
US 83 (US 2/52 to CR 16)	NDDOT	27	4.8	5.625	10.5
County Road 17 (US 2 to County Road 14)	Ward County	26	3.4	**7.65**	4
62nd St SW (County 14 to County 16)	Afton Township	23	4	**5.75**	4
County Road 14 (US 83 to US 52)	Ward County	33	3.85	**8.57**	4
County Road 14 (US 83 to 16th St SW)	Ward County	14	1	**14**	4
County Road 14 (30th St SW to 62nd St SW)	Ward County	7	3	2.3	4
County Road 16 (62nd St SW to 30th St SW)	Ward County	7	2	3.5	4
County Road 16 (30th St SW to 16th St SW)	Ward County	2	0.99	2.02	4
County Road 16 (16th St SW to US 83)	Ward County	6	1	**6**	4
County Road 16(US 83 to 42nd St SE)	Ward County	12	2.98	**4.02**	4
County Road 16 (42nd St SE to US 52)	Ward County	5	3.85	1.3	4


HIGHWAY 2AND 52 W
54TH ST SW
62ND ST SW
South Branch
2
52
83B
CANADIAN PACIFIC
Snowe (Souris) River
Livingston Creek
BURLINGTON NORTHERN SANTA FE
Harrison Township
Nedrose Township
55TH ST SE
37TH AVE SW
46TH ST SW
54TH AVE SW
66TH AVE SW
72ND ST SW
62ND ST SW
30TH ST SW
16TH ST SW
Afton Township
83
42ND ST SE
79TH AVE SW
Sundre Township
New Prairie Township
Kemp Coulee
Mostad Coulee
Legend
Access Inventory
Private Shared
Primary Intersection
Secondary Intersection
Private Access
Study Area
Ward County Roads
US Highway
State Highway
County Roads
Local Roads
Railroad
Lakes/Rivers
City/Township Limits
0
1
Miles
Source: Ward County, NDDOT, ND GIS Hub

VI. Summary of Existing Issues

Consistency with Regional Plans

Many City, County, and State plans and studies have been completed affecting the study area's system corridors, in which needs and opportunities were identified. A recurring recommendation of previous plans is to accommodate growth of commercial and industrial uses in the region through the development of a limited-access connection from US Highway 2/52 to US Highway 83. Coordination between government agencies and jurisdictions to ensure consistently applied right-of-way, access, drainage, and design standards applied to projects is essential for compliance with existing plans and studies. Safely and efficiently accommodating growing travel demands in the region is a top priority.

Capacity Needs

Operational analysis of the existing roadway network in the region identifies growing capacity issues, primarily on the arterial system through the urban core where LOS D occurs during peak hours.

It is likely that congestion issues will become more significant and widespread in the future due to traffic growth associated with both increases in regional freight traffic as well as new industrial and commercial development in southern Minot. Traffic operations under future conditions will be evaluated in a subsequent phase of this study.

Safety

Some crash issues currently exist within the study area, with issues present in certain areas on both the US highway system and the County Road system.

On the US highway system, crash rates are especially high on the urbanized segment of US 83, where traffic volumes are the highest and congestion is the most significant. There are also some high intersection-specific crash rates at skewed intersections along US 2 and US 52. Subsequent phases of this study will evaluate how changes in traffic patterns could potentially mitigate existing crash trends.

The most noticeable crash trend on the County system is single vehicle crashes, which appear to be generally attributable to vertical and horizontal roadway geometry combined with narrow roadway widths with dense access spacing. These issues are most pronounced on County Road 14 between US 83 and US 52 and on County Road 17 south of US 2. For County roads that may be considered as part of a future connector route, prevailing crash trends must be considered, especially if significant changes to roadway design are limited by terrain, available right-of-way, and access needs.

Access Spacing

Access spacing has a significant impact on both traffic operations and traffic safety, so it is important to balance property access needs with regional transportation goals.

An examination of 19 county, state and township corridors revealed that four segments on the county road network that do not meet Ward County's specified guidance for one access per quarter mile. These roadways include County Road 17/62nd Street SW and County Road 14 (both east and west of US 83), both of which are roadways with elevated crash rates.

The US Highway roadways examined determined that all road segments met the recommended access requirements of 10.5 per mile.

System Linkages

An essential component of the study is examining the connectivity of land uses. Connecting residences to places of employments, businesses to their customers, farmers to elevators, and industry to the global market makes the region economically viable. Major traffic generators inside and outside of the study area were examined including agricultural, commercial, industrial, and others. Ward County has deep roots in farming and an improved roadway networks must support connections for regional and interstate agricultural commerce. Presently no county roads in the study area provide 105,500-pound legal load restriction connections for year-round farm-to-market transportation. A new Trinity Hospital campus in the study area will require improved connections between US Highway 83, US Highway 2/52, and County Road 14 to populations in the region. Industrial users including aggregate producers and oil and gas distributors have established presences in the study area. An intermodal facility in the northeast Minot area also has been developed. Making regional connections between US Highway 52, US Highway 83, and US Highway 2 provides access to the region's robust industry to the global markets.

Ward County

SE/SW CONNECTOR STUDY

Section 2

Future Conditions Analysis

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Table of Contents

List of Figures

List of Tables

I. Introduction

This Future Conditions Report has been prepared to document analysis and recommendations related to assumed future traffic conditions in the connector corridor study area.

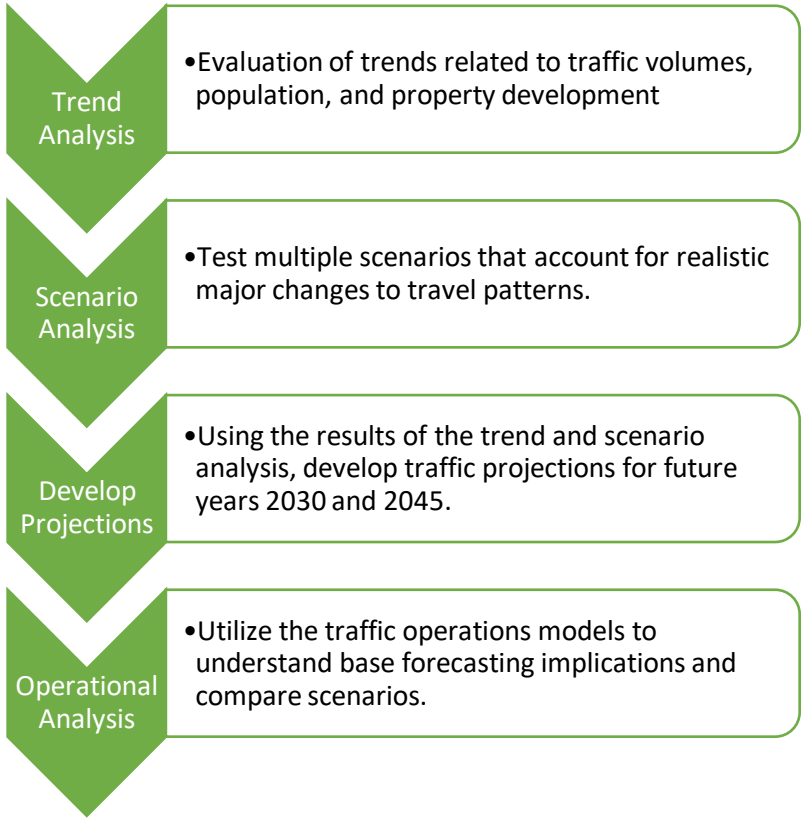
Methodology

Many of the most recent planning efforts in Minot were completed during the peak period of oil and gas activity in western North Dakota (2010 to 2015). These planning efforts were completed when future conditions were difficult to project given the unpredictable nature of oil and gas activity and development related to these industries. Since 2015, rapid growth has subsided, with development trends since 2015 more closely following typical trends for the region.

Given the major growth that was seen in Minot and the region between 2010 and 2015, a traffic projections methodology was developed to account for more typical growth, taking into consideration the long-term impacts of development that has occurred in the area in the last five to ten years. This process is summarized in Figure 1.

Using the results of the trend analysis, scenario analysis, and operational analysis, the Technical Analysis Committee (TAC) will be consulted to determine what forecasting assumptions should be used in the Alternatives Analysis phase of this study.

Figure 1 - Traffic Forecasting Methodology



II. Scenario Analysis

Transportation professionals are aware of changing travel behavior associated with sociological and technological changes, however developing data-based traffic projections with unknown future transportation landscape can be difficult. Scenario analysis provides a risk-based approach to traffic forecasting that allows the team to compare a wider array of variables to better understand possible traffic condition outcomes.

Potential Changes to the Transportation Landscape

To help establish assumptions for potential transportation changes in the future, a visioning workshop was held with the project technical advisory committee in September 2021.

Key items related to potential transportation changes in the area that were discussed at the workshop include:

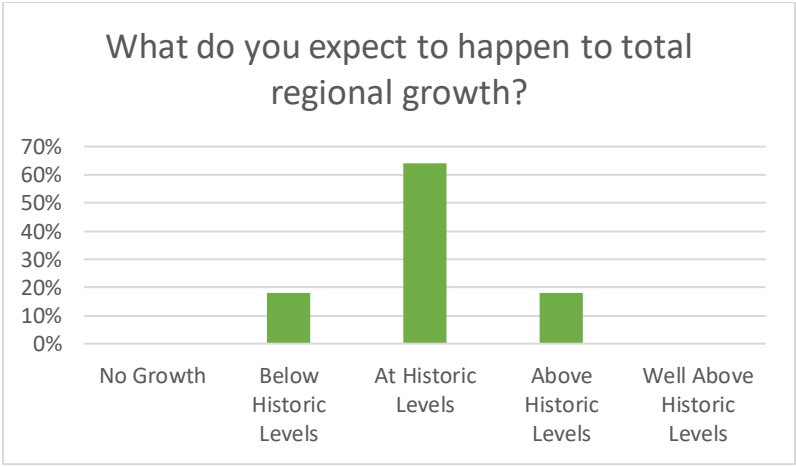
- Regional population growth
- Regional freight generator growth
- Study area development
- Study area development rate
- Game changers

Technical advisory committee members were polled regarding their thoughts related to the above items, with polling results summarized below.

Regional Population Growth

Predicting regional population growth in the Minot region can be a difficult exercise, especially after the unpredictability of the Bakken oil boom. Transportation infrastructure decisions should not be made using unrealistic expectations of growth, as it could lead to overbuilt roadways. Members of the technical advisory committee were asked their expectations of the regional population growth, with most of them expecting growth to happen at the historical pace.

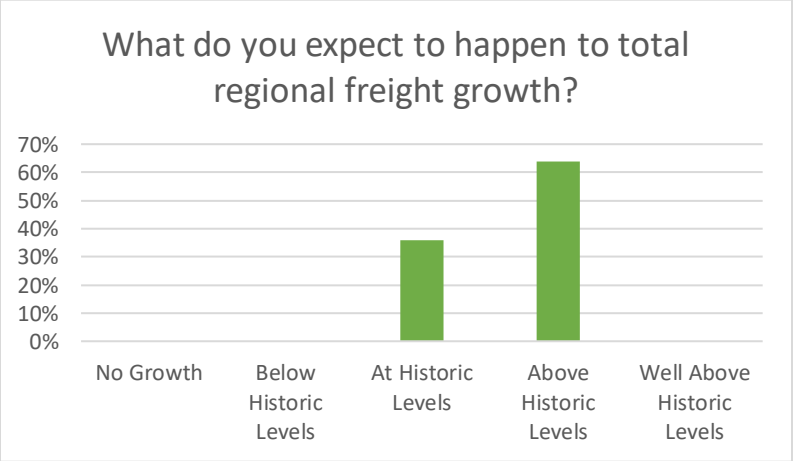
Figure 2 - TAC Feedback for Regional Population Growth



Regional Freight Generator Growth

According to the 2015 North Dakota Freight Plan, between 2000 and 2012 daily truck VMT increased 130% and the percentage of trucks by total roadway VMT increased from 14.7% to 22.4%. Industries that traditionally have heavy freight traffic are energy, agriculture, and manufacturing, all of which continue to be major industries in North Dakota. The technical advisory committee was asked about what they expect regional freight growth to look like. About two thirds of members expected to see growth above historic levels, with the remaining third expecting to see freight growth at the historic levels. Nobody on the committee expects to see either no growth or growth below historic levels.

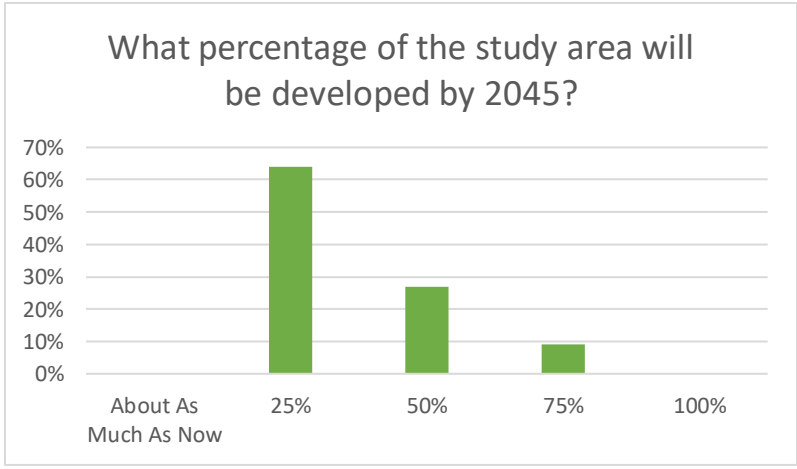
Figure 3 - TAC Feedback for Freight Growth



Study Area Development

Land use planning for Minot assumes that most future development will occur south and southwest of the city. Committee members were asked to estimate how much of the study area will be developed by 2045. Most members expected at least 25% of the area to be developed, with a smaller contingent expecting about 50% growth. No one on the committee expected the study area to be fully developed by 2045.

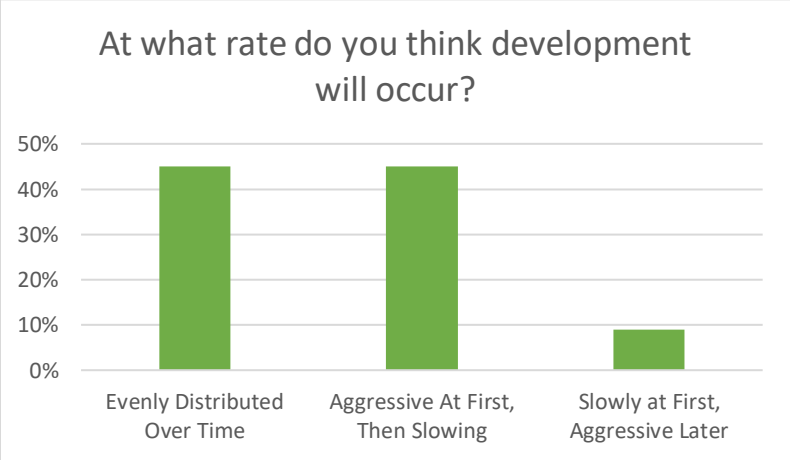
Figure 4 - TAC Feedback for Development Footprint



Study Area Development Rate

Committee members were also asked to predict the rate at which development of the study area will occur. The two options of "evenly distributed over time" and "agressive at first, then slowing" were tied as the most popular answer.

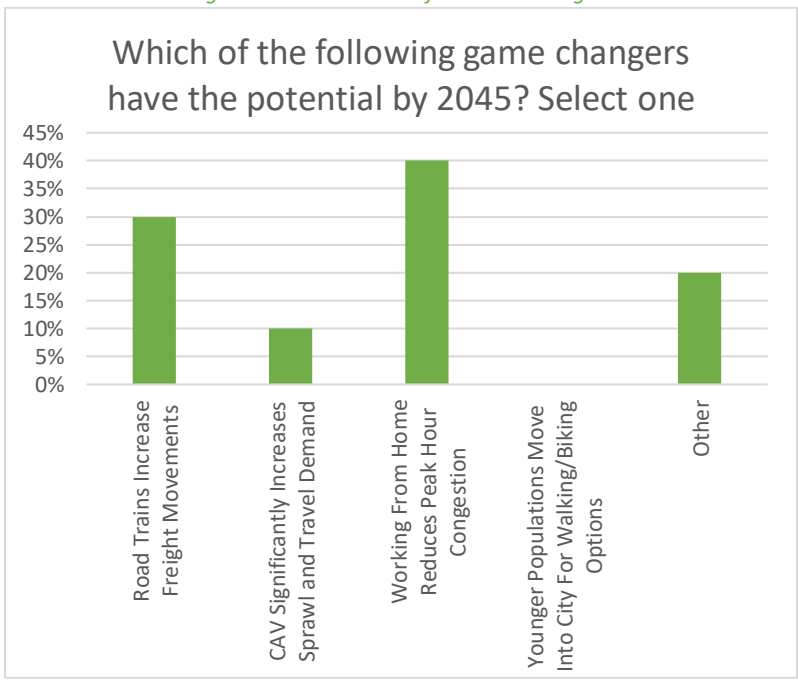
Figure 5 - TAC Feedback for Rate of Development



Game Changers

A final question asked to the committee was about potential events and innovations that could significantly change the development pattern of the region by 2045. The two most popular answers were working from home reducing peak hour congestion and road trains increasing freight movements. At the onset of the COVID-19 pandemic, there was a rapid shift towards working from home in many professions. While some workers have begun to return to working in offices, the option of working from home is more attractive for many people now compared to before the pandemic. Since 84% of commuters drove alone to work in 2019, reducing even a small percentage of those vehicles will have an impact on peak hour congestion.

Figure 6 - TAC Feedback for Game Changers



Traffic Growth Scenarios

Three traffic growth scenarios were identified to establish a range of 2045 traffic growth potentials to help make informed planning decisions. Scenario analysis can help identify break points where infrastructure investments may not be sufficient to meet project goals.

The three scenarios that were used for subsequent traffic analysis are:

- Low Growth
- Moderate Growth
- High Growth

Methodology

Multiple different types of traffic growth were estimated as part of the development of 2045 traffic projections. These include:

- Growth associated with new Trinity Hospital Campus
- Regional traffic growth (including truck growth)
- Local traffic growth

Trinity Hospital Campus

Traffic generated by the new Trinity Hospital campus in south Minot was estimated using data from the Institute of Transportation Engineers' *Trip Generation Manual.* Based on available information related to the new hospital, it is assumed that the new campus will generate around 8,600 trips per day. These new trips were assigned to the roadway network based on prevailing traffic patterns, using the same methodology that is commonly used in traffic impact analysis.

Note that traffic growth associated with the Trinity Hospital campus is included in the low growth, moderate growth, and high growth scenarios. The same amount of hospital traffic was assumed for each scenario.

Regional Traffic Growth

Regional traffic growth for this analysis is considered to be traffic growth on US 2, US 83, the US 83 northwest bypass, and US 52.

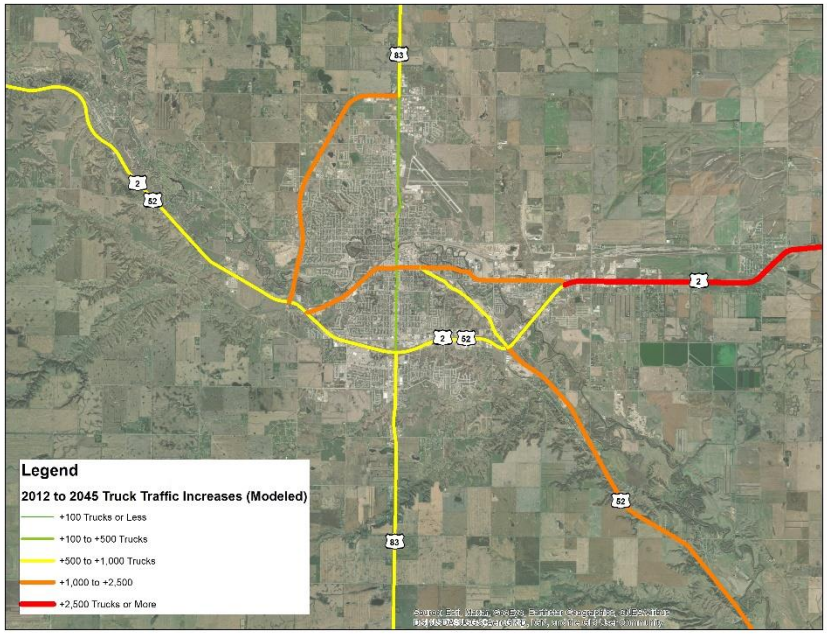
Low Growth Scenario:

- Assumes **0.5 percent annual traffic growth** for non-truck traffic on all regional roadways except the US 83 NW bypass, where a 0.75 percent annual traffic growth was assumed.
- Truck traffic growth is based on 2045 truck traffic projections from FHWA's Freight Analysis Framework (FAF) tool. For the low growth scenario, **FAF daily truck projections in the study area were reduced by 25 percent**.
    - The FAF travel demand model estimates national truck traffic as a function of spatially allocated data for agriculture, extraction, utility, construction, service, and other industry sectors
    - Given uncertainly related to specific truck activity associated with major generators like Minot Air Force Base and the North Dakota Intermodal Facility, it is assumed that FAF data will capture truck traffic associated with these locations.

Moderate Growth Scenario:

- Assumes **1.0 percent annual traffic growth** for non-truck traffic on all regional roadways except the US 83 NW bypass, where a 1.25 percent annual traffic growth was assumed.
- Truck traffic growth is based on 2045 FAF travel demand modeling results. FAF model outputs obtained from FHWA are shown in Figure 7. Note that some adjustments were made using engineering judgement and guidance from the technical advisory committee, primarily better balancing volume across links and assuming more truck traffic on US 83.

Figure 7 - Truck Traffic Growth 2012-2045 from Freight Analysis Framework Tool



High Growth Scenario:

- Assumes **1.5 percent annual traffic growth** for non-truck traffic on all regional roadways except the US 83 NW bypass, where a 1.75 percent annual traffic growth was assumed.
- Truck traffic growth is based on **2045 FAF travel demand modeling results that were increased by 25 percent**.

Basis for Non-Truck Traffic Growth Rates

A review of historic traffic data from NDDOT shows traffic has decreased over the past five to ten years throughout the study area. Traffic growth was however observed at some locations, especially the US 83 northwest bypass. A summary of traffic changes based on NDDOT data is shown in Table 1.

Table 1 - Traffic Trends on Regional Roadways

Roadway	Location	Annual Growth Rate	Data Timeframe
US 2	W of NW Bypass	-3.4%	2011-2020
US 2	NW Bypass	2.5%	2010-2020
US 2	E of NW Bypass	1.0%	2011-2020
US 2	W of US 83	-2.3%	2015-2020
US 2	E of US 83	1.0%	1995-2020
US 2	E of 13th St E	Minimal Change	2015-2020
US 2	NE of Valley St	-2.0%	2011-2020
US 2	E of NE Bypass	1.3%	2004-2020
US 52	SE of US 2	0.4%	2004-2020
US 52	SE of Minot	-1.3%	2016-2020
US 83	S of 31st Ave S	-1.0%	2011-2020
US 83	S of Minot	-1.0%	2017-2020

Since traffic decreases that have been observed in recent years are largely a result of changes in oil and gas activity in the region, some traffic growth was assumed on all regional roadways in each growth scenario to reflect a return to more typical traffic conditions through 2045.

Local Traffic Growth

Traffic growth on roadways off the regional highway system was estimated separately for locations north of US 2 and locations south of US 2. This was done since most areas along local arterials in Minot north of US 2 are generally built out and have less traffic growth potential compared to growth areas in south Minot. On roadways off the regional system, truck traffic was assumed to remain as it is today.

North of US 2

- Low Growth Scenario
  - Assumes **0.25 percent** annual traffic growth
- Moderate Growth Scenario
  - Assumes **0.50 percent** annual traffic growth
- High Growth Scenario
  - Assumes **0.75 percent** annual traffic growth

South of US 2

Traffic growth on local arterials south of US 2 was based on expected development trends in south Minot.

Assumed development in south Minot is based on future land use data obtained from the City of Minot, the Minot Comprehensive Plan, and input from local planning staff.

Traffic growth was estimated based on future land uses, using data from the Institute of Transportation Engineers' *Trip Generation* manual, other national trip generation data, and engineering judgement.

Low Growth Scenario

- The low growth scenario assumes around 10 percent of developable land in south Minot is developed (see Figure 8). Most of this development is concentrated around the new Trinity Hospital campus or areas in southeast Minot where some development is already occurring
- Based on the trip generation potential of development assumed in this scenario, an annual traffic growth rate of **1.0 percent is assumed west of US 83** and a growth rate of **0.5 percent is assumed east of US 83**.

Moderate Growth Scenario

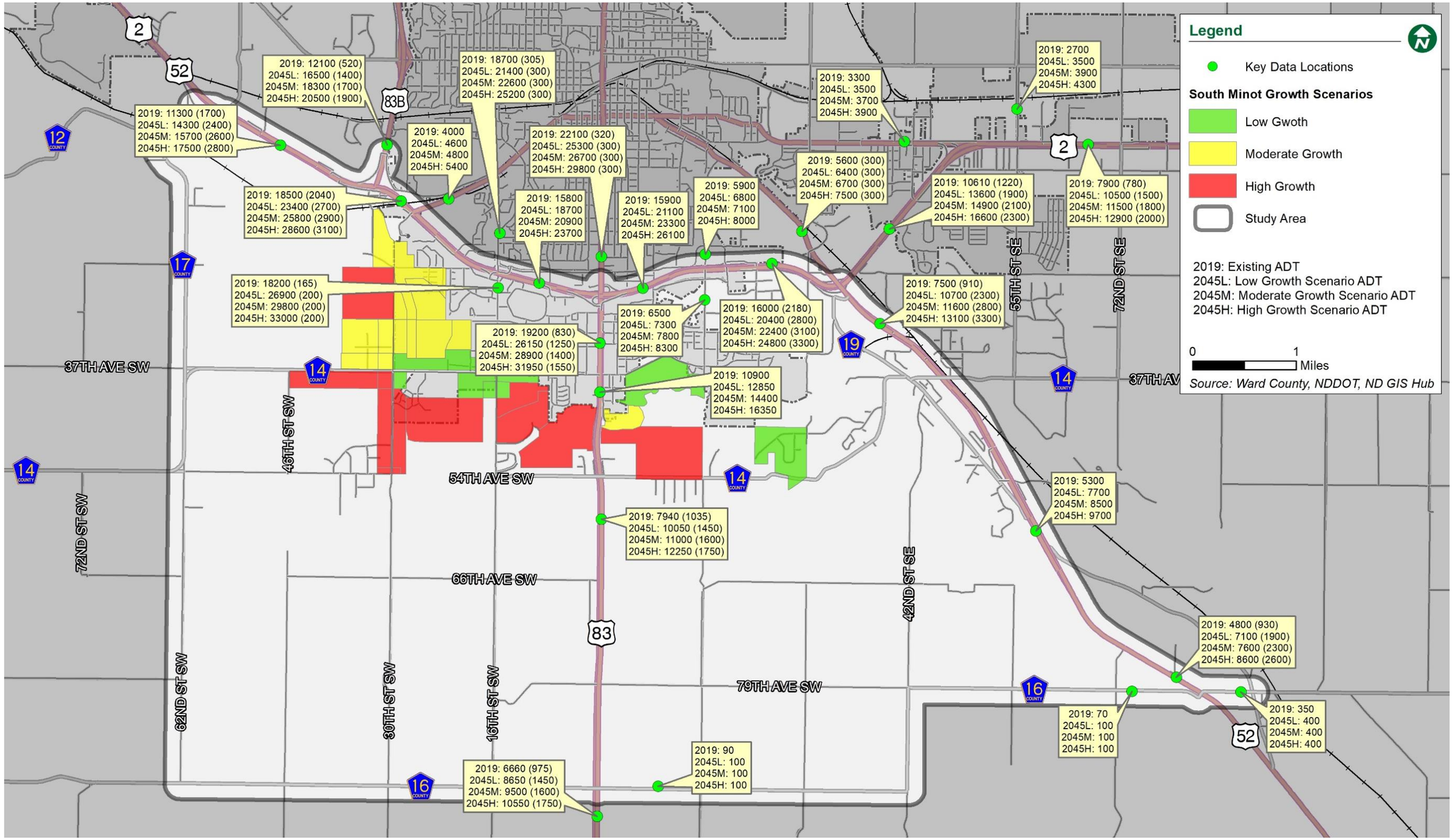
- The moderate growth scenario assumes around 20 percent of developable land in south Minot is developed (see Figure 8).
- Based on the trip generation potential of development assumed in this scenario, an annual traffic growth rate of **1.5 percent is assumed west of US 83** and a growth rate of **0.75 percent is assumed east of US 83**.

High Growth Scenario

- The high growth scenario assumes around 40 percent of developable land in south Minot is developed (see Figure 8).
- Based on the trip generation potential of development assumed in this scenario, an annual traffic growth rate of **2.0 percent is assumed west of US 83** and a growth rate of **1.0 percent is assumed east of US 83**.

2045 daily traffic projections for each scenario being considered are shown in Figure 8**.**

Figure 8 - 2045 Daily Traffic Projections



Future Traffic Operations

Using 2045 estimated traffic data for each growth scenario, future traffic operations were estimated using Simtraffic simulation models for AM and PM peak hour conditions.

Simulation models were used to quantify travel times between origin-destination pairs that could benefit from the construction of a new connector route and were also used to quantify intersection delays at key intersections that can serve as bottlenecks for both regional and local traffic.

AM Peak Hour

Traffic simulation indicates that AM peak hour traffic operations are not expected to be significantly deteriorated by traffic growth. Travel times along the US highway system are expected to remain generally unchanged when compared to existing conditions. When comparing to existing conditions, travel time increases between origin-destination points on the periphery of the study area are expected to be one minute or less in each traffic forecasting scenario. Travel time impacts in the AM peak hour for the 2045 high growth scenario are shown in Figure 9.

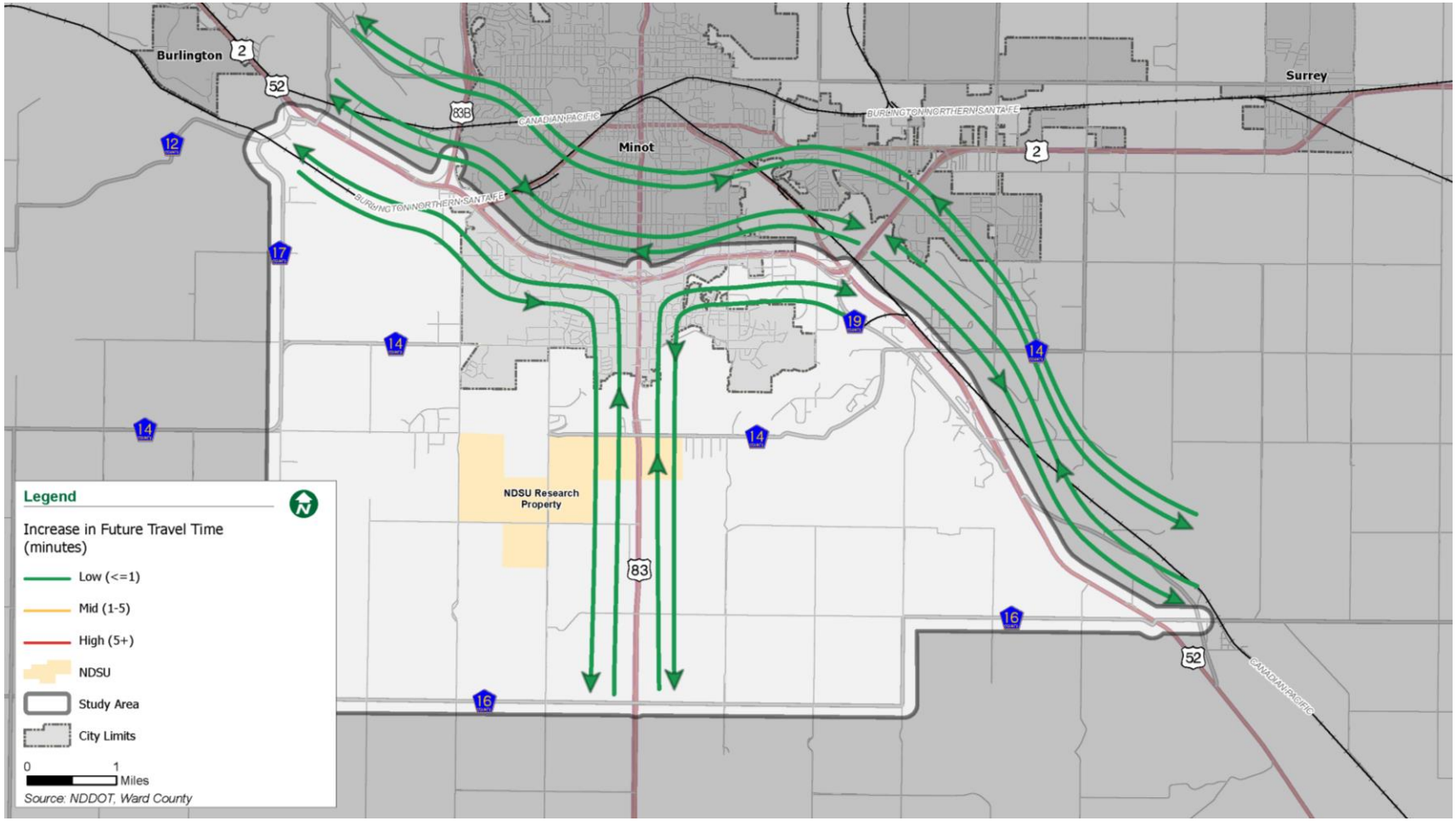
Intersection Capacity

Intersection capacity analysis was performed at key intersections to identify potential bottlenecks. This analysis revealed that most intersections are expected to operate acceptably throughout most of the study area. The only location with operations at LOS E or worse is the westbound off-ramp at the US 2/US 52 interchange in the high growth scenario.

Table 2 - 2045 AM Peak Intersection LOS at Key Intersections

Intersection	Traffic Control	Existing	2045 Low	2045 Moderate	2045 High
US 2 and US 2 NW Bypass	Signal	B	C	C	C
US 2 and 13th St E	Signal	C	C	D	D
US 52 and US 2 North Ramps	TWSC	B (WB)	C (WB)	D (WB)	E (WB)
US 52 and US 2 South Ramps	TWSC	B (EB)	B (EB)	B (EB)	B (EB)
US 83 and US 2 North Ramps	Signal	A	A	A	B
US 83 and US 2 South Ramps	Signal	A	A	A	A
US 83 and 31st Ave S	Signal	C	C	C	C
US 83 and 37th Ave S	Signal	B	B	B	B

Figure 9 - 2045 AM Peak Travel Time Increases (High Growth Scenario)



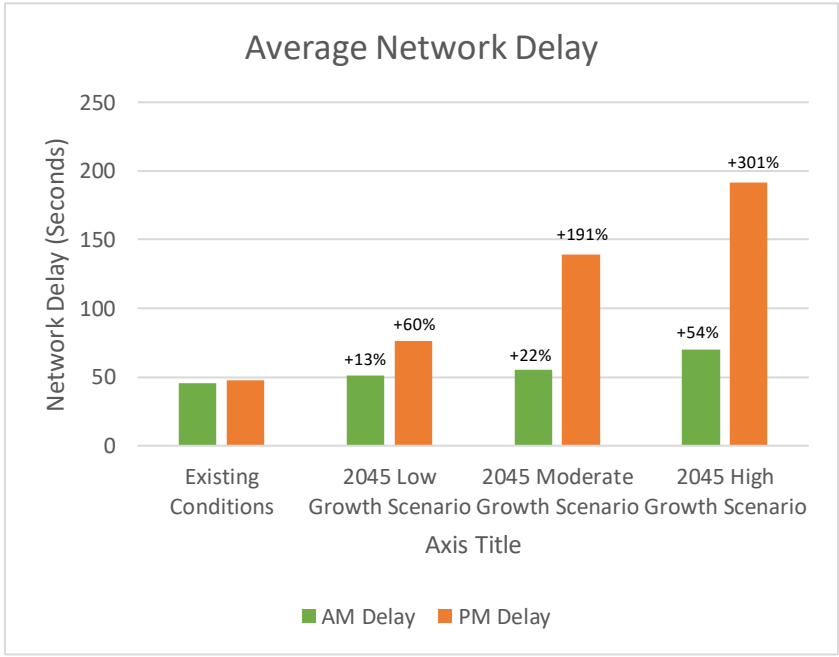
Note: Travel time increases are compared to existing AM peak hour

PM Peak Hour

In contrast to the AM peak hour, traffic operations impacts from traffic growth are expected to be more widespread in the PM peak hour, especially in the moderate and high growth scenarios.

To illustrate the magnitude of expected future PM peak hour delays, the AM peak hour network delay is expected to increase from a range of 13 percent in the low growth scenario to 54 percent in the high growth scenario while PM peak hour network delay increases are expected to range from 60 percent in the low growth scenario to 301 percent in the high growth scenario. Furthermore, AM and PM peak hour network-wide delays are approximately equal under existing conditions, but PM peak hour delays are nearly three times higher than AM peak hour delays in the moderate growth scenario and over four times higher than AM peak hour delays in the high growth scenario.

Figure 10 - Average Simulated Network Delay by Scenario



PM peak hour congestion is expected to have significant impacts to travel times on the US highway system in the moderate and high growth scenarios. Travel time impacts are much less significant in the low growth scenario, with travel time increases between key origin-destination pairs not exceeding five minutes.

The following notable travel time impacts were observed in the moderate and high growth scenarios:

- US 83/CR 16 intersection to US 2/US 52 interchange (northbound/eastbound)
  - +8.8 minutes in moderate growth scenario
  - +16.5 minutes in high growth scenario
  - Most significant traffic impacts are from breakdown of traffic flow on US 83 between US 2 and 37th Avenue South

- US 83/CR 16 intersection to US 2/US 83 NW Bypass intersection (northbound/westbound)
  - +14.7 minutes in moderate growth scenario
  - +24.7 minutes in high growth scenario
  - Most significant traffic impacts are from breakdown of traffic flow on US 83 between US 2 and 37th Avenue South and from delays at the US 2/US 83 NW Bypass intersection

- US 2/52 interchange to US 2/US 83 NW Bypass (westbound)
  - +6.2 minutes in moderate growth scenario
  - +8.6 minutes in high growth scenario
  - Most significant traffic impacts are from delays at the US 2/US 83 NW Bypass intersection, with delays at the US 52 interchange (westbound US 2 offramp) and the US 2/13th Street East intersection also contributing to travel time increases

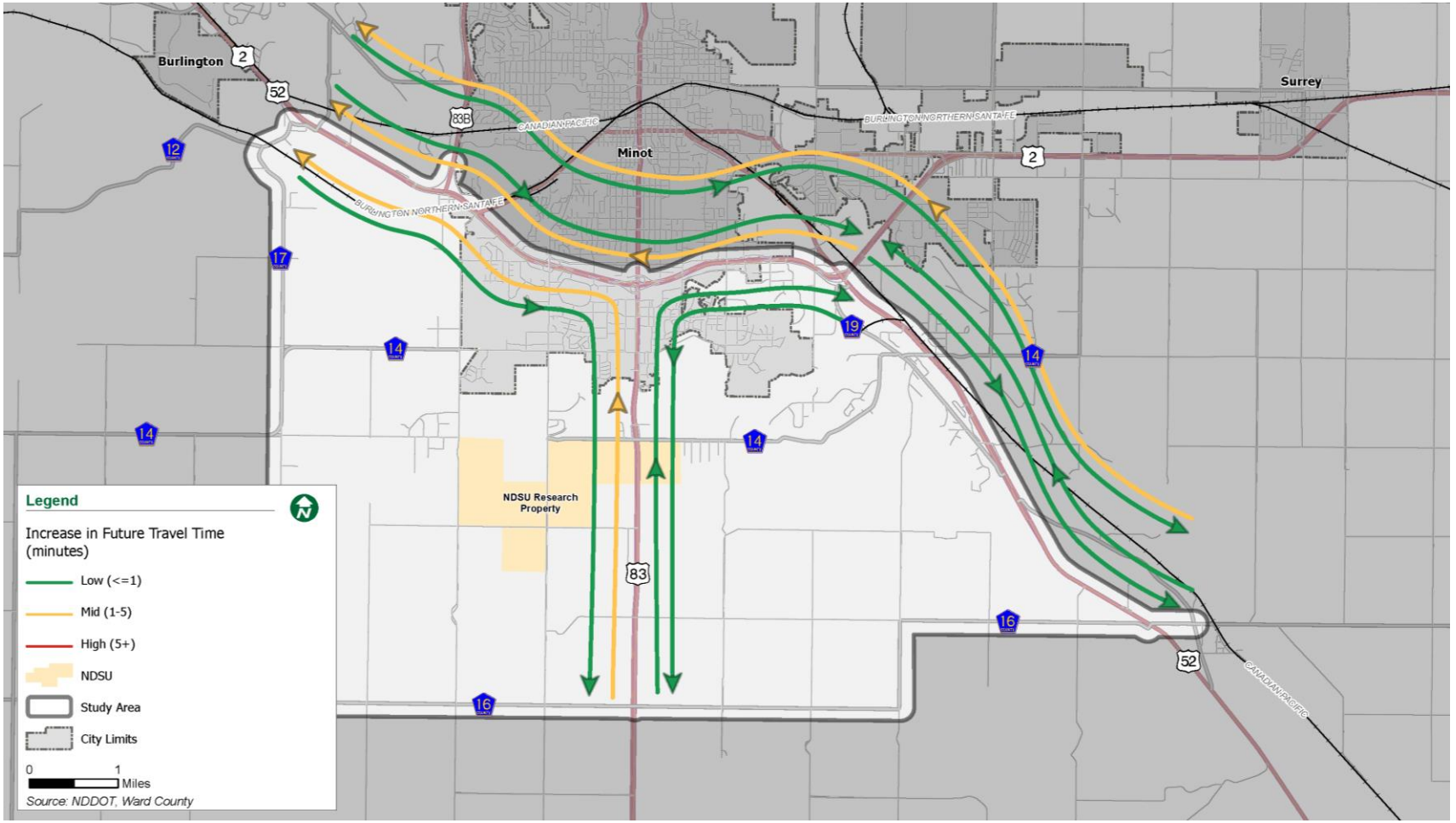
- US 52/CR 16 intersection to US 2/US 83 NW Bypass intersection (northbound/westbound)
  - +6.6 minutes in moderate growth scenario
  - +11.3 minutes in high growth scenario
  - Most significant traffic impacts are from delays at the US 2/US 83 NW Bypass intersection, with delays at the US 52 interchange and the US 2/13th Street East intersection also contributing to travel time increases

PM peak hour travel times between key origin-destination pairs in the 2045 low growth, moderate growth, and high growth scenarios are shown in Figure 11, Figure 12, and Figure 13, respectively. PM peak hour intersection delays at key intersections are shown in Table 3.

Table 3 - 2045 PM Peak Intersection LOS at Key Intersections

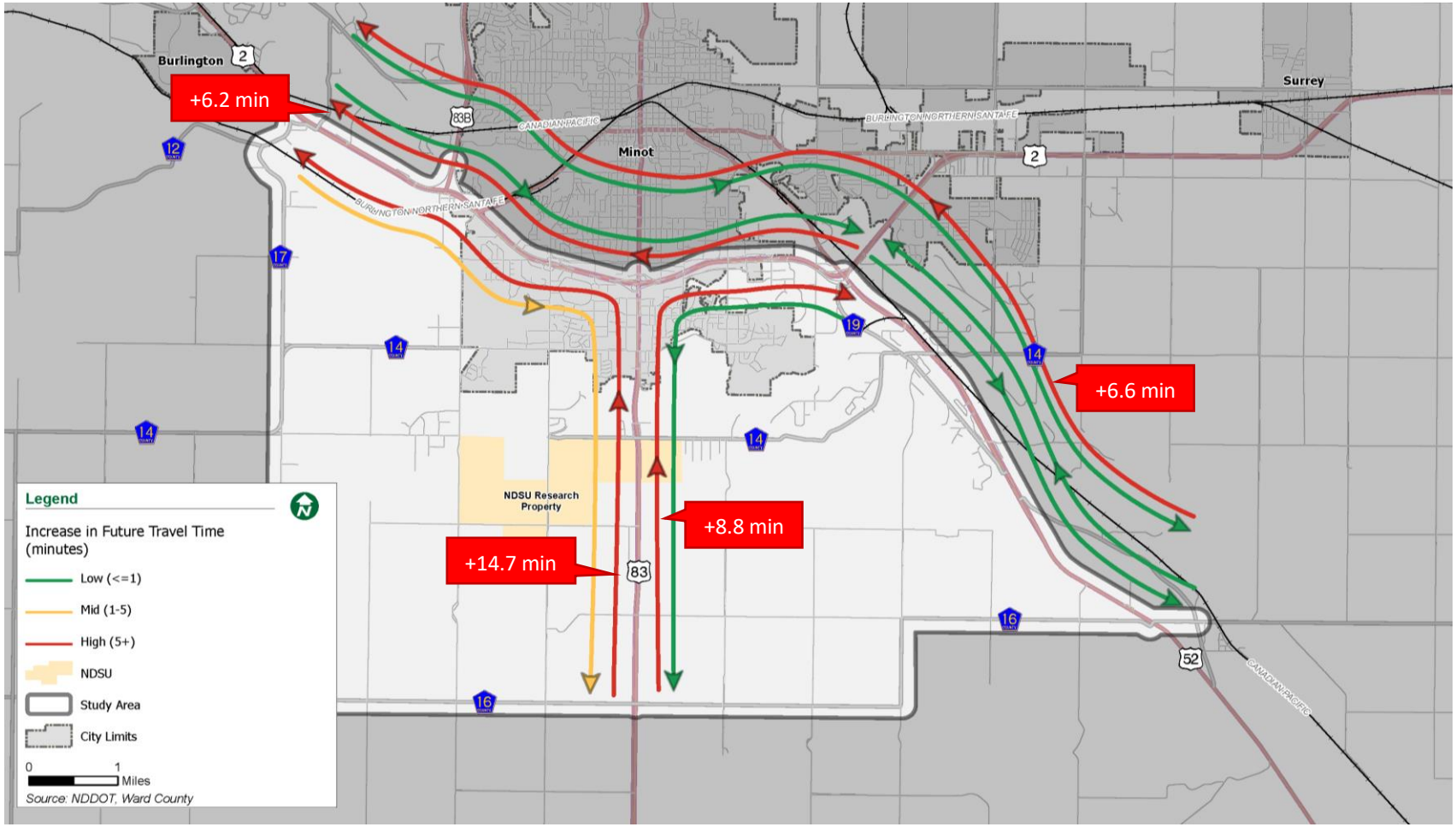
Intersection	Traffic Control	Existing	2045 Low	2045 Moderate	2045 High
US 2 and US 2 NW Bypass	Signal	B	C	E	F
US 2 and 13th St E	Signal	C	D	D	E
US 52 and US 2 North Ramps	TWSC	C (WB)	F (WB)	F (WB)	E (WB)
US 52 and US 2 South Ramps	TWSC	C (EB)	C (EB)	D (EB)	B (EB)
US 83 and US 2 North Ramps	Signal	A	B	B	C
US 83 and US 2 South Ramps	Signal	A	B	B	C
US 83 and 31st Ave S	Signal	C	C	F	F
US 83 and 37th Ave S	Signal	B	C	C	C

Figure 11 - 2045 PM Peak Travel Time Increases (Low Growth Scenario)



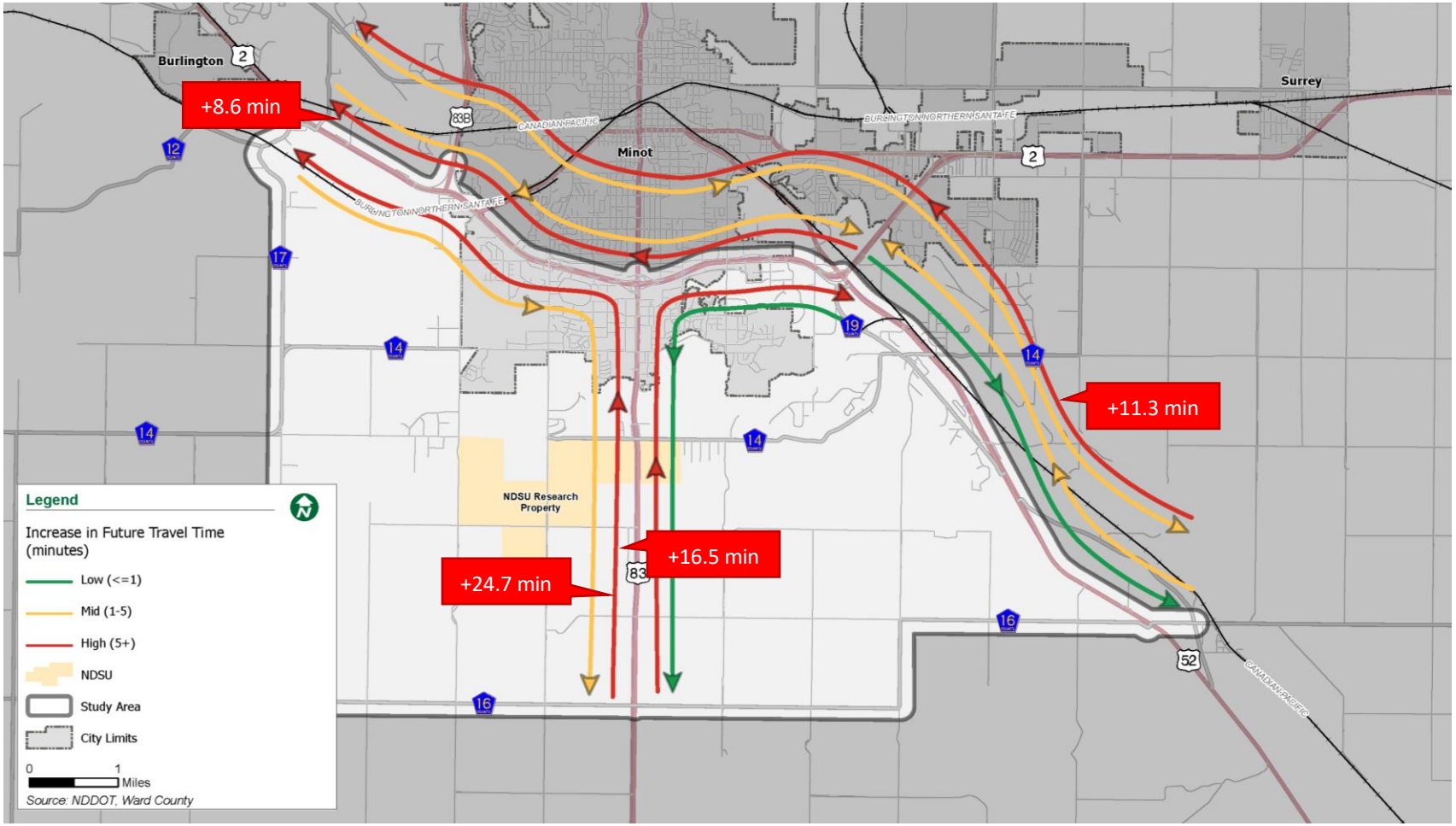
Note: Travel time increases are compared to existing PM peak hour

Figure 12 - 2045 PM Peak Travel Time Increases (Moderate Growth Scenario)



Note: Travel time increases are compared to existing PM peak hour

Figure 13 - 2045 PM Peak Travel Time Increases (High Growth Scenario)



Note: Travel time increases are compared to existing PM peak hour

Future Traffic Safety

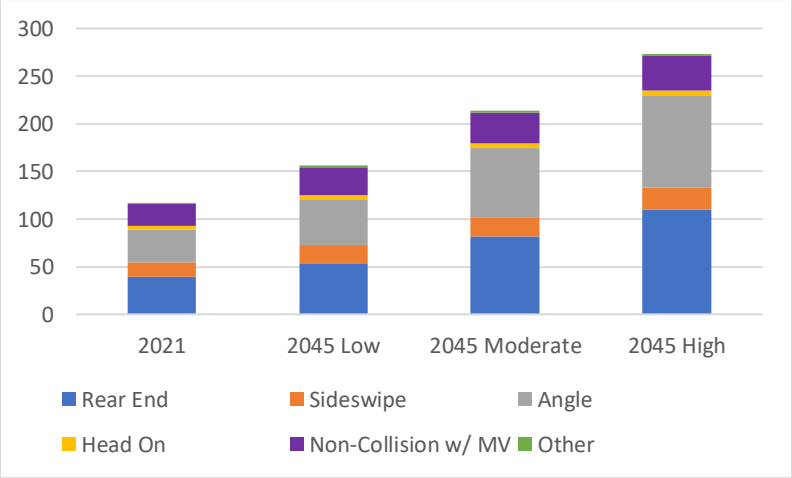
Traffic growth and associated congestion impacts are expected to increase crash potential throughout the study area. Crash patterns through 2045 were estimated using the following principles:

- Sideswipe, head-on, and single vehicle crash potential will increase proportionally with traffic volumes
- Rear-end and angle crash potential will increase proportionally with traffic delays

Using these principles, annual crash totals in each 2045 traffic growth scenario are shown in Figure 14. The following increases in crash frequency are predicted:

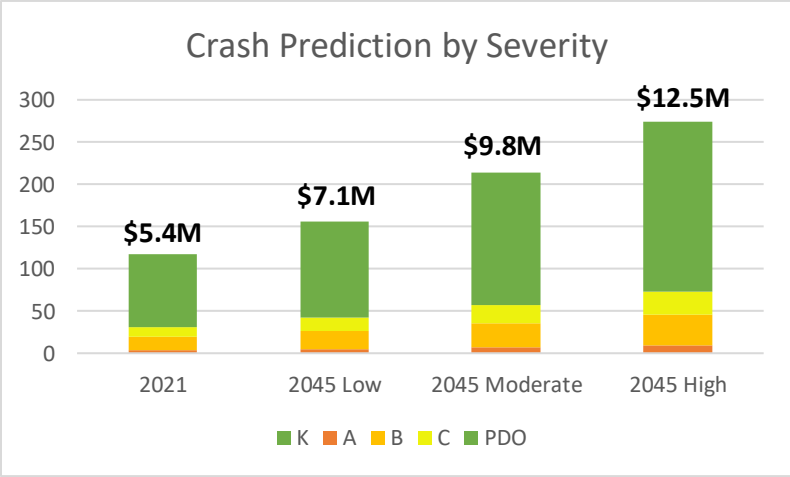
- 32 percent increase in 2045 Low Growth Scenario
- 82 percent increase in 2045 Moderate Growth Scenario
- 133 percent increase in 2045 High Growth Scenario

Figure 14 - Annual Crash Prediction by Type



Crash totals by severity were also predicted in each of the 2045 traffic scenarios and are shown in Figure 15. The estimated annual cost of crashes is expected to increase from around $5.4 million to a range of $7.1 million to $12.5 million, depending on the level of traffic growth in the area.

Figure 15 - Annual Crash Prediction by Severity



Crash Hotspots

Crash issues are expected to be most exacerbated by traffic growth in areas where existing crash rates are already elevated.

US 83: US 2 to 54th Avenue South

The current crash rate on the segment of US 83 between 54th Avenue South and US 2 is above the critical crash rate, with the most common crash types being rear-end crashes (47 percent), angle crashes (19 percent), and side swipe crashes (18 percent).

- Each of these crash types are expected to increase in frequency with additional traffic/congestion on the corridor.
- This segment of US 83, especially north of 37th Avenue is expected to have the most significant congestion, with a breakdown of traffic flow (LOS F) expected in the 2045 PM peak hour in both the Moderate Growth and High Growth Scenarios. Specifically, PM peak hour northbound travel times between 37th Avenue South and US 2 are expected to increase by over 5 times in the Moderate Growth Scenario and by 9 times in the High Growth Scenario
- AM peak hour congestion through 2045 is expected to be less significant, however travel time increases in the range of 15 to 20 percent are still expected in the Moderate Growth and High Growth scenarios

US 2: Evergreen Avenue and West Burdick Expressway Intersections

The minor approach stop controlled intersection of US 2 and Evergreen Avenue has an existing crash rate above the critical crash rate, with 73 percent of crashes being angle crashes.

- The west portion of US 2 in the Minot urbanized area is one of the areas with the highest amount of forecast congestion, with PM peak hour westbound travel times more than doubling in the 2045 Moderate and High Growth Scenarios.
- These delay increases will likely increase angle crash potential due to drivers on the stop-controlled approach making more aggressive gap-selection decisions.

The minor approach stop controlled intersection of US 2 and West Burdick Expressway is also above the critical crash rate, with an even split of rear-end and angle crashes. Like the Evergreen Avenue intersection discussed above, PM peak hour congestion in the 2045 Moderate and High Growth Scenarios will likely increase angle crash potential due to poor gap availability, and will also increase rear-end crash potential due to more frequent stop-and-go traffic and lengthy queues.

US 2 and US 83 Northwest Bypass

The intersection of US 2 and the US 83 Northwest Bypass is not currently above the critical crash rate, however with rear-end crashes being the most common crash type (55 percent), congestion increases in the 2045 PM peak are hour are expected to increase rear-end crash potential. For example, operations are at PM peak LOS B under existing conditions, with PM peak LOS E expected in the 2045 Low Growth Scenario and PM peak LOS F expected in the Moderate and High Growth Scenarios.

III. Preliminary Value Assessment

Methodology

To help guide subsequent alternatives analysis, potential traffic shifts were estimated for two preliminary connector route alignments:

A. Route generally following County Road 16 and County Road 17
B. Route generally following County Road 14 and 30th Street SW

Traffic carrying potential for both the southwest portion (west of US 83, south of US 2) and the southeast portion (east of US 83, south of US 2) of the connector route was estimated for each the two preliminary alignments. Traffic estimates are based on travel times between key origin-destination pairs, with estimated travel times based on existing travel time data and simulated travel time data. This analysis was completed for existing traffic conditions and for 2045 traffic conditions in each of the three growth scenarios.

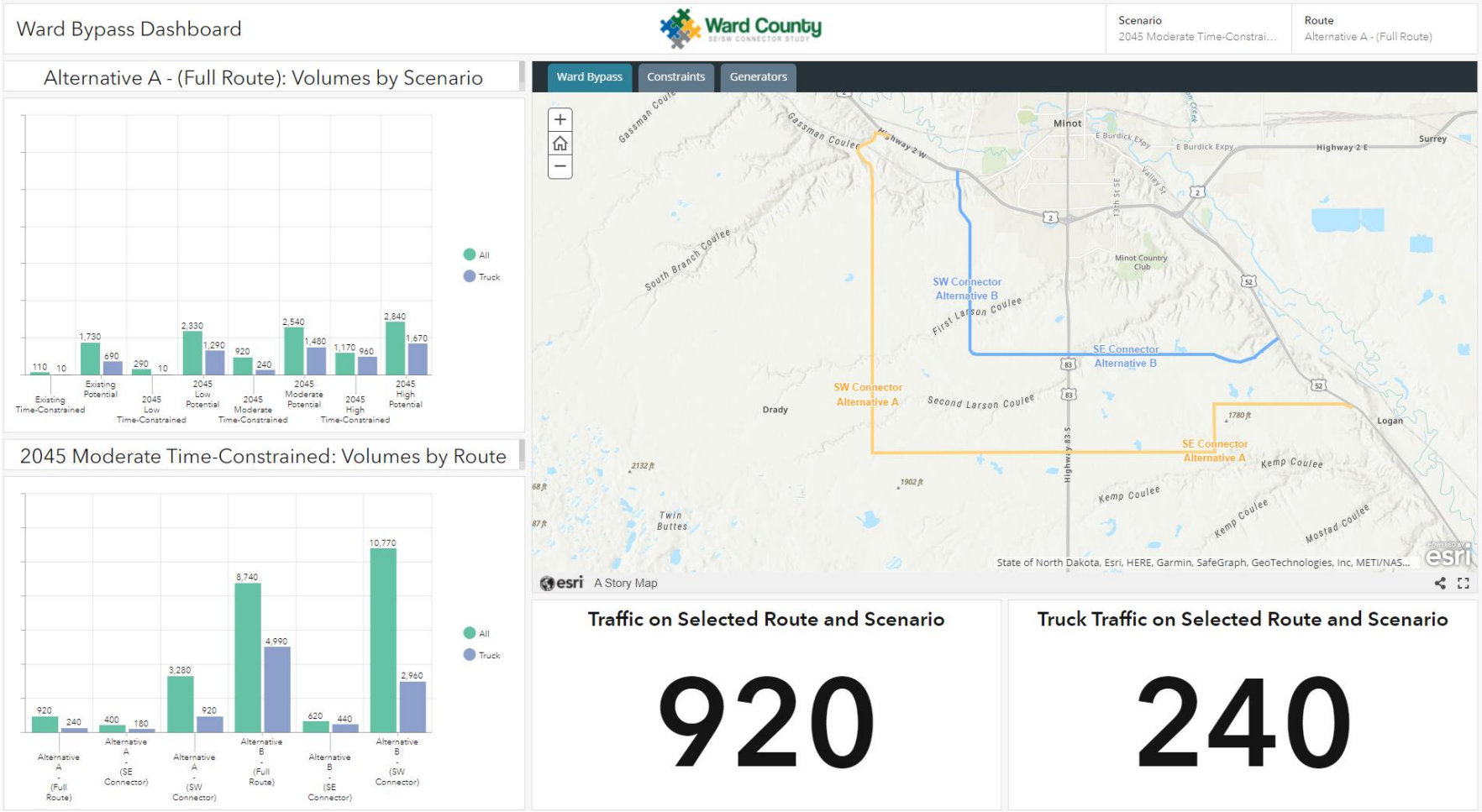
This preliminary analysis assumes that traffic will use routes with the lowest travel time, with estimated daily traffic volumes on each connector route concept shown in Figure 16 and Figure 17.

Results

Based on travel time analysis, it is clear that a southwest connection would carry much higher traffic volumes than a southeast connection. A southeast connection is expected to carry fewer than 1,000 vehicles per day regardless of the growth scenario or alignment, where a southwest connection is expected to carry an approximate range of 2,500 to 12,000 vehicles per day depending on the growth scenario or alignment that is being considered. The southeast alignment does become particularly valuable once the SW Connector Corridor is in place as a connection between southeast and west of Minot without going through the congested city center. Under this scenario, the SE Connector Corridor would carry as many as 1,300 vehicles (400 trucks) by 2040.

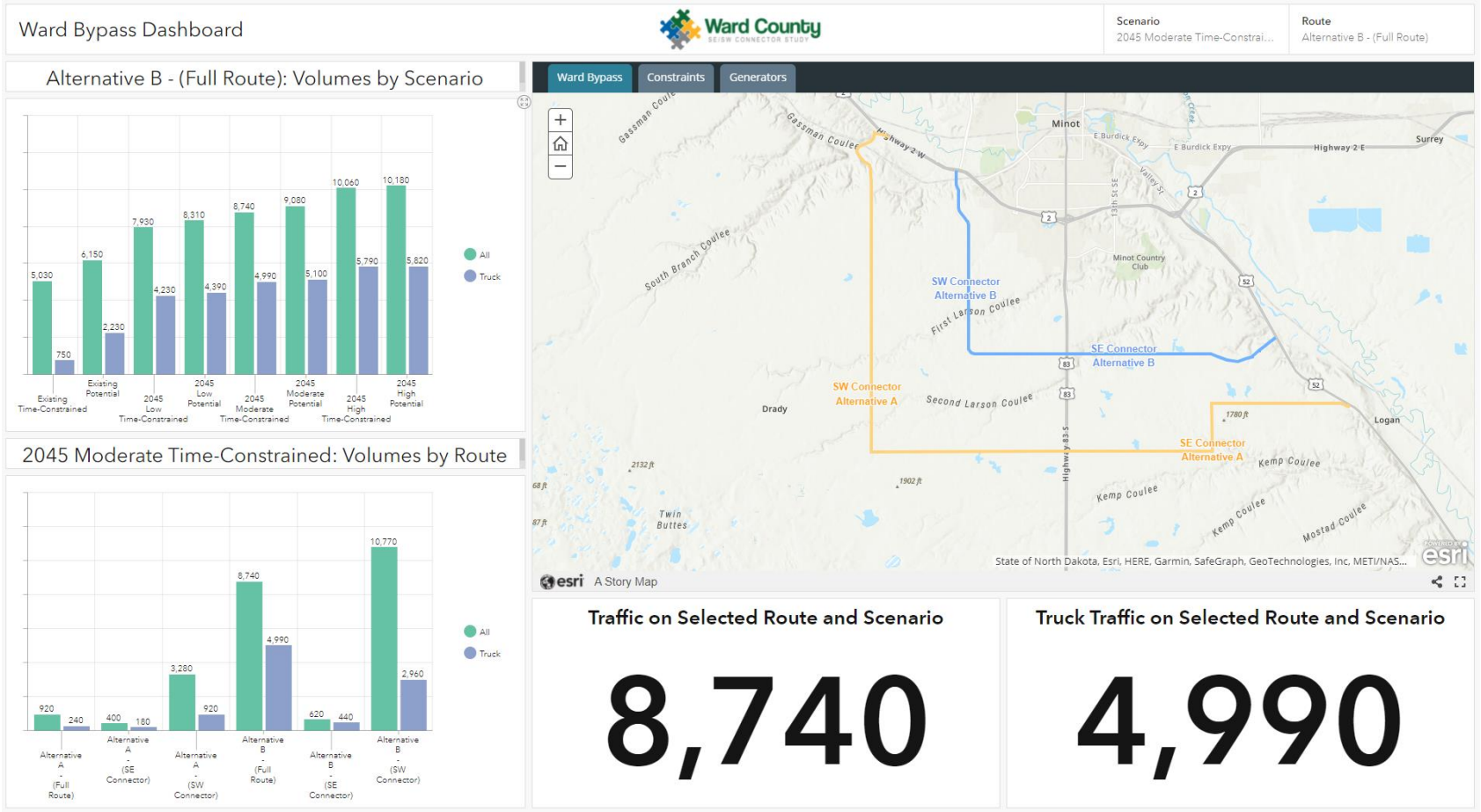
Analysis also shows that the traffic carrying potential of a connector route is maximized if the connector route is closer to the Minot urbanized area. For example, the southwest segment of Alternative A (generally following CR 14 and 30th Street SW) is expected to carry between 7,500 and 12,000 vehicles per day depending on the scenario being considered. In contrast, the southwest segment of Alternative B (generally following CR 16 and CR 17) is expected to carry only a range of 2,300 and 3,700 vehicles per day.

Figure 16 – Estimated Daily Traffic on Connector Route A



*The Full Route Analysis includes traffic that would use the entire Connector Corridor and is not additive of the results from the SW and SE Connector Corridor Results in this graphic.

Figure 17 – Estimated Daily Traffic on Connector Route B



*The Full Route Analysis includes traffic that would use the entire Connector Corridor and is not additive of the results from the SW and SE Connector Corridor Results in this graphic.

Ward County

SE/SW CONNECTOR STUDY

Section 3

Environmental Assessment

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Table of Contents

List of Figures

I. Environmental Screening

Environmental screening was completed for the existing US 2/52 Route and the potential connector corridor alignments. The findings related to potential environmental impacts within the footprint of the corridor will be used to inform and evaluate corridor alternatives as well as a primer for required National Environmental Policy Act (NEPA) and state environmental reviews during project development.

Land Use

Land use within the project area is primarily dominated by cropland with exception to developed areas located near Minot and a few residential developments located in the northern portions of Afton and Sundre townships. Please refer to Figure 1. There is no federal land ownership within the project area; however, there are parcels of private landownership with federal wetland easement protections. For more information regarding wetland easement, please refer to the Waterbodies section.

State owned property within the project area includes the North Dakota State University (NDSU) North Central Research Extension Center. This research center is primarily focused on studies related to crop production including crop rotation, nitrogen and sulfur needs, row spacing, weed control and disease protection. This facility also specializes in seed production and is an integral part of the planning and production of foundation seed in the state.

Waterbodies

While there are no named waterbodies, the project area does contain a number of water features that could affect the design and location of the project. Please refer to Figure 2. Several large drainages are located within the project area. These features are identified in the National Hydrography Dataset (NHD) as blueline features all draining to the Souris River located just east of the project area. It can be assumed that any wetland or other water features associated with these drainages would be under the jurisdiction of the US Army Corps of Engineers (USACE) and would require permitting if impacted. In addition to drainage features, there are also a number of wetland basins located throughout the project area. Many of these basins are identified in the National Wetland Inventory (NWI) dataset; however, based on analysis of aerial imagery, it is likely that many more wetlands exist in addition to those identified in the NWI dataset. USACE jurisdiction of these features is not certain, but many of these basins appear to have outlets (i.e., they are not closed basins) that may make them jurisdictional features under the regulatory authority of the USACE. Determination of jurisdiction would require the completion of a formal wetland delineation for submittal to the USACE along with a request for jurisdictional determination.

Figure 1: Existing Land Use

Southwest Southeast Connector Corridor Study

NDDOT/Ward County, ND

Land Use

September 2021

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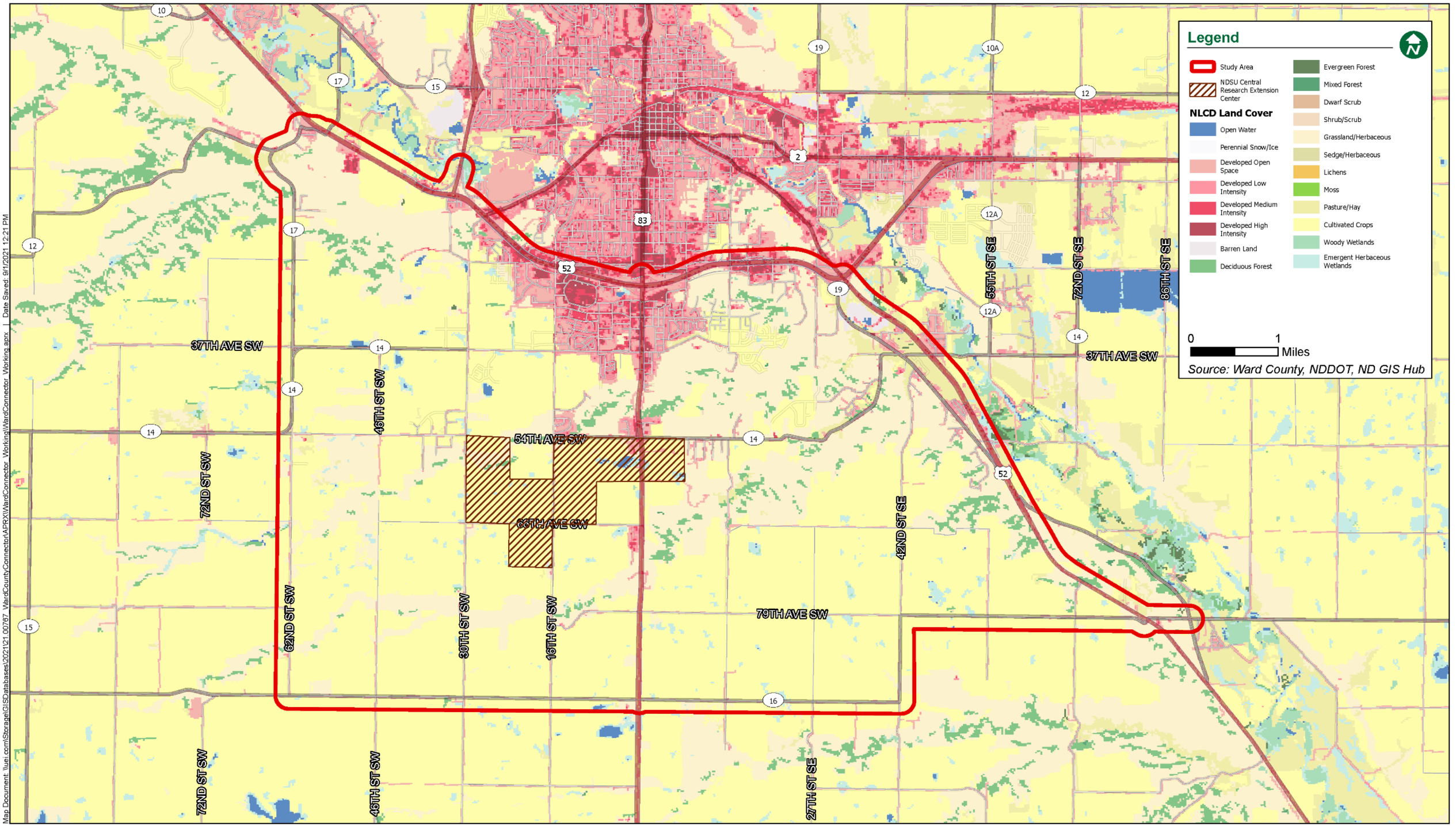

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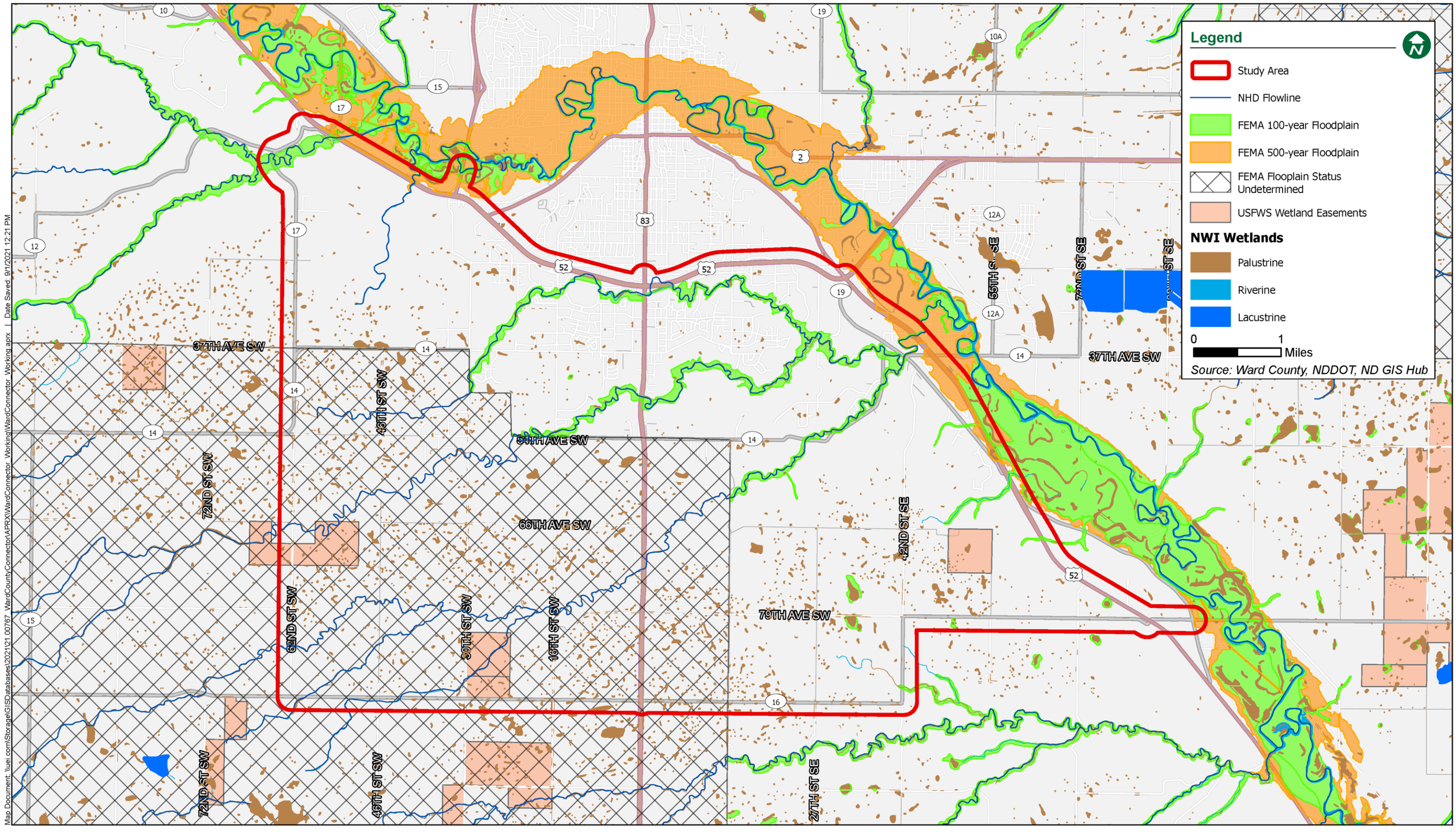
Figure 2: Water Features

Southwest Southeast Connector Corridor Study

NDDOT/Ward County, ND

Water Features

September 2021



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As previously mentioned in the Land Use section, there are a number of privately owned parcels of property within the project area that are subject to protective wetland easements administered by the US Fish and Wildlife Service (USFWS). These protective easements prohibit certain development activities but are only relevant to specific wetland features located on the property, not the property as a whole. If the project were to impact protected wetland features, consultation with the USFWS would be required including permitting and mitigation.

Numerous areas of mapped floodplains are located within the study area, primarily associated with the large drainage features that feed into the Souris River. If floodplains area impacted by the project, these impacts should be minimized to the extent possible by ensuring that all culverts and other hydraulic structures are properly designed and sized to avoid inducing upstream or downstream impacts. Additionally, projects impacting designated floodplains will require the acquisition of a floodplain permit from the local floodplain administrator.

Threatened and Endangered Species

Utilizing the USFWS Environmental Conservation Online System (ECOS) Information for Planning and Consultation (IPaC), federally listed species with the potential to occur within the project area include the Dakota skipper, northern long-eared bat (NLEB), piping plover, rufa red knot and whooping crane.

The Dakota skipper is a small butterfly that relies on healthy native prairie to complete its life cycle. The Dakota skipper remains in the larval stage throughout the majority of its life cycle but is most visible during the brief adult flight stage occurring from mid-June to early July, which is the only time in which the species can reproduce and disperse. In addition to its sensitive life cycle, the primary factor affecting recovery of the species is the widespread conversion of native grassland through over-grazing, agricultural uses and disruption of natural prairie fire cycles (USFWS, 2014a). The majority of the project corridor is dominated by cropland and developed areas which would not be considered suitable habitat for the Dakota skipper; however, potential areas of undisturbed native prairie exist along the draws and drainages within the project area. Please refer to Figure 3. Depending upon vegetation composition, these areas may be capable of providing suitable habitat for the Dakota skipper. Botanical survey would be required in order to definitively determine suitability of these areas.

The NLEB is known to occur across much of the eastern half of the United States including North Dakota. This species has experienced a dramatic decline in population due to the fungal disease, white-nose syndrome (WNS). In the summer months, the species typically roosts under bark or crevices of trees as well as caves and mines. In the winter, the NLEB utilizes caves and mines as hibernacula (USFWS, 2015). Habitat in the form of forested areas is present within the project area; however, the USFWS published a final 4(d) rule for the NLEB in 2016 focusing on protecting bats within the WNS zone in close proximity to hibernacula and maternity roost trees. As of July 27, 2021, North Dakota is located within the WNS zone, but no hibernacula or maternity roost trees have been identified within the state (USFWS, 2021).

The piping plover is a threatened small migratory shorebird (USFWS, 2016). Preferred habitat for the piping plover includes sparsely vegetated sandbars and gravel beaches associated with riverine habitats, and alkali lakes and wetlands. Habitat destruction and poor breeding success are the primary reasons

for the current listing status of the piping plover. Within the project area there are a number of wetlands that may be capable of providing suitable habitat for the species. Critical habitat has been designated for the piping plover, the closest parcel of which is located approximately 15 miles southwest of the project area.

The rufa red knot is a medium sized shorebird that migrates annually between breeding grounds in northern Canada, and wintering grounds in the southeastern United States, northeastern Gulf of Mexico, and South America. While most follow migration routes along the east or west coasts of North America, small numbers of the species follow an inland migration route, which may include stopovers in the Great Plains, including North Dakota (USFWS, 2014b). Preferred stopover habitat includes sandy or gravely beaches, tidal mudflats, salt marshes, shallow coastal impoundments and peat banks. (BIA, 2014). Suitable habitat within the project area is likely limited; however, some of the wetlands and other waterbodies may be capable of providing stopover habitat for the species.

Whooping cranes are documented annually within North Dakota during their spring and fall migrations between the southern United States and central Canada. Migration stopover habitat for the whooping crane consists of palustrine wetlands for roosting and croplands for feeding (USFWS, 2012). In general, areas of shallow water without visual obstructions (e.g., high or dense vegetation) are preferred over heavily vegetated wetlands (CWS and USFWS, 2007). Ward County is located within the primary whooping crane migration corridor through North Dakota and the project area contains both cropland and wetlands capable of providing feeding and roosting stopover habitat.

Figure 3: Threatened and Endangered Species

Southwest Southeast Connector Corridor Study

NDDOT/Ward County, ND

Threatened and Endangered Species

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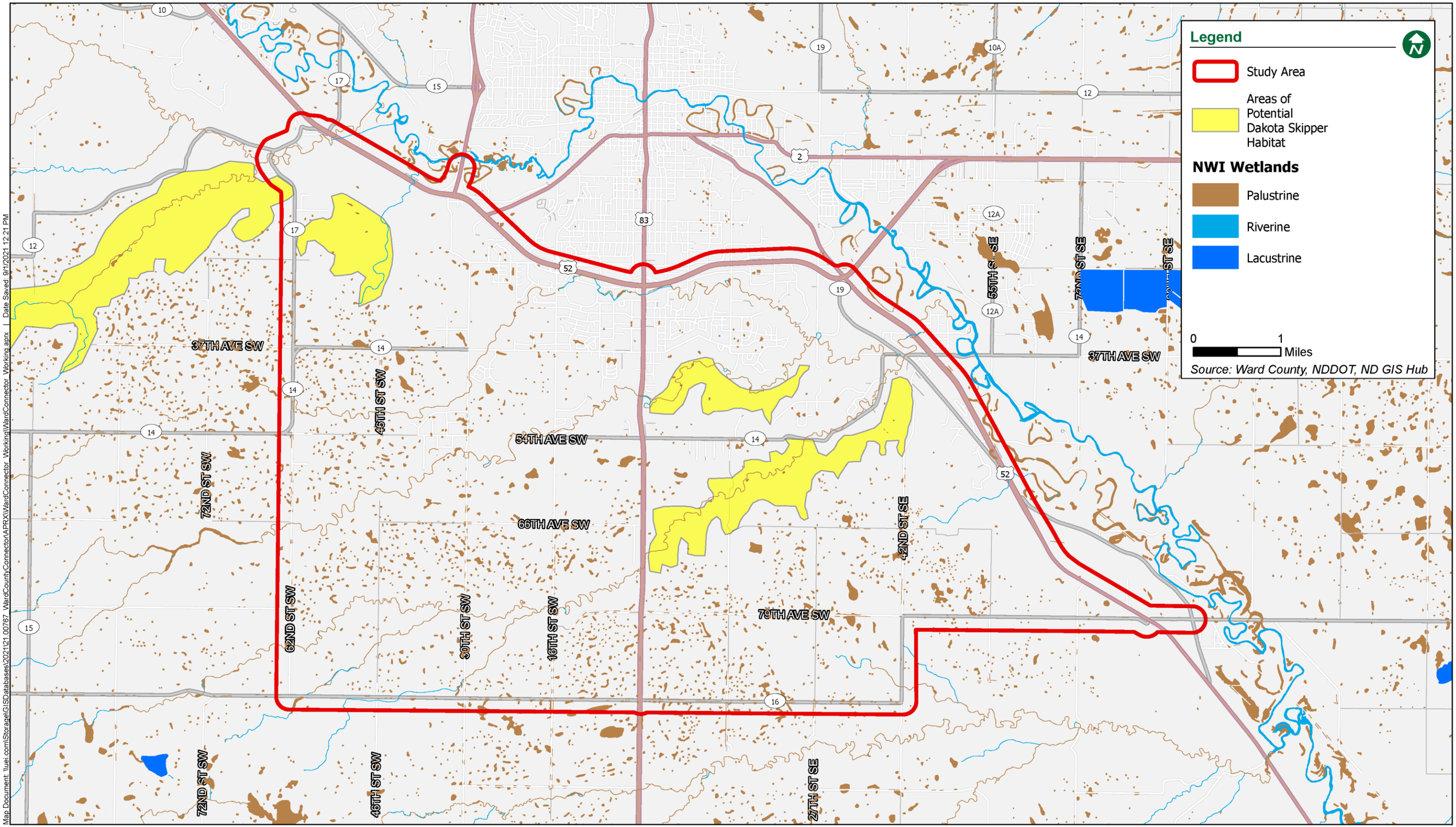

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Section 4(f) Properties

Section 4(f) is a special provision within the Department of Transportation Act of 1966, 49 United States Code (U.S.C.) 303, and Section 18(a) of the Federal-Aid Highway Act of 1968, 23 U.S.C. 138. This provision stipulates that agencies under the US Department of Transportation, including the Federal Highway Administration (FHWA), cannot approve the use of land from publicly owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historical sites unless there is no feasible and prudent avoidance alternative, or use of the property would result in a de minimis impact.

Known properties that would qualify for protection under Section 4(f) are limited within the project area. These include Radio City Park and various shared use paths, all of which are located within the city limits of Minot and are unlikely to be impacted any alternatives developed for the project. Cultural resources and historic sites are also eligible for protection under Section 4(f). Known cultural resources and historic sites are discussed in more detail in the Cultural Resources & Historic Properties section. As discussed in this section, there are numerous areas within the study area that have not been previously inventoried for cultural resources and historic properties so there may be additional Section 4(f) properties located within the action area that are not currently known.

ENVIRONMENTAL JUSTICE

In accordance with Executive Order 12898, FHWA has implemented Environmental Justice (EJ) guidance to identify and address disproportionately high and adverse effects of the agency's programs, policies, and activities on minority populations and low-income populations to achieve an equitable distribution of benefits and burdens. Utilizing the US Environmental Protection Agency's EJScreen tool, census block groups within the project area were analyzed to determine if EJ communities are present.

Relative to the state of North Dakota, one census block group within the project area fell into the 66th percentile relative to low-income populations. All other block groups within the project area were in the less than 50th percentiles relative to low-income populations. Relative to people of color populations, two block groups fell within the 80th and 90th percentile, while one fell within the 72nd percentile. All other block groups within the project area were in the less than 50th percentiles relative to people of color populations. Please refer to Figure 4 and Figure 5.

Figure 4: Non-White Populations

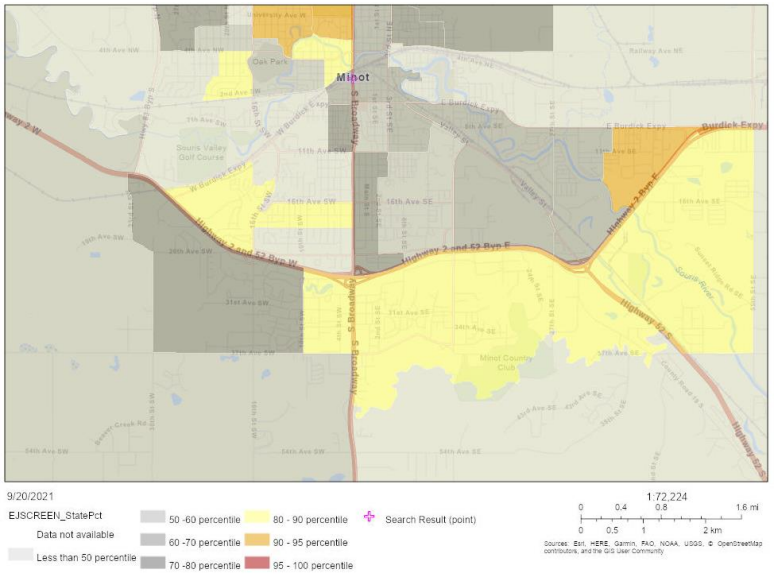
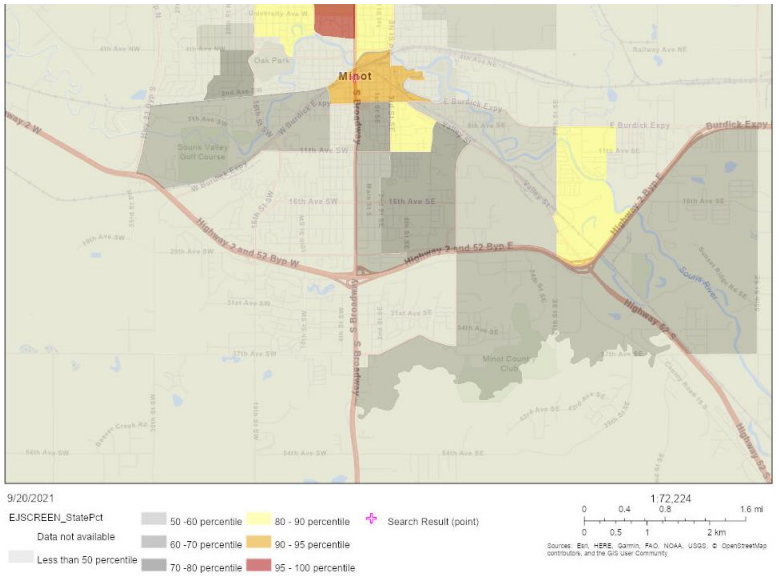


Figure 5: Low Income Populations



Cultural Resources & Historic Properties

Section 106 of the National Historic Preservation Act of 1966, as amended, requires that projects needing federal approval and/or federal permits be evaluated for the effects on historic and cultural properties included or eligible for listing on the National Register of Historic Places (NRHP). Eligibility for listing on the NRHP is divided into three classifications: eligible, not eligible and unevaluated. Typically, eligible sites warrant protection under Section 106 while non-eligible sites do not. Unevaluated sites are sites that may be eligible for listing, but further testing and evaluation are required to make an eligibility determination. Figure 6 shows the publicly available data for cultural and historic resources.

A Class I Literature Review of the North Dakota State Historic Preservation Office (SHPO) records was conducted by Metcalf Archaeological Consultants to identify known cultural and historic resources within the project area. This review identified a number of sites and properties with cultural and/or historic resources; however, the majority of the project corridor has not been previously inventoried, and it is assumed that many more cultural and historic resources exist in addition to the sites identified in the literature review. Additionally, many of the identified sites are unevaluated and would require additional field work to refine site boundaries and determine eligibility.

One property that was not included in the literature review is the Gassman Coulee Trestle Bridge located in the northwest portion of the project area. Built in 1899, this structure is potentially historic and eligible for listing on the NRHP; however, due to the lack of previous inventories in the area it has not been evaluated for eligibility. Once project alternatives have been developed, a Class III Cultural Resources Inventory of the proposed alignments would be required to further investigate potential cultural and historic resources within the study area. If eligible sites are identified along the project corridor, avoidance is always recommended. If avoidance is not possible, consultation with the SHPO would be required. Additionally, cultural and historic resources eligible for listing on the NRHP are considered Section 4(f) properties and therefore can only be impacted if impacts are determined to be de minimis or there are no feasible and prudent alternatives.

In accordance with 16 U.S.C. 470hh(a), information concerning the nature and location of archaeological resources is confidential. Such information is exempt from the Freedom of Information Act and is not included in this document.

Southwest Southeast Connector Corridor Study

NDDOT/Ward County, ND

Cultural and Historic Resources

September 2021

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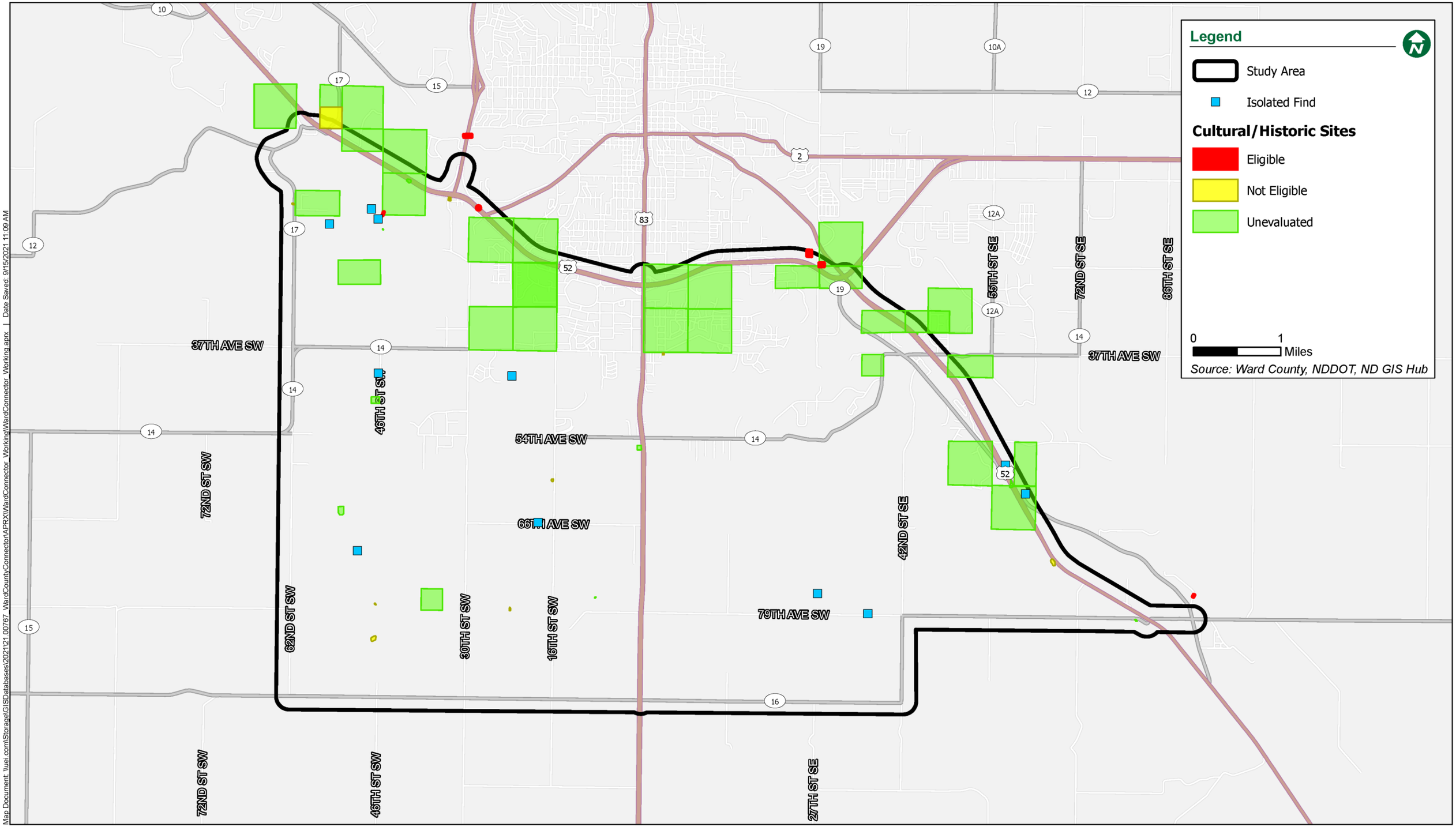

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II. Solicitation of Views

This study was built using the FHWA Planning and Environmental Linkages (PEL) approach. Planning and Environment Linkages (PEL) represents a collaborative and integrated approach to transportation decision-making that 1) considers environmental, community, and economic goals early in the transportation planning process, and 2) uses the information, analysis, and products developed during planning to inform the environmental review process. The benefits of the PEL process are improved relationship-building, improved project delivery timeframes, and on-the-ground outcome benefits.

To achieve the PEL Vision, Solicitation of Views (SOV) letters were sent to 37 agencies with potential impacts or knowledge of the area. Seven responses were received. Below is a list of the seven responding agencies and the potential conflicts they covered in their response. The full SOV responses can be found in Appendix A.

- Department of Water Resources – Floodplains, Floodway
- Minot Air Force Base – Convoy Operations
- Minot Fire Department – Potential 6th station in south Minot
- ND Department of Environmental Quality – NDPDES, UST
- ND Parks and Recreation – 6(f), Species of Concern
- US Army Corps of Engineers – Section 404
- Western Area Power Administration (WAPA) – 115 kV line in SE corner of study area

III. Purpose and Need

Ward County is a regional freight and economic hub that has experienced significant population growth over the past 20 years. Between 2000 and 2020, the population of Ward County grew by approximately 18 percent and is expected to continue this growth trajectory through 2040. The vast majority of this growth has occurred within and around Minot. This growth, combined with the location of Minot at the convergence point of three regionally and nationally significant US highways, has created the demand for an improved transportation system capable of addressing the current and future needs of the region. The purpose of the proposed project is to provide a transportation system that would:

- Address social demands created by the southern expansion of the Minot urban area and facilitate economic development within the region by providing an efficient and reliable highway system for the movement of freight
- Satisfy transportation demands identified in local and statewide planning documents
- Improve system linkage and roadway reliability by providing an alternative corridor capable of accommodating a 105,500-pound legal gross vehicle weight without height restrictions.
- Address current and future roadway capacity issues within the project area.

The purpose of the project, as previously identified, is being driven by the following underlying needs.

Social Demands/Economic Development - The City of Minot is a uniquely situated economic hub. It is the fourth largest city in North Dakota, is located at the convergence point of three major US highways and several major rail lines, it is economically influenced by the Minot Airforce Base and Port of North Dakota, it is surrounded by agricultural production, and it is located near the eastern edge of the Bakken oil play. Consequently, the transportation network in and around Minot plays a key role in the overall social and economic dynamics of the region.

Within an around Minot, trucks make up a significant portion of the overall traffic volumes along US 2, US 83 and US 52. Based on origin destination analysis, approximately 32 percent of truck traffic on these highways is regional traffic destined for locations outside of Minot. Currently, these three highways are located near the southern edge of the Minot urban core; however, future land use models predict increased urban expansion to the south. This future expansion is anticipated to be comprised primarily of low-density residential development creating both a social and economic need for providing an alternate southeast and southwest connector corridor for removing regional freight traffic from the urban core.

Additionally, as this urban expansion occurs, there will be a need to provide additional arterial roadway connections for local traffic. Capacity issues have already been identified on the arterial system within the project area and it is anticipated that these issues will become more significant under future traffic growth scenarios as traffic generators such as the new Trinity Hospital campus will place additional strain on the roadway network. These capacity issues also affect emergency services and their ability to respond in a timely manner, further highlighting the need for an arterial roadway to relive pressure on the local roadway network.

Transportation Demand – The concept of a south side connector corridor has been previously identified and studied in the Minot 2035 Long Range Transportation Plan and the Ward County Transportation Plan. These plans both identified anticipated urban expansion of Minot to the south and a need for an alternate corridor around the south side of Minot to accommodate freight and agricultural needs while also providing a benefit to local traffic. Additionally, the North Dakota State Freight Plan identifies the portions of US 2, US 83 and US 52 occurring within the project area as Level 1 in the North Dakota Strategic Freight System Index meaning they are critical rural freight corridors for both interstate and international freight movement. These existing plans all highlight the need for providing a reliable regional freight corridor while addressing future expansion of the Minot urban area.

System Linkage – In North Dakota, the legal gross vehicle weight on state highways is 105,500 pounds unless otherwise posted. Within the project area, the only roadways designed to accommodate gross vehicle weights up to 105,500 pounds are US 2, US 83 and US 52, all of which traverse through the urban core of Minot. There are currently no alternative options around the south side of Minot for vehicles exceeding a gross vehicle weight of 80,000 pounds. Additionally, along US 2 at the 16th Street Southwest interchange there is currently a 16-foot height restriction. Over height vehicles traveling this route do not currently have a convenient alternate route for bypassing this height restriction. This lack of alternative roadways can create reliability issues in the event of roadway closures and exacerbate capacity issues as the population of Minot continues to grow.

US 83 near the US 2/US 52 interchange is one area of particular concern with regards to regional freight movements. As US 83 nears this interchange from the south, the existing roadway corridor becomes increasingly urbanized and access density increases significantly. Seven access points are currently located within one mile of this interchange, and as previously stated, urban expansion of Minot to the south is anticipated to continue. Based on the origin destination study completed for this project, approximately 25 precent of all truck traffic traveling north on US 83 within the project area is regional traffic destined for locations outside of Minot. Providing an alternate roadway connection around the south side of Minot would remove these vehicles from the urban corridor, improving regional system linkage and overall network reliability.

Capacity – A traffic analysis has been completed for the project analyzing various growth scenarios to determine traffic and operational conditions now and in the future. Results of this analysis highlight existing delays within the system particularly during PM peak traffic along US 2 and US 83. Both corridors are currently classified as unreliable based on planning time index, and analysis of future growth scenarios shows these issues compounding. By 2045, it is estimated that congestion will increase network-wide delays by a range of 13 to 54 percent in the AM peak hour and by a range of 60 to 300 percent in the PM peak hour. Under a moderate traffic growth scenario, drivers traveling US 83 northbound are anticipated to experience more than 14 minutes of delay during PM peak while drivers traveling westbound on US 2 are anticipated to experience more than 6 minutes of delay. In addition to the driver delay, this breakdown in overall roadway operations is also anticipated to result in increased crash potential throughout the project study area.

Ward County

SE/SW CONNECTOR STUDY

Section 4

Alternatives Analysis

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Table of Contents

List of Figures

List of Tables

I. Background

This Alternatives Analysis report was developed to document analysis related to potential US 2/52/83 connector corridor configurations. Alternatives analysis was performed for several connector corridor route alignments as well as major junction points where a new connector corridor would intersect with the existing highway system. Analysis in this report is intended to provide a data-driven assessment of alternatives, with the goal of identifying alternatives that can be carried into project programming and eventual implementation.

The overall study process is shown in **Figure 1,** with this chapter documenting the *Analyze Routes and Intersections* phase of the study.

Figure 1: Connector Corridor Study Process

II. Development of Alternatives

The purpose of analysis documented in this chapter is to identify feasible connector corridor routing and intersection alternatives. Also included is analysis of these alternatives, including assessments of how each fare in the categories of regional mobility, local accessibility, crash potential, multimodal connectivity, cost, and environmental impacts. This information will help to develop preferred alternatives for the Southwest and Southeast Connector Corridor.

Brainstorming Workshop Summary

To help guide the development of various roadway alternatives, a Transportation Action Committee (TAC) workshop was held on December 2nd, 2021. A key component of this workshop was a brainstorming session. Attendees completed worksheets that asked questions about preferences related to the following:

- Value Profile
- Connector Corridor Routing
- Connector Corridor Characteristics
- Intersection Options

Also included in the worksheet packet was a map of the project constraints. This map included information such as road ownership, traffic counts, zoning, wetland boundaries, and 50' contour lines. Participants in the workshop were to use this map to draw their preferred routes.

There were six attendees of the second Transportation Action Committee workshop who filled out the worksheet packet. Below, is a discussion of the questions that were asked, and the answers provided by these six attendees.

Value Profile

The value profile asked attendees to assign a value (out of 100 – higher numbers mean higher priority) to each of the major evaluation categories being used to assess the alternatives (Regional Mobility, Local Accessibility, Crash Potential, Multimodal Connectivity, Cost, Environmental Impacts). The scores each attendee gave were averaged, with the averages being used to assign a weight to each factor. These scores are used during the routing alternative evaluation phase and are included within the evaluation matrices.

Value scores for the key criteria are summarized in **Figure 2** and **Figure 3.**

Figure 2: TAC Value Profile Results (Average of All Responses)

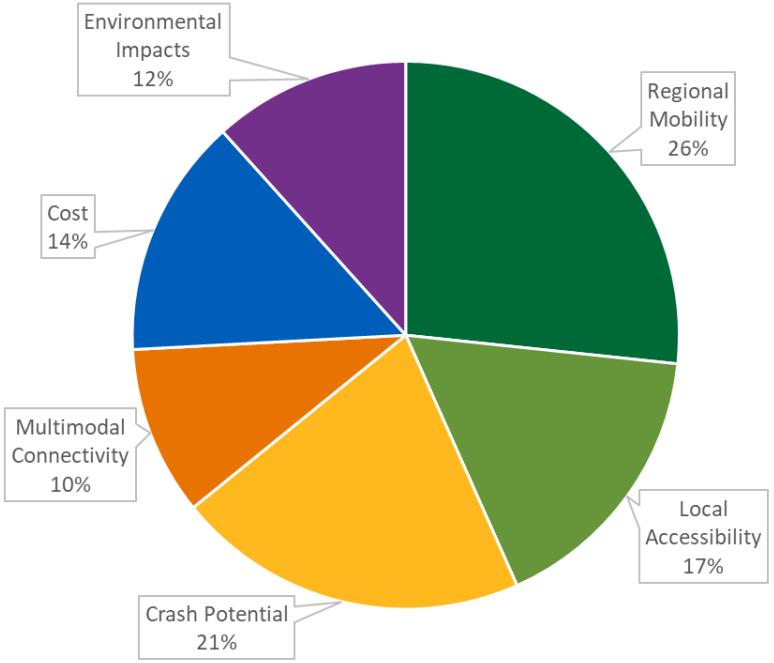
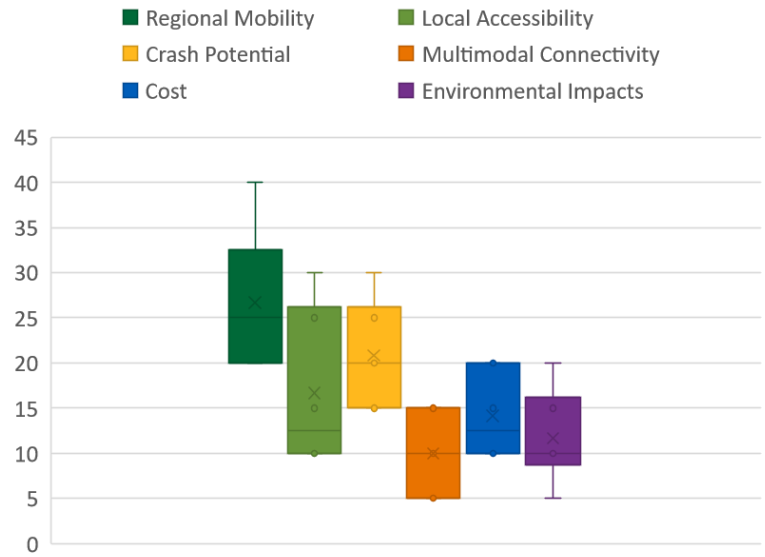


Figure 3: TAC Value Profile Results (Range of All Responses)



Routing

This question asked the attendees to rank four potential generalized routing alternatives. The four options were:

- SW Connector (US 2/52 to US 83)
- SE Connector (US 83 to US 52)
- East Connector (US 52 to US 2)
- Major Improvements to US 2/52

Attendees were also given the option to indicate if a route is unnecessary.

The SW Connector was the most popular option, receiving an average rank of 1.2. Major improvements to US 2/52 and the SE Connector were tied with an average of 2.4, while the East connector was the least preferred alternative. The East connector was deemed unnecessary by three participants, and another attendee noted that "this would be great but would be a challenge."

Connector Corridor Characteristics

The next section asked attendees to select certain corridor characteristics that they would like to see implemented. The characteristics fall into these five categories:

- Cross Section
- Multimodal Components
- Preferred Traffic Control (With Deviations Where Space and Volumes Dictate)
- Preferred Design Speed
- Access Spacing

In this section, attendees could choose more than one option for each section. Some did choose multiple options, as they felt that different parts of the corridor will require different speed limits, access spacing requirements, lane configurations, etc. Results were mixed, although a two-lane rural highway with passing lanes and a 65 miles per hour speed limit was a popular choice. Most participants noted that this vision would need to evolve through the more urbanized sections of the study area.

Intersection Options

The final question of the brainstorming workshop asked attendees about what type of intersections they would like to see on the connector. They were asked to only consider their top choice route and to choose intersection treatments for four different sections of their proposed connector, which included:

- NW Connection to US 2/52
- South Connection to US 83
- SE Connection to US 52
- Intersections (North and South) of County Road 14 and 17 with Connector Corridor

The most common type of intersection that was selected was a Reduced Crossing U-Turn Intersection, also called an RCUT. It was selected for at least one of the sections by 5 of the 6 attendees. Interchanges were also a popular choice, especially for the NW Connection section of the connector. For the intersections with County Road 14 and 17, a roundabout was an almost universal choice.

This workshop helped to determine what were some of the main desired outcomes for the SW/SE Connector Corridor. The answers

provided are taken into consideration during the decision-making process on recommended alternatives in the sections below.

Analysis and Scoring Methodology

Several options for both corridor alignments/routing and intersection designs at key connection points were proposed, evaluated, and ranked in terms of performance related to key criteria.

Performance Evaluation Criteria

Each route alignment or intersection alternative was evaluated using the technical criteria provided to the TAC in the Value Profile exercise. These technical criteria are:

Regional Mobility

Route Alignments: Based on expected traffic volumes, travel speeds, travel times, and expected delays on the proposed route.

Intersections: Based on intersection delays and levels of service, focusing on intersection approaches utilized by regional traffic.

Traffic volume data that was used for analysis related to regional mobility is based on traffic projections documented in the *Future Conditions* chapter of this study. Some adjustments were made to traffic projections based on alternative-specific roadway configurations. Projected traffic data was then used in SimTraffic traffic simulation models to estimate travel times and intersection delays throughout the study area.

Local Accessibility

Route Alignments: Based on the utility a connector route would have to local traffic, generally based on the proximity to the developed parts of Minot as well as automobile level of service along the new corridors.

Intersections: Based on intersection delays and levels of service, focusing on intersection approaches utilized by local traffic.

The same traffic modeling approach that was used for Regional Mobility assessment was applied for the Local Accessibility assessment.

Crash Potential

Route Alignments: Based on horizontal and vertical roadway geometry on connector route as well as safety improvements that can be expected in conjunction with reduction in delays and conflict exposure in the developed part of Minot

Intersections: Based on the number and types of conflict points associated with an alternative. Also based on research-supported safety statistics for specific intersection designs

Multimodal Connectivity

Route Alignments: Based on the types of pedestrian and bicycle facilities that are being proposed and the level of safety and comfort these facilities provide to non-motorized users

Intersections: Based on the ease of crossing US 2, US 83, or US 2 on foot or on bicycle

Cost

Route Alignments and Intersections: Based on planning level cost estimates

Environmental Impacts

Route Alignments and Intersections: Based on the degree of environmental and other property impacts associated with an alternative

Alternative Scoring

For each technical criterion described above, a score between 1 and 10 was assigned based on how the alternative under consideration performs. A score of 1 indicates poor performance and a score of 10 indicates very good performance.

To evaluate the overall performance of an alternative, an overall score was calculated using a weighted average of all technical criteria, with weights based on the average Value Profile score for each criterion. For example, since regional mobility was rated the most important, these scores will be weighted more heavily when calculating the overall score for an alternative.

III. Route Alignment Alternatives

Route alignment alternatives were developed and analyzed for three subareas within the project area (see **Figure 4**):

West Segment: This segment is where the proposed connector route would connect to US 2 on the west side of Minot. Eight alignment alternatives were developed for this segment. Specific details related to each of the eight alternatives are shown in **Figure 5** through **Figure 12.**

Southwest Segment: This segment covers the majority of a route that would be in the southwest quadrant of US 83 and US 2. Seven alignment alternatives were developed for this segment. Specific details related to each of the seven alternatives are shown in **Figure 13** through **Figure 19.**

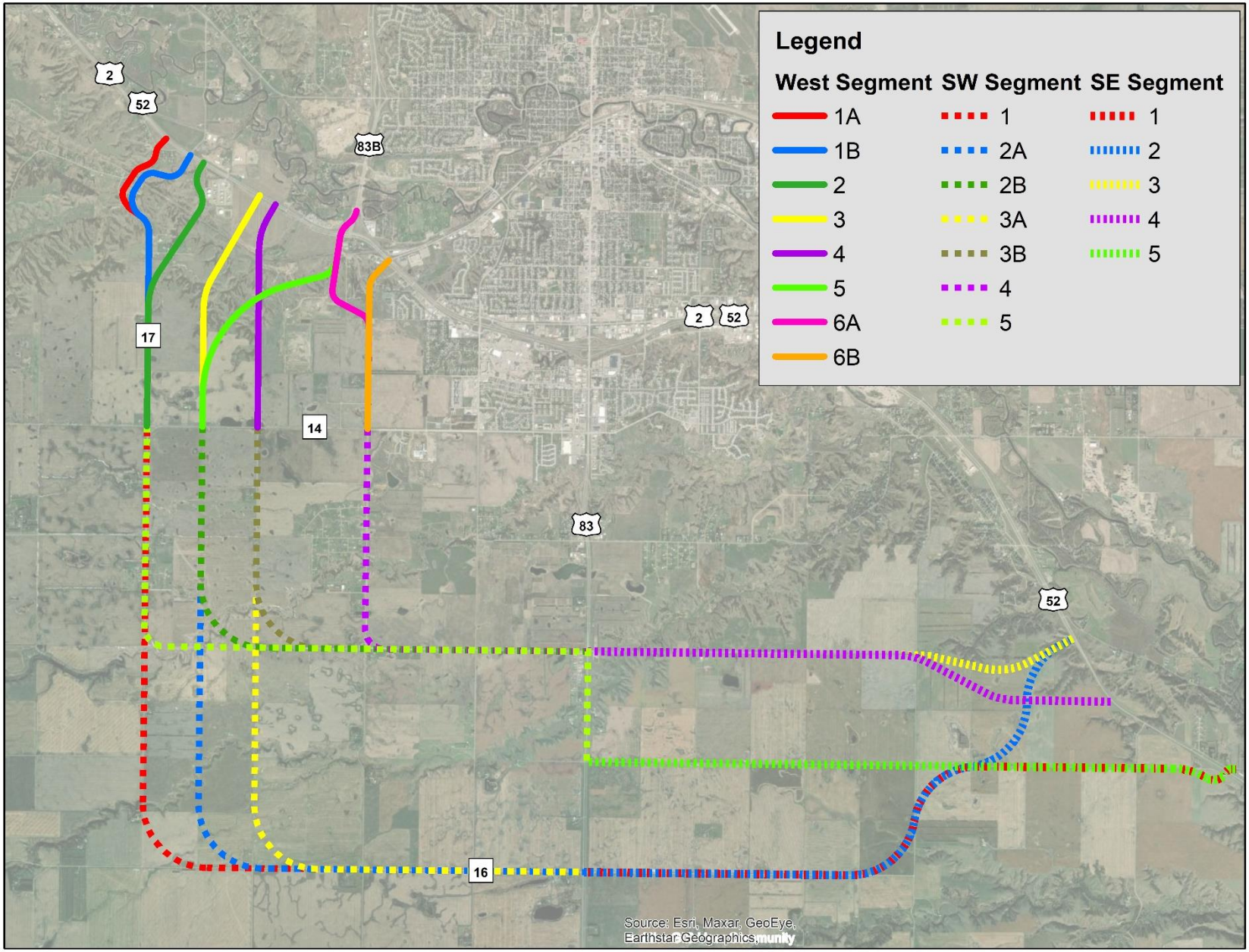
Southeast Segment: This segment covers the entire of a route that would connect south US 83 to US 52. Five alignment alternatives were developed for this segment. Specific details related to each of the eight alternatives are shown in **Figure 20** through **Figure 24.**

Near, Far, and Mid Connections

There are pros and cons associated with having a connector route either close to the developed part of Minot or further away from the developed part of Minot. As such, route alignment alternatives are broadly characterized as:

- **Near connections** – Alignments that are closer to the developed part of Minot. These alignments would still be designed to best facilitate the movement of regional traffic, however more consideration would also be given to providing utility to local traffic compared to alternatives further away.
- **Far connections** – Alignments that are farther away from the developed part of Minot. These alignments are intended to prioritize the movement of regional traffic.
- **Mid connections** – Alignments that balance local and regional traffic needs.

Figure 4: Alternatives Under Consideration



Route Alternatives Analysis Results

Results from alternatives analysis for route alignments are shown in **Figure 5** through **Figure 24**. These figures show the following key items related to each alternative:

- Horizontal alignment
- Roadway cross section
- Proposed access spacing
- Estimated 2045 daily traffic volumes
- Performance related to key technical criteria

West Segment Route Alignment Alternatives

The eight West Segment alternatives are presented in **Figure 5** through **Figure 12**. A summary of the performance of all West Segment alternatives is provided in **Table 1**.

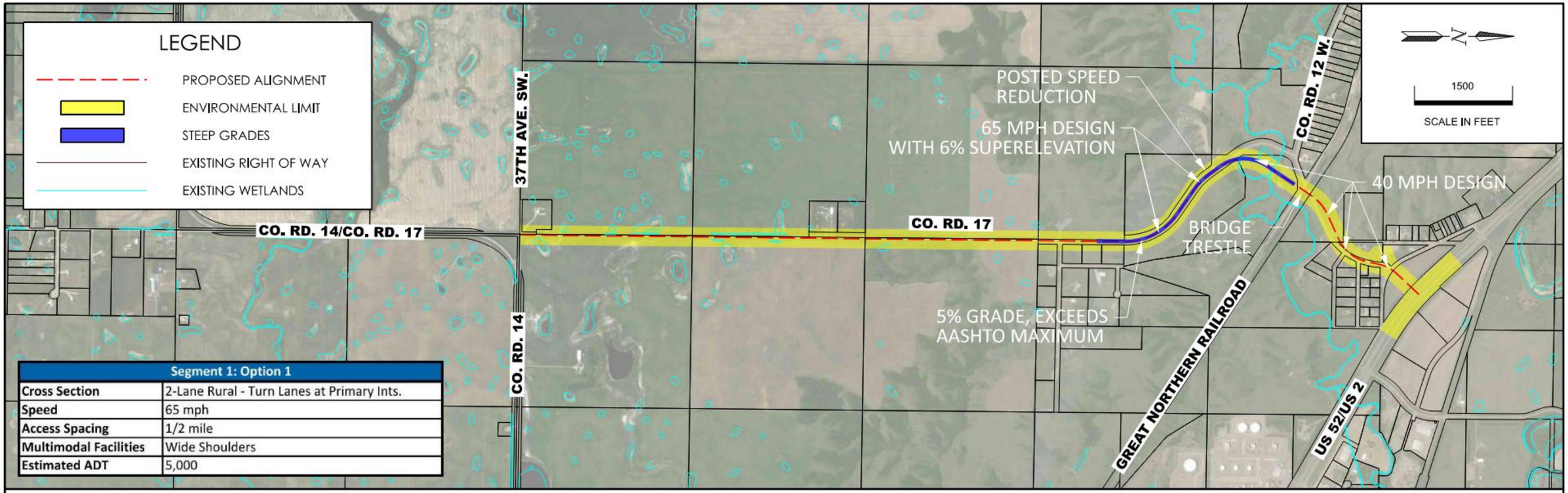
Southwest Segment Alternatives

The seven West Segment alternatives are presented in **Figure 13** through **Figure 19**. A summary of the performance of all Southwest Segment alternatives is provided in **Table 2**.

Southeast Segment Alternatives

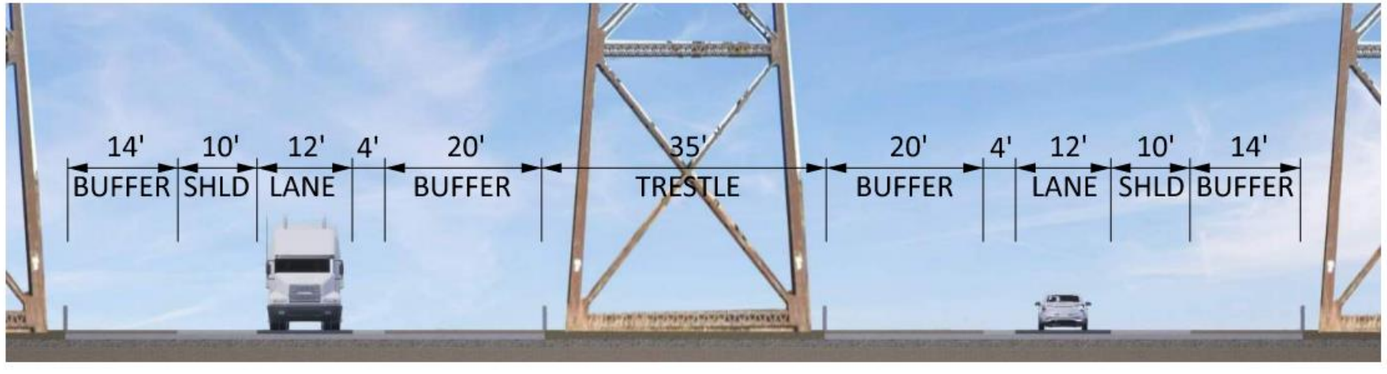
The five West Segment alternatives are presented in **Figure 20** through **Figure 24**. A summary of the performance of all Southeast Segment alternatives is provided in **Table 3**.

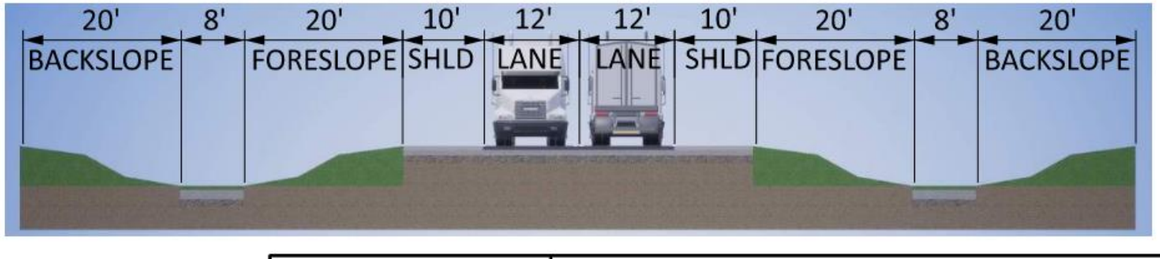
Figure 5: West Segment - Alternative 1A



Segment 1: Option 1	
Cross Section	2-Lane Rural - Turn Lanes at Primary Ints.
Speed	65 mph
Access Spacing	1/2 mile
Multimodal Facilities	Wide Shoulders
Estimated ADT	5,000

West Segment			Option 1a: Far Route
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●○○○○	• Distance from city center reduces local traffic, prioritizing regional traffic • 2.9 miles in length • 65 mph design speed, 40 mph curves in residental area
Local Accessibility	17	●●●●●○○○○○	• 1/2 mile access spacing emphasizes traffic flow rather than access to local roadway network • LOS C expected through 2045 (LOS B if passing lanes are provided) - some extra capacity available to carry local traffic if adjacent areas begin to develop
Crash Potential	21	●●●●○○○○○○	• 5% grade for 1 mile, with horizontal curvature within vertical curve section • Full superelevation required for horizontal curves • Single vehicle crashes are common around Minot on similar roadways with combined horizontal and vertical curvature
Multimodal Connectivity	10	●●○○○○○○○○	• Wide shoulder can carry bike traffic, but no sidewalk/paths for pedestrians • Low non-motorized travel demand due to distance from typical bike/pedestrian generators
Cost	14	●●●●●●●●○○	• Planning level cost estimate: $10,000,000 to $25,000,000 • Utilizes existing railroad trestle as grade separation between roadway and railroad • Potential for multiple stream crossings
Environmental Impacts	12	●●●●●●○○○○	• 15 NWI wetlands impacted for a total of 3.2 acres of potential impacts • 34% of the route occurs within grassland and could impact areas of potential Dakota skipper habitat • The route is located within two floodplains and may require additional analysis depending on final design
Overall	100	●●●●●○○○○○ 5.3	





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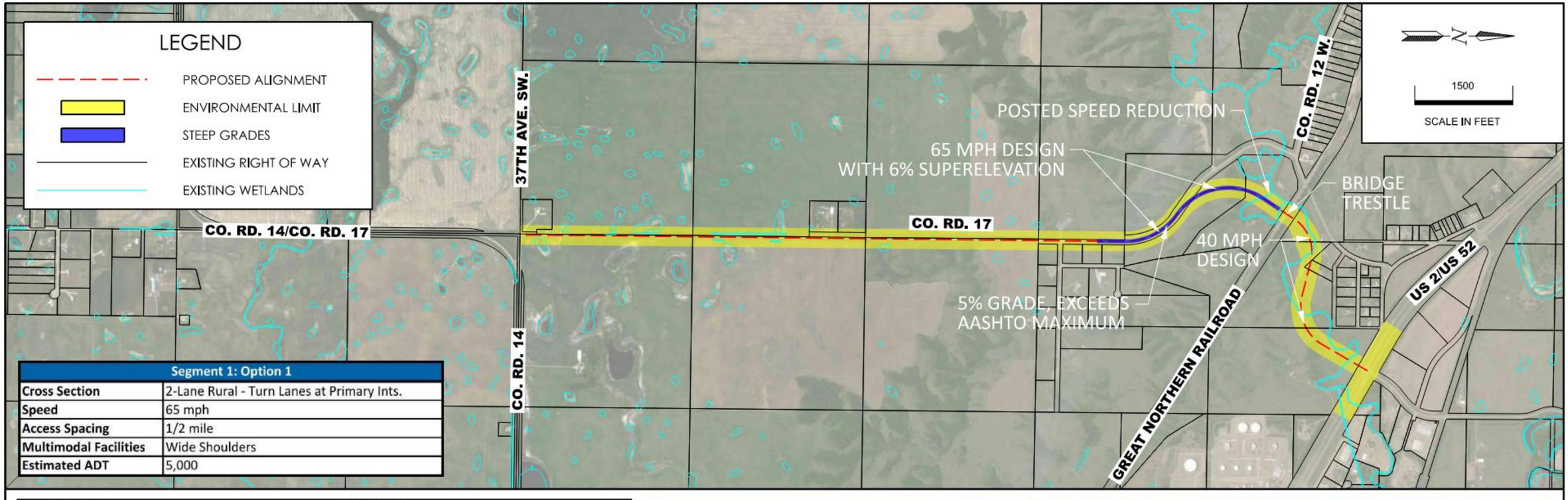
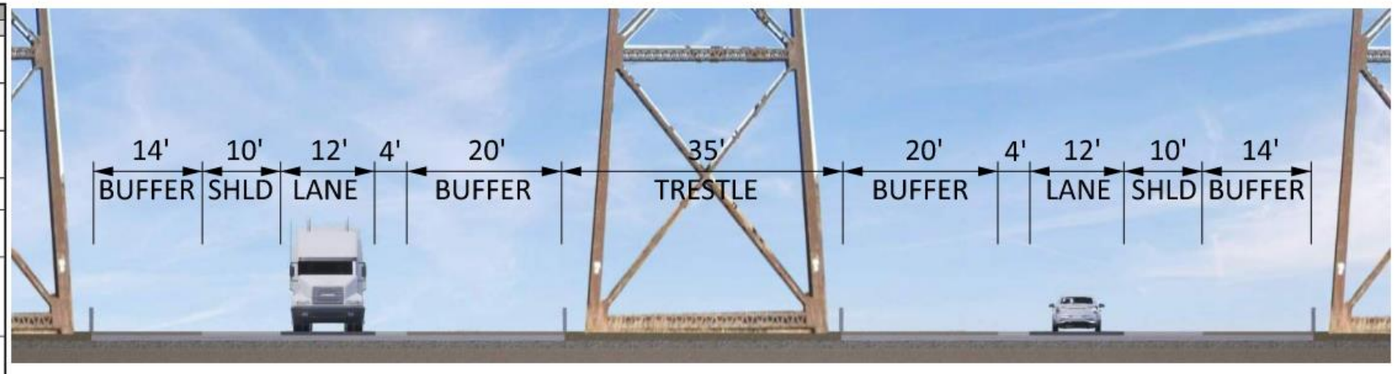
WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
SEGMENT 1 OPTION 1A

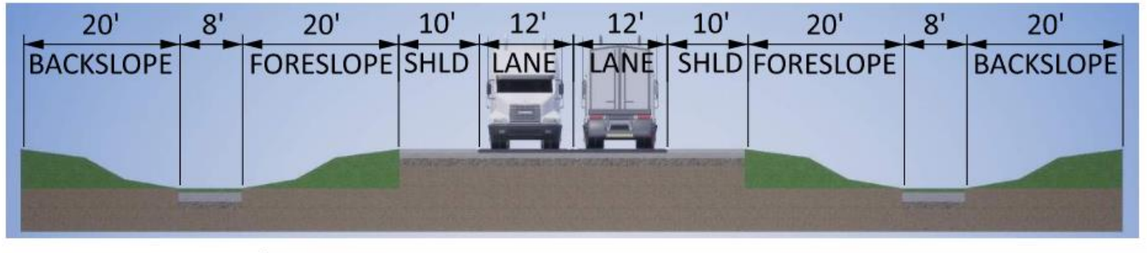
Figure 6: West Segment - Alternative 1B



Segment 1: Option 1	
Cross Section	2-Lane Rural - Turn Lanes at Primary Ints.
Speed	65 mph
Access Spacing	1/2 mile
Multimodal Facilities	Wide Shoulders
Estimated ADT	5,000

West Segment			Option 1b: Far Route
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●○○○○	• Distance from city center reduces local traffic, prioritizing regional traffic • 2.9 miles in length • 65 mph design speed, 40 mph curves in residental area
Local Accessibility	17	●●●●●○○○○○	• 1/2 mile access spacing emphasizes traffic flow rather than access to local roadway network • LOS C expected through 2045 (LOS B if passing lanes are provided) - some extra capacity available to carry local traffic if adjacent areas begin to develop
Crash Potential	21	●●●●○○○○○○	• 5% grade for 1 mile, with horizontal curvature within vertical curve section • Full superelevation required for horizontal curves • Single vehicle crashes are common around Minot on similar roadways with combined horizontal and vertical curvature
Multimodal Connectivity	10	●●○○○○○○○○	• Wide shoulder can carry bike traffic, but no sidewalk/paths for pedestrians • Low non-motorized travel demand due to distance from typical bike/pedestrian generators
Cost	14	●●●●●●●●○○	• Planning level cost estimate: $15,000,000 - $25,000,000 • Utilizes existing railroad trestle as grade separation between roadway and railroad • Potential for multiple stream crossings
Environmental Impacts	12	●●○○○○○○○○	• 17 NWI wetlands impacted for a total of 4.3 acres of potential impacts • 43% of the route occurs within grassland and could impact areas of potential Dakota skipper habitat • The route is located within two floodplains and may require additional analysis depending on final design • Potential to impact unevaluated cultural resources • Impacts up to 3 dwellings on Dodson Drive
Overall	100	●●●●○○○○○○ 4.8	





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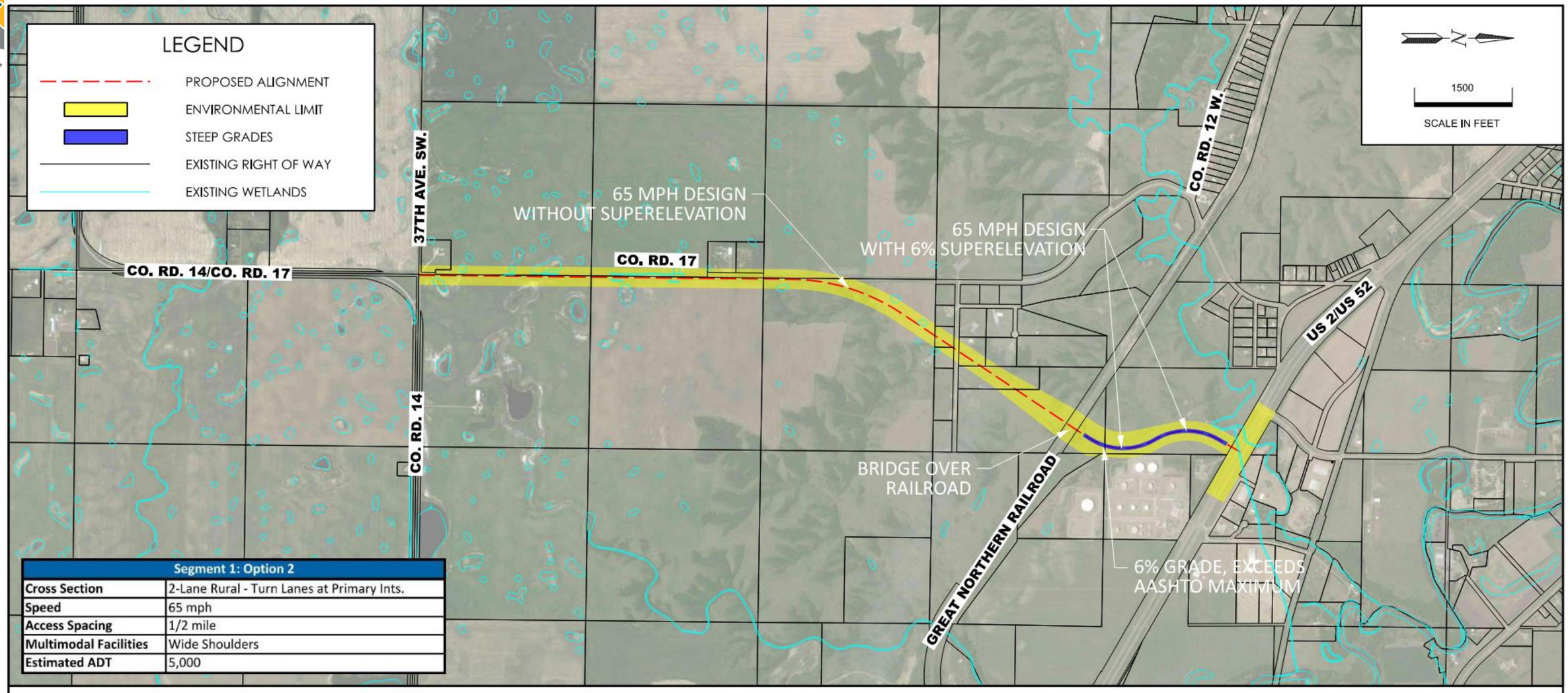
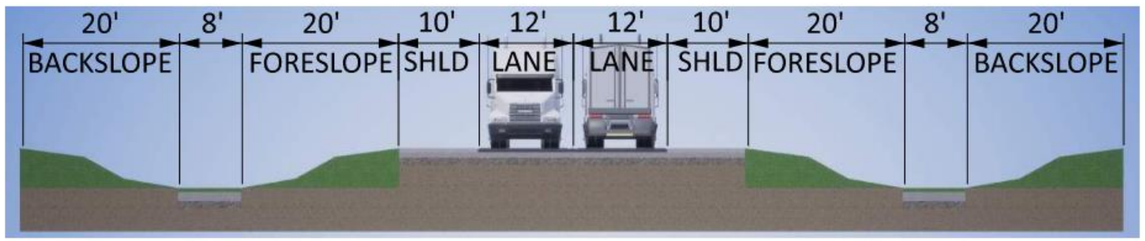
WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
SEGMENT 1 OPTION 1B

Figure 7: West Segment - Alternative 2



Segment 1: Option 2	
Cross Section	2-Lane Rural - Turn Lanes at Primary Ints.
Speed	65 mph
Access Spacing	1/2 mile
Multimodal Facilities	Wide Shoulders
Estimated ADT	5,000

West Segment			Option 2: Far Route
Category	**Weight**	**Score**	**Key Factors**
Regional Mobility	27	●●●●●●●●●●	• Distance from city center reduces local traffic, prioritizing regional traffic • 2.5 Miles in length • 65 mph design speed
Local Accessibility	17	●●●●●○○○○○	• 1/2 mile access spacing emphasizes traffic flow rather than access to local roadway network • LOS C expected through 2045 (LOS B if passing lanes are provided) - some extra capacity available to carry local traffic if adjacent areas begin to develop
Crash Potential	21	●○○○○○○○○○	• 6% grade for 3/4 mile, with combined horizontal and vertical curvature • Single vehicle crashes are common around Minot on similar roadways with combined horizontal and vertical curvature
Multimodal Connectivity	10	●●○○○○○○○○	• Wide shoulder can carry bike traffic, but no sidewalk/paths for pedestrians • Low non-motorized travel demand due to distance from typical bike/pedestrian generators
Cost	14	●●●●●●○○○○	• Planning level cost estimate: $35,000,000 • Includes new bridge over railroad • Significant right-of-way acquisition needed • Significant fill sections
Environmental Impacts	12	●●●○○○○○○○	• Requires the buyout of one home, and encroaches on three additional homes • 21 NWI wetlands impacted for a total of 3.5 acres acres of potential impacts • 53% of the route occurs within grassland and could impact areas of potential Dakota skipper habitat • Potential to impact unevaluated cultural resources
Overall	100	●●●●●○○○○○ 5.1	



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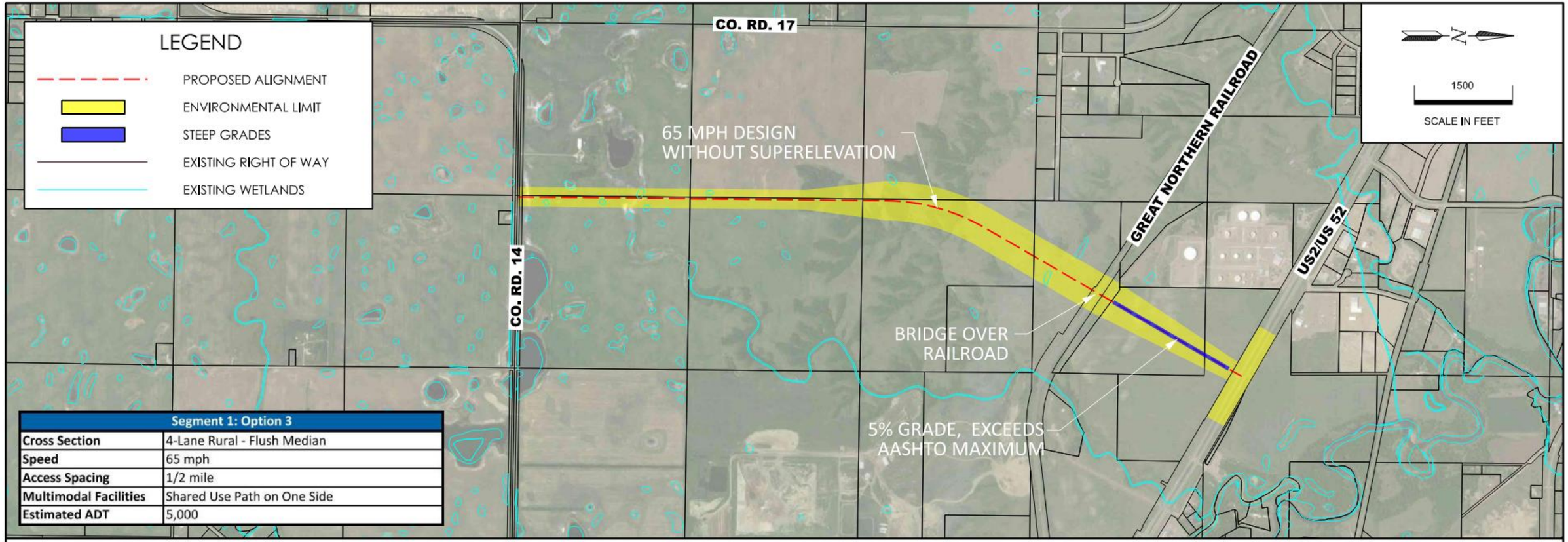
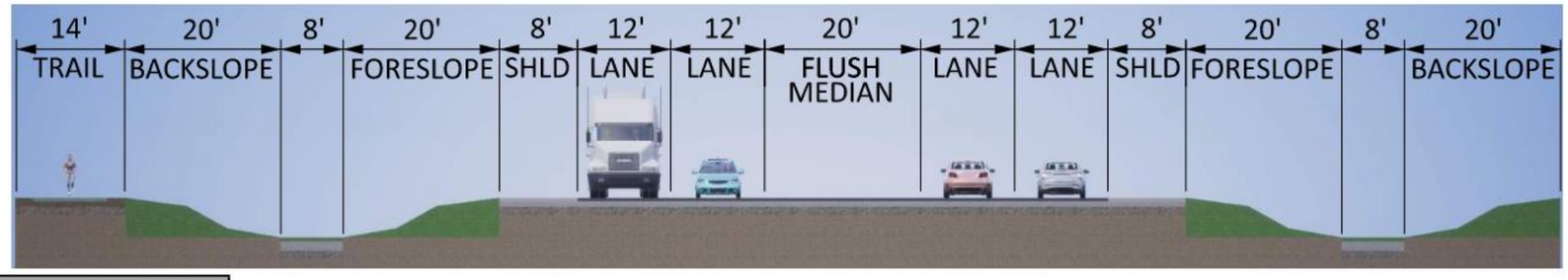
WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
SEGMENT 1 OPTION 2

Figure 8: West Segment - Alternative 3



Segment 1: Option 3	
Cross Section	4-Lane Rural - Flush Median
Speed	65 mph
Access Spacing	1/2 mile
Multimodal Facilities	Shared Use Path on One Side
Estimated ADT	5,000



West Segment			Option 3: Mid Route
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●●○○	• Balances supporting regional traffic flow and providing some transportation support for Minot growth areas • 2.3 miles in length • 65 mph design speed
Local Accessibility	17	●●●●●●○○○○	• 1/2 mile access spacing emphasizes traffic flow rather than access to local roadway network • LOS B expected through 2045 - extra capacity available to carry local traffic if adjacent areas begin to develop
Crash Potential	21	●●●●●○○○○○	• 5% grade for 1/3 mile • One large horizontal curve
Multimodal Connectivity	10	●●●●●○○○○○	• Shared use path on one side of the highway accomodates bikes and pedestrians • Shared use path can support future non-motorized demand if Minot begins to develop closer to the route
Cost	14	●●●●○○○○○○	• Planning level cost estimate: $65,000,000 • Includes new bridge over railroad • Significant fill sections
Environmental Impacts	12	●●●●●●●○○○	• 9 NWI wetlands impacted for a total of 1.2 acres acres of potential impacts • 39% of the route occurs within grassland and could impact areas of potential Dakota skipper habitat • Potential to impact unevaluated cultural resources
Overall	100	●●●●●●○○○○ 6.1	

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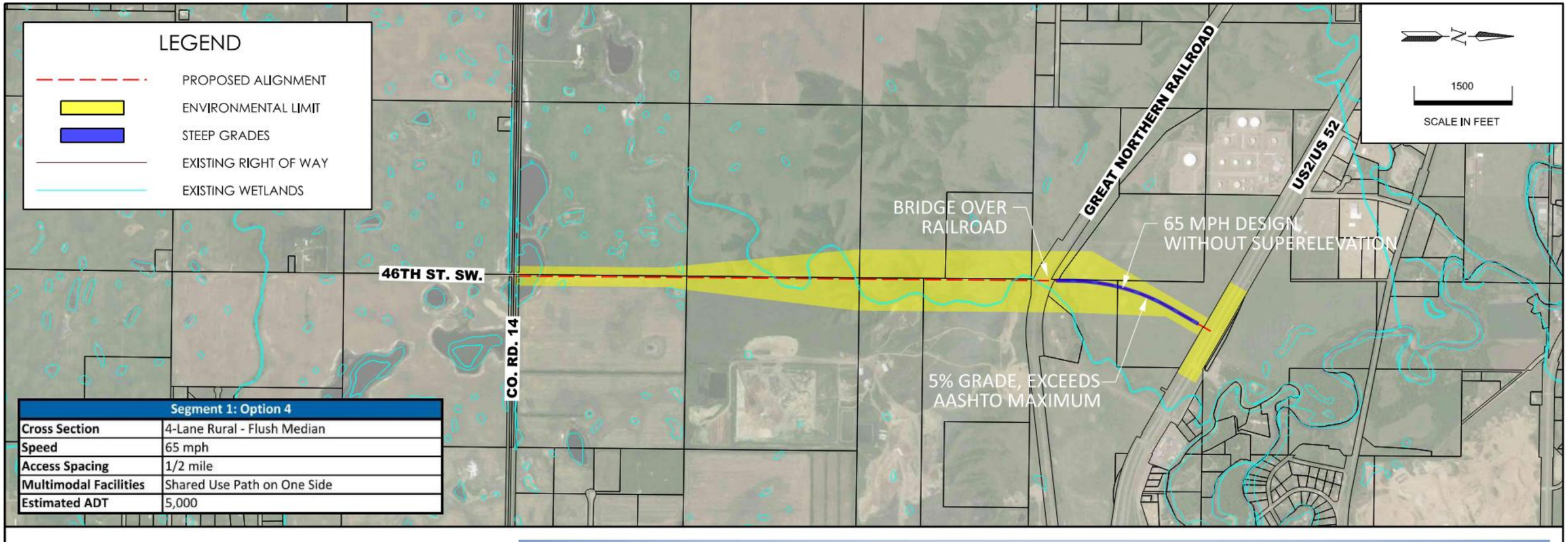
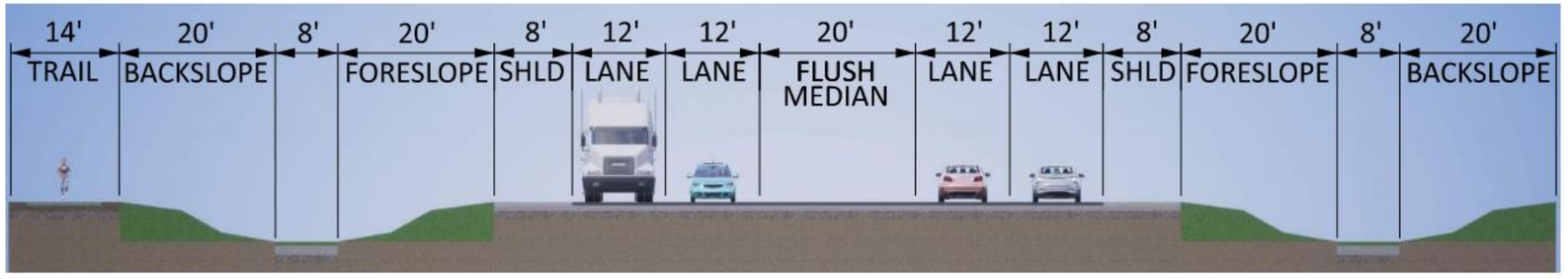
WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
SEGMENT 1 OPTION 3

Figure 9: West Segment - Alternative 4



Segment 1: Option 4	
Cross Section	4-Lane Rural - Flush Median
Speed	65 mph
Access Spacing	1/2 mile
Multimodal Facilities	Shared Use Path on One Side
Estimated ADT	5,000



West Segment			Option 4: Mid Route
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●●○○	• Balances supporting regional traffic flow and providing some transportation support for Minot growth areas • 2.1 miles in length • 65 mph design speed
Local Accessibility	17	●●●●●●○○○○	• 1/2 mile access spacing emphasizes traffic flow rather than access to local roadway network • LOS B expected through 2045 - extra capacity available to carry local traffic if adjacent areas begin to develop
Crash Potential	21	●●●●●○○○○○	• Minimal horizontal curvature • 5% grade for 1/2 mile
Multimodal Connectivity	10	●●●●●○○○○○	• Shared use path on one side of the highway accomodates bikes and pedestrians • Shared use path can support future non-motorized demand if Minot begins to develop closer to the route
Cost	14	●●○○○○○○○○	• Planning level cost estimate: $92,000,000 • Includes new bridge over railroad • Significant fill sections (most of any alternative on this segment)
Environmental Impacts	12	●●●●●●○○○○	• 6 NWI wetlands impacted for a total of 5.3 acres acres of potential impacts • 85% of the route occurs within grassland and could impact areas of potential Dakota skipper habitat, depending on final alignment • Potential to impact unevaluated cultural resources
Overall	100	●●●●●○○○○○ 5.7	

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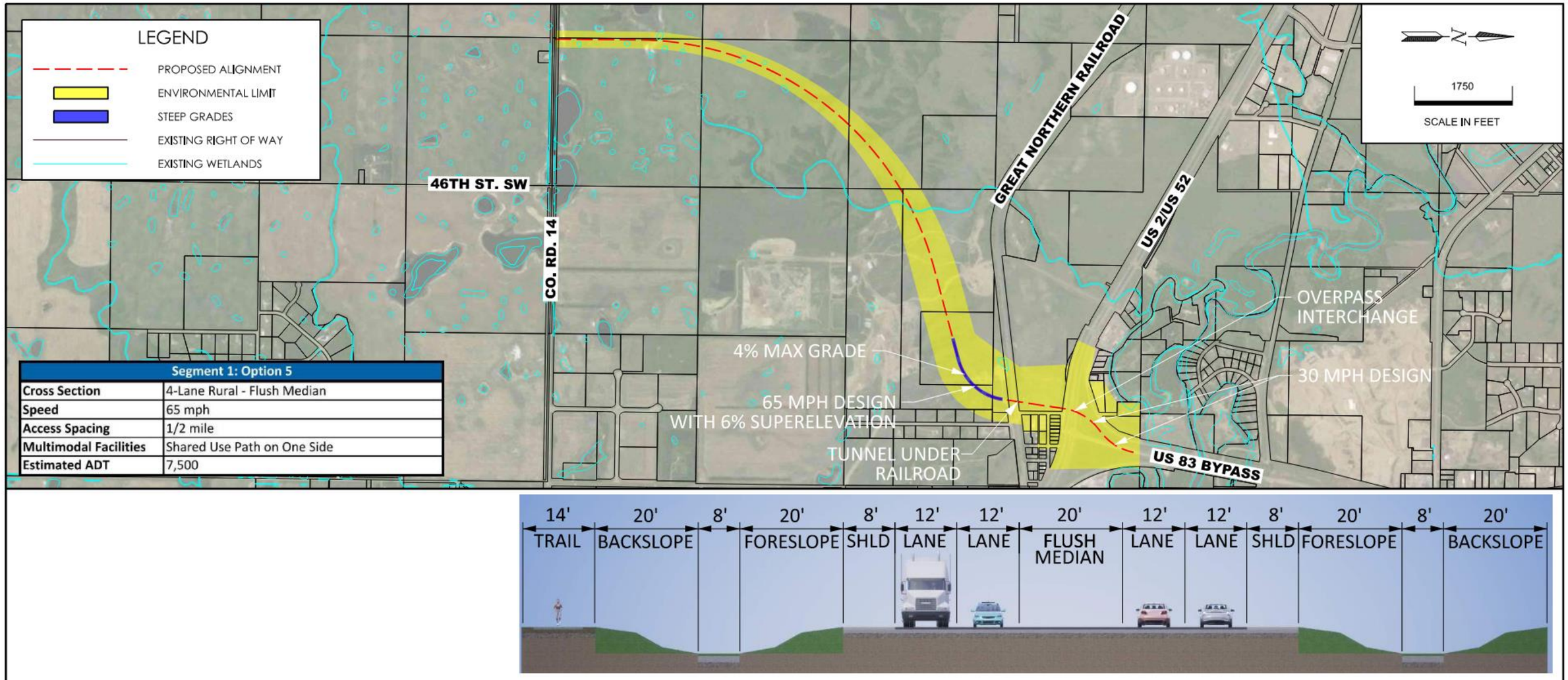
WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
SEGMENT 1 OPTION 4

Figure 10: West Segment - Alternative 5



Segment 1: Option 5	
Cross Section	4-Lane Rural - Flush Median
Speed	65 mph
Access Spacing	1/2 mile
Multimodal Facilities	Shared Use Path on One Side
Estimated ADT	7,500

West Segment			Option 5: Near Route
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●○○○	• Balances supporting regional traffic flow and providing some transportation support for Minot growth areas • Connects to NW US 83B to support regional traffic flows to the north, but with circuitous routing to the west • Circuitous routing for traffic to/from west US 2 • 2.2 miles in length • 65 mph design speed
Local Accessibility	17	●●●●●●●○○○	• 1/2 mile access spacing emphasizes traffic flow rather than access to local roadway network • LOS B expected through 2045 - extra capacity available to carry local traffic if adjacent areas begin to develop • Direct connection to NW US 83B provides utility to local traffic, however circuitous routing to the west may reduce this
Crash Potential	21	●●●●●●○○○○	• Large reverse curves, which is suboptimal design • 4% maximum grade for 1/3 of a mile • Single vehicle crashes are common around Minot on similar roadways with combined horizontal and vertical curvature
Multimodal Connectivity	10	●●●●●●○○○○	• Shared use path on one side of the highway accomodates bikes and pedestrians • Shared use path can support future non-motorized demand if Minot begins to develop closer to the route
Cost	14	●●●●○○○○○○	• Planning level cost estimate: $60,000,000 • Includes railroad underpass/tunnel • Lower earthwork requirements than other options
Environmental Impacts	12	●●○○○○○○○○	• Numerous businesses and homes near the north end of the route that may be subject to buyout/relocation (project limits encompass nine residential lots and several businesses) • Close to City of Minot landfill, increasing potential to encounter hazardous materials or contaminated soil/water • 15 NWI wetlands impacted for a total of 2.5 acres acres of potential impacts • 43% of the route occurs within grassland and could impact areas of potential Dakota skipper habitat • Potential to impact unevaluated cultural resources
Overall	100	●●●●●○○○○○ 5.7	

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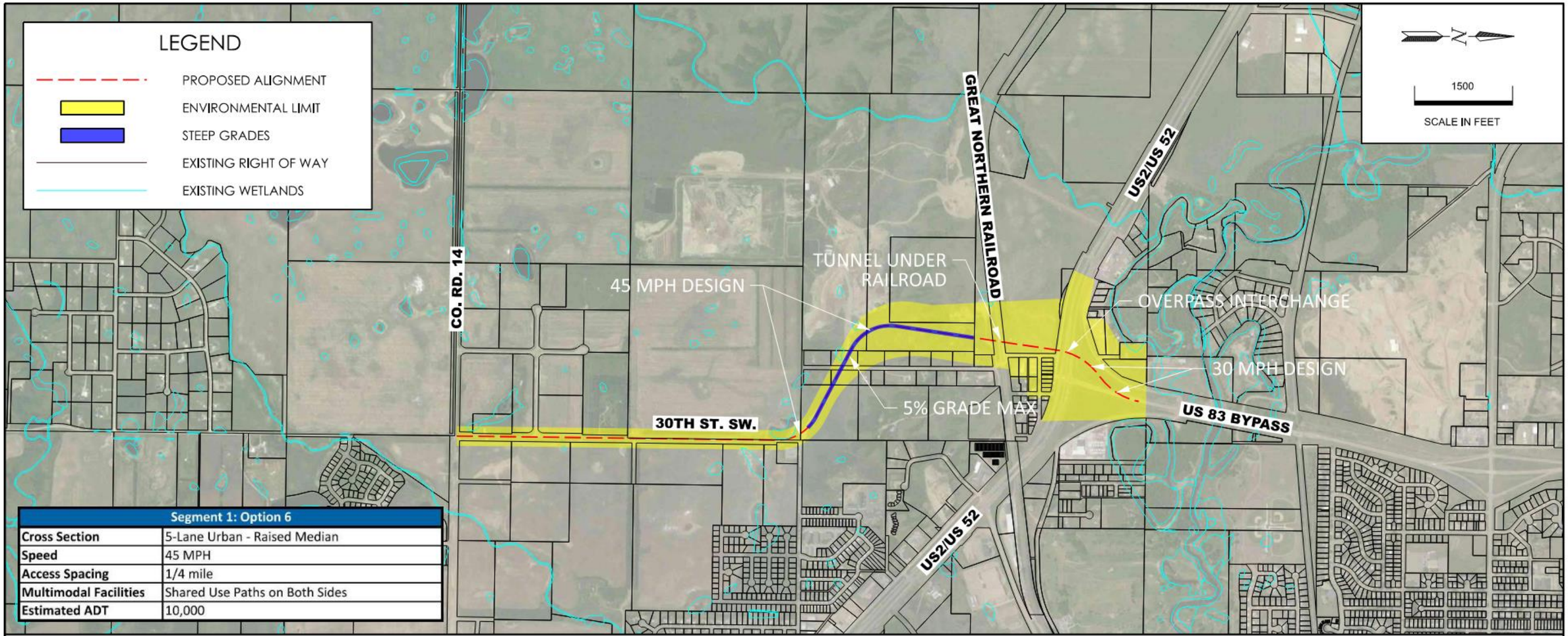
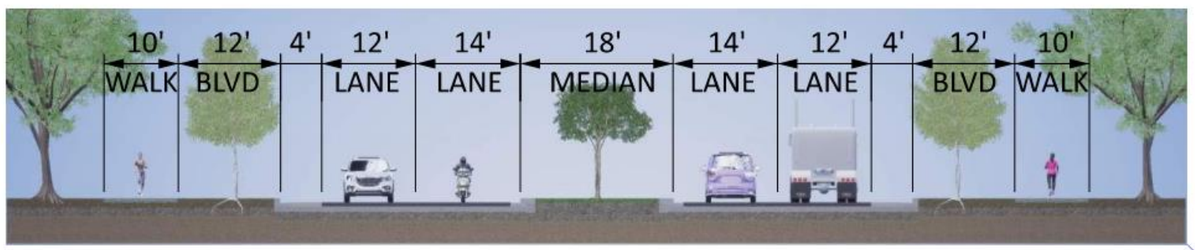
WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
SEGMENT 1 OPTION 5

Figure 11: West Segment - Alternative 6A



Segment 1: Option 6	
Cross Section	5-Lane Urban - Raised Median
Speed	45 MPH
Access Spacing	1/4 mile
Multimodal Facilities	Shared Use Paths on Both Sides
Estimated ADT	10,000

West Segment			Option 6a: Near Route
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●○○○○	• Balances supporting regional traffic flow and providing some transportation support for Minot growth areas • Connects to NW US 83B to further support regional traffic flows, routing is less circuitous than Option 5 • 1.9 miles in length • 45 mph design speed
Local Accessibility	17	●●●●●●●●○	• 1/4 mile access spacing balances regional traffic flow and access to local roadway network • LOS B expected through 2045 - some extra capacity available to carry local traffic if adjacent areas begin to develop • Less circuitous routing for connection to NW US 83B when compared to Option 5 provides more utility to local traffic • Proximity to center of Minot improves support for local traffic
Crash Potential	21	●●●●●●●○○○	• Sharper curves require 45 mph design speed, including curve just south of proposed grade separation
Multimodal Connectivity	10	●●●●●●●●○○	• Shared use paths on each side of the highway accomodates bikes and pedestrians • Shared use path can support future non-motorized demand if Minot begins to develop closer to the route • Lower vehicle speeds compared to other options better supports non-motorized traffic
Cost	14	●●○○○○○○○○	• Planning level cost estimate: $100,000,000 • Includes grade separation/tunnel under railroad
Environmental Impacts	12	●●●○○○○○○○	• Numerous businesses and homes near the north end of the route that may be subject to buyout/relocation. Project limits encompass nine residential lots and several businesses • Close to City of Minot landfill, increasing potential to encounter hazardous materials or contaminated soil/water • 10 NWI wetlands impacted for a total 2.3 acres acres of potential impacts • Around 64% of route occurs within grasslands and could impact areas of potential Dakota skipper habitat
Overall	100	●●●●●○○○○○ 6.0	



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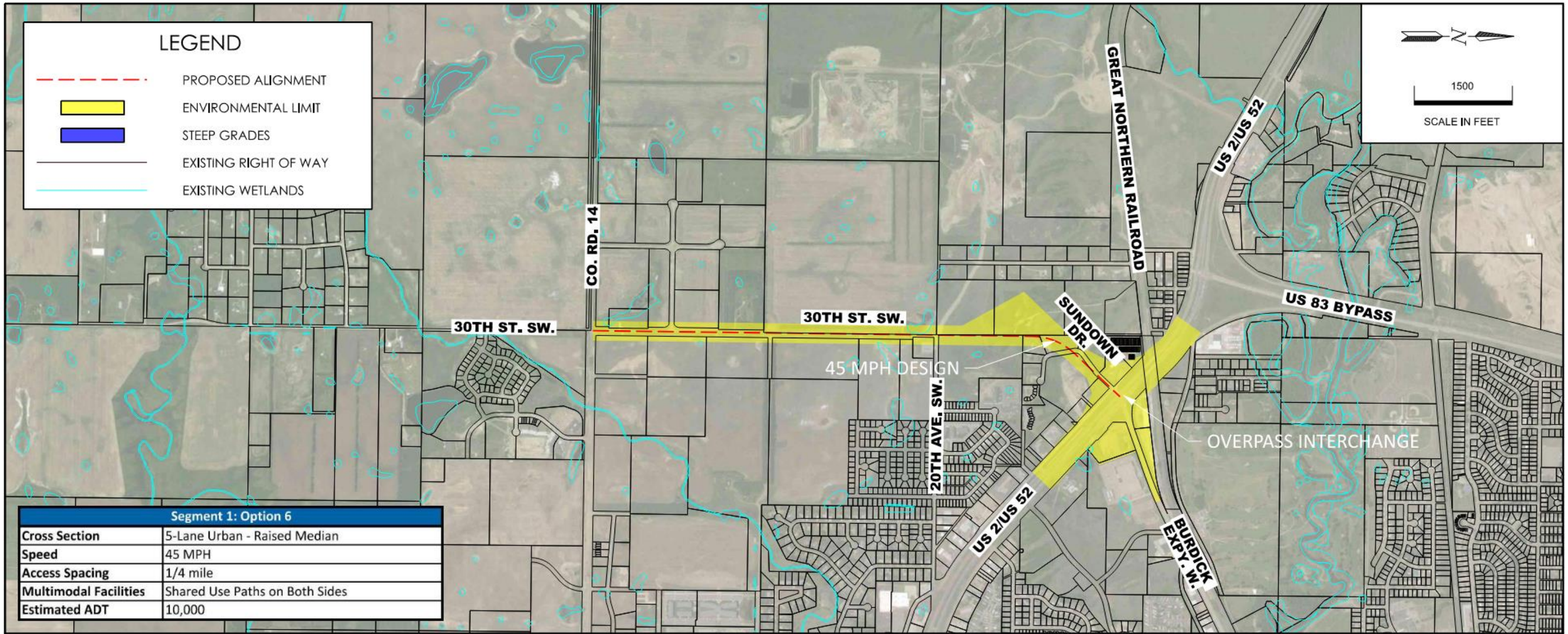
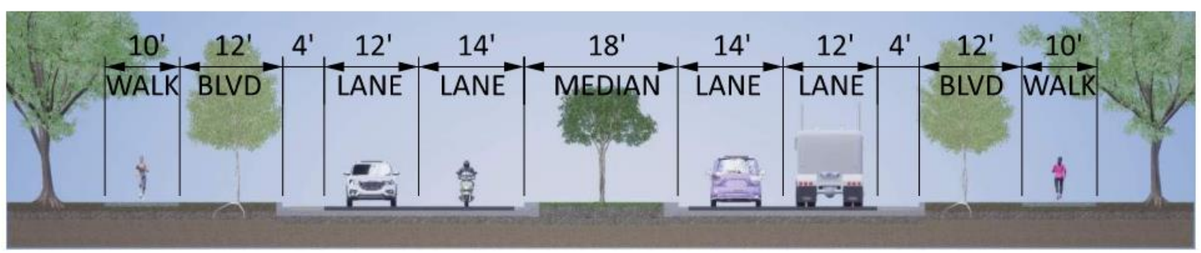
WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
SEGMENT 1 OPTION 6A

Figure 12. West Segment Alternative 6B



Segment 1: Option 6	
Cross Section	5-Lane Urban - Raised Median
Speed	45 MPH
Access Spacing	1/4 mile
Multimodal Facilities	Shared Use Paths on Both Sides
Estimated ADT	10,000

West Segment			Option 6b: Near Route
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●○○○○	• Balances supporting regional traffic flow and providing some transportation support for Minot growth areas • Connects to NW US 83B to further support regional traffic flows, routing is less circuitous than Option 5 • 1.5 miles in length • 45 mph design speed
Local Accessibility	17	●●●●●●●●○	• 1/4 mile access spacing balances regional traffic flow and access to local roadway network • LOS B expected through 2045 - some extra capacity available to carry local traffic if adjacent areas begin to develop • Less circuitous routing for connection to NW US 83B when compared to Option 5 provides more utility to local traffic • Proximity to center of Minot improves support for local traffic
Crash Potential	21	●●●●●●●○○○	• Sharper curves require 45 mph design speed, including curve just south of proposed grade separation
Multimodal Connectivity	10	●●●●●●●●○○	• Shared use paths on each side of the highway accomodates bikes and pedestrians • Shared use path can support future non-motorized demand if Minot begins to develop closer to the route • Lower vehicle speeds compared to other options better supports non-motorized traffic
Cost	14	●●●●●●●○○○	• Planning level cost estimate: $35,000,000 • Urban four-lane design - concrete medians, curbs, urban drainage
Environmental Impacts	12	●●●○○○○○○○	• Numerous businesses and homes near the north end of the route that may be subject to buyout/relocation. Project limits encompass three residential lots and several businesses • 6 NWI wetlands impacted for a total of 1.4 acres of potential impacts • Around 16% of route occurs within grasslands, but is unlikely to impact Dakota skipper habitat • Potential to impact unevaluated cultural resources
Overall	100	●●●●●●○○○○ 6.7	



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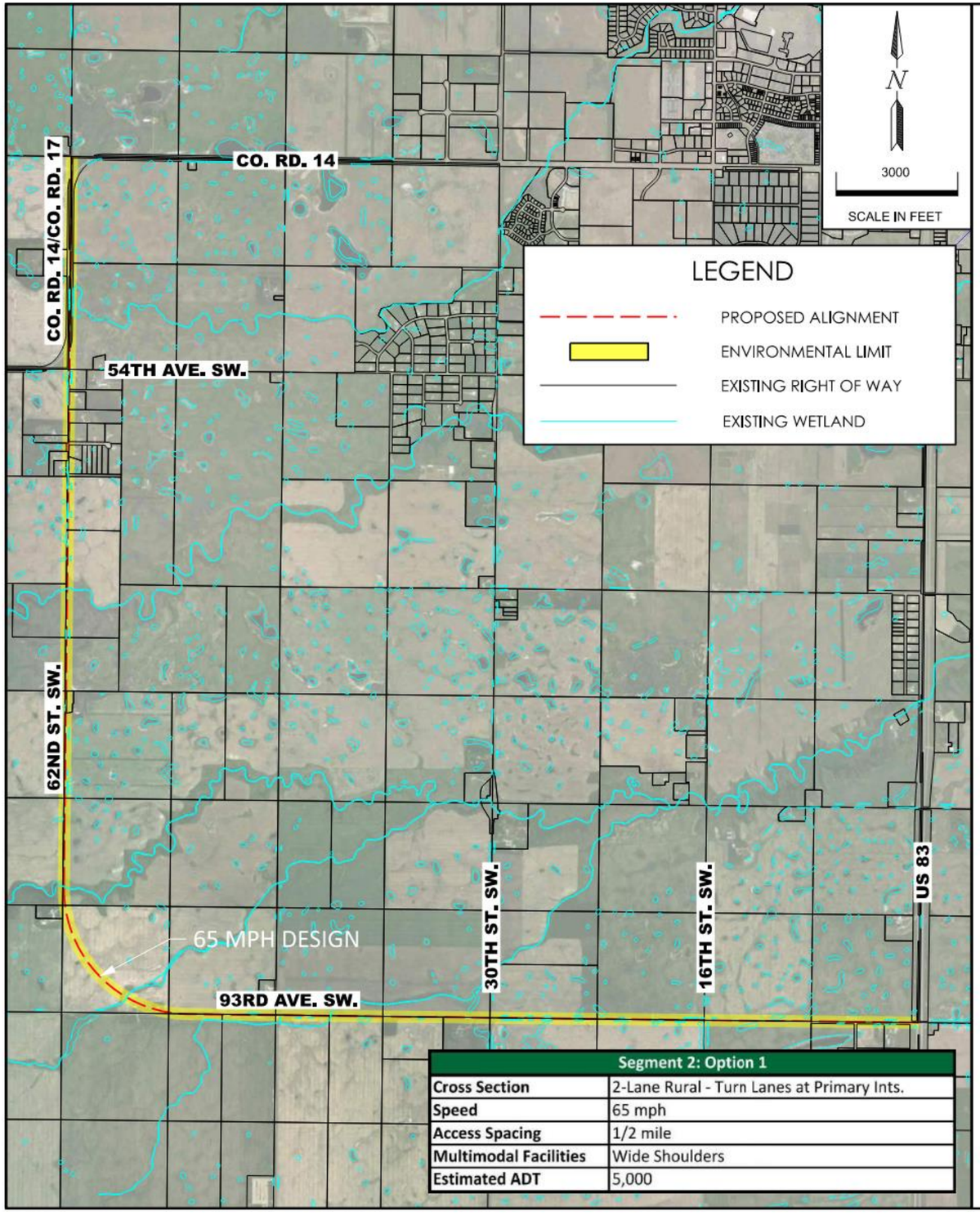
WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
SEGMENT 1 OPTION 6B

Table 1: West Segment Alternatives Analysis Summary

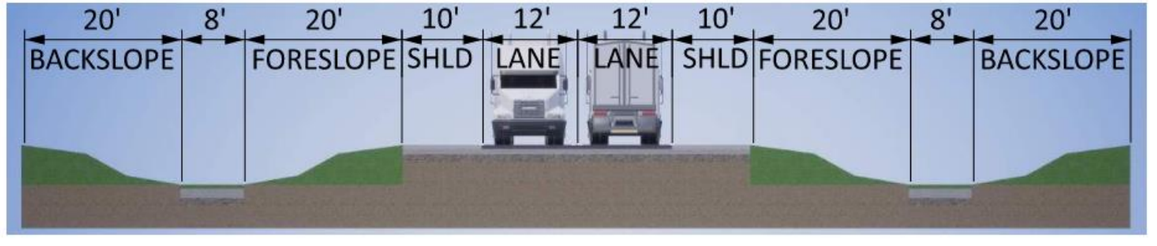
Metric	1a	1b	2	3	4	5	6a	6b	No Build
Regional Mobility	●●●●●●○○○○	●●●●●●○○○○	●●●●●●●●●●	●●●●●●●●○○	●●●●●●●●○○	●●●●●●●○○○	●●●●●●○○○○	●●●●●●○○○○	●●○○○○○○○○
Local Accessibility	●●●●●○○○○○	●●●●●○○○○○	●●●●●○○○○○	●●●●●●○○○○	●●●●●●○○○○	●●●●●●●○○○	●●●●●●●●●○	●●●●●●●●●○	●●●○○○○○○○
Crash Potential	●●●●○○○○○○	●●●●○○○○○○	●○○○○○○○○○	●●●●●○○○○○	●●●●●○○○○○	●●●●●●○○○○	●●●●●●●○○○	●●●●●●●○○○	●●●○○○○○○○
Multimodal Connectivity	●●○○○○○○○○	●●○○○○○○○○	●●○○○○○○○○	●●●●●○○○○○	●●●●●○○○○○	●●●●●●○○○○	●●●●●●●●○○	●●●●●●●●○○	●○○○○○○○○○
Cost	●●●●●●●●○○	●●●●●●●●○○	●●●●●●○○○○	●●●●○○○○○○	●●○○○○○○○○	●●●●○○○○○○	●●○○○○○○○○	●●●●●●●○○○	●●●●●●●●●●
Environmental Impacts	●●●●●●○○○○	●●○○○○○○○○	●●●○○○○○○○	●●●●●●●○○○	●●●●●●○○○○	●●○○○○○○○○	●●●○○○○○○○	●●●○○○○○○○	●●●●●●●●●●
Overall	●●●●●○○○○○ 5.3	●●●●○○○○○○ 4.8	●●●●●○○○○○ 5.1	●●●●●●○○○○ 6.1	●●●●●○○○○○ 5.7	●●●●●○○○○○ 5.7	●●●●●○○○○○ 6.0	●●●●●●○○○○ 6.7	●●●●○○○○○○ 4.3
Rank	6	8	7	2	5	4	3	1	9

Figure 13: Southwest Segment - Alternative 1



Segment 2: Option 1	
Cross Section	2-Lane Rural - Turn Lanes at Primary Ints.
Speed	65 mph
Access Spacing	1/2 mile
Multimodal Facilities	Wide Shoulders
Estimated ADT	5,000

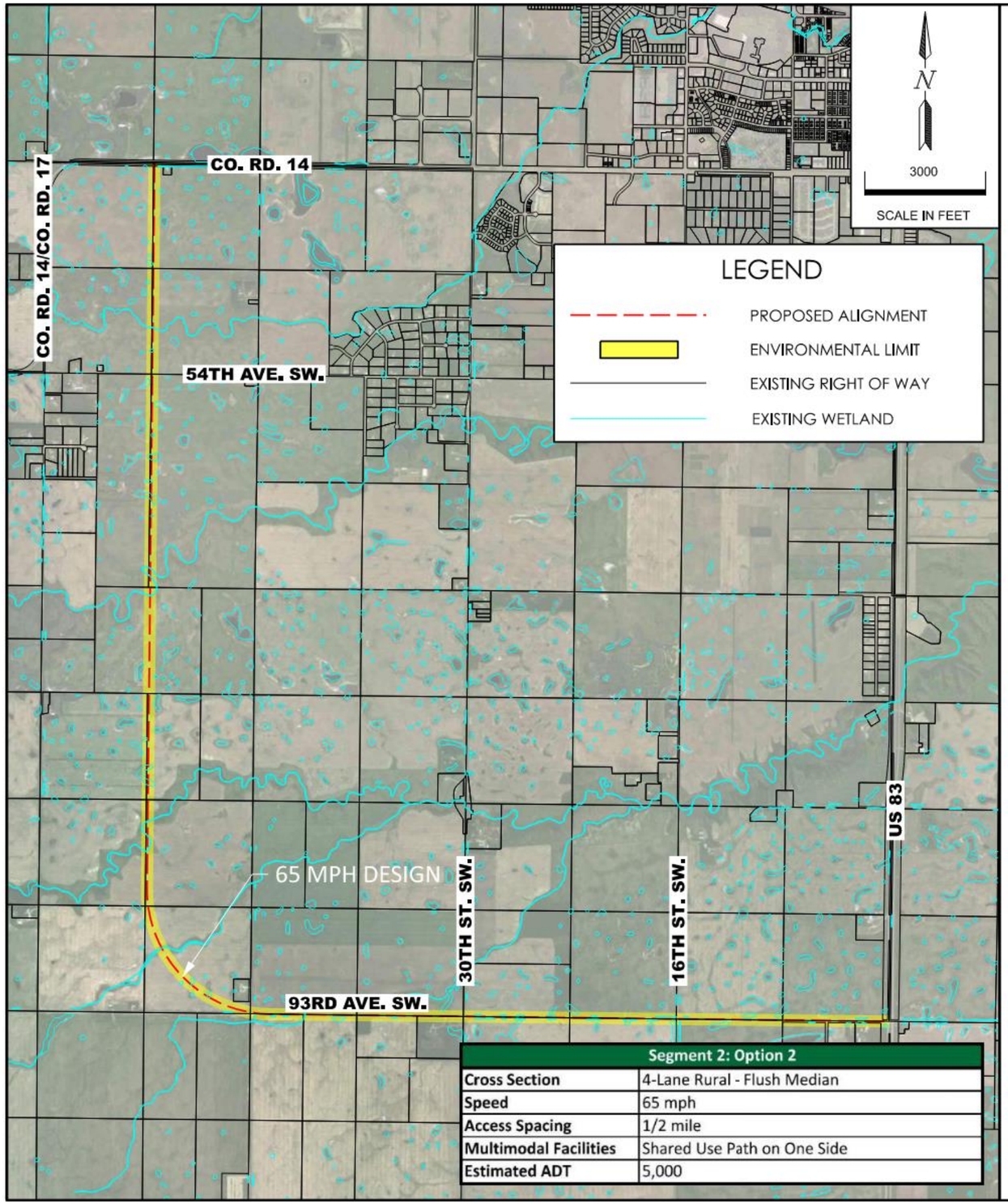
SW Segment			Option 1: Far Route
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●○○○	• Distance from city center reduces local traffic, prioritizing regional traffic • US 2 West to US 83 South travel times reduced by a range of 10 to 15% in high traffic time periods ; US 83 South to US 2 West travel times reduced by a range of 5 to 20% in high traffic time periods. The higher end of travel time changes applies to PM peak hour conditions • Travel times between US 2 West and US 52 South generally unchanged for both travel directions in PM peak hour • 7.3 miles in length • 65 mph design speed
Local Accessibility	17	●●●●●●●○○○	• 1/2 mile access spacing emphasizes traffic flow rather than access to local roadway network • LOS C expected through 2045 (LOS B if passing lanes are provided) - some extra capacity available to carry local traffic if adjacent areas begin to develop • Re-routing of regional traffic from the core of Minot reduces network-wide delays by around 12% in the PM peak hour • Traffic shifts mitigate deficiencies at urban signals, with all signals operating at LOS C or better
Crash Potential	21	●●●●●●○○○○	• One 65 mph curve, otherwise generally tangent sections • Delay reduction in urban core of Minot reduces rear-end and angle crash potential - Annual safety benefits are estimated to be around $800,000 per year under 2045 traffic volumes • Crash history on US 83 between 54th Ave S and US 2 shows crash rates above the critical crash rate, with rear-end and angle crashes being the most represented
Multimodal Connectivity	10	●●○○○○○○○○	• Wide shoulder can carry bike traffic, but no sidewalk/paths for pedestrians • Low non-motorized travel demand due to distance from typical bike/pedestrian generators
Cost	14	●●●●●●●●●○	• Planning level cost estimate: $5,000,000 to $35,000,000 • Most culverts required of any option • Some sections of two-lane configuration reduce estimated cost
Environmental Impacts	12	●●●●●●○○○○	• 80 NWI wetlands impacted for a total of 12.1 acres acres of potential impacts • 6% of the route occurs within grassland, but no impacts to Dakota skipper habitat are anticipated • Multiple tributaries of the Souris River would be impacted, although none occur within a mapped floodplain. Additional analysis is required to determine if negative impacts would occur. • Potential to impact 16 acres of USFWS wetland easements
Overall	100	●●●●●●○○○○ 6.5	



BOLTON & MENK

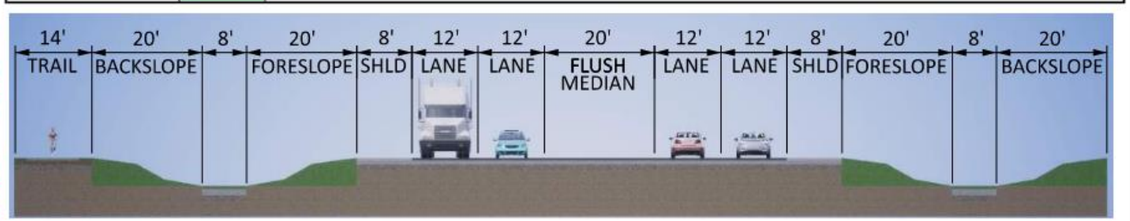
WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
SEGMENT 2 OPTION 1

Figure 14: Southwest Segment - Alternative 2A



Segment 2: Option 2	
Cross Section	4-Lane Rural - Flush Median
Speed	65 mph
Access Spacing	1/2 mile
Multimodal Facilities	Shared Use Path on One Side
Estimated ADT	5,000

SW Segment	Option 2a: Far Route		
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●○○○	• Distance from city center reduces local traffic, prioritizing regional traffic • US 2 West to US 83 South travel times reduced by a range of 10 to 15% in high traffic time periods ; US 83 South to US 2 West travel times reduced by a range of 5 to 20% in high traffic time periods. The higher end of travel time changes applies to PM peak hour conditions • Travel times between US 2 West and US 52 South generally unchanged for both travel directions in PM peak hour • 6.3 miles in length • 65 mph design speed
Local Accessibility	17	●●●●●●●○○○	• 1/2 mile access spacing emphasizes traffic flow rather than access to local roadway network • LOS B expected through 2045 - significant extra capacity available to carry local traffic if adjacent areas begin to develop • Re-routing of regional traffic from the core of Minot reduces network-wide delays by around 12% in the PM peak hour • Traffic shifts mitigate deficiencies at urban signals, with all signals operating at LOS C or better
Crash Potential	21	●●●●●●○○○○	• One 65 mph curve, otherwise generally tangent sections • Delay reduction in urban core of Minot reduces rear-end and angle crash potential - Annual safety benefits are estimated to be around $800,000 per year under 2045 traffic volumes • Crash history on US 83 between 54th Ave S and US 2 shows crash rates above the critical crash rate, with rear-end and angle crashes being the most represented
Multimodal Connectivity	10	●●○○○○○○○○	• Shared use path on one side of the highway accomodates bikes and pedestrians • Shared use path can support future non-motorized demand if Minot begins to develop closer to the route
Cost	14	●●●●●○○○○○	• Planning level cost estimate: $50,000,000 • North/south segment would be new construction
Environmental Impacts	12	●●●●●○○○○○	• 77 NWI wetlands impacted for a total of 14 acres of potential impacts • 6 percent of the route occurs within grassland, but no impacts to Dakota skipper habitat are anticipated • Multiple tributaries of the Souris River would be impacted, although none occur within a mapped floodplain. Additional analysis is required to determine if negative impacts would occur. • Potential to impact 25 of USFWS wetland easements • 23 percent of the route occurs in grasslands, but no impacts to Dakota skipper habitat are anticipated
Overall	100	●●●●●○○○○○ 5.8	



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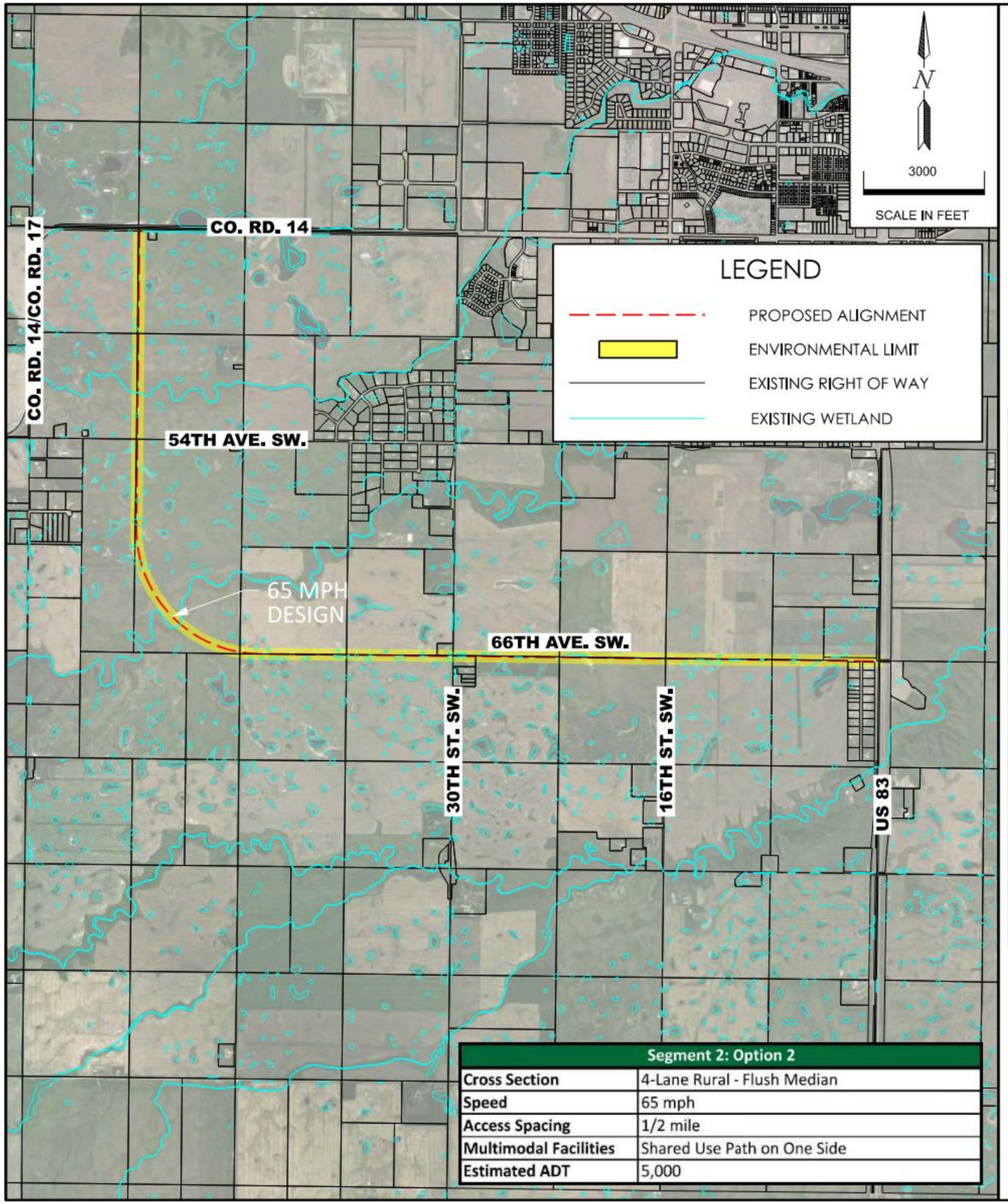
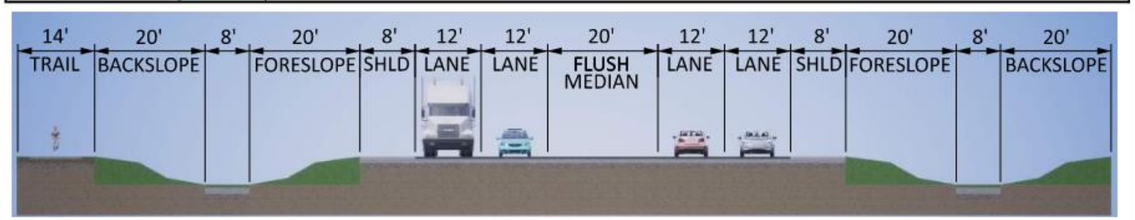
SEGMENT 2 OPTION 2A



Segment 2: Option 2	
Cross Section	4-Lane Rural - Flush Median
Speed	65 mph
Access Spacing	1/2 mile
Multimodal Facilities	Shared Use Path on One Side
Estimated ADT	5,000

SW Segment			Option 2b: Mid Route
Category	**Weight**	**Score**	**Key Factors**
Regional Mobility	27	●●●●●●○○○○	• E/W Segment is closer to urban area, increasing potential for local traffic • US 2 West to US 83 South travel times reduced by a range of 10 to 15% in high traffic time periods ; US 83 South to US 2 West travel times reduced by a range of 5 to 20% in high traffic time periods. The higher end of travel time changes applies to PM peak hour conditions • Travel times between US 2 West and US 52 South generally unchanged for both travel directions in PM peak hour • 5.3 miles in length • 65 mph design speed
Local Accessibility	17	●●●●●●●●○○	• 1/2 mile access spacing emphasizes traffic flow rather than access to local roadway network • LOS B expected through 2045 - significant extra capacity available to carry local traffic if adjacent areas begin to develop • Re-routing of regional traffic from the core of Minot reduces network-wide delays by around 18% in the PM peak hour • Traffic shifts mitigate deficiencies at urban signals, with all signals operating at LOS C or better
Crash Potential	21	●●●●●●○○○○	• One 65 mph curve, otherwise generally tangent sections • Delay reduction in urban core of Minot reduces rear-end and angle crash potential - Annual safety benefits are estimated to be around $1,250,000 per year under 2045 traffic volumes • Crash history on US 83 between 54th Ave S and US 2 shows crash rates above the critical crash rate, with rear-end and angle crashes being the most represented
Multimodal Connectivity	10	●●●●○○○○○○	• Shared use path on one side of the highway accomodates bikes and pedestrians • Shared use path can support future non-motorized demand if Minot begins to develop closer to the route
Cost	14	●●●●●○○○○○	• Planning level cost estimate: $55,000,000 • North/south segment would be new construction
Environmental Impacts	12	●●●●●●○○○○	• 64 NWI wetlands impacted for a total of 10.1 acres of potential impacts, depending on final alignment • 6 percent of the route occurs within grassland, but no impacts to Dakota skipper habitat are anticipated • Multiple tributaries of the Souris River would be impacted, although none occur within a mapped floodplain. Additional analysis is required to determine if negative impacts would occur. • Potential to impact 27 acres of USFWS wetland easements • 27 percent of the route occurs in grasslands, but no impacts to Dakota skipper habitat are anticipated
Overall	100	●●●●●○○○○○ 6.0	



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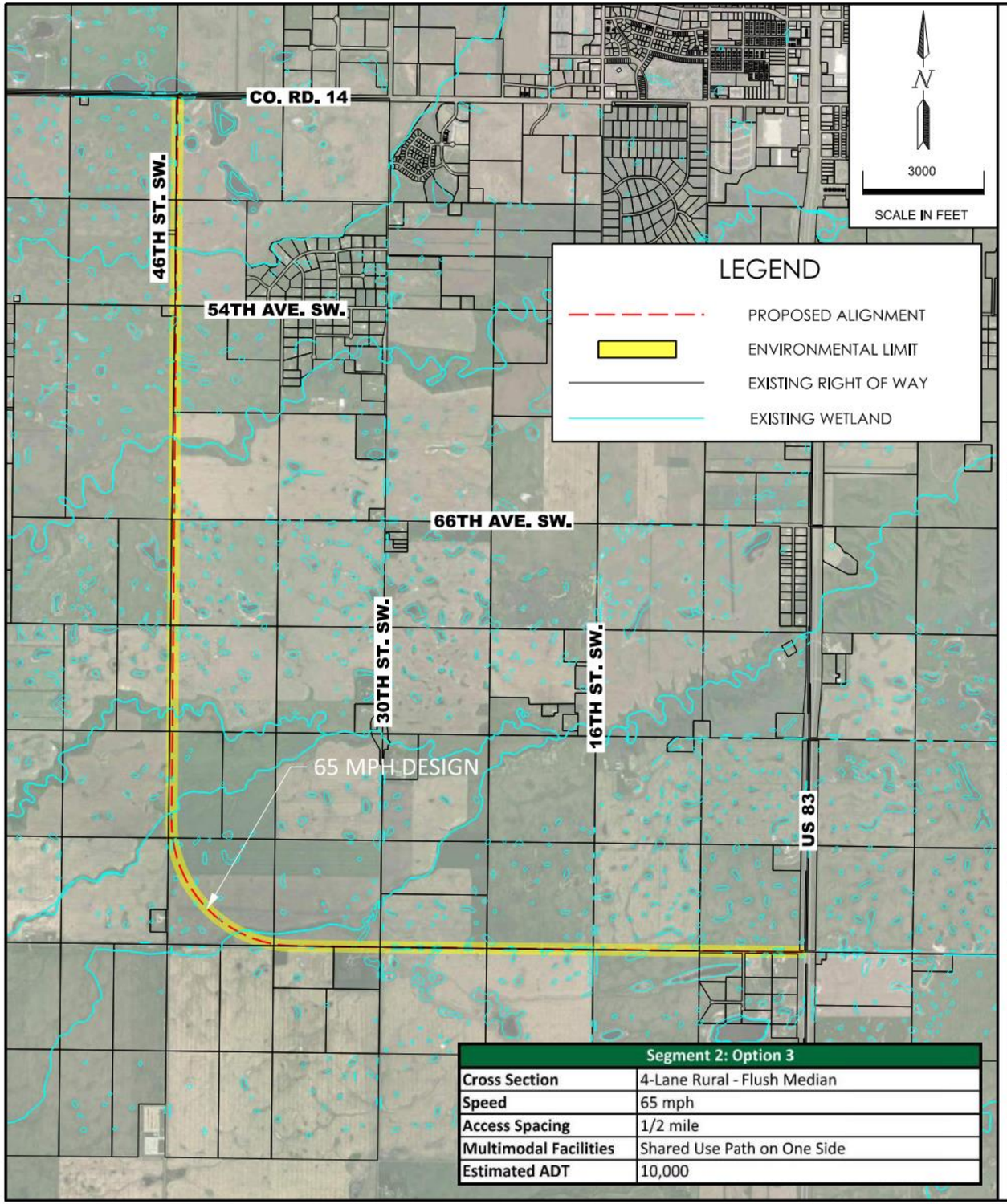
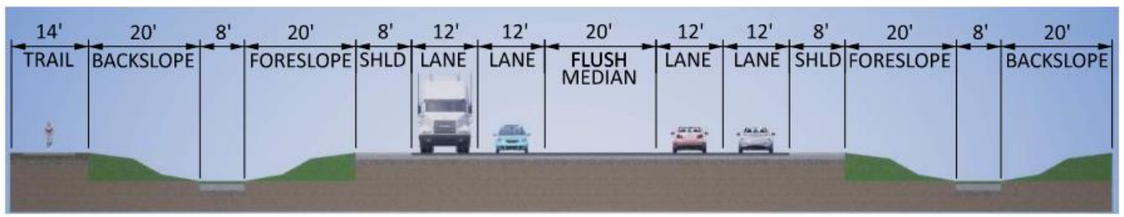
SEGMENT 2 OPTION 2B

Figure 16: Southwest Segment - Alternative 3A



Segment 2: Option 3	
Cross Section	4-Lane Rural - Flush Median
Speed	65 mph
Access Spacing	1/2 mile
Multimodal Facilities	Shared Use Path on One Side
Estimated ADT	10,000

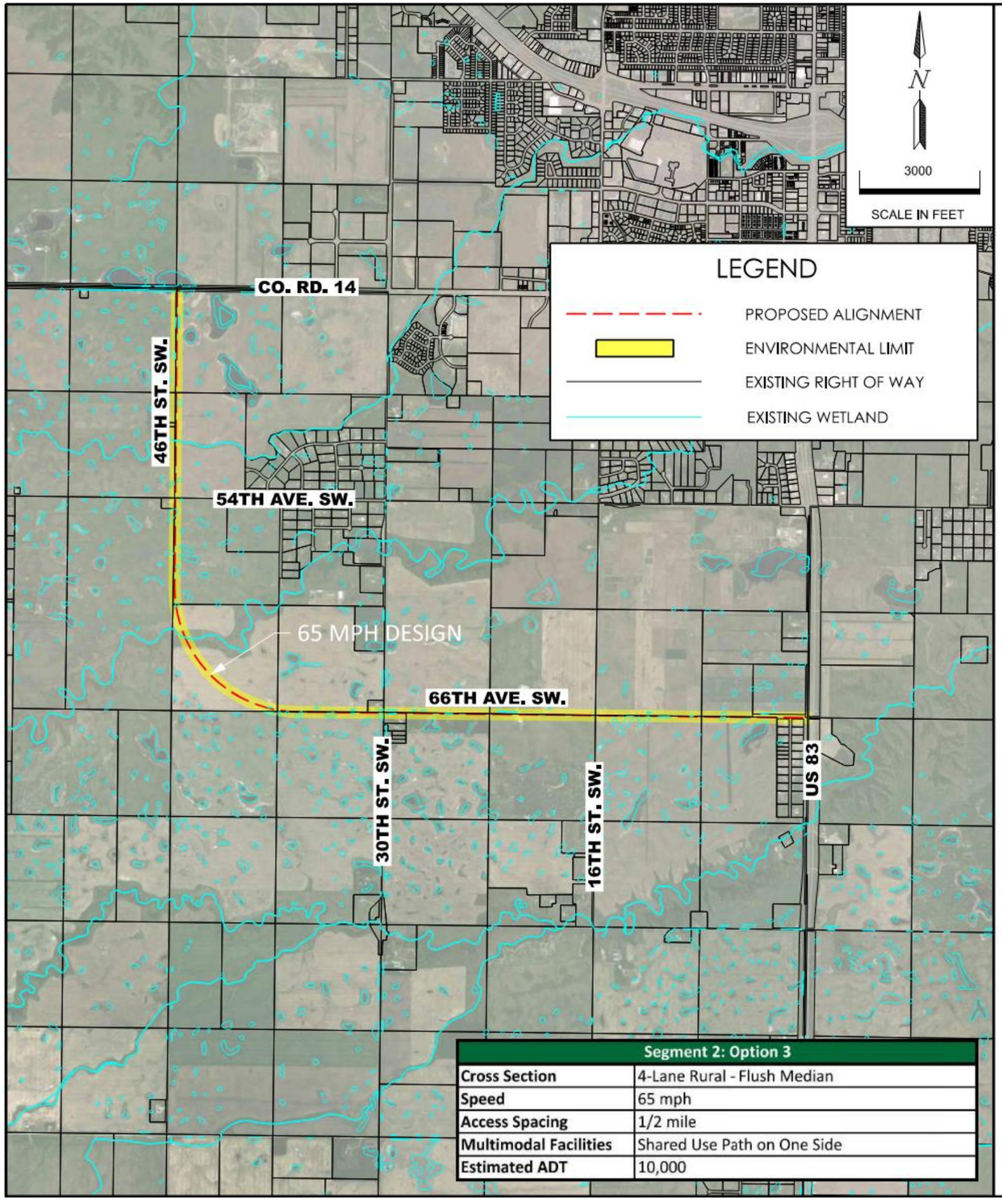
SW Segment			Option 3a: Far Route
Category	**Weight**	**Score**	**Key Factors**
Regional Mobility	27	●●●●●●●●○○	• US 2 West to US 83 South travel times reduced by a range of 5 to 15% in high traffic time periods ; US 83 South to US 2 West travel times reduced by a range of 15 to 25% in high traffic time periods. The higher end of travel time changes applies to PM peak hour conditions • 6.7 miles in length • 65 mph Design Speed
Local Accessibility	17	●●●●●●●○○○	• 1/2 mile access spacing emphasizes traffic flow rather than access to local roadway network • LOS B expected through 2045 - some extra capacity available to carry local traffic if adjacent areas begin to develop • Re-routing of regional traffic from the core of Minot reduces network-wide delays by around 18% in the PM peak hour • Traffic shifts mitigate deficiencies at urban signals, with all signals operating at LOS C or better
Crash Potential	21	●●●●●●●●○○	• One 65 mph curve, otherwise generally tangent sections • Delay reduction in urban core of Minot reduces rear-end and angle crash potential - Annual safety benefits are estimated to be around $1,250,000 per year under 2045 traffic volumes • Crash history on US 83 between 54th Ave S and US 2 shows crash rates above the critical crash rate, with rear-end and angle crashes being the most represented
Multimodal Connectivity	10	●●●●○○○○○○	• Shared use path on one side of the highway accomodates bikes and pedestrians • Shared use path can support future non-motorized demand if Minot begins to develop closer to the route
Cost	14	●●●●●●○○○○	• Planning level cost estimate: $45,000,000
Environmental Impacts	12	●●●●●○○○○○	• 80 NWI wetlands impacted for a total 11.7 acres of potential impacts • 16% of the route occurs within grassland, but no impacts to Dakota skipper habitat are anticipated • Impacts multiple tributaries of the Souris River. Additional analysis is required to determine if negative impacts would occur. • Potential to impact 7 acres of USFWS wetland easements • Potential to impact unevaluated cultural resources
Overall	100	●●●●●●○○○○ 7.0	



BOLTON & MENK

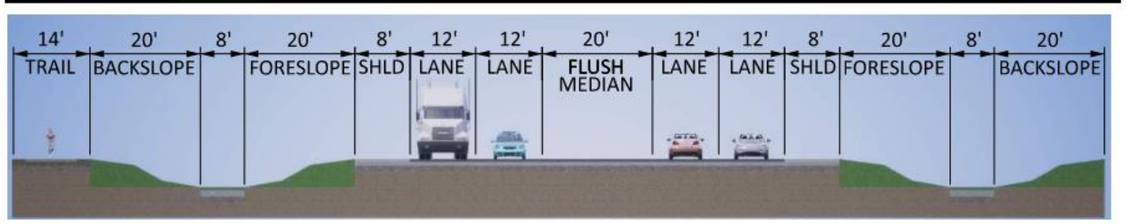
WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
SEGMENT 2 OPTION 3A

Figure 17: Southwest Segment - Alternative 3B



Segment 2: Option 3	
Cross Section	4-Lane Rural - Flush Median
Speed	65 mph
Access Spacing	1/2 mile
Multimodal Facilities	Shared Use Path on One Side
Estimated ADT	10,000

SW Segment			Option 3b: Mid Route
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●○○○	• Closer proximity to city center will add more local traffic as Minot grows • US 2 West to US 83 South travel times reduced by a range of 5 to 15% in high traffic time periods ; US 83 South to US 2 West travel times reduced by a range of 15 to 25% in high traffic time periods. The higher end of travel time changes applies to PM peak hour conditions • 4.7 miles in length • 65 mph Design Speed
Local Accessibility	17	●●●●●●●●○	• 1/2 mile access spacing emphasizes traffic flow rather than access to local roadway network • LOS B expected through 2045 - some extra capacity available to carry local traffic if adjacent areas begin to develop • Re-routing of regional traffic from the core of Minot reduces network-wide delays by around 25% in the PM peak hour • Traffic shifts mitigate deficiencies at urban signals, with all signals operating at LOS C or better
Crash Potential	21	●●●●●●●●○	• One 65 mph curve, otherwise generally tangent sections • Delay reduction in urban core of Minot reduces rear-end and angle crash potential - Annual safety benefits are estimated to be around $1,750,000 per year under 2045 traffic volumes • Crash history on US 83 between 54th Ave S and US 2 shows crash rates above the critical crash rate, with rear-end and angle crashes being the most represented
Multimodal Connectivity	10	●●●●●●○○○○	• Shared use path on one side of the highway accomodates bikes and pedestrians • Shared use path can support future non-motorized demand if Minot begins to develop closer to the route
Cost	14	●●●●●○○○○○	• Planning level cost estimate: $55,000,000
Environmental Impacts	12	●●●●●○○○○○	• 57 NWI wetlands impacted for a total of 8.6 acres of potential impacts • 11% of the route occurs within grassland, but no impacts to Dakota skipper habitat are anticipated • Impacts one tributary of the Souris River. Additional analysis is required to determine if negative impacts would occur. • Potential to impact unevaluated cultural resources
Overall	100	●●●●●●●○○○ 7.1	



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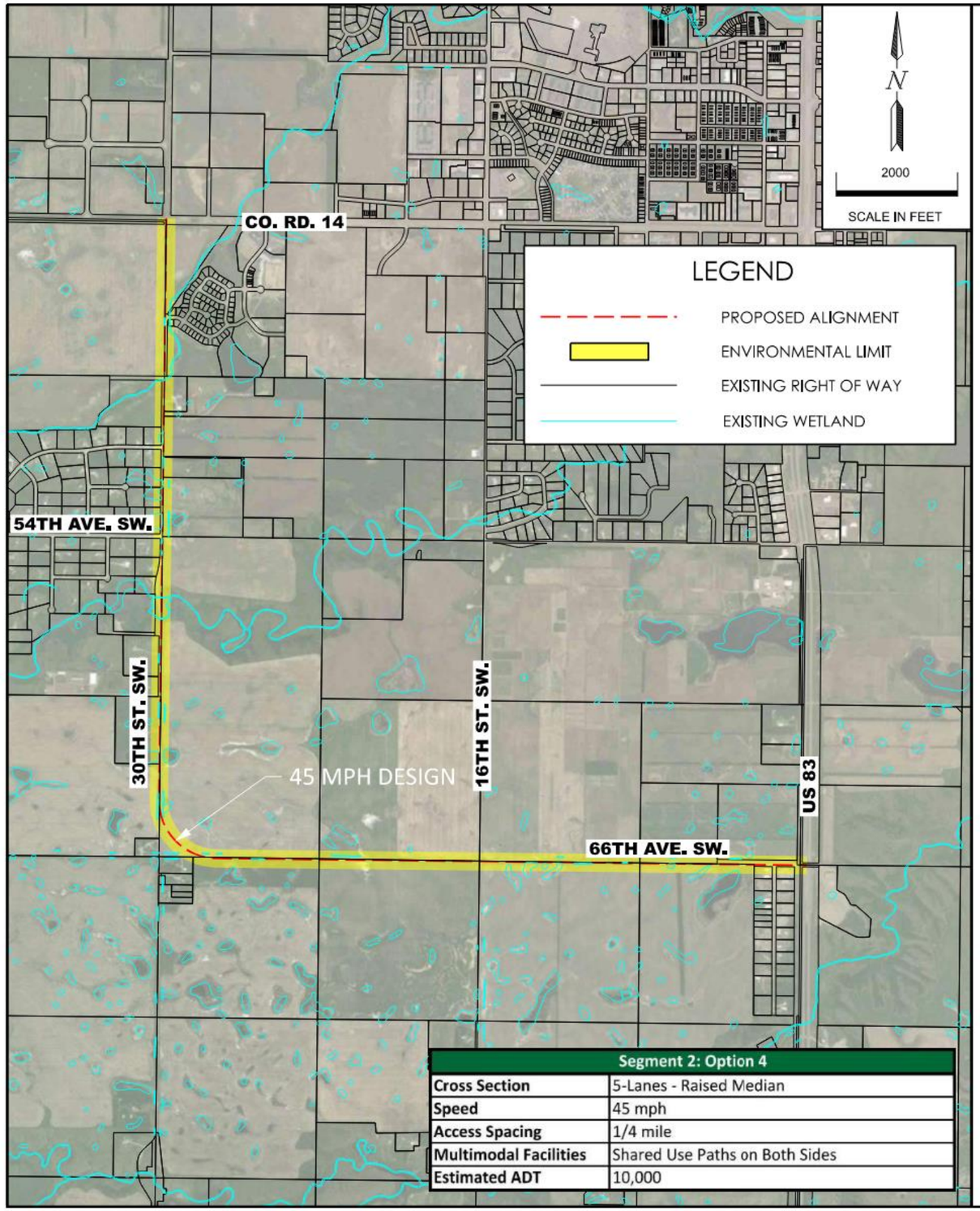
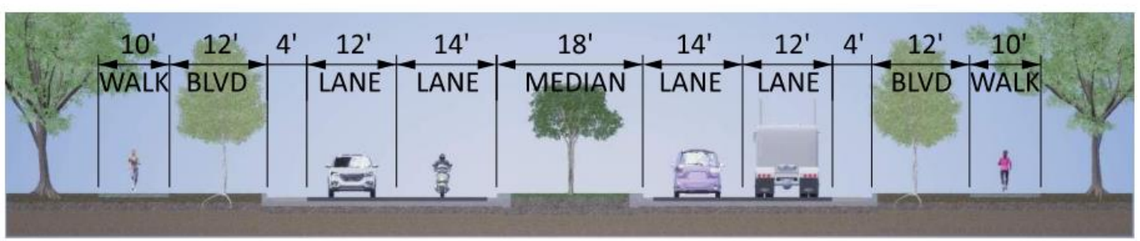
WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
SEGMENT 2 OPTION 3B



Segment 2: Option 4	
Cross Section	5-Lanes - Raised Median
Speed	45 mph
Access Spacing	1/4 mile
Multimodal Facilities	Shared Use Paths on Both Sides
Estimated ADT	10,000

SW Segment			Option 4: Near Route
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●○○○	• Closer proximity to city center will add more local traffic as Minot grows • US 2 West to US 83 South travel times reduced by a range of 5 to 15% in high traffic time periods ; US 83 South to US 2 West travel times reduced by a range of 15 to 25% in high traffic time periods. The higher end of travel time changes applies to PM peak hour conditions
Local Accessibility	17	●●●●●●●●○	• 1/4 mile access spacing balances regional traffic flow and access to local roadway network • LOS B expected through 2045 - some extra capacity available to carry local traffic if adjacent areas begin to develop • Re-routing of regional traffic from the core of Minot reduces network-wide delays by around 25% in the PM peak hour (5% reduction in AM peak hour) • Traffic shifts mitigate deficiencies at urban signals, with all signals operating at LOS C or better
Crash Potential	21	●●●●●●●●○	• One 65 mph curve, otherwise generally tangent sections • Delay reduction in urban core of Minot reduces rear-end and angle crash potential - Annual safety benefits are estimated to be around $1,750,000 per year under 2045 traffic volumes • Crash history on US 83 between 54th Ave S and US 2 shows crash rates above the critical crash rate, with rear-end and angle crashes being the most represented
Multimodal Connectivity	10	●●●●●●●●○○	• Shared use paths on each side of the highway accomodates bikes and pedestrians • Shared use path can support future non-motorized demand if Minot begins to develop closer to the route
Cost	14	●●●●●○○○○○	• Planning level cost estimate: $45,000,000
Environmental Impacts	12	●●●●○○○○○○	• 42 NWI wetlands impacted for a total of 7.9 acres acres of potential impacts • 7 percent of the route occurs within grassland, but no impacts to Dakota skipper habitat are anticipated • Requires small amount of ROW acquisition from NDSU Research Extension
Overall	100	●●●●●●●○○○ 7.5	



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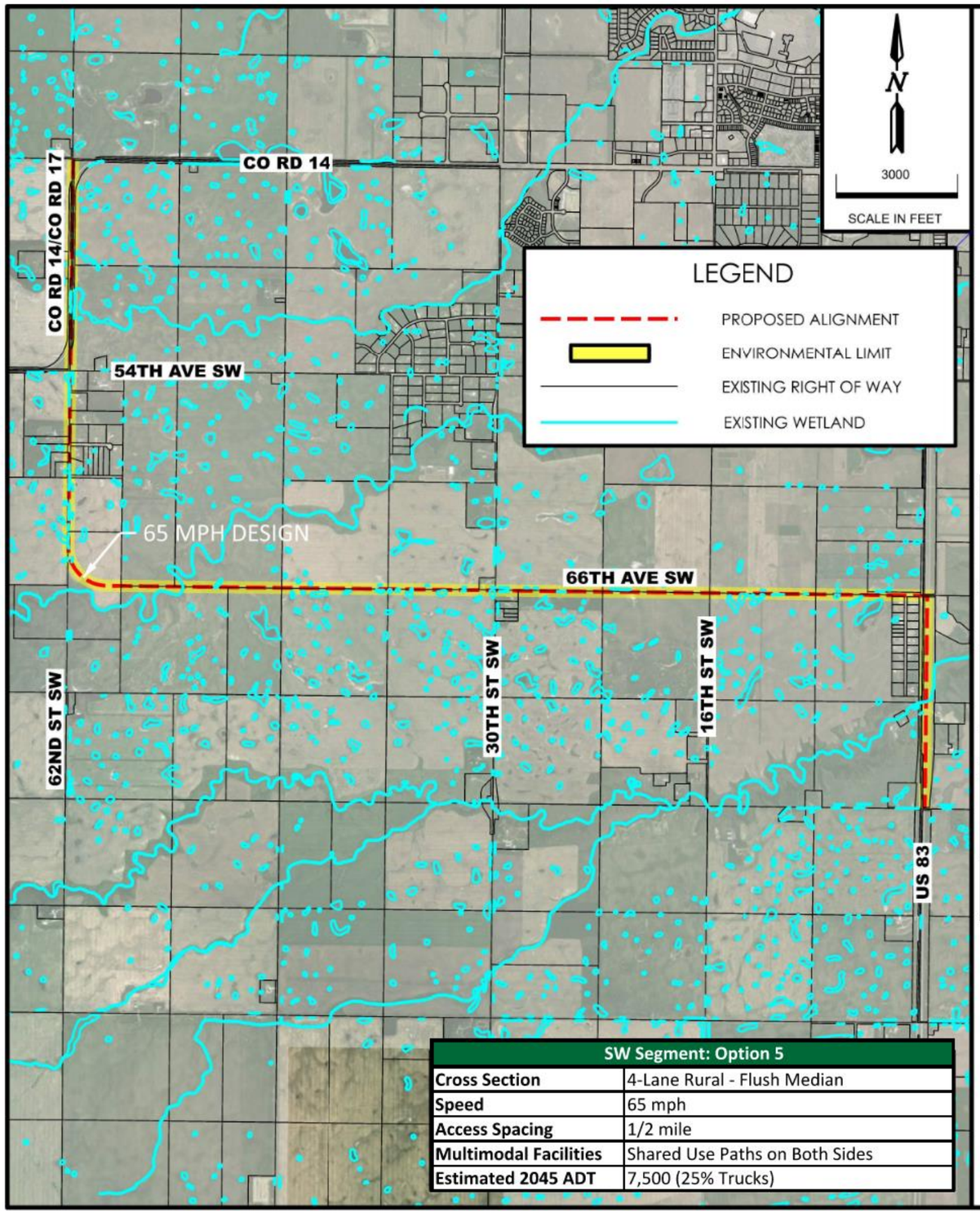
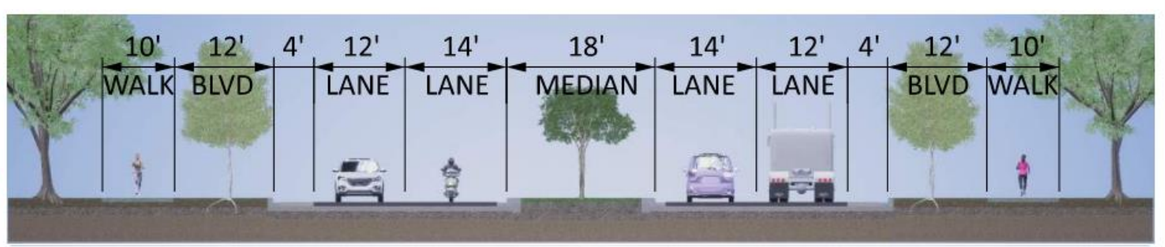
WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
SEGMENT 2 OPTION 4

Figure 19: Southwest Segment - Alternative 5



SW Segment: Option 5	
Cross Section	4-Lane Rural - Flush Median
Speed	65 mph
Access Spacing	1/2 mile
Multimodal Facilities	Shared Use Paths on Both Sides
Estimated 2045 ADT	7,500 (25% Trucks)

SW Segment			Option 5: Mid Route
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●●○○	• US 2 West to US 83 South travel times reduced by a range of 5 to 15% in high traffic time periods ; US 83 South to US 2 West travel times reduced by a range of 15 to 25% in high traffic time periods. The higher end of travel time changes applies to PM peak hour conditions • 5.9 miles in length • 65 mph Design Speed
Local Accessibility	17	●●●●●●●●○○	• 1/2 mile access spacing emphasizes traffic flow rather than access to local roadway network • LOS B expected through 2045 - some extra capacity available to carry local traffic if adjacent areas begin to develop • Re-routing of regional traffic from the core of Minot reduces network-wide delays by around 18% in the PM peak hour • Traffic shifts mitigate deficiencies at urban signals, with all signals operating at LOS C or better
Crash Potential	21	●●●●●●●●○○	• One 65 mph curve, otherwise generally tangent sections • Delay reduction in urban core of Minot reduces rear-end and angle crash potential - Annual safety benefits are estimated to be around $1,250,000 per year under 2045 traffic volumes • Crash history on US 83 between 54th Ave S and US 2 shows crash rates above the critical crash rate, with rear-end and angle crashes being the most represented
Multimodal Connectivity	10	●●●●●●●●○○	• Shared use path on both sides of the highway accomodates bikes and pedestrians • Shared use path can support future non-motorized demand if Minot begins to develop closer to the route
Cost	14	●●●●●●○○○○	• Planning level cost estimate: $78,000,000
Environmental Impacts	12	●●●●●●○○○○	• 42 NWI wetlands impacted for aproximately 8-10 acres of potential impacts • 7% of the route occurs within grassland, but no impacts to Dakota skipper habitat are anticipated • Multiple tributaries of the Souris River would be impacted, although none occur within a mapped floodplain. Additional analysis is required to determine if negative impacts would occur. • Requires small amount of ROW acquisition from NDSU Research Extension
Overall	100	●●●●●●●○○○ 7.5	



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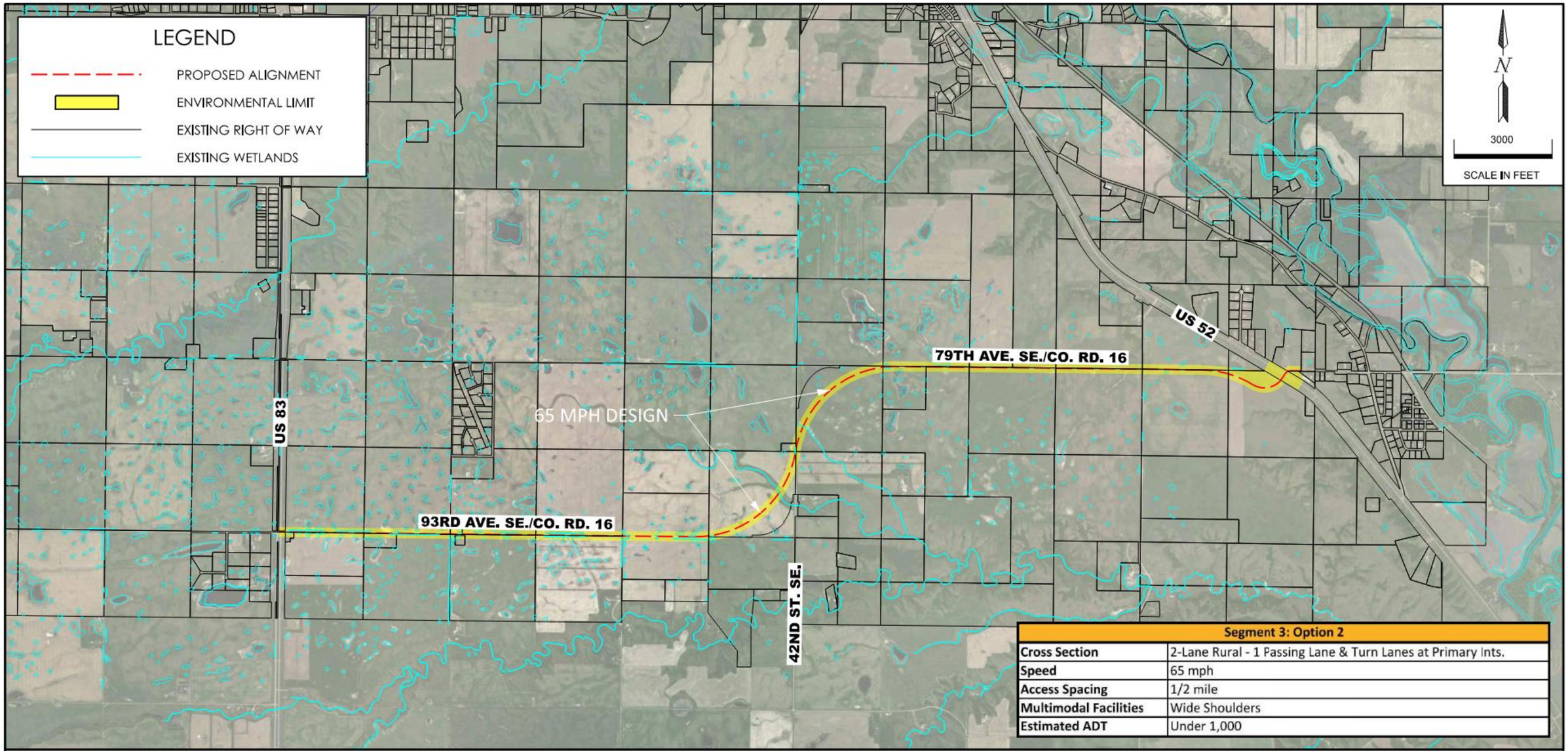
WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
SEGMENT 2 OPTION 5

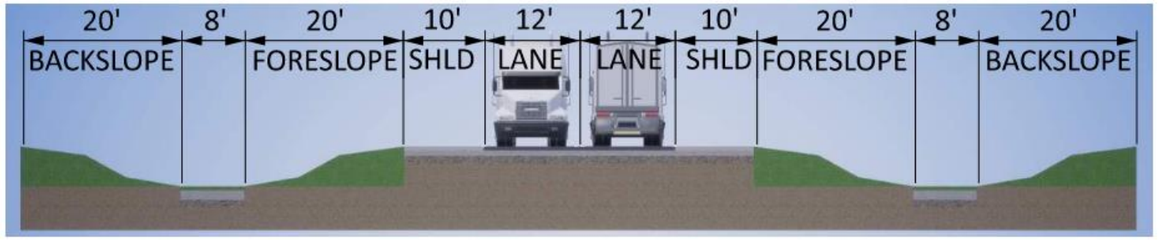
Table 2: Southwest Segment Alternatives Analysis Summary

Metric	1	2a	2b	3a	3b	4	5	No Build
Regional Mobility	●●●●●●●○○○	●●●●●●●○○○	●●●●●●○○○○	●●●●●●●●○○	●●●●●●●○○○	●●●●●●●○○○	●●●●●●●●○○	●●○○○○○○○○
Local Accessibility	●●●●●●●○○○	●●●●●●●○○○	●●●●●●●●○○	●●●●●●●●○○	●●●●●●●●●○	●●●●●●●●●○	●●●●●●●●○○	●●●○○○○○○○
Crash Potential	●●●●●●○○○○	●●●●●●○○○○	●●●●●●○○○○	●●●●●●●●○○	●●●●●●●●●○	●●●●●●●●●○	●●●●●●●●○○	●●●○○○○○○○
Multimodal Connectivity	●●○○○○○○○○	●●○○○○○○○○	●●●●○○○○○○	●●●●○○○○○○	●●●●●●○○○○	●●●●●●●●○○	●●●●○○○○○○	●○○○○○○○○○
Cost	●●●●●●●●●○	●●●●●○○○○○	●●●●●○○○○○	●●●●●●○○○○	●●●●●○○○○○	●●●●●●○○○○	●●●●●●○○○○	●●●●●●●●●●
Environmental Impacts	●●●●●●○○○○	●●●●●○○○○○	●●●●●●○○○○	●●●●●○○○○○	●●●●●○○○○○	●●●●●○○○○○	●●●●●○○○○○	●●●●●●●●●●
Overall	●●●●●●○○○○ 6.5	●●●●●○○○○○ 5.8	●●●●●○○○○○ 6.0	●●●●●●○○○○ 7.0	●●●●●●●○○○ 7.1	●●●●●●●○○○ 7.5	●●●●●●○○○○ 7.0	●●●●○○○○○○ 4.3
Rank	5	7	6	4	2	1	3	9



Segment 3: Option 2	
Cross Section	2-Lane Rural - 1 Passing Lane & Turn Lanes at Primary Ints.
Speed	65 mph
Access Spacing	1/2 mile
Multimodal Facilities	Wide Shoulders
Estimated ADT	Under 1,000

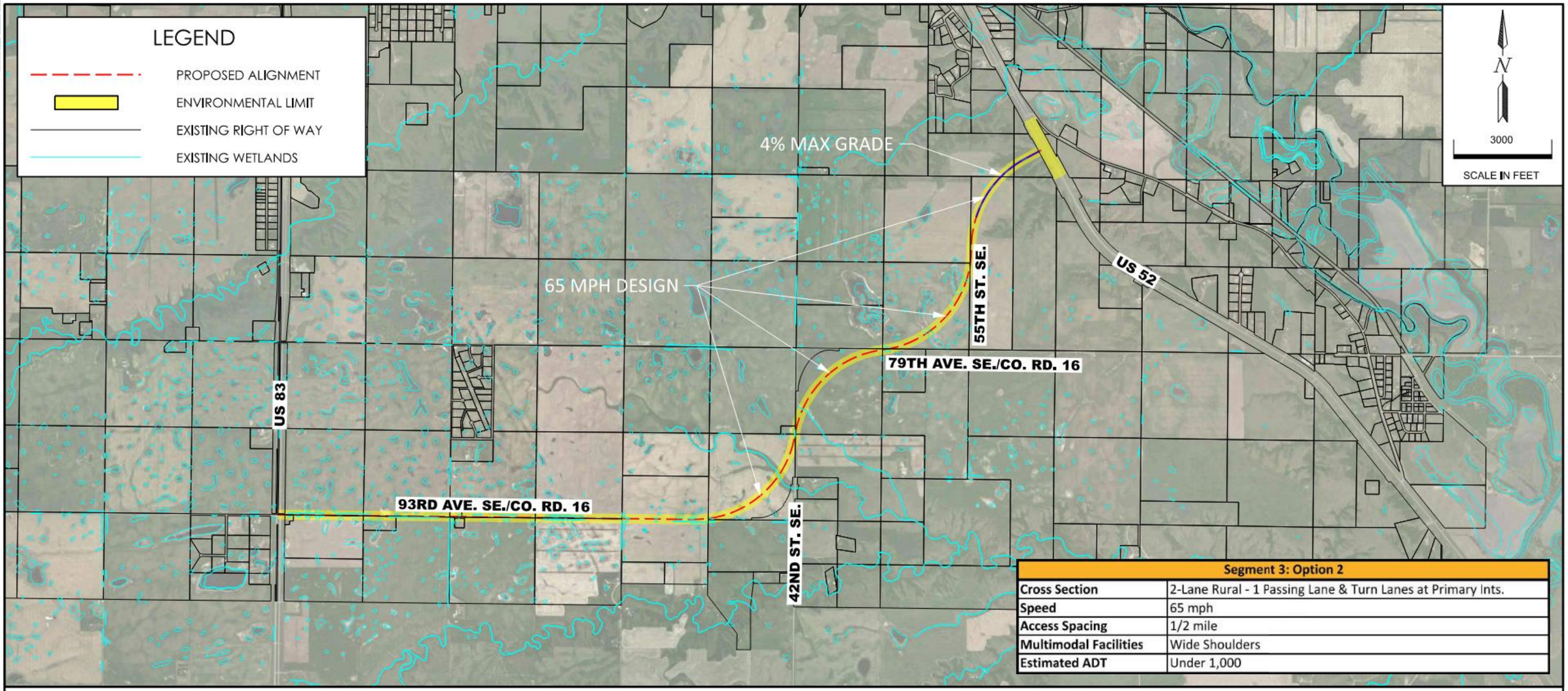
SE Segment			Option 1: Far Route
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●●○○	• Distance from city center reduces local traffic, prioritizing regional traffic • SE connection serves low volume origin-destination pairs, lowering its utility compared to a SW connection • 7 Miles in length • 65 mph design speed
Local Accessibility	17	●●●●●●○○○○	• 1/2 mile access spacing emphasizes traffic flow rather than access to local roadway network • LOS A expected through 2045 - significant extra capacity available to carry local traffic as well as regional traffic
Crash Potential	21	●●●●○○○○○○	• Two 65 mph reverse curves, which is suboptimal design
Multimodal Connectivity	10	●●○○○○○○○○	• Wide shoulder can carry bike traffic, but no sidewalk/paths for pedestrians • Low non-motorized travel demand due to distance from typical bike/pedestrian generators
Cost	14	●●●●●●●●○○	• Planning level cost estimate: $15,000,000 - $35,000,000
Environmental Impacts	12	●●●●●●●○○○	• 73 NWI wetlands impacted for a total of 12.1 acres acres of potential impacts • 11 percent of the route occurs within grassland, but no impacts to Dakota skipper habitat are anticipated
Overall	100	●●●●●●○○○○ 6.1	



BOLTON & MENK

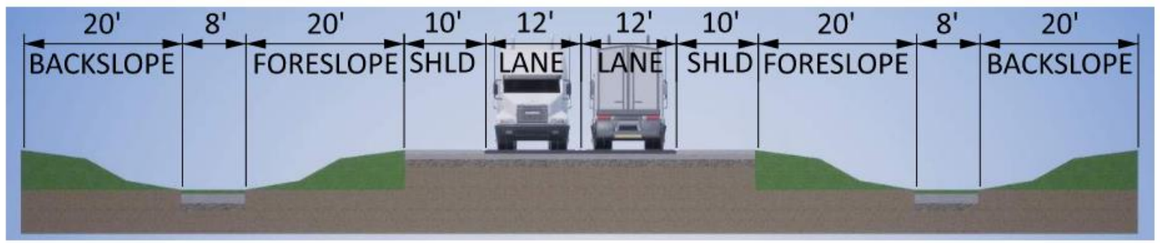
WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
SEGMENT 3 OPTION 1

Figure 21: Southeast Segment - Alternative 2



Segment 3: Option 2	
Cross Section	2-Lane Rural - 1 Passing Lane & Turn Lanes at Primary Ints.
Speed	65 mph
Access Spacing	1/2 mile
Multimodal Facilities	Wide Shoulders
Estimated ADT	Under 1,000

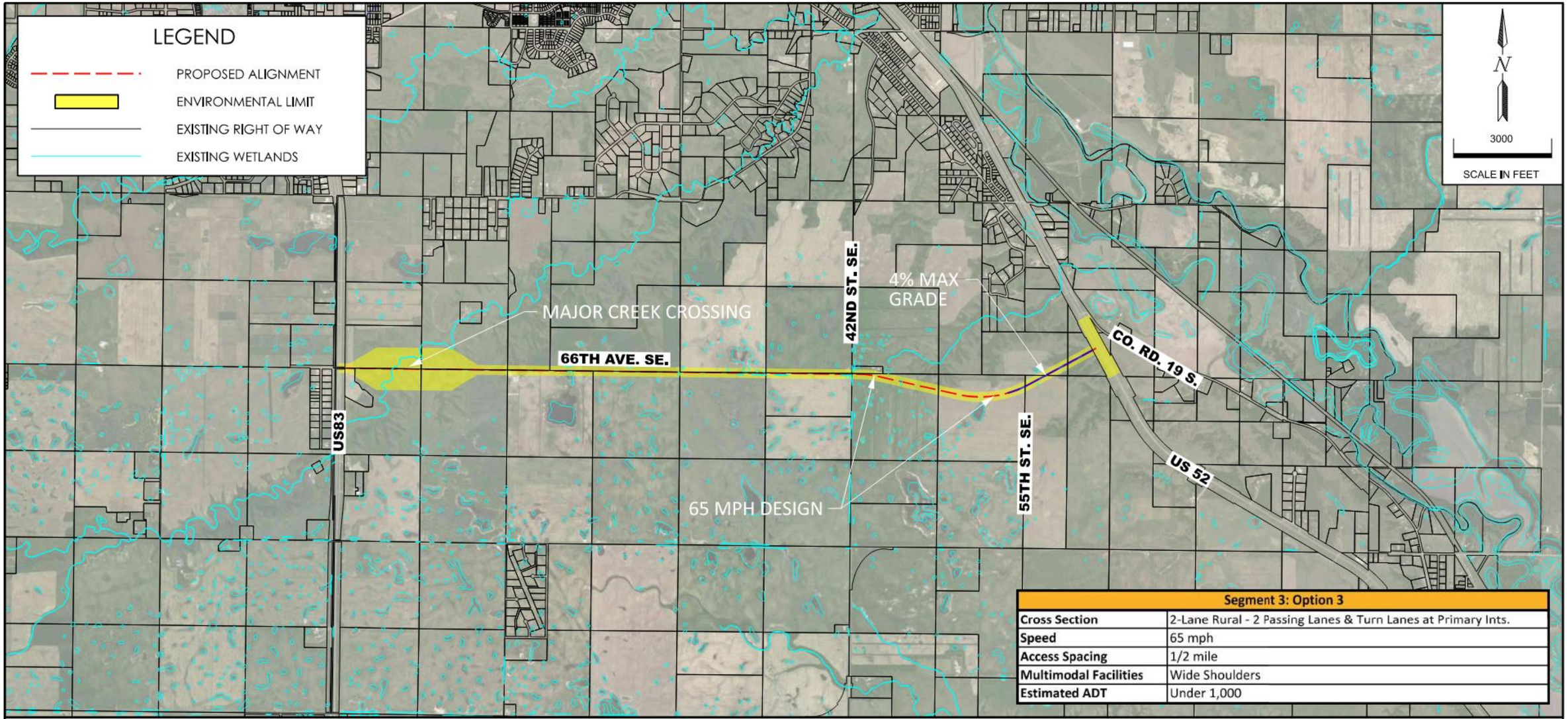
SE Segment			Option 2: Far Route
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●●○	• Distance from city center reduces local traffic, prioritizing regional traffic • SE connection serves low volume origin-destination pairs, lowering its utility compared to a SW connection • 6.4 miles in length • 65 mph design speed
Local Accessibility	17	●●●●●○○○○○	• 1/2 mile access spacing emphasizes traffic flow rather than access to local roadway network • LOS A expected through 2045 - significant extra capacity available to carry local traffic if adjacent areas begin to develop
Crash Potential	21	●●○○○○○○○○	• Three 65 mph reverse curves, which is suboptimal design • 4% maximum grade for 1/2 mile • Single vehicle crashes are common around Minot on similar roadways with combined horizontal and vertical curvature
Multimodal Connectivity	10	●●○○○○○○○○	• Wide shoulder can carry bike traffic, but no sidewalk/paths for pedestrians • Low non-motorized travel demand due to distance from typical bike/pedestrian generators
Cost	14	●●●●●○○○○○	• Planning level cost estimate: $40,000,000 - $50,000,000 • Significant cut sections
Environmental Impacts	12	●●●●●●○○○○	• 71 NWI wetlands impacted for a total of 12.6 acres acres of potential impacts • 11 percent of the route occurs within grassland, but no impacts to Dakota skipper habitat are anticipated • Potential to impact 5 acres of USFWS wetland easements • Potential to impact unevaluated cultural resources
Overall	100	●●●●●○○○○○ 5.4	



BOLTON & MENK

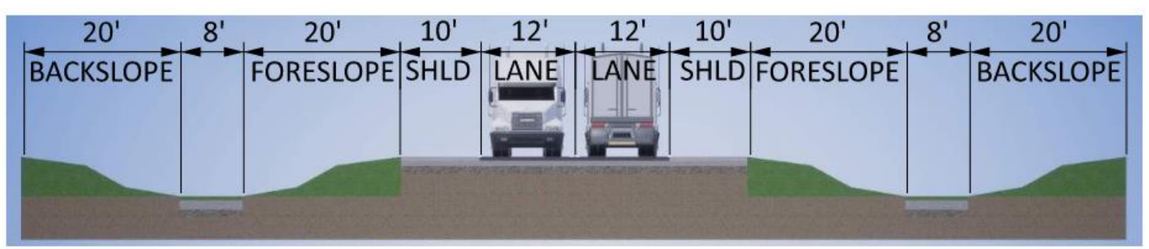
WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
SEGMENT 3 OPTION 2

Figure 22: Southeast Segment - Alternative 3



Segment 3: Option 3	
Cross Section	2-Lane Rural - 2 Passing Lanes & Turn Lanes at Primary Ints.
Speed	65 mph
Access Spacing	1/2 mile
Multimodal Facilities	Wide Shoulders
Estimated ADT	Under 1,000

Segment 3			Option 3: Inner Alignment
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●○○○○○○	• Emphasizes regional traffic rather than supporting transportation in growth areas of Minot • SE connection serves low volume origin-destination pairs, lowering its utility compared to a SW connection • 6 miles in length • 65 mph design speed
Local Accessibility	17	●●○○○○○○○○	• 1/2 mile access spacing emphasizes traffic flow rather than access to local roadway network • LOS A expected through 2045 - significant extra capacity available to carry local traffic if adjacent areas begin to develop
Crash Potential	21	●●●●●●●○○○	• 4% maximum grade for 1/2 mile
Multimodal Connectivity	10	●●○○○○○○○○	• Wide shoulder can carry bike traffic, but no sidewalk/paths for pedestrians • Low non-motorized travel demand due to distance from typical bike/pedestrian generators
Cost	14	●●●○○○○○○○	• Planning level cost estimate: $71,000,000 • Alignment travels through ravine
Environmental Impacts	12	●●●●●○○○○○	• 21 NWI wetlands impacted for a total of 4.4 acres acres of potential impacts • 39 percent of the route occurs within grassland and could impact potential Dakota skipper habitat • Potential to impact 18 acres of USFWS wetland easements • Potential to impact unevaluated cultural resources
Overall	100	●●●●○○○○○○	



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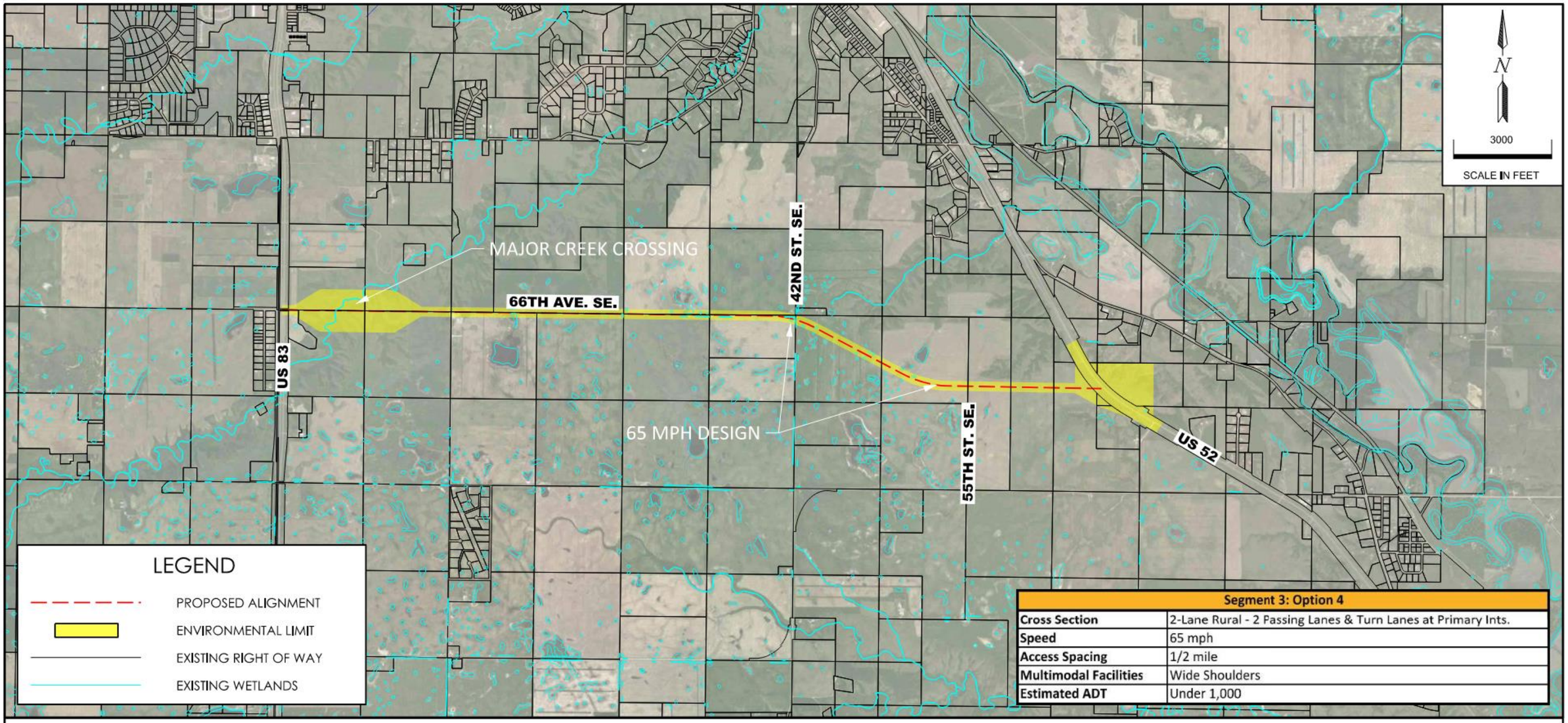
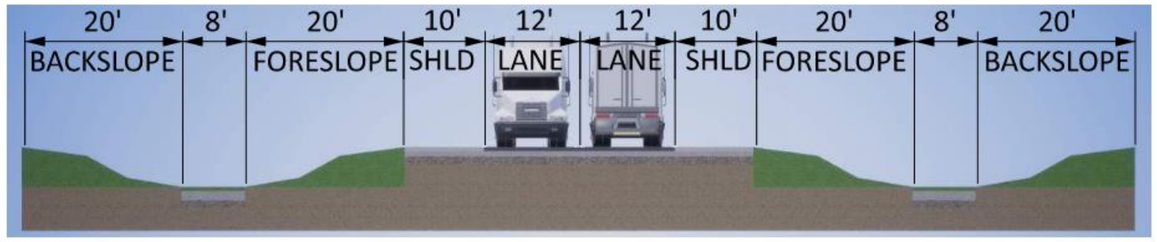
WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
SEGMENT 3 OPTION 3

Figure 23: Southeast Segment - Alternative 4



Segment 3: Option 4	
Cross Section	2-Lane Rural - 2 Passing Lanes & Turn Lanes at Primary Ints.
Speed	65 mph
Access Spacing	1/2 mile
Multimodal Facilities	Wide Shoulders
Estimated ADT	Under 1,000

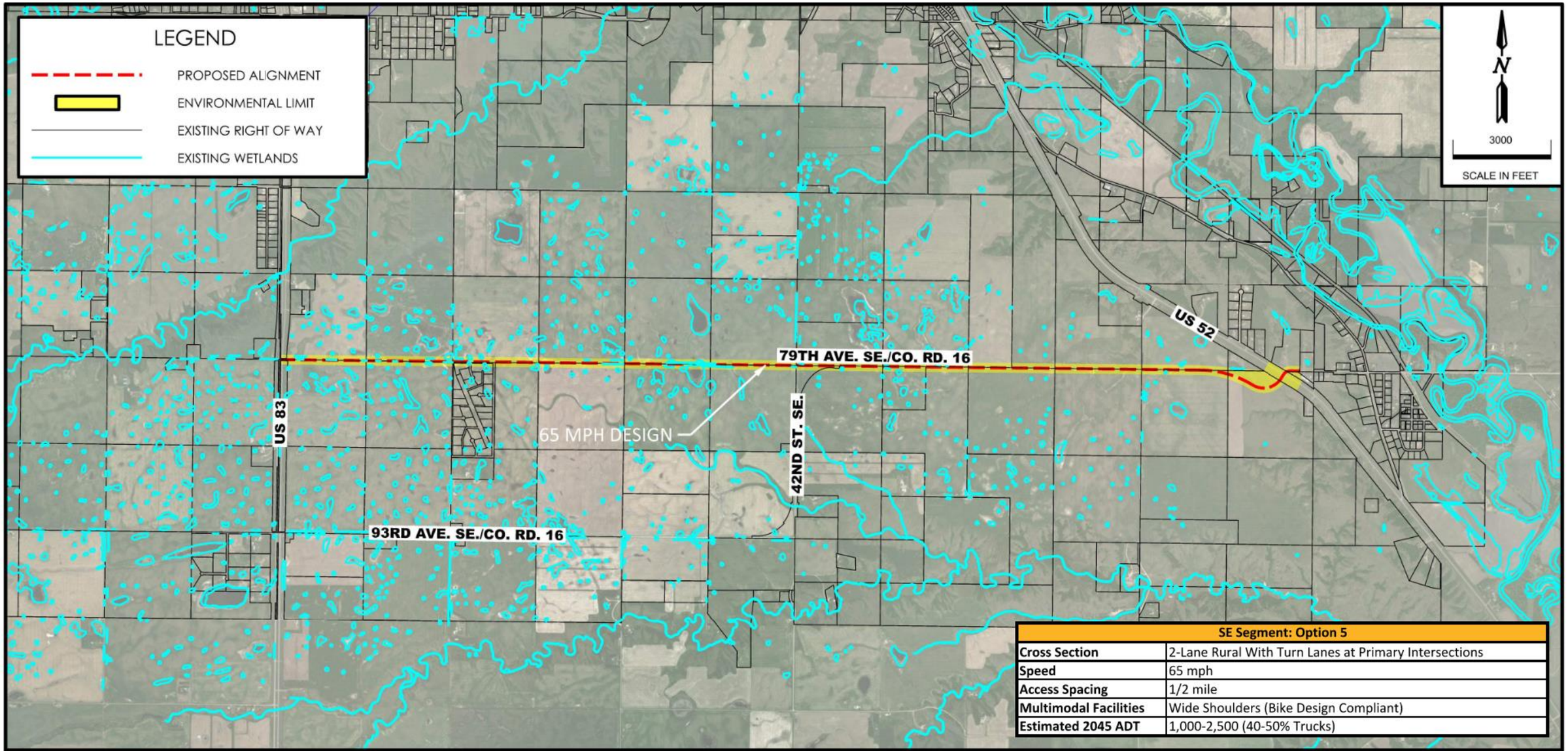
SE Segment			Option 4: Near Route
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●○○○	• SE connection serves low volume origin-destination pairs, lowering its utility compared to a SW connection • 5.3 miles in length • 65 mph design speed
Local Accessibility	17	●●●●●●●○○○	• 1/2 mile access spacing emphasizes traffic flow rather than access to local roadway network • LOS A expected through 2045 - significant extra capacity available to carry local traffic if adjacent areas begin to develop
Crash Potential	21	●●●●●●●○○○	• Two 65 mph horizontal curves
Multimodal Connectivity	10	●●○○○○○○○○	• Wide shoulder can carry bike traffic, but no sidewalk/paths for pedestrians • Low non-motorized travel demand due to distance from typical bike/pedestrian generators
Cost	14	●●●●●○○○○○	• Planning level cost estimate: $40,000,000 - $55,000,000 • Alignment travels through ravine
Environmental Impacts	12	●●●●●●○○○○	• 28 NWI wetlands impacted for a total of 4.9 acres acres of potential impacts • 11 percent of the route occurs within grassland, but no impacts to Dakota skipper habitat are anticipated • Potential to impact 19 acres of USFWS wetland easements • Potential to impact unevaluated cultural resources
Overall	100	●●●●●●○○○○ 6.1	



BOLTON & MENK

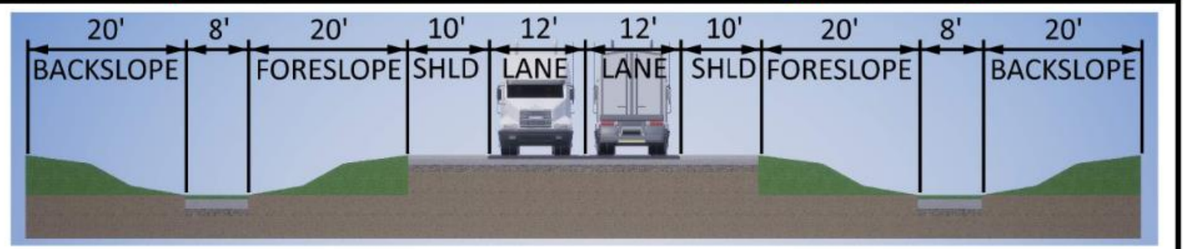
WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
SEGMENT 3 OPTION 4

Figure 24: Southeast Segment - Alternative 5



SE Segment: Option 5	
Cross Section	2-Lane Rural With Turn Lanes at Primary Intersections
Speed	65 mph
Access Spacing	1/2 mile
Multimodal Facilities	Wide Shoulders (Bike Design Compliant)
Estimated 2045 ADT	1,000-2,500 (40-50% Trucks)

SE Segment			Option 5: Mid Route
Category	**Weight**	**Score**	**Key Factors**
Regional Mobility	27	●●●●●●●○○○	• SE connection serves low volume origin-destination pairs, lowering its utility compared to a SW connection • 5.9 miles in length • 65 mph design speed
Local Accessibility	17	●●●●●●●○○○	• 1/2 mile access spacing emphasizes traffic flow rather than access to local roadway network • LOS A expected through 2045 - significant extra capacity available to carry local traffic if adjacent areas begin to develop
Crash Potential	21	●●●●●●●○○○	• Two 65 mph horizontal curves • No roadway curvature except approach to US 52
Multimodal Connectivity	10	●●○○○○○○○○	• Wide shoulder can carry bike traffic, but no sidewalk/paths for pedestrians • Low non-motorized travel demand due to distance from typical bike/pedestrian generators
Cost	14	●●●●●●●○○○	• Planning level cost estimate: $26,000,000 - $31,000,000 • Alignment utilizes and existing roadway
Environmental Impacts	12	●●●●●●○○○○	• 43 NWI wetlands impacted for aproximately 12 acres of potential impacts • 11 percent of the route occurs within grassland, but no impacts to Dakota skipper habitat are anticipated • Potential to impact 5 acres of USFWS wetland easements • Potential to impact unevaluated cultural resources
Overall	100	●●●●●●○○○○ 6.4	



BOLTON & MENK

WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
SEGMENT 3 OPTION 5

Table 3: Southeast Segment Alternatives Analysis Summary

Metric	1	2	3	4	5	No Build
Regional Mobility	●●●●●●●●○○	●●●●●●●●●○	●●●●●●○○○○	●●●●●●●○○○	●●●●●●●○○○	●●○○○○○○○○
Local Accessibility	●●●●●●○○○○	●●●●●●○○○○	●●●●●●●○○○	●●●●●●●○○○	●●●●●●●○○○	●●●○○○○○○○
Crash Potential	●●●●○○○○○○	●●○○○○○○○○	●●●●●●●○○○	●●●●●●●○○○	●●●●●●●○○○	●●●○○○○○○○
Multimodal Connectivity	●●○○○○○○○○	●●○○○○○○○○	●●○○○○○○○○	●●○○○○○○○○	●●○○○○○○○○	●○○○○○○○○○
Cost	●●●●●●●●○○	●●●●●○○○○○	●●●○○○○○○○	●●●●●○○○○○	●●●●●○○○○○	●●●●●●●●●●
Environmental Impacts	●●●●●●●○○○	●●●●●●○○○○	●●●●●○○○○○	●●●●●●○○○○	●●●●●●○○○○	●●●●●●●●●●
Overall	●●●●●●○○○○ 6.1	●●●●●○○○○○ 5.4	●●●●●○○○○○ 5.4	●●●●●●○○○○ 6.1	●●●●●●○○○○ 6.1	●●●●○○○○○○ 4.3
Rank	1	5	4	2	2	6

IV. Intersection Alternatives

Intersection alternatives were developed for locations that will serve as key connection points between the proposed connector route and the existing US highway system in the Minot area. These connection points are:

- **Connection with US 2 west of Minot.** Four intersection alternatives were developed. Specific details related to each of these alternatives are shown in **Figure 25** through **Figure 28**.
- **Connection with US 83 south of Minot.** Four intersection alternatives were developed. Specific details related to each of these alternatives are shown in **Figure 29** through **Figure 32**.
- **Connection with US 52 southeast of Minot.** Four intersection alternatives were developed. Specific details related to each of these alternatives are shown in **Figure 33** through **Figure 36**.
- **Intersections of CR 14/17 (North and South Intersections) with Connector Route.** Two intersection alternatives were developed for each intersection. Specific details related to each of these alternatives are shown in **Figure 37** through **Figure 40**.

Intersection Alternative Compatibility With Route Alignment Alternatives

Given the different traffic patterns that are associated with different route alignment alternatives (i.e. routes closer to Minot or further away from Minot), specific intersection alternatives are assumed to be most compatible with specific route alternatives. For example, an intersection alternative for the connection at west US 2 may be compatible with a Far Route alignment concept, but less compatible with a Near Route alignment concept.

Intersection alternative summary sheets provided in **Figure 25** through **Figure 40** indicate which route alignment concepts are assumed in intersection alternatives analysis results.

Intersection Alternatives Analysis Results

Results from alternatives analysis for key intersections are shown in **Figure 25** through **Figure 40**. These figures show concept layouts to illustrate intersection designs and have information related to how each alternative performs related to the key performance/evaluation criteria.

Connection to West US 2 Intersection Alternatives

The four intersection alternatives for a connection to US 2 are presented in **Figure 25** through **Figure 28**. A summary of the performance of all intersection alternatives for this location is provided in **Table 4**.

Connection to South US 83 Intersection Alternatives

The four intersection alternatives for a connection to US 83 are presented in **Figure 29** through **Figure 32**. A summary of the performance of all intersection alternatives for this location is provided in **Table 5**.

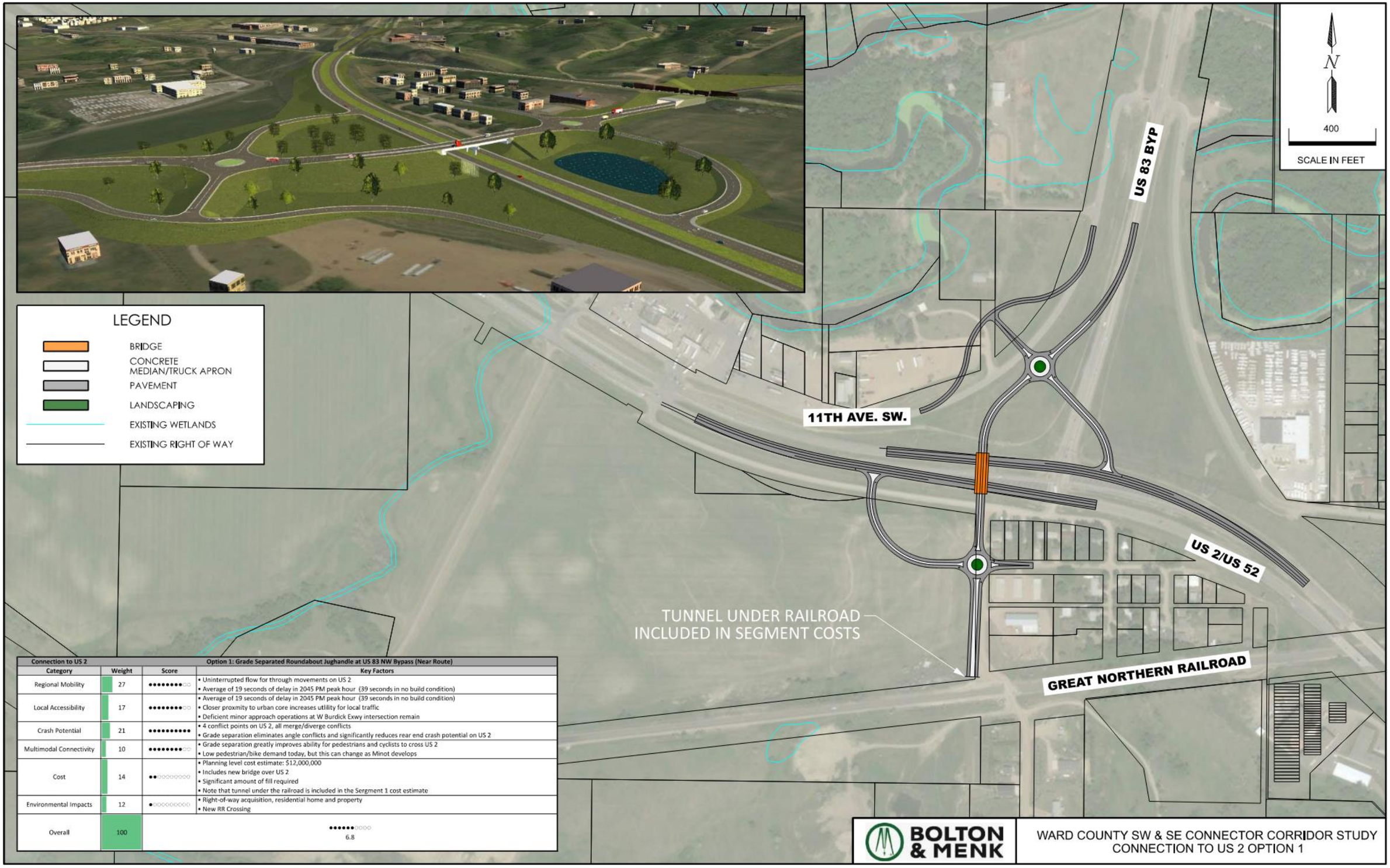
Connection to Southeast US 52 Intersection Alternatives

The four intersection alternatives for a connection to US 52 are presented in **Figure 33** through **Figure 36**. A summary of the performance of all intersection alternatives for this location is provided in **Table 6**.

CR 14/17 Intersection Alternatives

The four CR 14/17 alternatives are presented in **Figure 37** through **Figure 40**. A summary of the performance of all West Segment alternatives is provided in **Table 7.**

Figure 25: US 2 Intersection Alternative 1



Connection to US 2			Option 1: Grade Separated Roundabout Jughandle at US 83 NW Bypass (Near Route)
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●●○○	• Uninterrupted flow for through movements on US 2 • Average of 19 seconds of delay in 2045 PM peak hour (39 seconds in no build condition)
Local Accessibility	17	●●●●●●●●○○	• Average of 19 seconds of delay in 2045 PM peak hour (39 seconds in no build condition) • Closer proxmity to urban core increases utility for local traffic • Deficient minor approach operations at W Burdick Exwy intersection remain
Crash Potential	21	●●●●●●●●●●	• 4 conflict points on US 2, all merge/diverge conflicts • Grade separation eliminates angle conflicts and significantly reduces rear end crash potential on US 2
Multimodal Connectivity	10	●●●●●●●●○○	• Grade separation greatly improves ability for pedestrians and cyclists to cross US 2 • Low pedestrian/bike demand today, but this can change as Minot develops
Cost	14	●●○○○○○○○○	• Planning level cost estimate: $12,000,000 • Includes new bridge over US 2 • Significant amount of fill required • Note that tunnel under the railroad is included in the Sergment 1 cost estimate
Environmental Impacts	12	●○○○○○○○○○	• Right-of-way acquisition, residential home and property • New RR Crossing
Overall	100	●●●●●●○○○○ 6.8	

Figure 26: US 2 Intersection Alternative 2

Connection to US 2			Option 2: Roundabout Diamond Interchange at W Burdick Exwy (Near Route)
Category	**Weight**	**Score**	**Key Factors**
Regional Mobility	27	●●●●●●●●○○	• Uninterrupted flow for through movements on US 2 • Operates at LOS B or better throughout the day through 2045, all approaches at LOS B or better • Delays at NW US 83B signal remain
Local Accessibility	17	●●●●●●●●○○	• Improved access to US 2 for local traffic (minor approach LOS F under TWSC - poor existing peak hour operations • Closer proxmity to urban core increases utility for local traffic
Crash Potential	21	●●●●●●●●●●	• 4 conflict points on US 2, all merge/diverge conflicts • Grade separation eliminates angle conflicts and significantly reduces rear end crash potential on US 2
Multimodal Connectivity	10	●●●●●●●●○○	• Grade separation greatly improves ability for pedestrians and cyclists to cross US 2 • Low pedestrian/bike demand today, but this can change as Minot develops
Cost	14	●○○○○○○○○○	• Planning level cost estimate: $18,000,000 • Includes new bridge over US 2 • Includes two ramp structures over railroad • Significant amount of fill required
Environmental Impacts	12	●○○○○○○○○○	• Right-of-way acquisition, residential home and property (multiple, including memory care facility)
Overall	100	●●●●●●○○○○ 6.6	

Figure 27: US 2 Intersection Alternative 3

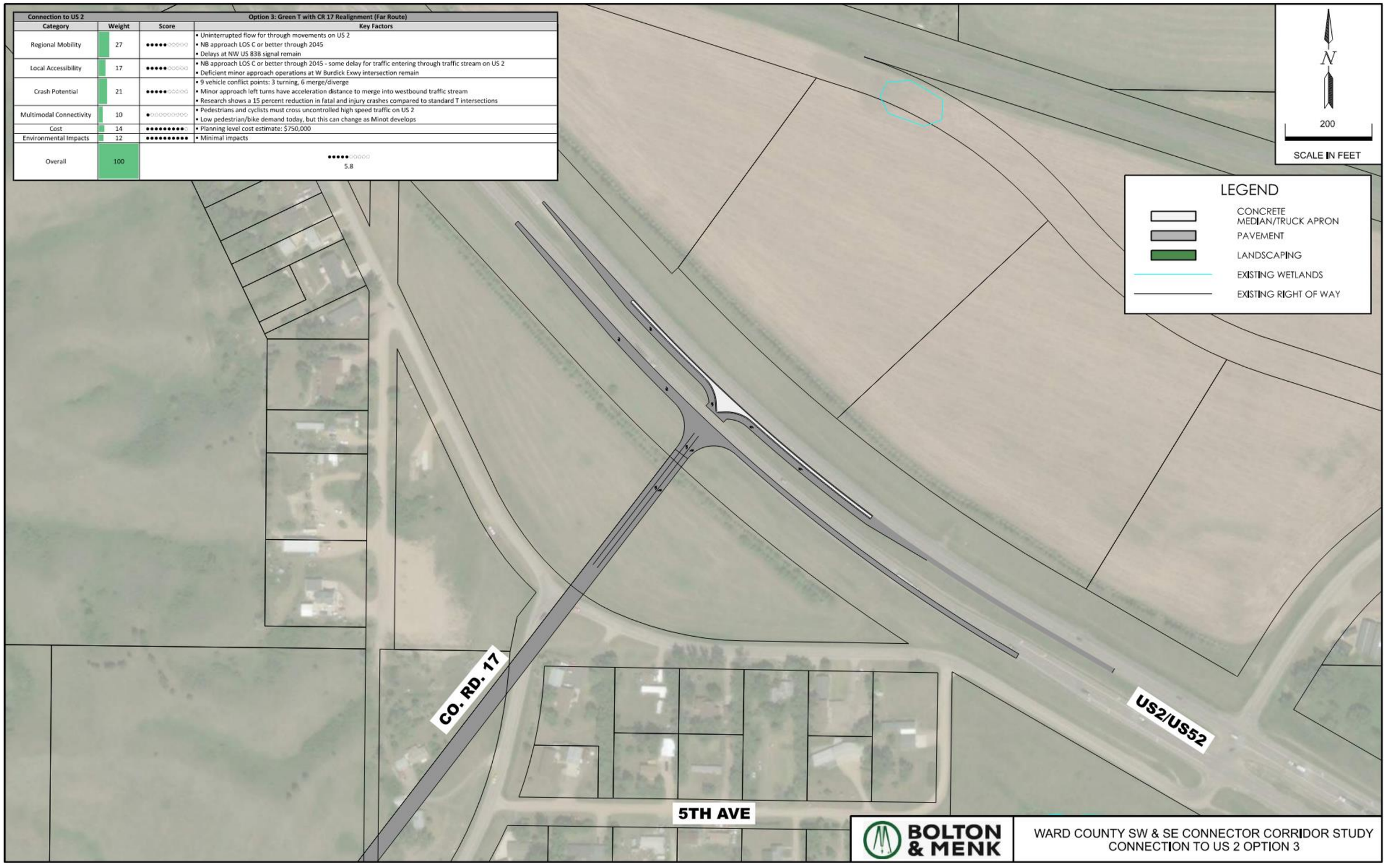
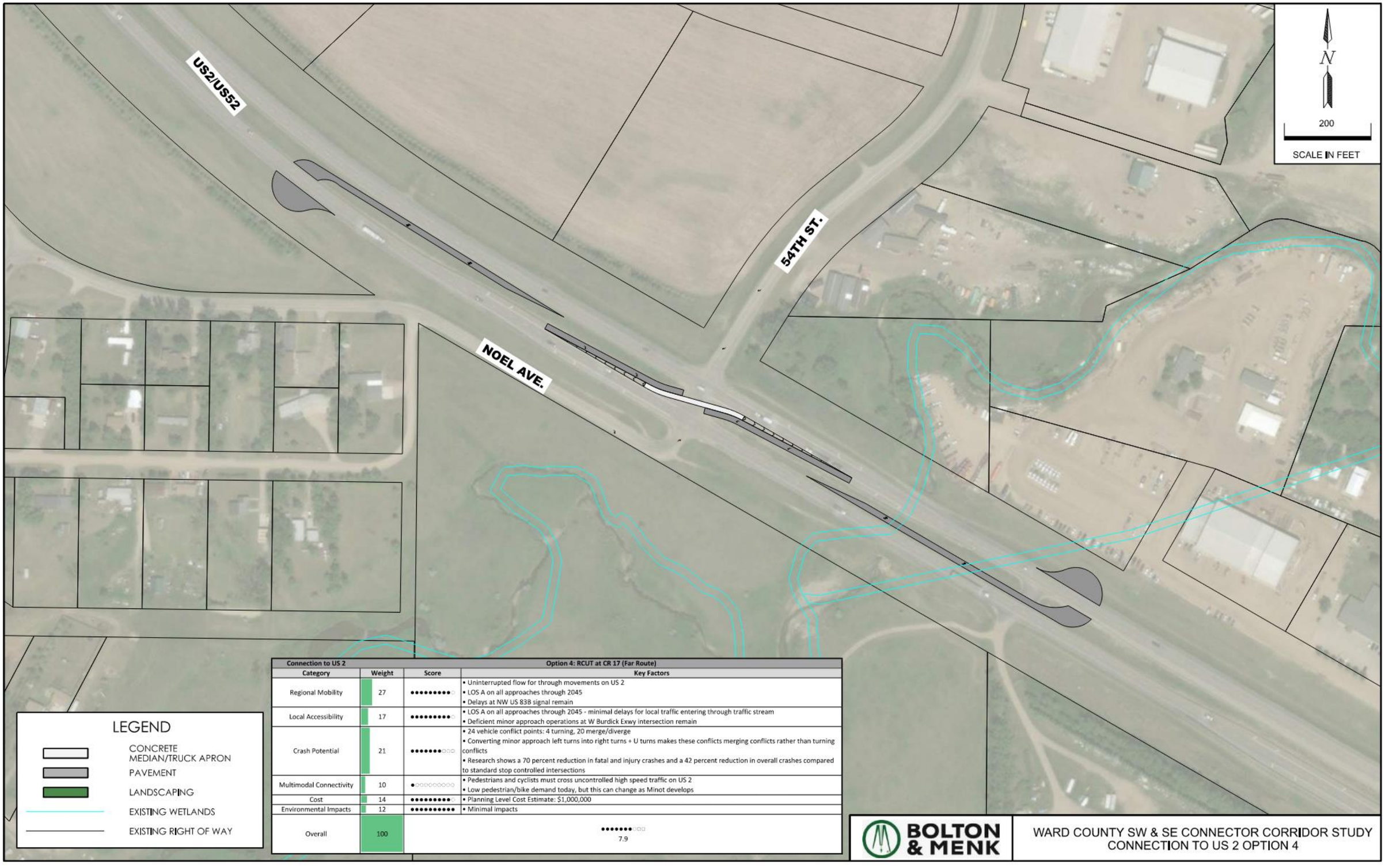


Figure 28: US 2 Intersection Alternative 4

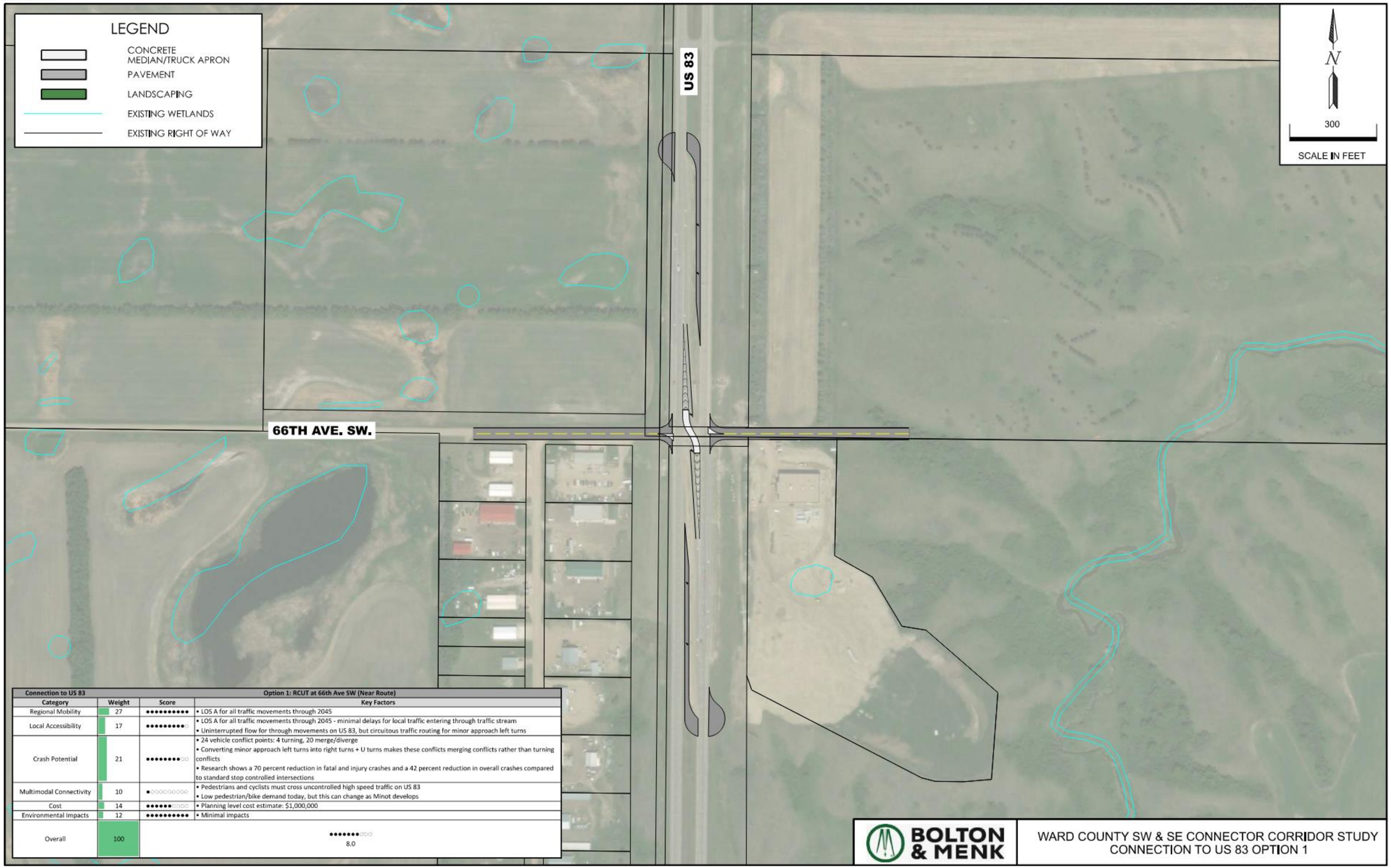


Connection to US 2			Option 4: RCUT at CR 17 (Far Route)
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●●○	• Uninterrupted flow for through movements on US 2 • LOS A on all approaches through 2045 • Delays at NW US 83B signal remain
Local Accessibility	17	●●●●●●●●○	• LOS A on all approaches through 2045 - minimal delays for local traffic entering through traffic stream • Deficient minor approach operations at W Burdick Exwy intersection remain
Crash Potential	21	●●●●●●●○○○	• 24 vehicle conflict points: 4 turning, 20 merge/diverge • Converting minor approach left turns into right turns + U turns makes these conflicts merging conflicts rather than turning conflicts • Research shows a 70 percent reduction in fatal and injury crashes and a 42 percent reduction in overall crashes compared to standard stop controlled intersections
Multimodal Connectivity	10	●○○○○○○○○○	• Pedestrians and cyclists must cross uncontrolled high speed traffic on US 2 • Low pedestrian/bike demand today, but this can change as Minot develops
Cost	14	●●●●●●●●○	• Planning Level Cost Estimate: $1,000,000
Environmental Impacts	12	●●●●●●●●●●	• Minimal impacts
Overall	100	●●●●●●●○○○ 7.9	

Table 4: US 2 Intersection Alternatives Analysis Summary

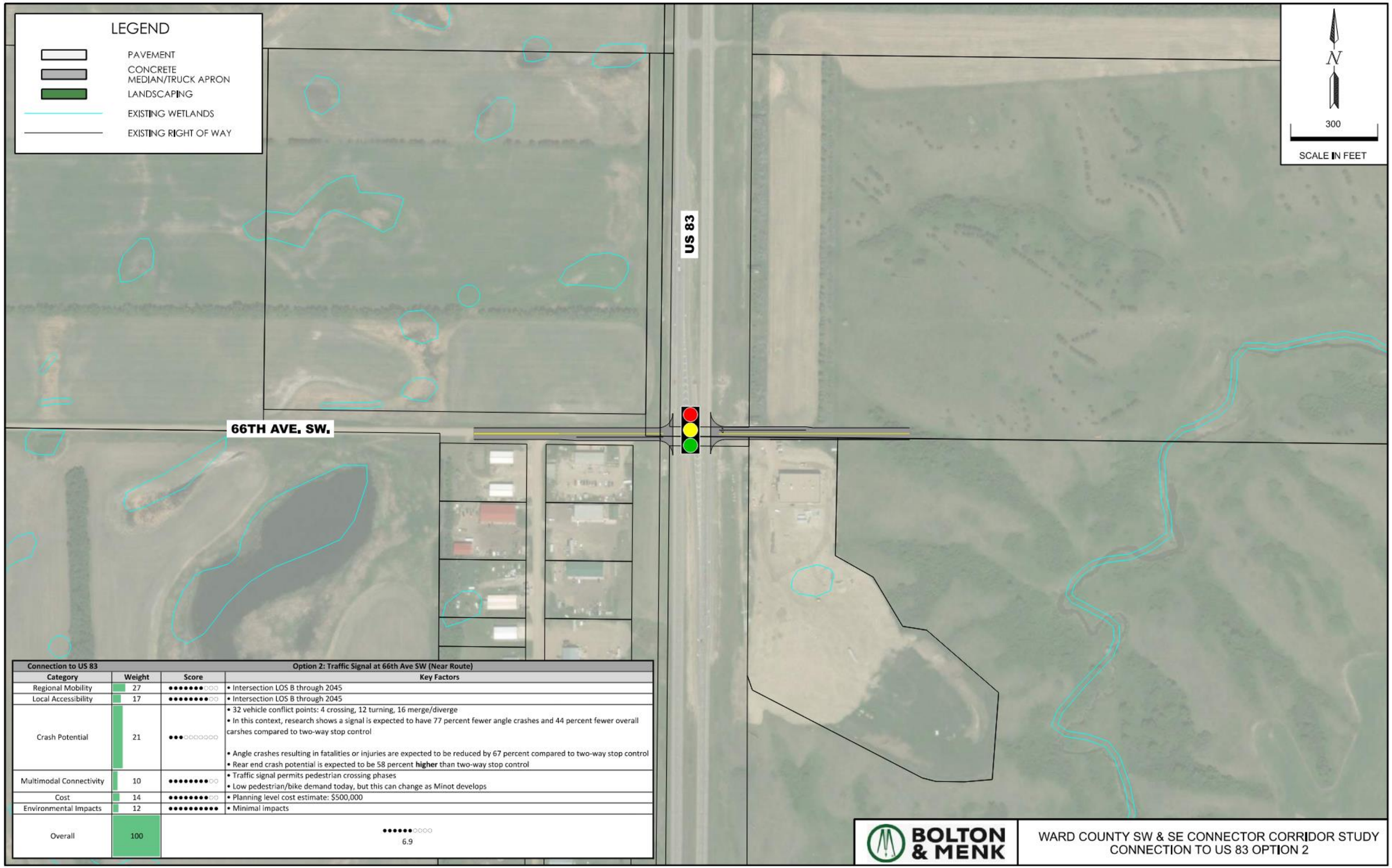
Metric	1	2	3	4	No Build
Regional Mobility	●●●●●●●●○○	●●●●●●●●○○	●●●●●○○○○○	●●●●●●●●●○	●●○○○○○○○○
Local Accessibility	●●●●●●●●○○	●●●●●●●●○○	●●●●●○○○○○	●●●●●●●●●○	●○○○○○○○○○
Crash Potential	●●●●●●●●●●	●●●●●●●●●●	●●●●●○○○○○	●●●●●●●○○○	●○○○○○○○○○
Multimodal Connectivity	●●●●●●●●○○	●●●●●●●●○○	●○○○○○○○○○	●○○○○○○○○○	●○○○○○○○○○
Cost	●●○○○○○○○○	●○○○○○○○○○	●●●●●●●●●○	●●●●●●●●●○	●●●●●●●●●●
Environmental Impacts	●○○○○○○○○○	●○○○○○○○○○	●●●●●●●●●●	●●●●●●●●●●	●●●●●●●●●●
Overall	●●●●●●○○○○ 6.8	●●●●●●○○○○ 6.6	●●●●●○○○○○ 5.8	●●●●●●●○○○ 7.9	●●●○○○○○○○ 3.6
Rank	2	3	4	1	5
Best Route Fit	Near Route (Full or Partial)	Near Route (Full or Partial)	Far Route (Full or Partial)	Far Route (Full or Partial)	-

Figure 29: US 83 Intersection - Alternative 1



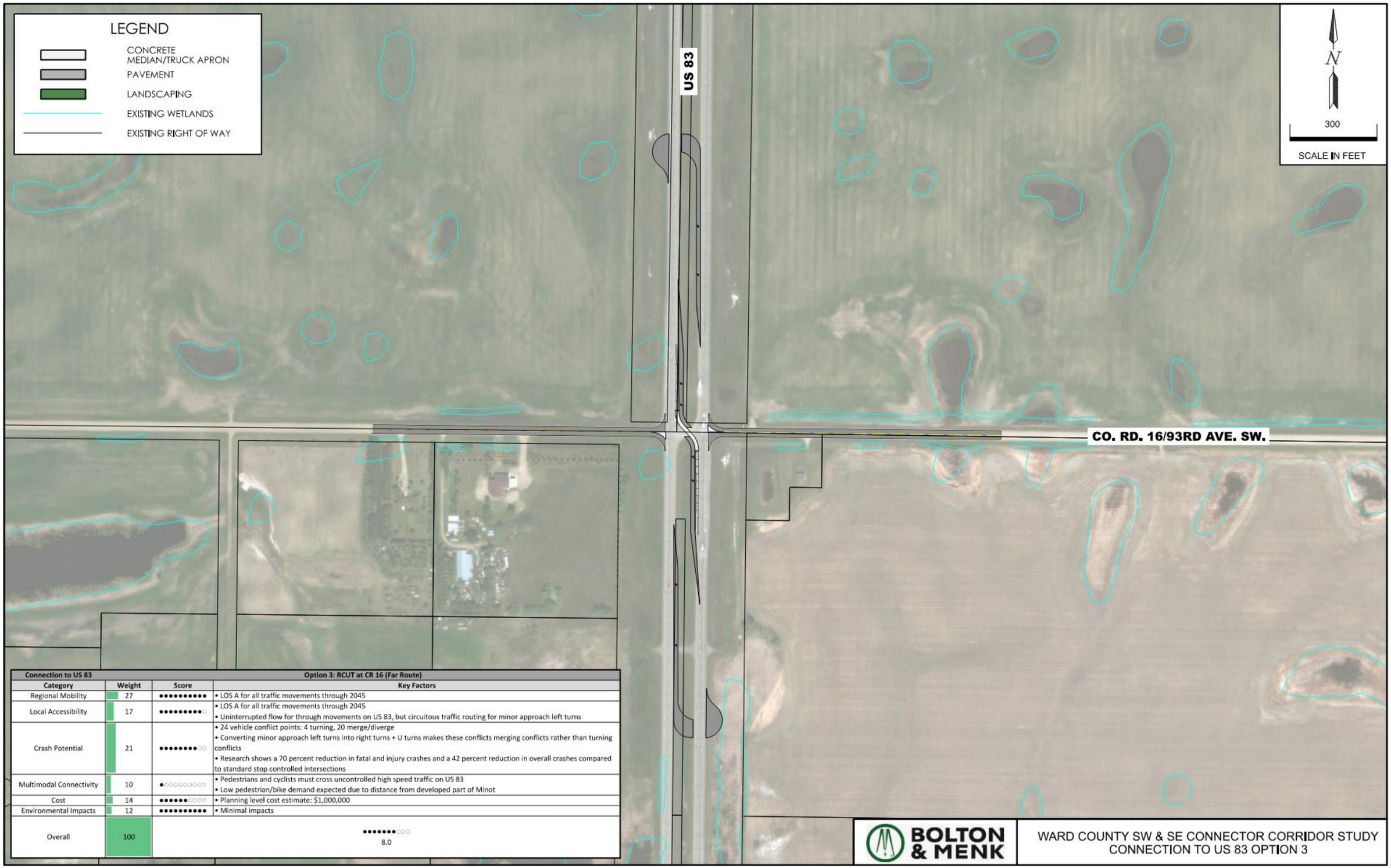
Connection to US 83			Option 1: RCUT at 66th Ave SW (Near Route)
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●●●●	• LOS A for all traffic movements through 2045
Local Accessibility	17	●●●●●●●●●○	• LOS A for all traffic movements through 2045 - minimal delays for local traffic entering through traffic stream • Uninterrupted flow for through movements on US 83, but circuitous traffic routing for minor approach left turns
Crash Potential	21	●●●●●●●●○○	• 24 vehicle conflict points: 4 turning, 20 merge/diverge • Converting minor approach left turns into right turns + U turns makes these conflicts merging conflicts rather than turning conflicts • Research shows a 70 percent reduction in fatal and injury crashes and a 42 percent reduction in overall crashes compared to standard stop controlled intersections
Multimodal Connectivity	10	●○○○○○○○○○	• Pedestrians and cyclists must cross uncontrolled high speed traffic on US 83 • Low pedestrian/bike demand today, but this can change as Minot develops
Cost	14	●●●●●●○○○○	• Planning level cost estimate: $1,000,000
Environmental Impacts	12	●●●●●●●●●●	• Minimal impacts
Overall	100	●●●●●●●●○○ 8.0	

Figure 30: US 83 Intersection - Alternative 2



Connection to US 83			Option 2: Traffic Signal at 66th Ave SW (Near Route)
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●○○○	• Intersection LOS B through 2045
Local Accessibility	17	●●●●●●●●○○	• Intersection LOS B through 2045
Crash Potential	21	●●●○○○○○○○	• 32 vehicle conflict points: 4 crossing, 12 turning, 16 merge/diverge • In this context, research shows a signal is expected to have 77 percent fewer angle crashes and 44 percent fewer overall carshes compared to two-way stop control • Angle crashes resulting in fatalities or injuries are expected to be reduced by 67 percent compared to two-way stop control • Rear end crash potential is expected to be 58 percent **higher** than two-way stop control
Multimodal Connectivity	10	●●●●●●●●○○	• Traffic signal permits pedestrian crossing phases • Low pedestrian/bike demand today, but this can change as Minot develops
Cost	14	●●●●●●●●○○	• Planning level cost estimate: $500,000
Environmental Impacts	12	●●●●●●●●●●	• Minimal impacts
Overall	100	●●●●●●○○○○ 6.9	

Figure 31: US 83 Intersection - Alternative 3



Connection to US 83			Option 3: RCUT at CR 16 (Far Route)
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●●●●	• LOS A for all traffic movements through 2045
Local Accessibility	17	●●●●●●●●○	• LOS A for all traffic movements through 2045 • Uninterrupted flow for through movements on US 83, but circuitous traffic routing for minor approach left turns
Crash Potential	21	●●●●●●●●○○	• 24 vehicle conflict points: 4 turning, 20 merge/diverge • Converting minor approach left turns into right turns + U turns makes these conflicts merging conflicts rather than turning conflicts • Research shows a 70 percent reduction in fatal and injury crashes and a 42 percent reduction in overall crashes compared to standard stop controlled intersections
Multimodal Connectivity	10	●○○○○○○○○	• Pedestrians and cyclists must cross uncontrolled high speed traffic on US 83 • Low pedestrian/bike demand expected due to distance from developed part of Minot
Cost	14	●●●●●●○○○○	• Planning level cost estimate: $1,000,000
Environmental Impacts	12	●●●●●●●●●●	• Minimal impacts
Overall	100	●●●●●●●○○○ 8.0	

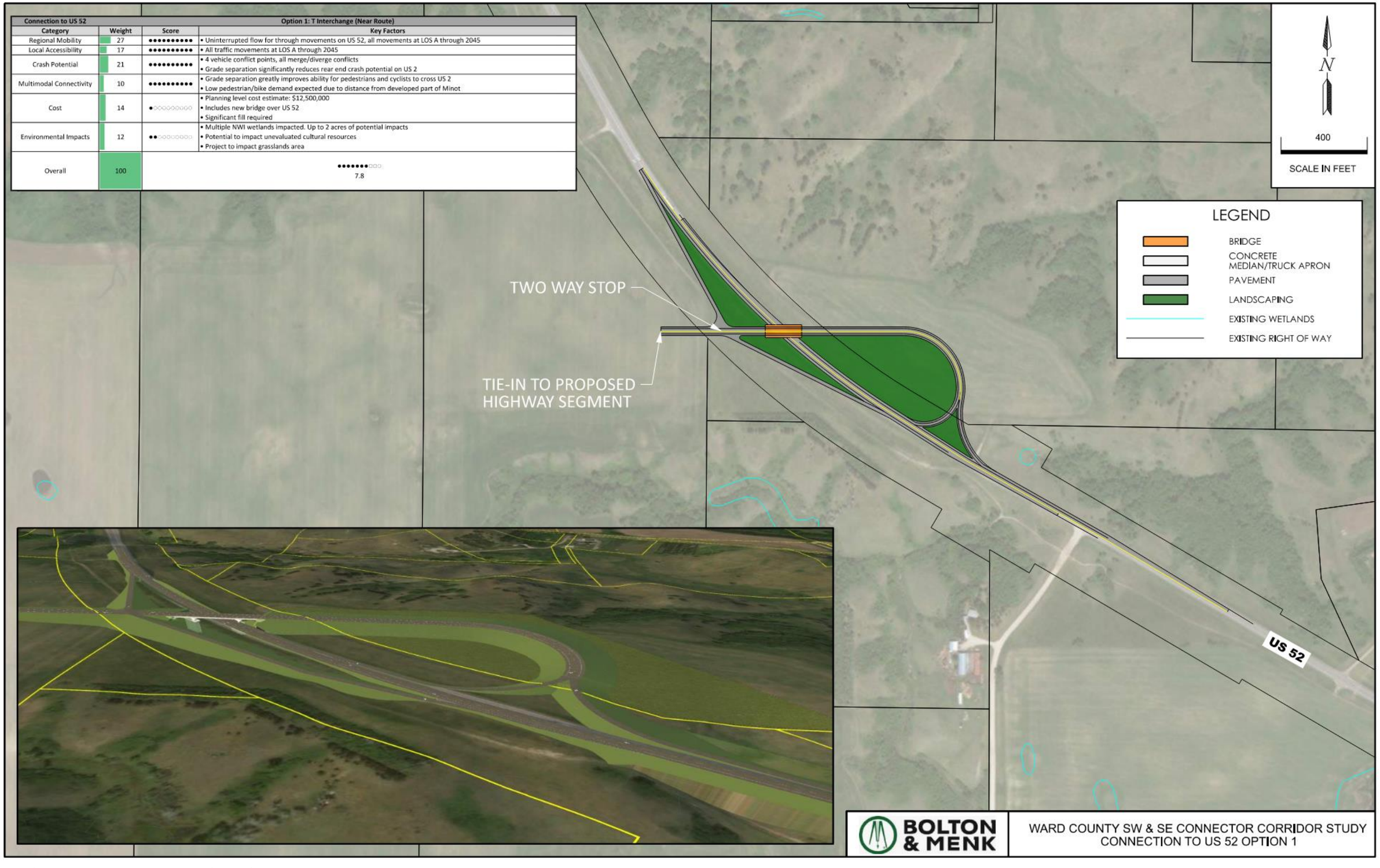
Figure 32: US 83 Intersection - Alternative 4

Connection to US 83			Option 4: Roundabout at CR 16 (Far Route)
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●○○○	• LOS A for all traffic movements through 2045 - however all traffic is required to slow down at roundabout
Local Accessibility	17	●●●●●●●●●○	• LOS A for all traffic movements through 2045
Crash Potential	21	●●●●●●●○○○	• 8 vehicle conflict points, all merge/diverge conflicts • Roundabouts reduce fatal and injury crashes by 82% compared to two-way stop control (FHWA)
Multimodal Connectivity	10	●●●●●○○○○○	• Roundabout serves as traffic calming device on all approaches • No dedicated pedestrian crossing phase as would occur at a traffic signal • Low pedestrian/bike demand expected due to distance from developed part of Minot
Cost	14	●●●●○○○○○○	• Planning level cost estimate: $4,000,000
Environmental Impacts	12	●●●●●●●○○○	• Minor right-of-way acquisition required
Overall	100	●●●●●●○○○○ 6.7	

Table 5: US 83 Intersection Alternatives Analysis Summary

Metric	1	2	3	4	No Build
Regional Mobility	●●●●●●●●●●	●●●●●●●○○○	●●●●●●●●●●	●●●●●●●○○○	●●●●●●●●●●
Local Accessibility	●●●●●●●●●○	●●●●●●●●○○	●●●●●●●●●○	●●●●●●●●●○	●●●○○○○○○○
Crash Potential	●●●●●●●●○○	●●●○○○○○○○	●●●●●●●●○○	●●●●●●●○○○	●●●●○○○○○○
Multimodal Connectivity	●○○○○○○○○○	●●●●●●●●○○	●○○○○○○○○○	●●●●●○○○○○	●○○○○○○○○○
Cost	●●●●●●○○○○	●●●●●●●●○○	●●●●●●○○○○	●●●●○○○○○○	●●●●●●●●●●
Environmental Impacts	●●●●●●●●●●	●●●●●●●●●●	●●●●●●●●●●	●●●●●●●○○○	●●●●●●●●●●
Overall	●●●●●●●○○○ 8.0	●●●●●●○○○○ 6.9	●●●●●●●○○○ 8.0	●●●●●●○○○○ 6.7	●●●●●●○○○○ 6.7
Rank	1	3	1	4	5
Best Route Fit	Near Route (Partial)	Far Route (Full)	Far Route (Partial)	Near Route (Full)	-

Figure 33: US 52 Intersection - Alternative 1



Connection to US 52			Option 2: RCUT at CR 19 (Near Route)
Category	**Weight**	**Score**	**Key Factors**
Regional Mobility	27	●●●●●●●●○	• Uninterrupted flow for through movements on US 52 • LOS A through 2045 for stop controlled movements turning onto US 52 + U turns
Local Accessibility	17	●●●●●●●●○	• LOS A through 2045 for stop controlled movements turning onto US 52 + U turns
Crash Potential	21	●●●●●●●○○	• 24 vehicle conflict points: 4 turning, 20 merge/diverge • Converting minor approach left turns into right turns + U turns makes these conflicts merging conflicts rather than turning conflicts • Research shows a 70 percent reduction in fatal and injury crashes and a 42 percent reduction in overall crashes compared to standard stop controlled intersections
Multimodal Connectivity	10	●○○○○○○○○	• Pedestrians and cyclists must cross uncontrolled high speed traffic on US 83 • Low pedestrian/bike demand expected due to distance from developed part of Minot
Cost	14	●●●●●●●○○○	• Planning level cost estimate: $1,000,000
Environmental Impacts	12	●●●●●●●●●●	• Minimal impacts
Overall	100	●●●●●●●○○○ 7.8	

BOLTON & MENK

WARD COUNTY SW & SE CONNECTOR CORRIDOR STUDY
CONNECTION TO US 52 OPTION 2

Figure 35: US 52 Intersection - Alternative 3

Connection to US 52			Option 3: Roundabout at CR 16 (Far Route)
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●○○○	• LOS A for US 52 movements through 2045 - however all traffic is required to slow down at roundabout
Local Accessibility	17	●●●●●●●●○○	• LOS B for side street movements through 2045
Crash Potential	21	●●●●●●●○○○	• 8 vehicle conflict points, all merge/diverge conflict types • Roundabouts reduce fatal and injury crashes by 82% compared to two-way stop control (FHWA), however rear-end crash potential could increase due to mainline traffic being required to slow down
Multimodal Connectivity	10	●●●●●○○○○○	• Roundabout serves as traffic calming device on all approaches • No dedicated pedestrian crossing phase as would occur at a traffic signal • Low pedestrian/bike demand expected due to distance from developed part of Minot
Cost	14	●●●●●●○○○○	• Planning level cost estimate: $2,500,000
Environmental Impacts	12	●●●●●●●●●○	• Minimal impacts
Overall	100	●●●●●●●○○○ 7.1	

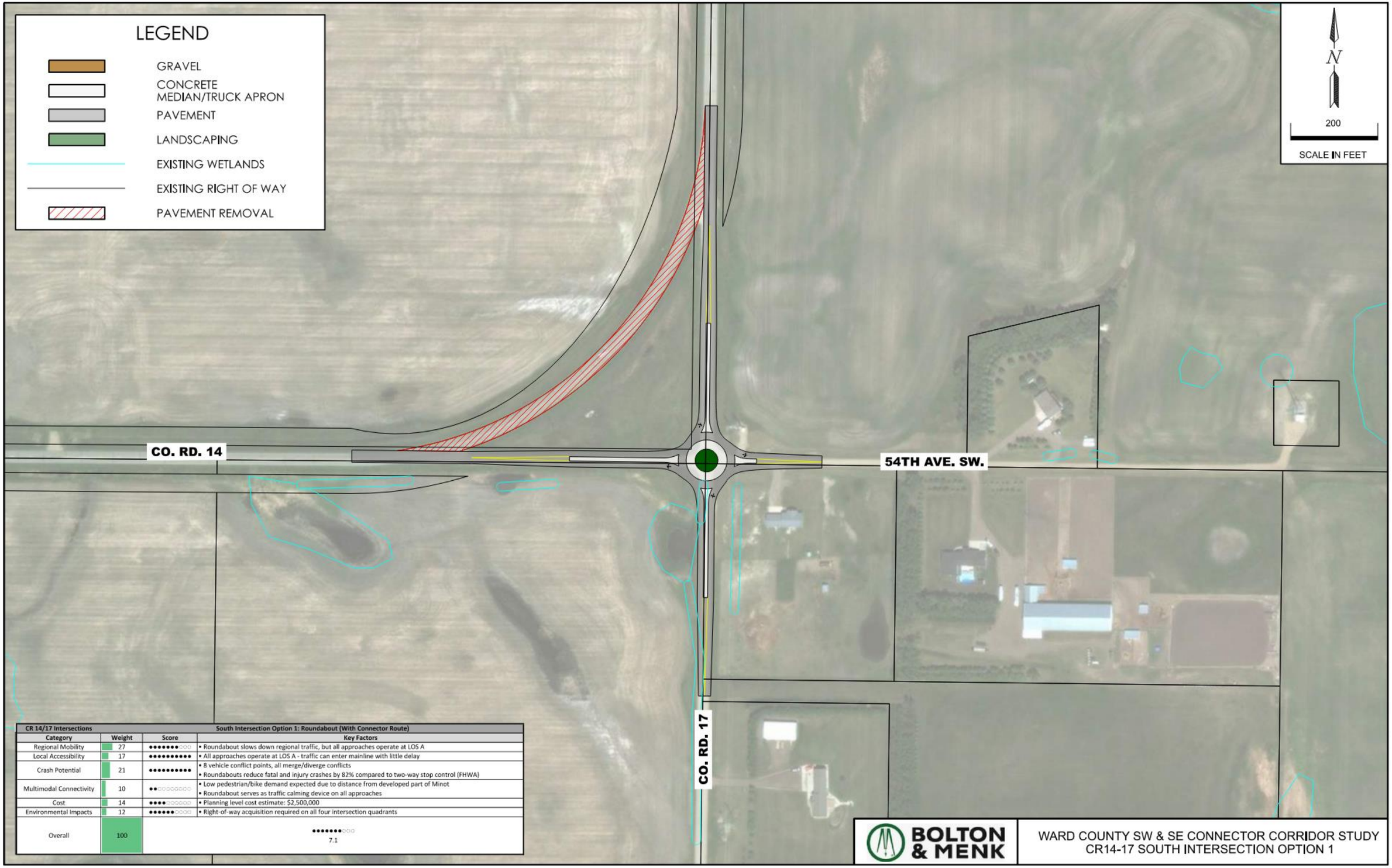
Figure 36: US 52 Intersection - Alternative 4

Connection to US 52			Option 4: Realign West Approach of CR 16 (Far Route)
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●○○○	• Uninterrupted flow for through movements on US 52 • LOS C in 2045 for stop controlled movements turning onto US 52
Local Accessibility	17	●●●●●○○○○○	• LOS C through 2045 for stop controlled movements turning onto US 52 - local traffic would experience some delay entering the through traffic stream on US 52
Crash Potential	21	●●●○○○○○○○	• 32 vehicle conflict points: 4 crossing, 12 turning, 16 merge/diverge
Multimodal Connectivity	10	●○○○○○○○○○	• Pedestrians and cyclists must cross uncontrolled high speed traffic on US 52 • Low pedestrian/bike demand expected due to distance from developed part of Minot
Cost	14	●●●●●●●○○○	• Planning level cost estimate: $1,000,000
Environmental Impacts	12	●●●●●●○○○○	• Right-of-way acquisition (residential & agricultural)
Overall	100	●●●●●○○○○○ 5.1	

Table 6. US 52 Intersection Alternatives Analysis Summary

Metric	1	2	3	4	No Build
Regional Mobility	●●●●●●●●●●	●●●●●●●●●○	●●●●●●●○○○	●●●●●●●○○○	●●●●●●●○○○
Local Accessibility	●●●●●●●●●●	●●●●●●●●●○	●●●●●●●●○○	●●●●●○○○○○	●●●●●○○○○○
Crash Potential	●●●●●●●●●●	●●●●●●●●○○	●●●●●●●○○○	●●●○○○○○○○	●●○○○○○○○○
Multimodal Connectivity	●●●●●●●●●●	●○○○○○○○○○	●●●●●○○○○○	●○○○○○○○○○	●○○○○○○○○○
Cost	●○○○○○○○○○	●●●●●●●○○○	●●●●●●○○○○	●●●●●●●○○○	●●●●●●●●●●
Environmental Impacts	●●○○○○○○○○	●●●●●●●●●●	●●●●●●●●●○	●●●●●●○○○○	●●●●●●●●●●
Overall	●●●●●●●○○○ 7.8	●●●●●●●○○○ 7.8	●●●●●●●○○○ 7.1	●●●●●○○○○○ 5.1	●●●●●○○○○○ 5.8
Rank	2	1	3	5	4
Best Route Fit	Far Route (Full)	Near Route (Partial)	Near Route (Full)	Far Route (Partial)	-

Figure 37: CR 14/17 South Intersection - Alternative 1



CR 14/17 Intersections			South Intersection Option 1: Roundabout (With Connector Route)
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●○○○	• Roundabout slows down regional traffic, but all approaches operate at LOS A
Local Accessibility	17	●●●●●●●●●●	• All approaches operate at LOS A - traffic can enter mainline with little delay
Crash Potential	21	●●●●●●●●●●	• 8 vehicle conflict points, all merge/diverge conflicts • Roundabouts reduce fatal and injury crashes by 82% compared to two-way stop control (FHWA)
Multimodal Connectivity	10	●●○○○○○○○○	• Low pedestrian/bike demand expected due to distance from developed part of Minot • Roundabout serves as traffic calming device on all approaches
Cost	14	●●●●○○○○○○	• Planning level cost estimate: $2,500,000
Environmental Impacts	12	●●●●●●○○○○	• Right-of-way acquisition required on all four intersection quadrants
Overall	100	●●●●●●●○○○ 7.1	

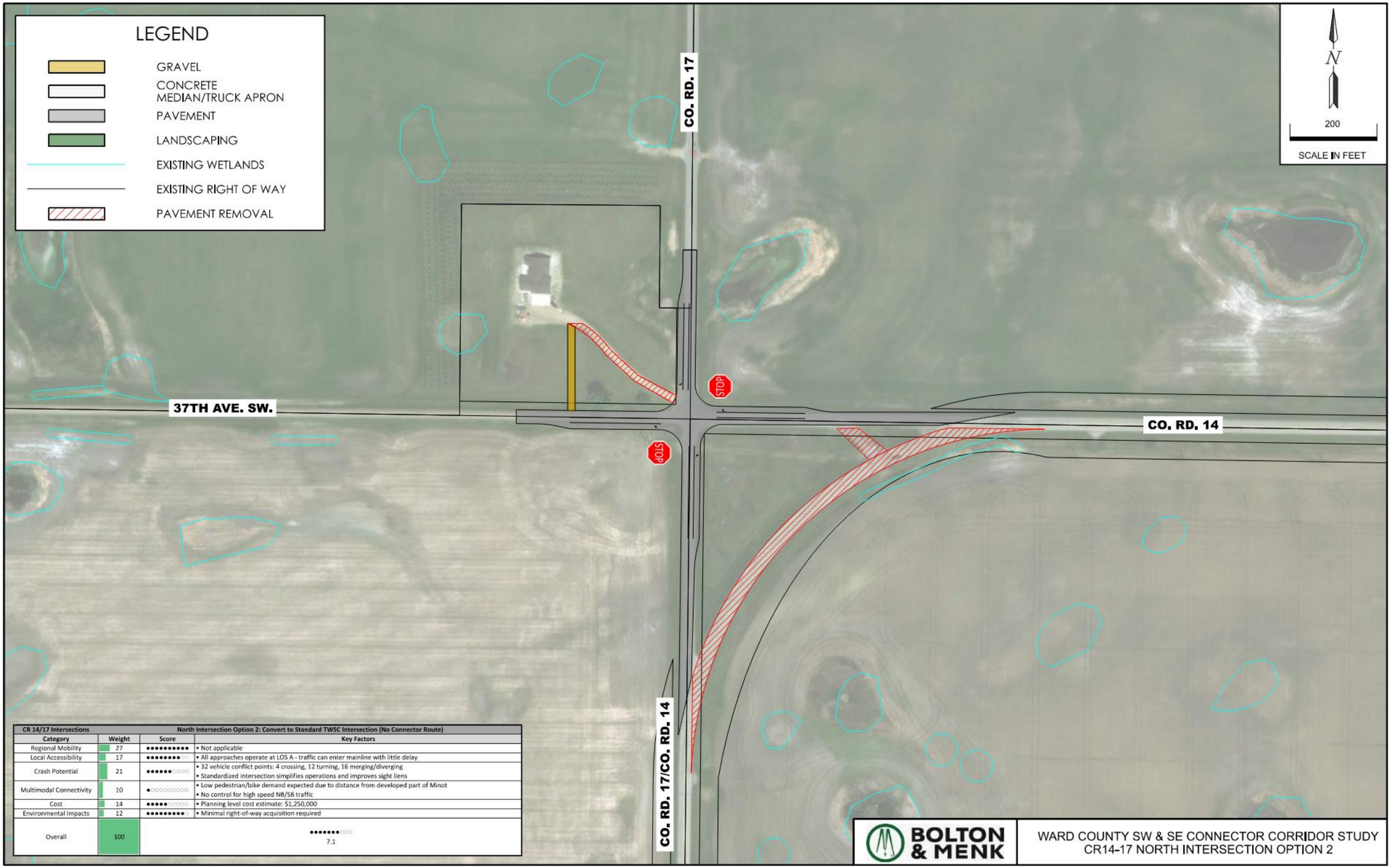
Figure 38: CR 14/17 South - Intersection Alternative 2

CR 14/17 Intersections		South Intersection Option 2: Convert to Standard TWSC Intersection (No Connector Route)	
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●●●●	• Not applicable
Local Accessibility	17	●●●●●●●●○○	• All approaches operate at LOS A - traffic can enter mainline with little delay
Crash Potential	21	●●●●●●○○○○	• 32 vehicle conflict points: 4 crossing, 12 turning, 16 merging/diverging • Standardized intersection simplifies operations and improves sight lines
Multimodal Connectivity	10	●○○○○○○○○○	• Low pedestrian/bike demand expected due to distance from developed part of Minot • No control for high speed NB/SB traffic
Cost	14	●●●●●○○○○○	• Planning level cost estimate: $1,250,000
Environmental Impacts	12	●●●●●●●●○○	• Minimal right-of-way acquisition required
Overall	100	●●●●●●●○○○ 7.1	

Figure 39: CR 14/17 North Intersection - Alternative 1

CR 14/17 Intersections			North Intersection Option 1: Roundabout (With Connector Route)
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●○○○	• Roundabout slows down regional traffic, but all approaches operate at LOS A
Local Accessibility	17	●●●●●●●●●●	• All approaches operate at LOS A - traffic can enter mainline with little delay
Crash Potential	21	●●●●●●●●●●	• 8 vehicle conflict points, all merge/diverge conflict types • Roundabouts reduce fatal and injury crashes by 82% compared to two-way stop control (FHWA)
Multimodal Connectivity	10	●●○○○○○○○○	• Low pedestrian/bike demand expected due to distance from developed part of Minot • Roundabout serves as traffic calming device on all approaches
Cost	14	●●●●○○○○○○	• Planning level cost estimate: $2,500,000
Environmental Impacts	12	●●●●●●○○○○	• Right-of-way acquisition required on all four intersection quadrants
Overall	100	●●●●●●●○○○ 7.1	

Figure 40: CR 14/17 North Intersection - Alternative 2



CR 14/17 Intersections		North Intersection Option 2: Convert to Standard TWSC Intersection (No Connector Route)	
Category	Weight	Score	Key Factors
Regional Mobility	27	●●●●●●●●●●	• Not applicable
Local Accessibility	17	●●●●●●●●○○	• All approaches operate at LOS A - traffic can enter mainline with little delay
Crash Potential	21	●●●●●●○○○○	• 32 vehicle conflict points: 4 crossing, 12 turning, 16 merging/diverging • Standardized intersection simplifies operations and improves sight liens
Multimodal Connectivity	10	●○○○○○○○○○	• Low pedestrian/bike demand expected due to distance from developed part of Minot • No control for high speed NB/SB traffic
Cost	14	●●●●●○○○○○	• Planning level cost estimate: $1,250,000
Environmental Impacts	12	●●●●●●●●●○	• Minimal right-of-way acquisition required
Overall	100	●●●●●●●○○○ 7.1	

Table 7: CR 14/17 Intersection Alternatives Analysis Summary

Metric	South 1	South 2	North 1	North 2	No Build
Regional Mobility	●●●●●●●○○○	●●●●●●●●●●	●●●●●●●○○○	●●●●●●●●●●	●●●●●●●●●●
Local Accessibility	●●●●●●●●●●	●●●●●●●●○○	●●●●●●●●●●	●●●●●●●●○○	●●●●●●●○○○
Crash Potential	●●●●●●●●●●	●●●●●●○○○○	●●●●●●●●●●	●●●●●●○○○○	●○○○○○○○○○
Multimodal Connectivity	●●○○○○○○○○	●○○○○○○○○○	●●○○○○○○○○	●○○○○○○○○○	●○○○○○○○○○
Cost	●●●●○○○○○○	●●●●●○○○○○	●●●●○○○○○○	●●●●●○○○○○	●●●●●●●●●●
Environmental Impacts	●●●●●●○○○○	●●●●●●●●●○	●●●●●●○○○○	●●●●●●●●●○	●●●●●●●●●●
Overall	●●●●●●●○○○ 7.1	●●●●●●●○○○ 7.1	●●●●●●●○○○ 7.1	●●●●●●●○○○ 7.1	●●●●●●○○○○ 6.7
Rank	3	1	3	1	5

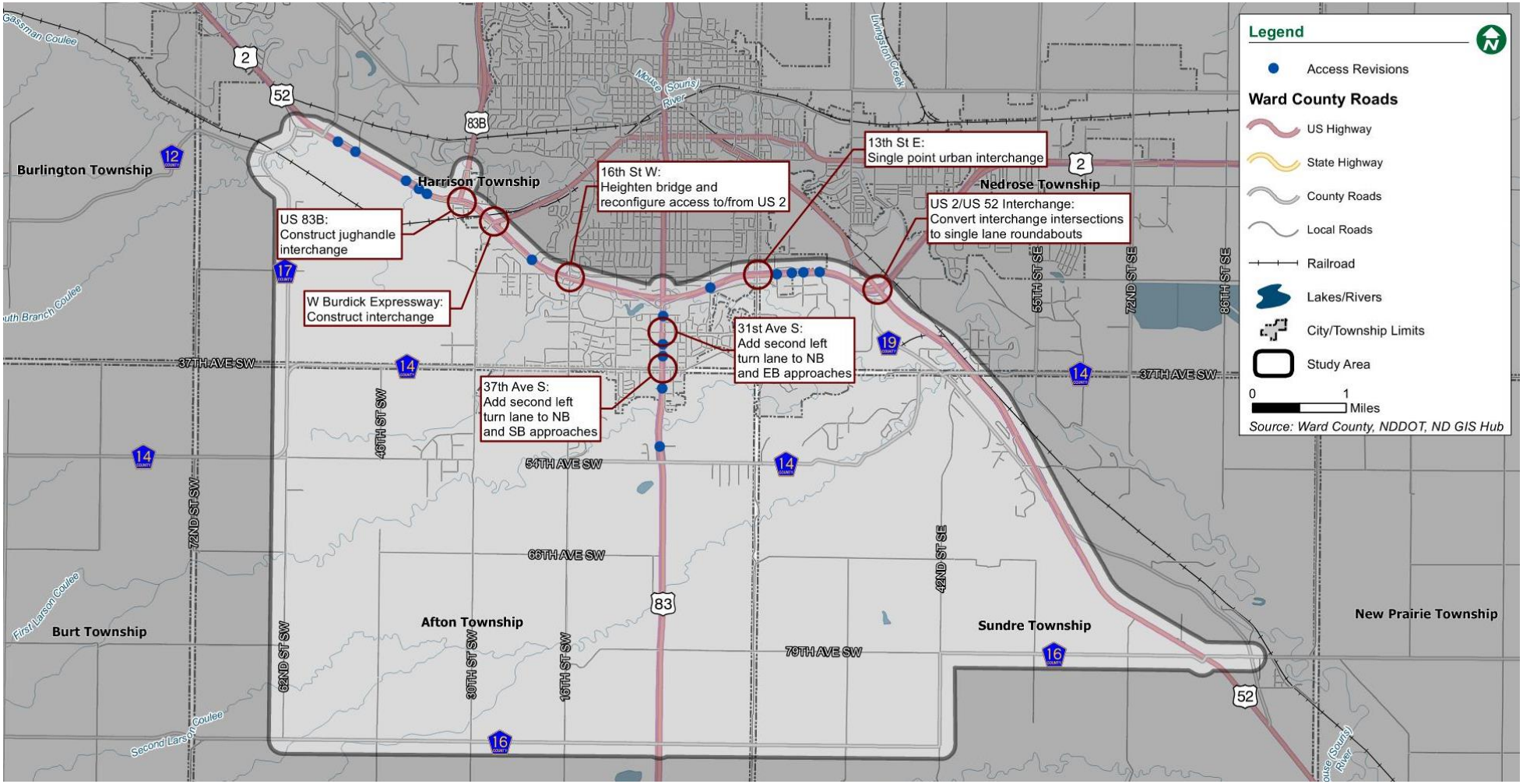
Arterial Improvement Concept

A concept that improved the existing US highway system through Minot in lieu of constructing a new connector route was also considered. Improvements that were considered as part of this concept are shown in **Figure 41.** Analysis results related to key technical criteria are shown in **Table 8**.

Table 8: Arterial Improvement Concept Performance

Arterial Improvement Concept			
Category	**Weight**	**Score**	**Key Factors**
Regional Mobility	27	●●●●●●●○○○	• Removes two existing traffic signals from US 2, reducing need to stop for through traffic • Reduces PM peak hour network-wide delay by 17 percent • Reduces east-to-west travel times on US 2 by around 10 percent, with all other travel times between external nodes being within 10 percent of no-build travel times
Local Accessibility	17	●●●○○○○○○○	• Converts 16 existing full access or 3/4 access points to right-in/right-out only accesses, changing how some roadways and properties are accessed • Reduces PM peak hour network-wide delay by 15 percent. The PM peak hour delay reduction is 5 percent more than the connector route concept that is closer to Minot
Crash Potential	21	●●●●●●●●●●	• Grade separation of West Burdick Expressway intersction at US 2 mitigates angle and rear end crash potential. Existing crash rate is above the critical crash rate. • Smoother traffic flow at the south US 52/US 2 interchange intersection reduces rear end crash potential. Existing crash rate is above the critical crash rate. • Access revisions at 16 unsignalized intersections reduces number of conflict points by 85%
Multimodal Connectivity	10	●●●●●●●○○○	• US 2 grade separations at US 83B, W Burdick Exwy, and 13th Street E provide safer crossings of US 2 • Reduced number of conflict points at right-in/right-out intersections
Cost	14	●○○○○○○○○○	• $100,000,000 - $120,000,000
Environmental Impacts	12	●○○○○○○○○○	• Significant construction impacts at some of the highest-traffic intersections in Minot • Significant ROW acquisition and building impacts to construct three interchanges
Overall	100	●●●●●○○○○○ 5.4	

Figure 41: Arterial Improvement Concept



V. Planning Level Benefit/Cost Analysis

After completion of the analysis presented above, a planning level benefit-cost analysis was performed to better understand the value of roadway improvements that were being considered.

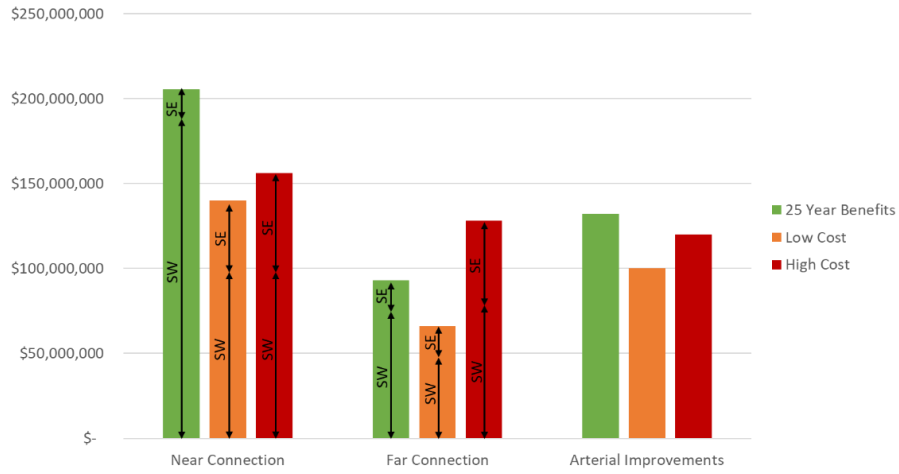
For this analysis, improvements were broadly categorized into three categories: Near Connection (new connector corridor closer to Minot), Far Connection (new connector corridor further from Minot), and Arterial Improvements (improvements to US highway system through Minot, but no new connector corridor).

Using technical analysis completed as part of existing conditions analysis, future conditions analysis, and alternatives analysis, the monetary benefit of delay savings and safety benefits over a 25-year period was estimated then compared against estimated project costs. Given the planning-level nature of this analysis, a range of project costs were assumed (lower end of cost estimates and higher end of cost estimates were considered).

Based on this analysis, the key takeaways are as follows:

- A **Near Connection** alignment closer to Minot offers the greatest benefits, with the value of benefits exceeding project costs in both the low and high-cost estimates. While this concept had the greatest costs, it had far and away the greatest benefits.
- A **Far Connection** alignment has a positive benefit-cost ratio if the lower end of project cost estimates is assumed. The higher end of cost estimates however exceeds the value of operations and safety benefits. Meaning, concepts that required a new roadway to be built are not technically beneficial, but the utilization of existing routes provides clear benefits.
- The **Arterial Improvement Concept** has a positive benefit-cost ratio with both the low and high-cost estimates. Benefits are lower than the Near Connection scenario, but higher than the Far Connection scenario. This concept however, does not resolve the issues on US 83 and was considered technically infeasible from an impacts perspective by several TAC Members.
- Breakdown of Benefits – Across all three scenarios studied in benefit-cost analysis, around 80 percent of the monetary value of benefits come from delay benefits, with the remaining 20 percent coming from crash reduction benefits.

Figure 42: Planning Level Benefit-Cost Analysis



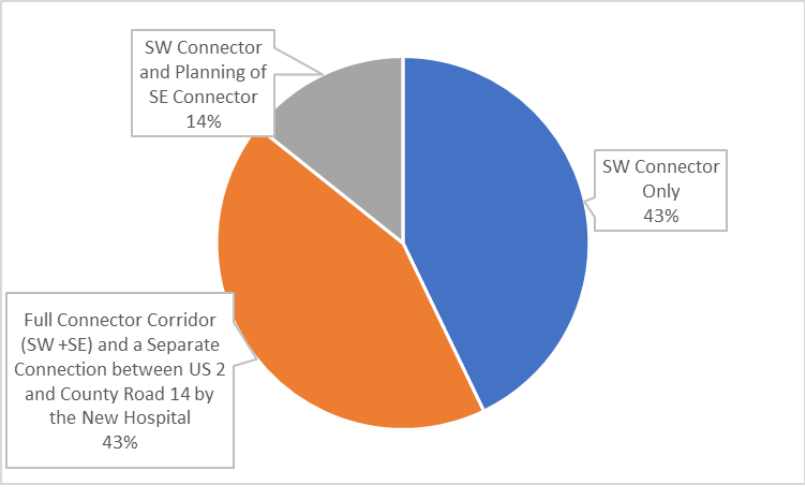
Technical Advisory Committee Feedback

All alternatives discussed in this report were presented to the project Technical Advisory Committee (TAC) in March 2022. A summary of TAC feedback is presented below.

Phasing of Improvements

Feedback was mixed related to how a connector corridor should be built. All TAC members believe that at least a Southwest Connector should be built, however less consensus was reached related a Southeast Connector. 43 percent of responses indicate both the Southeast and Southwest Connectors should be built, with an additional 14 percent indicating that the Southeast Connector should at a minimum be planned and preserved.

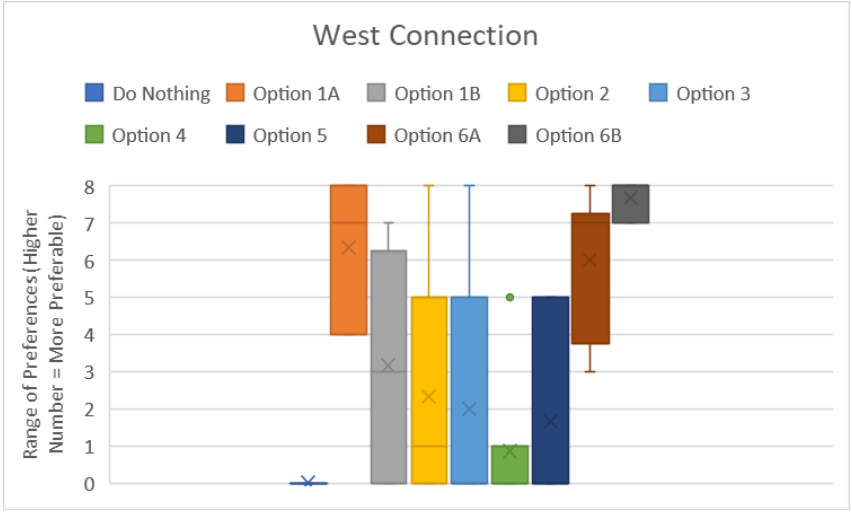
Figure 43: TAC Responses - Phasing of Improvements



West Segment Alternatives

Options 1A, 6A, and 3 were viewed most favorably by the TAC. Most other options had mixed levels of support (some favorable, some unfavorable), with only the Do Nothing option and Option 4 being unanimously viewed as unfavorable. The group agreed that there were several concepts that were technically infeasible due to costs and impacts.

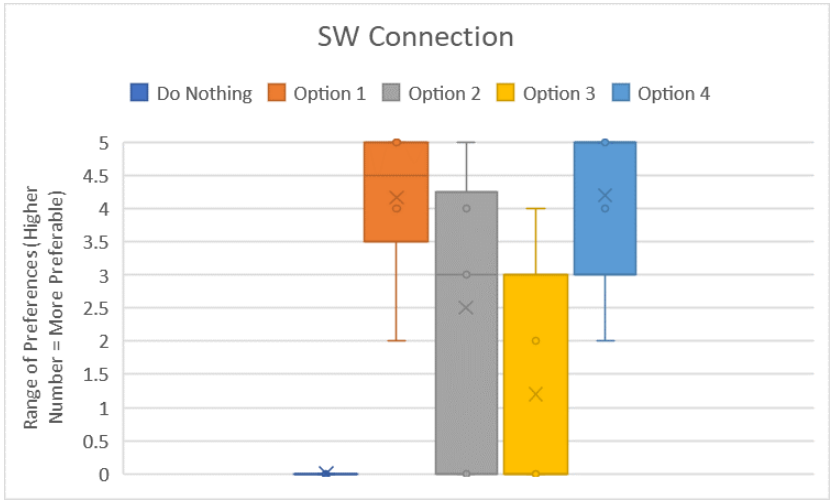
Figure 44: TAC Responses - West Segment Alternatives



Southwest Segment Alternatives

Options 1 and 4 received the highest amount of TAC support, with Option 2 and Option 3 receiving more mixed levels of support. The only option that was unanimously viewed as unfavorable is a Do Nothing option.

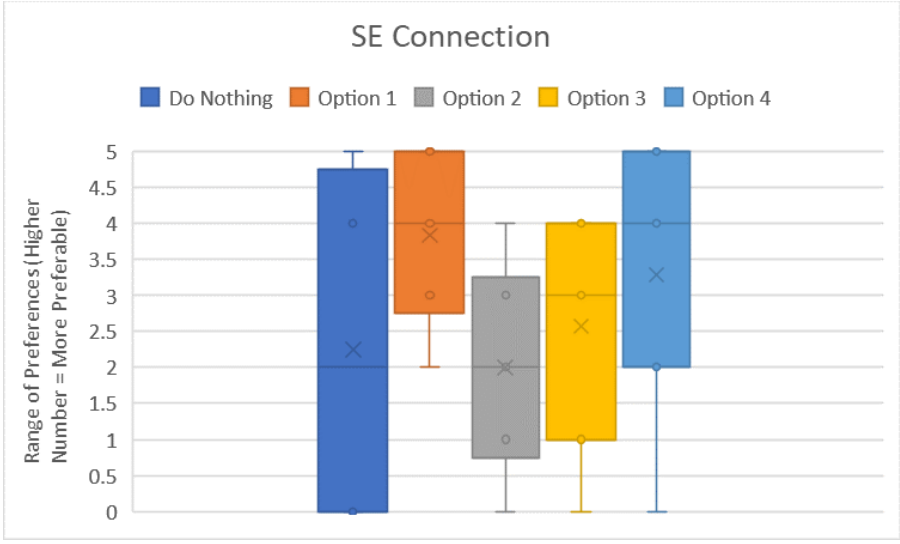
Figure 45: TAC Responses - Southwest Segment Alternatives



Southeast Segment Alternatives

All options had some level of positive TAC support (including a Do Nothing option), however Option 1 and Option 4 had more unanimous support.

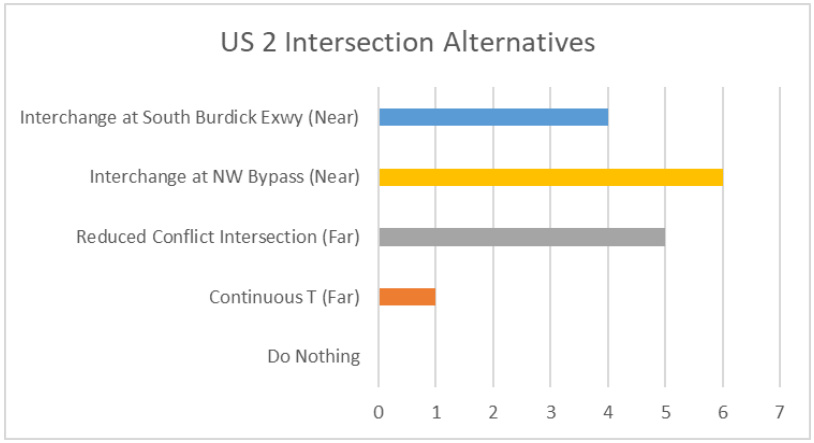
Figure 46: TAC Responses – Southeast Segment Alternatives



US 2 Intersection Alternatives

An interchange at the US 83 NW Bypass received the highest level of TAC support, but an Interchange at Burdick Expressway and a Reduced Conflict Intersection further from Minot both received high levels of support as well.

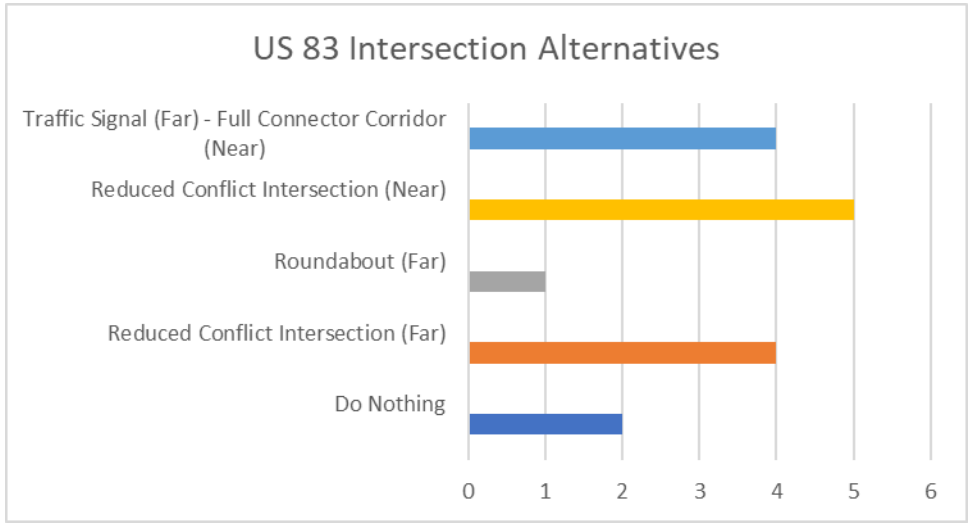
Figure 47: TAC Responses – US 2 Intersection Alternatives



US 83 Intersection Alternatives

A reduced conflict intersection closer to Minot received the highest level of TAC support, however a traffic signal and a reduced conflict intersection further from Minot also received high levels of support.

Figure 48: TAC Responses – US 83 Intersection Alternatives

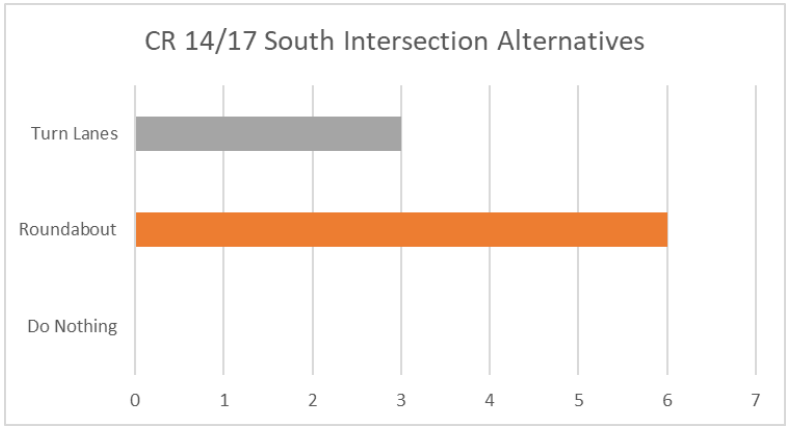


County Road 14/17 Intersection Alternatives

South Intersection

A roundabout received a higher level of support from the TAC, however a standard intersection design with turn lanes also received some support.

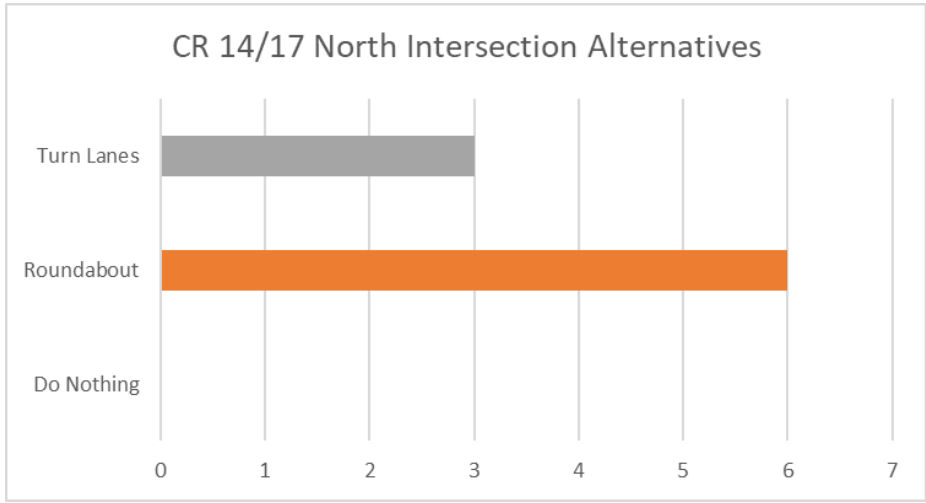
Figure 49: TAC Responses – CR 14/17 South Intersection Alternatives



North Intersection

Like the south intersection, a roundabout received the highest level of support, but a standard intersection design with turn lanes received some support as well.

Figure 50: TAC Responses – CR 14/17 North Intersection Alternatives

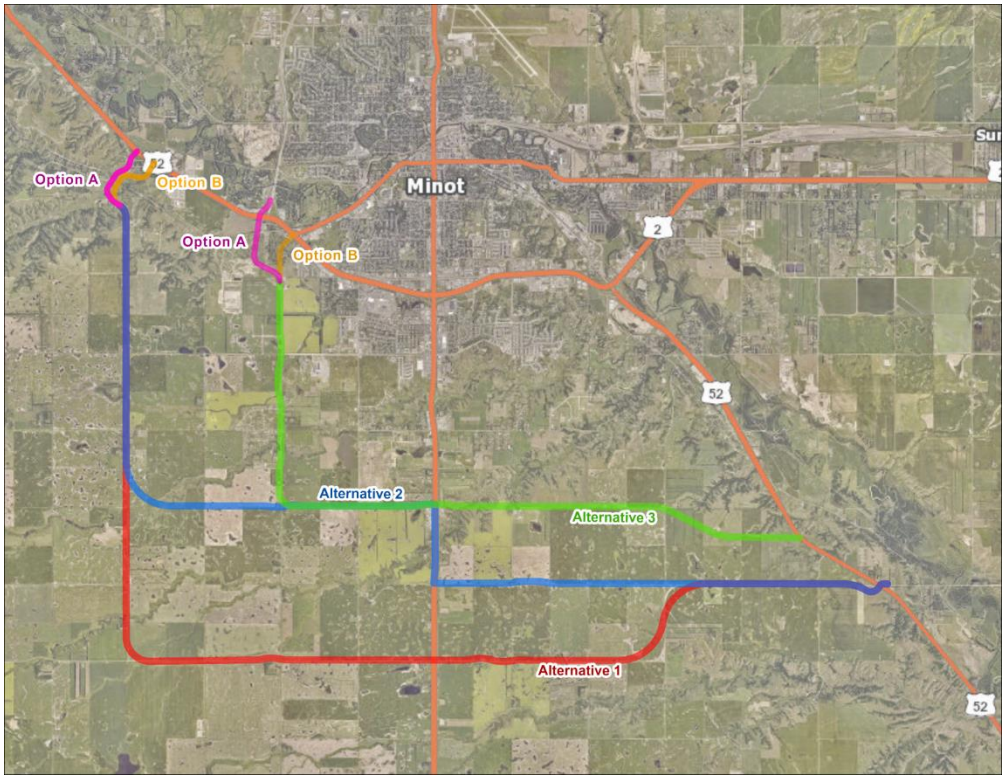


Alternatives Carried to Public Engagement

Using TAC input, a truncated list of alternatives was developed to use as part of public engagement in May 2022. This approach allowed for a clearer discussion to occur with the public that eliminated infeasible concepts that did not meet the Purpose and Need of the Project.

- Alternative 1 – Far connection
- Alternative 2 – Mid/hybrid connection
- Alternative 3 – Near connection

Figure 51: Alternatives Carried to Public Engagement



Ward County

SE/SW CONNECTOR STUDY

Section 5

Public Engagement Summary

BOLTON & MENK

Real People. Real Solutions.

Ulteig

We listen. We solve.

Table of Contents

List of Figures

List of Tables

I. Public Engagement Plan

Overview

Ward County has a proven history of proactive transportation planning and engagement, even building their own northeast bypass around Minot, while other cities and counties waited for state aid. Their latest vision is the Southwest and Southeast Connector Corridor. The southern connection would provide an alternative route for freight, agricultural, and other regional traffic around Minot. These improvements have the potential to alleviate some of the worst congestion on the urban core's roadways, including both local roads and those of regional significance, like US 83/Broadway, US 52, and US 2. It would establish new minor arterials where no such routes exist, improving mobility for cars and trucks. However, each potential route has potential cost and environmental ramifications that must be taken into consideration.

Engagement with the public is an important piece of any project. Communicating project progress and routing ideas, as well as soliciting feedback are all important parts of the project process. This section discusses the engagement efforts of the project, including the Project Management Team, the Technical Advisory Committee, regional stakeholder engagement, and efforts to engage with the general public.

The goal of this public engagement plan will be to consult the public. This means the project team will obtain feedback on key issues, opportunities, and objectives and encourage refinement on analysis, alternatives, and transportation decisions.

Target Audience and Outreach Techniques

The following are target audiences and key stakeholders that were engaged and general approaches to communication and feedback.

Regional Stakeholders. Regional stakeholders may or may not live along the corridor but were still important voices to determine the improvements necessary to enhance traffic performance, mobility, and driver satisfaction. Emergency responders and representatives of larger traffic users, like freight and special generators, were engaged through the key stakeholder meetings. The Minot Area Chamber Economic Development Council (EDC) helped distribute information to regionally significant businesses as well.

Impacted Property Owners. Property owners may be directly affected by alternatives that could be proposed for the connector routes. Direct mailers were sent to property owners within the corridor search area.

General Public. Other interested parties may have opinions on issues, alternatives, and implementation and should also be consulted. Legal advertisements, press releases, and social media will be used to inform the general public of the public

Figure 1. Public Engagement at the Stakeholder Meeting

input opportunities through the corridor study process.

Project Management Team

The project management team was comprised of representatives from Ward County, NDDOT, and Bolton & Menk. This group received monthly status reports on the project and had six ad hoc meetings to help advance key initiatives.

Technical Advisory Committee

The Technical Advisory Committee (TAC) was tasked with guiding and reviewing the technical components of the study before they reach the public, local decision makers and NDDOT Management. This group helped to weed out ideas that were not suitable while advancing ideas that worked for the community. They were prepared for and attended all committee meetings, reviewed, and completed action items assigned in a timely manner, and were advocates for the project and their organizational interests. Below is a list of the members of the Technical Advisory Committee.

Table 1: Technical Advisory Committee

Name	Agency
John Fjeldahl	Ward County Commissioner
Dana Larsen	Ward County Highway
Travis Schmit	Ward County Highway
Korby Seward	NDDOT - Minot District
Wayne Zache	NDDOT - Local Government
Bryon Fuchs	NDDOT - Local Government
Lance Meyer	City Engineer for Minot
Mike Wolf	CHS Sun Prairie Rep
Bryan Korgel	Afton Township Chairman
Justin Schlosse	NDDOT - Traffic Operations
Kent Leben	NDDOT - Environmental Transportation Services

During the project, the TAC met five times:

Meeting #1: Planning and Environmental Linkages

- Meeting with FHWA to discuss Planning and Environmental Linkages Requirements
- Establish Scope of Work

Meeting #2: Goals and Objectives Workshop

- Goals and Objectives Roundtable
- Existing Conditions Assessment
- Future Scenarios Workshop
- Stakeholder Identification Activity

Meeting #3: Needs Summary and Alternatives Brainstorm

- Present and Review the Future Conditions Report
- Present and Review the Environmental Barriers Report
- Brainstorm Alternative Routes and Intersection Concepts

Meeting #4: Alternative Analysis and Public Imput Presentation

- Review and Refine the Route and Intersection Analysis
- Prepare for the Public Open House

Meeting #5: Implementation Plan

- Public Feedback Summary
- Present Implementation Strategy Options
- Collaboratively Identify Next Steps, Jurisdictional Transfers, and PEL Activities

Regional Stakeholder Engagement

Two stakeholder meetings were held to gauge the desired outcomes of the project from two key groups that would be most affected by the change, emergency services and freight services. Each group had their own focus group, with the emergency services meeting occurring on February 22nd, 2022, and the freight services discussion occurring the next day on February 23rd, 2022.

Both meetings were well attended. In addition to three representatives from Bolton & Menk to ask questions, spur discussion, and take notes, 14 professionals participated in the Freight Services Workshop and 17 professionals participated in the Emergency Services Workshop.

Participants

Emergency Services, agencies represented included the following:

- Trinity Health Ground Ambulance
- Minot Rural Fire
- Ward County Emergency Management
- CHS Cenex Pipeline Emergency Response Team
- NDDOT
- Ward County 911
- Minot Police Department
- Ward County Highway Department

Companies and agencies represented at the Freight Service Discussion included:

- Minot Area Chamber Economic Development Corporation
- Dakotas Midland Grain
- Dakota Agronomy Partners
- Enbridge Pipeline
- Sundre Sand and Gravel
- CHS
- Farstad Oil
- Sun Prairie Minot
- Minot Milling
- WinField United
- Gravel Products
- Visit Minot
- Ward County Highway Department
- NDDOT

Format

Each meeting lasted for approximately one hour, and five personalized questions were prepared for each focus group. Questions were designed to keep answers focused on the participants prior experiences, with conceptual questions kept at high levels of discussion. Since the discussions took place in a round table format, all participants were given a chance to provide an answer for each question.

Emergency Services Discussion Themes

The Emergency Service Group unanimously supported the Connector Corridor Vision, and the group preferred the route would be closer to Minot.

- A big reason for this was access to the new Trinity Hospital Campus currently under construction. Many of the focus group participants felt that being able to easily access the new campus would be beneficial for emergency response times.

Adding additional traffic as projected by the study would be add concerns for quick access to the new hospital campus.

- This would slow down emergency response times at already congested areas like US 2, Broadway Avenue, and 16th Street.

The Southeast is a key point when trying to access Logan, especially for Fire Departments.

- The intersection between the new connector and US 52 needs to be done in a way to prevent congestion or difficult turning movements.

Mutual Aid calls are also important to factor into the decision.

- The ability to respond quickly to townships across the Minot Area was important to many of the emergency responders present at the discussion.

Freight Services Discussion Themes

The following are the main themes discussed by participants in the Freight Services discussion:

The freight group preferred routes away from the city center.

- Freight operators preferred the outer connector routes since this would lessen traffic and increase speeds, both beneficial characteristics for the members of this focus group.

The freight group unanimously supported the vision of a connector corridor.

- Being able to relieve congestion on US 2/52 by sending trucks on a connector route instead would be beneficial to most freight operators, with secondary benefits to tourists, who frequently encounter heavy truck activity along major routes.

There is a mix of challenges on the east side.

- This includes difficulty for trucks to make left turns onto US 52 without an interchange, especially if they are fully loaded.

Intersection control is the key to success.

- Stoplights slow down trucks and can create additional congestion.
- Currently there are frequent complaints from truck drivers about long wait times to turn left onto US 52 during morning rush hour when traffic is heaviest.

There is expected freight and industrial growth in the future for Minot.

- Most participants noted that they expected to have more trucks on the road in the coming years, so the connector placement should take both today's traffic and future traffic volumes into account.

General Public Engagement

Multiple outreach methods were used in order to engage the largest amount of the general public as possible. While open houses are the traditional form of engagement, they do not necessarily capture a community consensus, as large segments of the community may not be able to attend an open house for one reason or another. Other methods that do not require attendance at a specific time were offered to bridge that gap. Each outreach method used for this project is listed below:

- Marketing
- Website
- Open House
- Surveys
- InputID (GIS-Based Comment Mapping Tool)

Marketing

To publicize the landowner stakeholder meeting and the survey, a mailer was sent out to local property owners and businesses. On 5/4/2022, 317 mailers were dispersed. This mailer can be seen below:

Figure 2. Marketing Mailer

To generate involvement from the general public and additional stakeholders, an advertisement was posted in the Minot Daily News 3 times from 5/10/2022 to 5/21/2022 and information about the project was shared on KMOT News on 5/26/2022 during the last week of engagement. Existing networks of interested community leaders were leveraged through the ListServs of Visit Minot and Minot Area Chamber EDC.

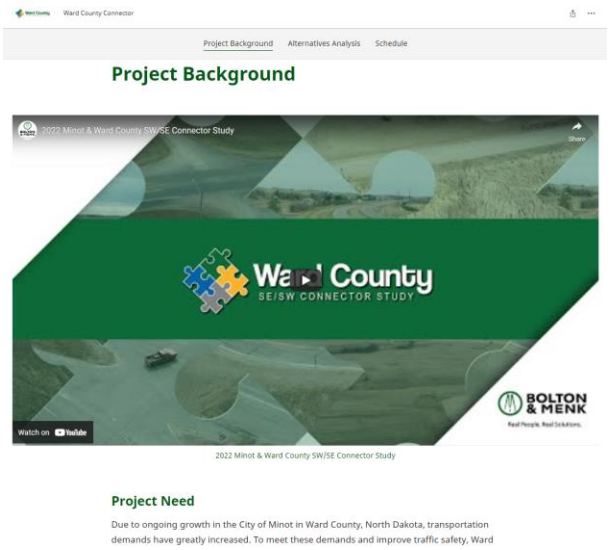
Website

A project website was set up to be used as an online open house. Launched on May 9th, 2022, the website provided key study details. There are three sections to the website, which is an ArcGIS Story map:

- Project Background
- Alternatives Analysis
- Schedule

At the top of the Project Background section is an embedded video, which gives context for the necessity of the project, shows information about the project process, and shows the three potential alignment alternatives. The video also illustrates how to use the InputID website, which is one of the tools for collecting public comment.

Figure 3. Website Screenshot



Landowner Stakeholder Meeting

A landowner stakeholder meeting was hosted on 05/19/2022. It was held at the North Central Research Extension Center in Minot, North Dakota. There were three different timeslots where the open house was hosted in hopes that more people would be able to attend.

The open houses provided landowners and stakeholders located near the proposed alignments an opportunity to view the connector corridor alternatives, ask questions about the alignments, and leave their comments about the project. Each hour-long meeting started with a 15-minute presentation, 15 minutes for a discussion, and 30 minutes to view the alternatives and to leave comments and ask questions.

There were over 120 people in attendance at the open house sessions. Over 90% of those were property owners, with the other attendees being business owners, government agency representatives, and emergency services representatives.

Figure 4. Stakeholder Meeting

Surveys

Two types of surveys were collected, a paper copy and online results. Paper surveys were distributed at the open house on May 19th, 2022, while online surveys were open between 5/9/2022 and 6/5/2022. In total, 101 surveys were returned. 36 were paper surveys, while 65 were online surveys.

The survey had six questions, which asked participants to rank how they felt about the alternatives and sub-alternatives. For each alternative, participants had five options to choose from on how they felt about that specific alternative: Strongly Oppose, Oppose, Neutral, Support, and Strongly Support. Participants were also asked if they had any additional comments, concerns, or questions.

InputID

The InputID website was open between 5/9/2022 and 6/5/2022. InputID is a web-based public engagement platform that allows stakeholders and the public to provide comments on the proposed corridor alternatives. The visual, map-based platform allows users to see exactly where the alternatives will be located and allows them to react and comment on the alternatives.

There are five different reactions a stakeholder can put on the map: Likes, Dislikes, Concerns, Ideas and Opportunities, and Other. After placing a reaction on the map, a comment can be added to detail the reason why that specific reaction was selected. Comments are public facing, and other people can like, dislike, or reply to a comment.

Public Engagement Results

Survey Results

Below are the results of the survey handed out at the open house and available online. Figure 1 details each routing alternative presented to survey participants. *Figure 2* shows the ratio of people who supported ever route, some of the routes, or none of the routes. *Figure 3*, *Figure 4,* and *Figure 5* detail the level of support for each of the presented route alternatives.

Figure 5. Route Alternatives

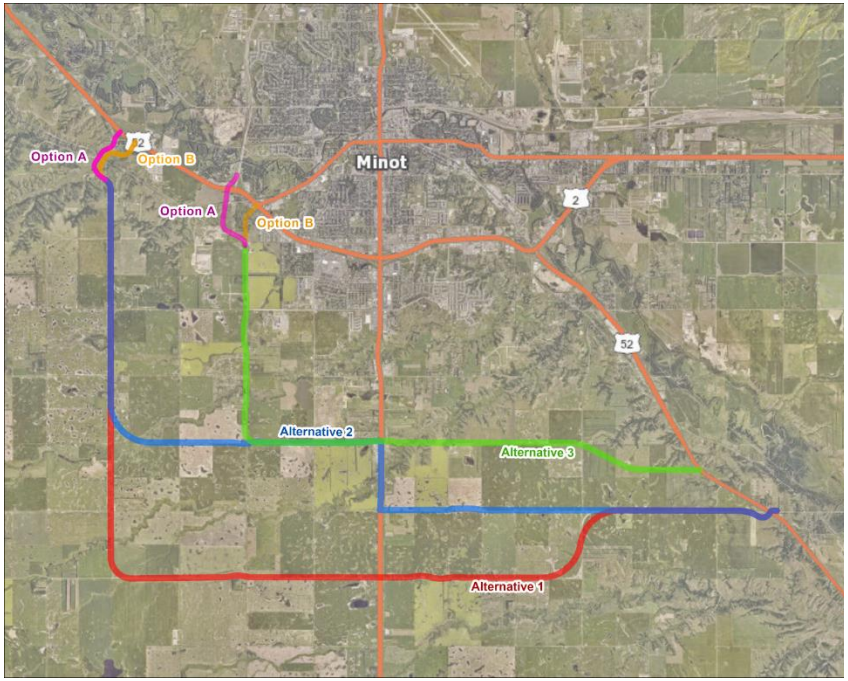


Figure 6. Support for Route Alternatives

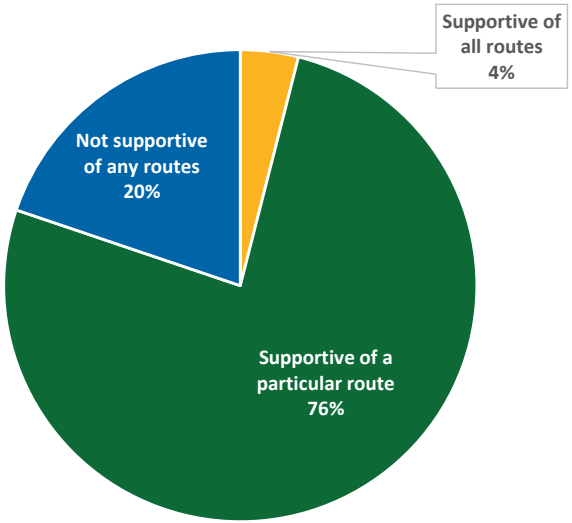


Figure 7. Support for Alternative 1

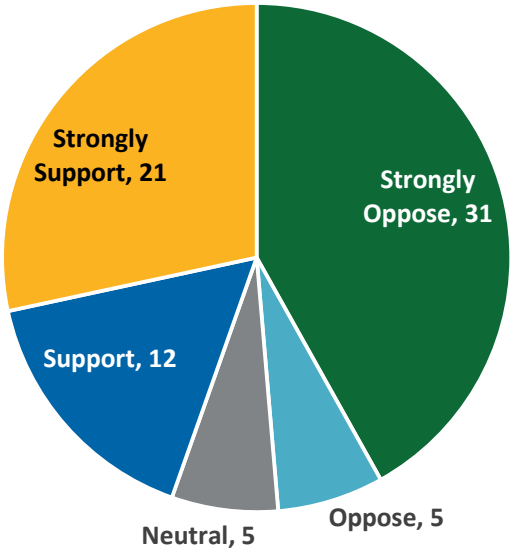


Figure 8. Support for Alternative 2

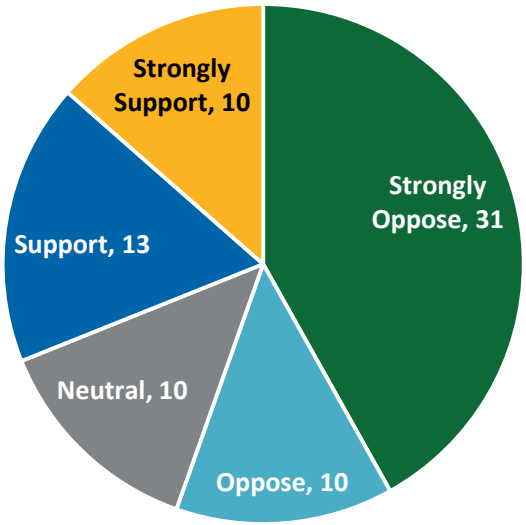
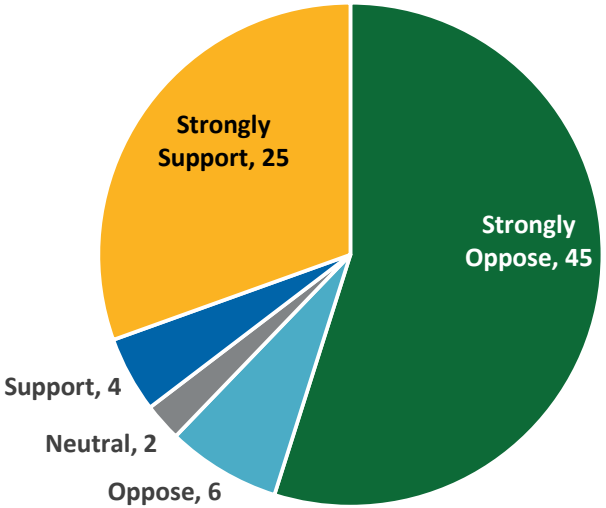


Figure 9. Support for Alternative 3



Alternative 1 (*Figure 3*) had the greatest level of support (split between Support and Strongly Support), with 46% of those who responded supporting this alternative. With 7% of responses feeling neutral, Alternative 1 was the only one with less than 50% disapproval.

Support for Alternative 2 (*Figure 4*) was less than Alternative 1. It received the most evenly distributed answers among the six categories and had the largest number of responses that were neutral about the Alternative, with 10 (13.5%). Strongly Support and Oppose also received 13.5% of the votes.

Alternative 3 (*Figure 5*) was the most divisive of the three options. It received the most responses for both Strongly Support (25) and Strongly Oppose (41). This was the option that received the most opposition, with 62% of the responses opposed to Alternative 3.

Figure 1 tells us that 80% of people who filled out a survey were supportive of at least one route. Only 4% of people supported all three routes, while 20% were opposed to all three alternatives. Most of the responses opposed to every alternative included a comment about how a connector corridor was not necessary.

InputID Results

When looking at the results of the InputID site, it was clear that anyone who lived adjacent to the concepts was concerned about how close the connector corridor could be built to their homes. InputID Results are provided in Appendix A.

Areas of Clarification

The following points are important clarification regarding the connector corridor study:

- The connector corridor doesn't insinuate a highly trafficked bypass, the need to better connect the area or volume projections.
- Most of the routes would have cross sections that are very similar to the current roadway configurations.
- Many who attended the stakeholder meetings were concerned that the decisions about the connector had been made and a route already selected. They appreciated the transparency and the ability to participate in the engagement process.

Ward County
SE/SW CONNECTOR STUDY

InputID Summary

InputID is an interactive online survey mapping tool that allows community members to leave custom notes on a map sharing their comments of concern and ideas for improvements.

Open for Comments
May 6 - June 13, 2022

23 Comments

7 Replies

43 Total Interactions

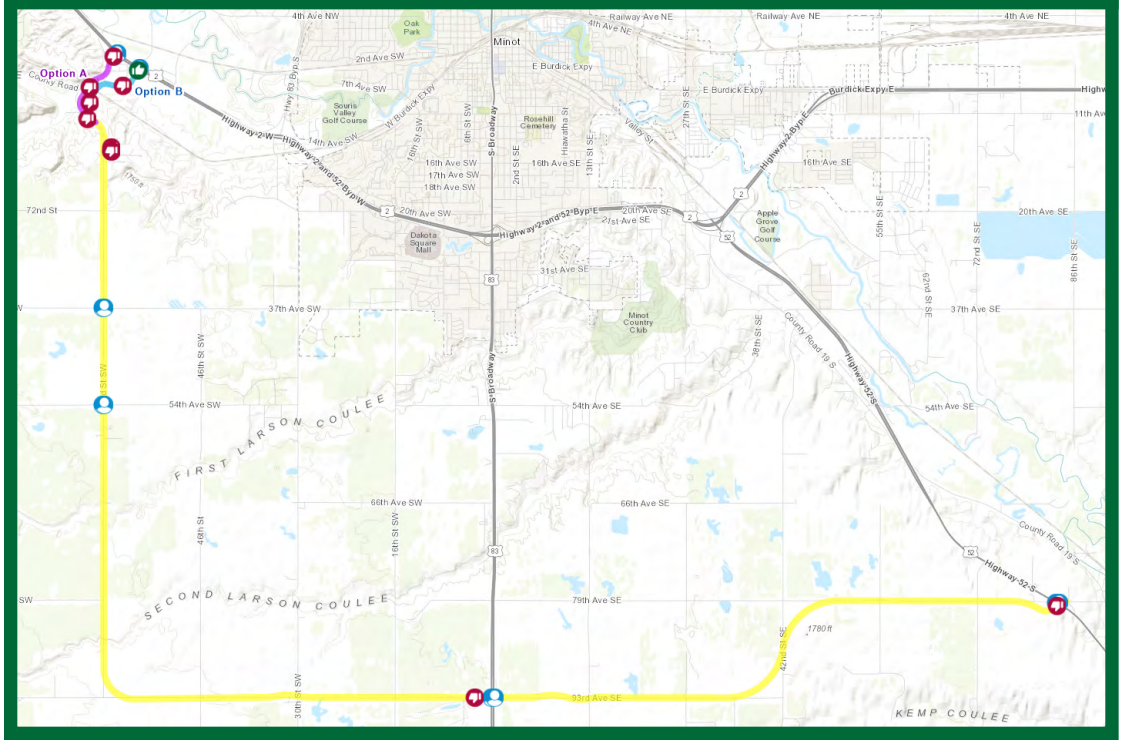
Alignment 1 - **16**

Alignment 2 - **1**

Alignment 3 - **26**

Alignment 1

Highest Approval Rating



Comment Summary

Common Topics

Gassman Coulee Trestle Bridge

Proximity to Homes

Gassman Coulee Trestle Bridge

- Concerns about accidents potentially damaging the bridge

Proximity to Homes

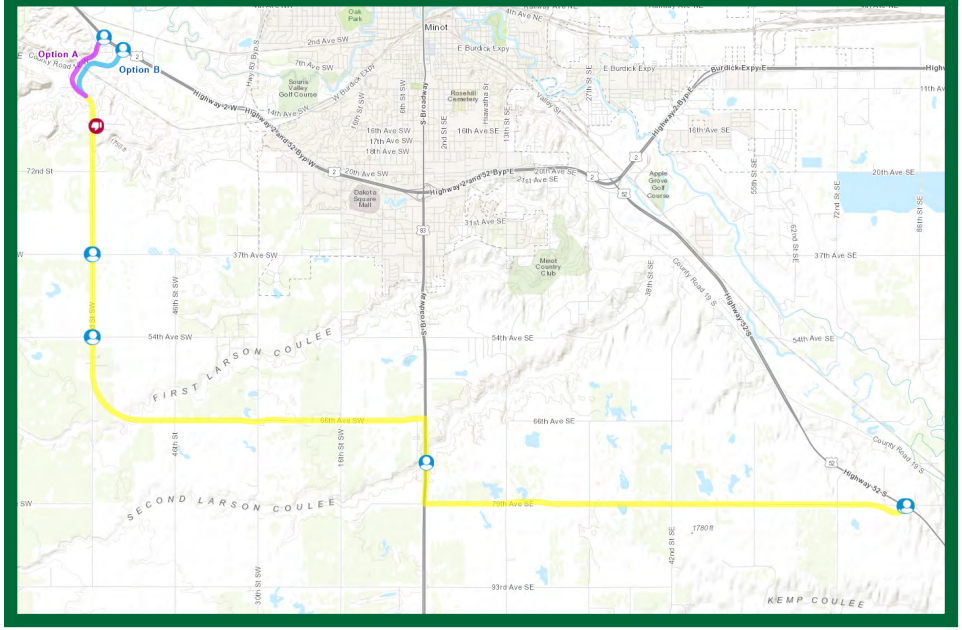
- Most people who commented on this alignment live close to it, as a common feeling was that the alignment would run too close to their property.

Other Comments

- High volume of wildlife crossing this route
- Steep grade causing issues in winter
- Congestion issues near US-83
- Unsafe intersections for trucks

Alignment 2

Least Interacted With



Comment Summary

Only one comment submitted through ImputID

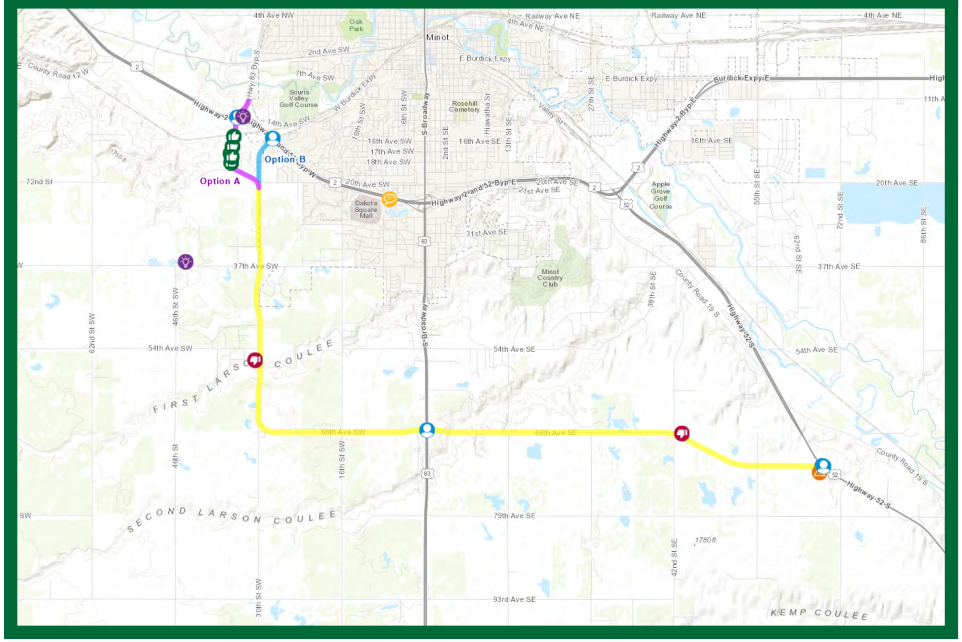
- Concerned abouty proximity of the alternative to their home

Most comments from Alignment 1 apply to Alignment 2, as they were concentrated around Option A and Option B. This includes comments about the following topics:

- Concerns about accidents potentially damaging the bridge
- The alignment is too close to my home
- High volume of wildlife crossing this route
- Steep grade causing issues in winter

Alignment 3

Most Liked Alignment



Comment Summary

<u>Common Topics</u>

Proximity to Homes

Best for Connections and Access

Proximity to Homes

- A common feeling was that the alignment would run too close to their neighborhood, Beaver Creek.

Best for Connections and Access

- Alignment 3 allows for the most convenient connections to the new hospital complex and downtown Minot.

Other Comments

- Does not endanger the Trestle Bridge

Ward County

SE/SW CONNECTOR STUDY

Section 6

Implementation Plan

BOLTON & MENK

Real People. Real Solutions.

Ulteig

We listen. We solve.

Table of Contents

List of Figures

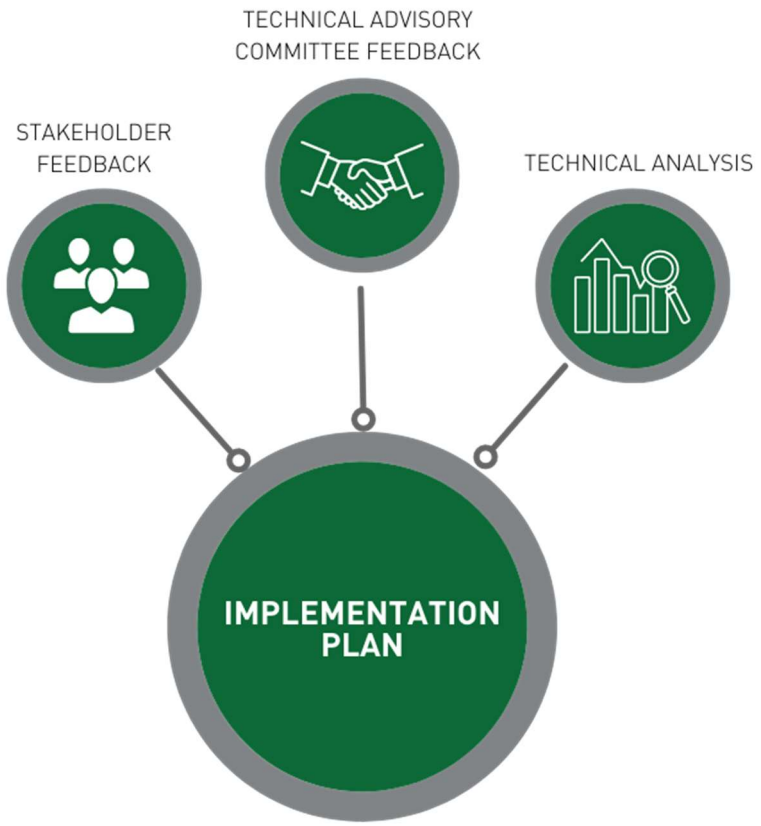
I. Introduction

The Ward County Southwest and Southeast Connector Corridor Study (Connector Corridor) was initiated by Ward County to lay the foundation for future connections south of Minot from US Highway 2/52 west of Minot to US 52 east of Minot. This implementation plan has been crafted to achieve the project goal of southern connections that create alternative routes for freight, emergency responders, and motorists to alleviate congestion in the urban core including US 2/52 and US 83/Broadway.

While the project team has evaluated many alternatives, the implementation strategies that follow will focus on programming needs and phasing for one alternative while continuing to note other feasible alternatives that should be carried into the environmental document phase of project development. The implementation plan was derived based on input from key factors: **Technical Analysis, Technical Advisory Committee Feedback, and Stakeholder Feedback.** This methodology has allowed the project team to balance voices and analysis into a concise, easy-to-follow playbook for connections in the project area.

This study was built using the FHWA Planning and Environmental Linkages (PEL) approach. Planning and Environment Linkages (PEL) represents a collaborative and integrated approach to transportation decision-making that 1) considers environmental, community, and economic goals early in the transportation planning process, and 2) uses the information, analysis, and products developed during planning to inform the environmental review process. The benefits of the PEL process are improved relationship-building, improved project delivery timeframes, and on-the-ground outcome benefits. This process started with the environmental review, advanced into the Purpose and Need Statement to guide alternative development and refinement, and concludes within the implementation plan, where environmental next steps are provided to fulfill the vision.

Figure 1: Implementation Strategy



Paving the Way for a Multimodal Network

From its onset, project team members, the Technical Advisory Committee, and stakeholders wanted to avoid the terminology of bypass, freight routes, or reliever route. The proposed roadways will, as insinuated by the name of the project, be connections. The alternatives proposed are intended to provide a network of automotive, freight, emergency responders, agricultural travel, bicycle, and pedestrian improvements that support a growing region. To improve connectivity, the implementation plan strives to prioritize improvements based on weighing connectivity, costs, the ability to support future growth in the study area, and environmental impacts.

Figure 2: Implementation Criteria

Logical Connectivity and Utility of Improvements	Routes that utilize, extend or continue existing travel routes, or connect critical roadways and destinations are positively valued
Costs and Programming Likelihood	A fiscally constrained plan will consider project costs, funding availability, and the likelihood that supporting government entities will enact planned improvements
Growth Needs (i.e., hospital)	As growth continues in the project area, roadway connections will support ongoing residential, commercial, industrial, and agricultural uses
Environmental Challenges	To minimize impacts and mitigation efforts, considering environmental concerns is essential to project feasibility

A Balanced Approach

Listening to feedback through the project, the Implementation Plan developed balances needs and concerns by using a hybrid approach of the developed alternatives. Residents along each corridor expressed concerns about increased truck traffic or large influxes of vehicles along traditionally low volume roadways. By utilizing multiple connections as outlined in this plan, we can make the same critical connections required for regional success while reducing impacts on individual roadways. With this strategy, the proposed 30th Street South connection will carry local traffic, minimizing total volume increases on County Road 17. Whereas, an improved County Road 17 alignment will provide a safe alternative route for regional agricultural traffic, minimizing truck movements on 30th Street South. Each of these improvements are projected to have both local and regional benefits.

Future Network Required

Most feedback received during the study reflects an understanding from stakeholders and the public that growth in the study area will necessitate future connections. The majority of public respondents support some form of improvement. Continued growth in the region like the new Trinity Hospital will cause increased travel demand on roadways like County Road 17 immediately. Communities such as Burlington, Des Lacs, Berthold, and others will immediately use County Road 17 as the primary route to the hospital upon its completion. Input from emergency services stated that safe and reliable travel on these “Near Minot” connections is vital to ambulance, police, and fire protection. County Road 17 will require immediate safety improvements to

address the influx of traffic expected from future southern Minot development.

30th Street South has already experienced traffic increases from increased development. Improvements in the region of the hospital include residential, commercial, and industrial developments. This region is well within the City of Minot's growth plan, and the City's Future Land Use Plan calls for continued growth into the future with high density residential, office business park, and industrial uses among intended development on this future vital roadway. Poor roadway onnections south of County Road 14 will make this north-south connection at 30th Street Southwest a short-term need for improvements.

16th Street Southwest in Southwest Minot has an Average Daily Traffic of nearly 20,000 vehicles per day and presently provides the westernmost Highway 2 North-South crossing. It would be probable, with development occurring in Southwest Minot, that traffic will increase on this roadway. A detailed analysis of the corridor would likely further highlight the benefits of additional North-South connections to the west of 16th Street Southwest.

Figure 4: New Trinity Hospital Site

Figure 3: Expected Development Along 30th Street South

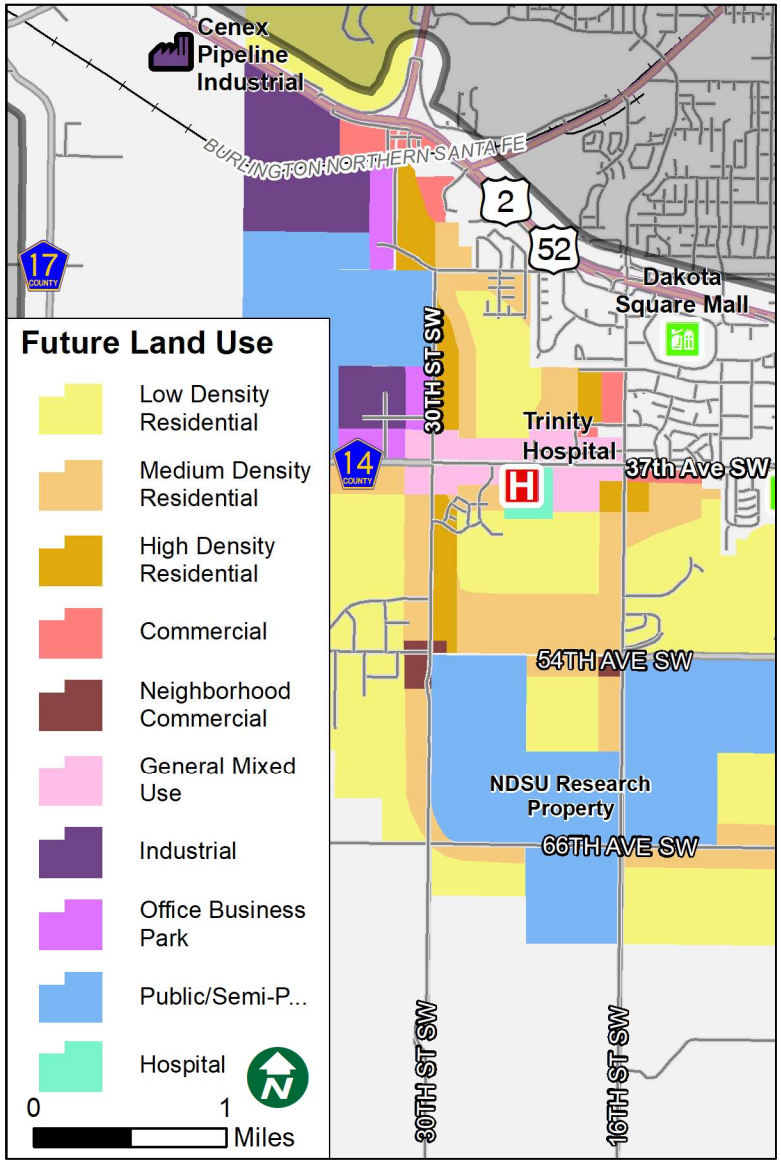


Figure 5: 16th Street Southwest Region and Traffic

II. Implementation Phases

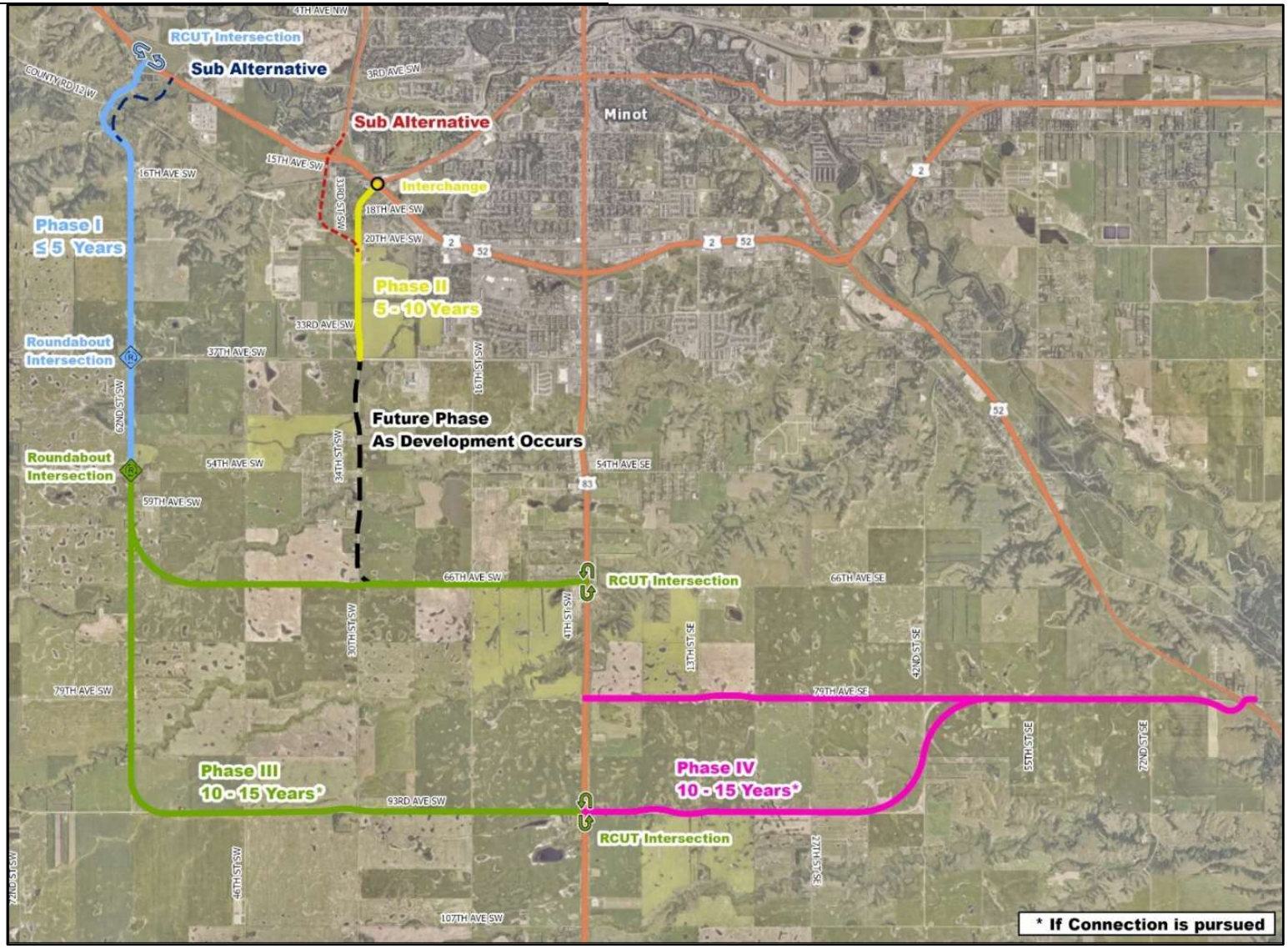


Figure 6: Implementation Phases

When and Why

When

- Short-term: Within next 5 years

Why

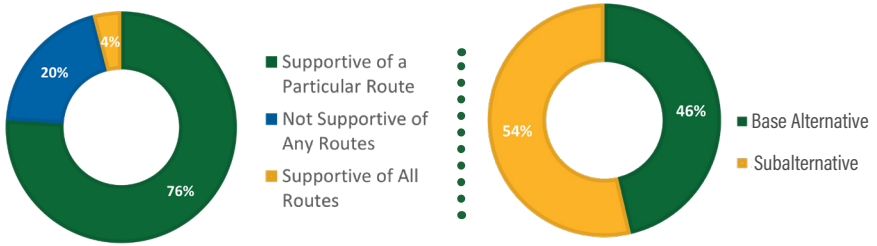
Region:

- Improved regional connectivity to the hospital
- Improved intersection operations at existing regional intersection
- Potential to reduce freight delays and crash potential through busy urban area
- By 2045, this concept, in combination with the Connector Corridor Vision is expected to accrue nearly $4M annual in translated regional delay and crash reduction benefits. Much of this is concentrated within the limits of this project.

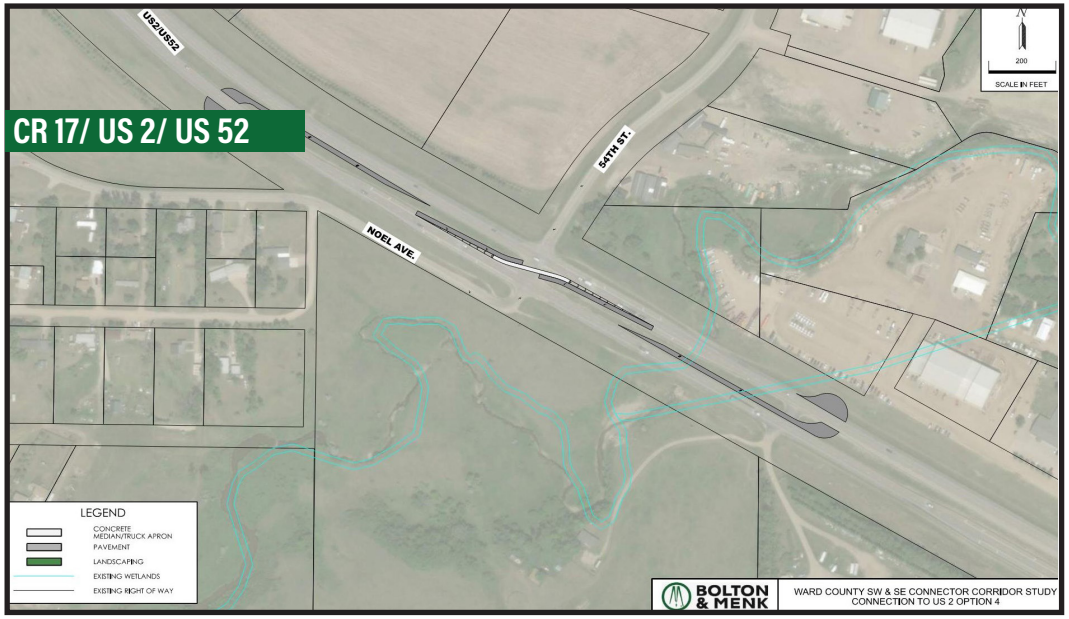
Locals:

- Reduced delays and improved safety at the US 2/52 intersection and CR 14 intersection.
- Designed to improve roadways that will naturally carry increased traffic volumes to the hospital and Minot's primary growth area.
- Roadway improvements allow for softening of horizontal and vertical curvature between CR 12 and 16th Avenue SW, one of the highest crash rate areas in the region.
- Opportunity to accentuate and protect with better roadway design and guardrails, the Trestle Bridge for its historic and aesthetic value.

Public Support

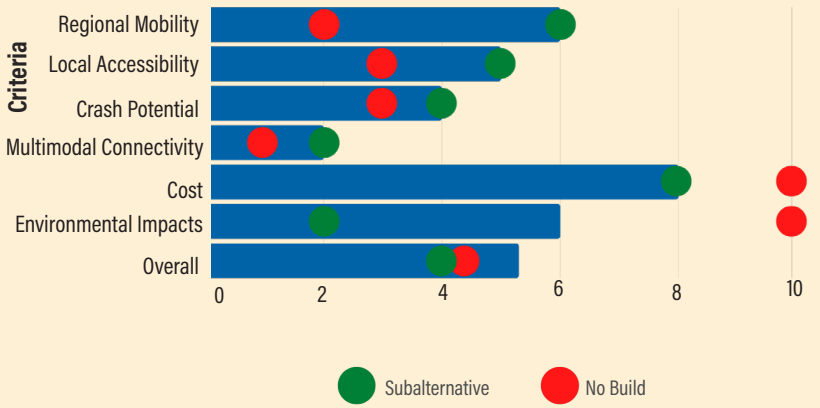


Ward County
SE/SW CONNECTOR STUDY



Project Cost $ 25-30 M

Technical Findings



Next Steps

Programming

- Work with NDDOT to get project into the Statewide Transportation Improvement Program (STIP)
- Highway Safety Improvement Program for intersection and railroad trestle guardrail improvements
- Ward County Highway Sales Tax Fund for roadway improvements
- Consider pairing Phase I and Phase II in INFRA/Rural Surface Transportation solicitation
- United States Department of Defense Missile Access Road Funds for County Road 14 (Designated Route) intersection safety improvements

Preservation

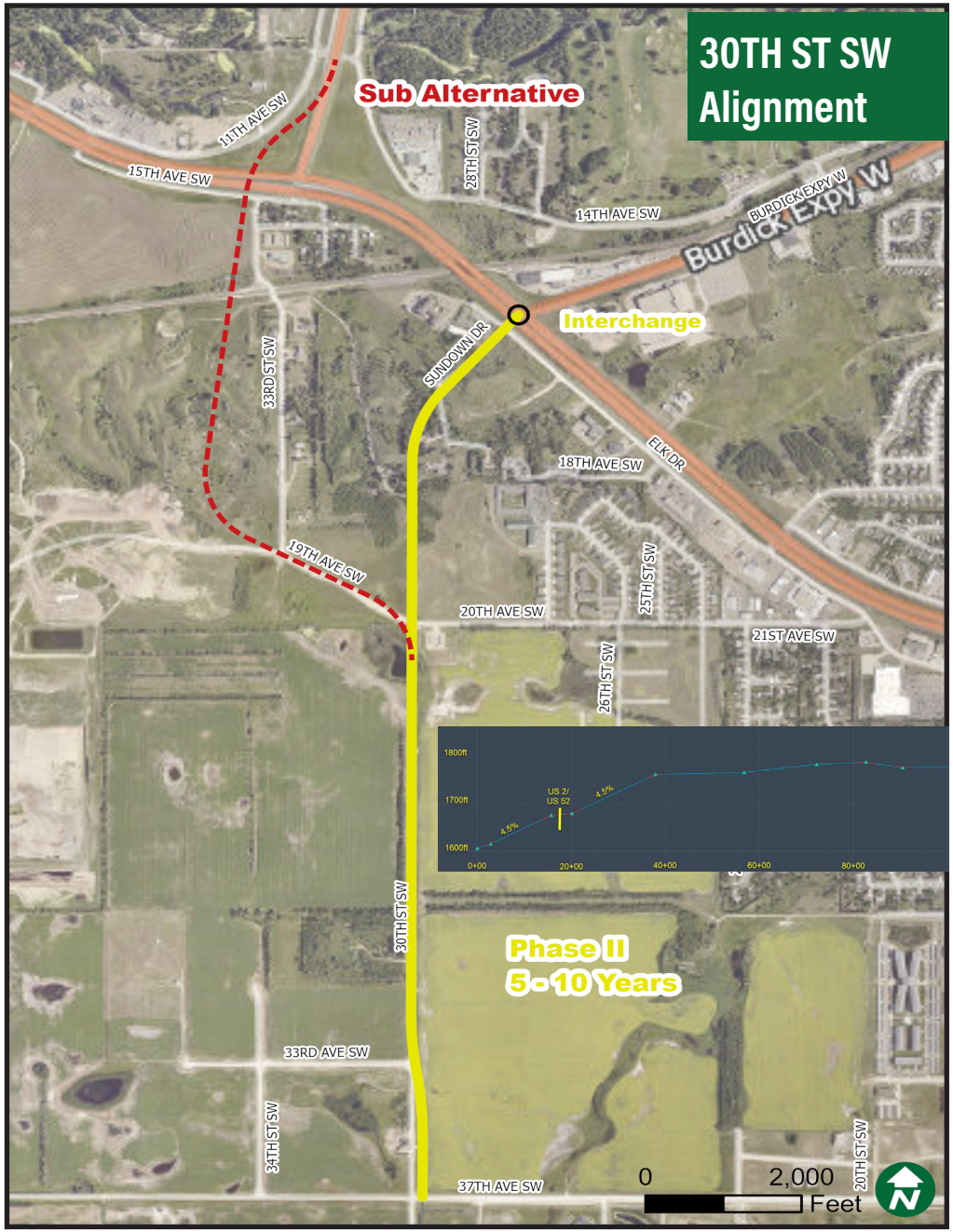
- Need to preserve the proposed alignment to avoid continued and future impacts.
- Begin Right-of-way purchase and negotiations as soon as possible to begin project development.
- Actively manage future access requests along this corridor.

Environmental Analysis

- Once a project (or part of a project) is programmed, begin the formal NEPA process.
- Critical to preserve and enhance the railroad trestle, not negatively impact it.
- Continued coordination with residents to address traffic concerns
- Conduct Wetland Delineation to further refine alternatives.
- Conduct noise analysis particularly for increased noise associated with downhill freight's potential noise impacts to nearby residences
- Complete further analysis of cultural resources to ensure concept does not have any fatal flaws.

Alternatives

- Do Nothing
- Alternate Routing Concept Connecting to US 2/52 (Concept 1B)
- Continuous T-Intersection at US 2/52
- Turn Lane Improvements at County Road 14



When and Why

When

- Short-term: Within next 5-10 years

Why

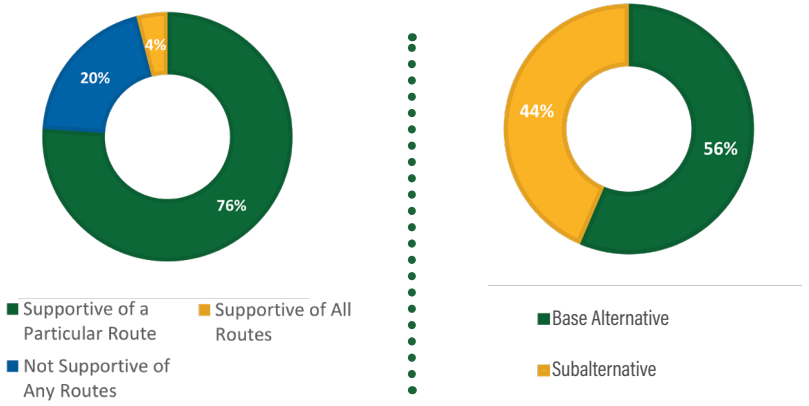
Region:

- Improved police, ambulance, and fire protection through unlocking a major portion of Minot's growth area and improving access to the hospital.
- Major congestion benefits to US highway system and 16th Street South
- Elimination of one of the highest crash intersections in the region (Burdick Expressway) and major exposure reductions to the primary regional crash areas.
- By 2045, this concept, in combination with the Connector Corridor Vision is expected to accrue more than $8M annual in translated regional delay and crash reduction benefits. Much of this is concentrated within the limits of this project.

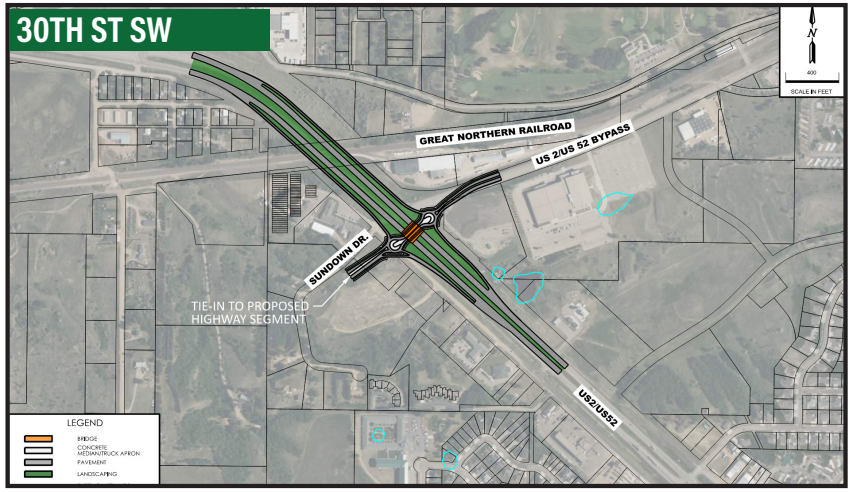
Locals:

- Improved connectivity to hospital, north Minot, and downtown via Burdick Expressway improvement
- Improved roadways enhancements to 30th Avenue to support regional growth
- Improved facilities to provide bicycle and pedestrian connections across Highway 2/52 to southern Minot

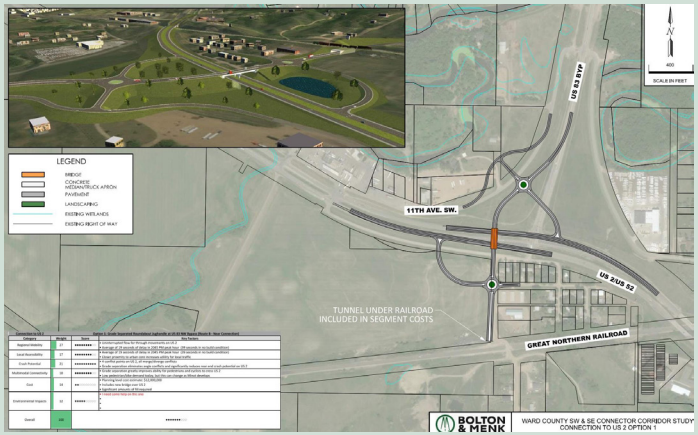
Public Support



Ward County
SE/SW CONNECTOR STUDY



Alternatives



- Do Nothing
- Alignment connecting to the NW Bypass along with interchange at this intersection
- Phased capacity approach (3 lane to 5 lane)
- Alternative single point urban interchange design concepts (i.e., signalized)

Project Cost

Base Alternarive: 55-60 M
Subalternative: 100-110 M

Next Steps

Programming

- Joint contributions with NDDOT, Ward County, and City of Minot
- Position for grant funding
  - Accentuate economic competitiveness and opportunity, partnership, environmental sustainability, and safety (grade separated intersection) to target federal grants (RAISE)
  - Identify opportunities to highlight connections created for Areas of Persistent Poverty or Historically Disadvantaged Communities providing economic opportunity.
  - Target INFRA/Rural Surface Transportation Program Solicitation as this project benefits the National Highway System
  - Consider Safe Streets and Roads for All (SS4A) Grant Program with multimodal connection from downtown Minot to hospital and commercial areas south of US 2 and intersection safety benefits.
  - Recommend pairing with Phase I HSIP projects.
  - Position for Transportation Alternative program for bicycle/pedestrian facilities
- Future Study
  - Conduct analysis of congestion and safety issues along 16th Street to further understand overall north-south arterial needs in Minot. Feedback throughout the study indicates that this is likely to increase the benefit to cost ratio of this project.

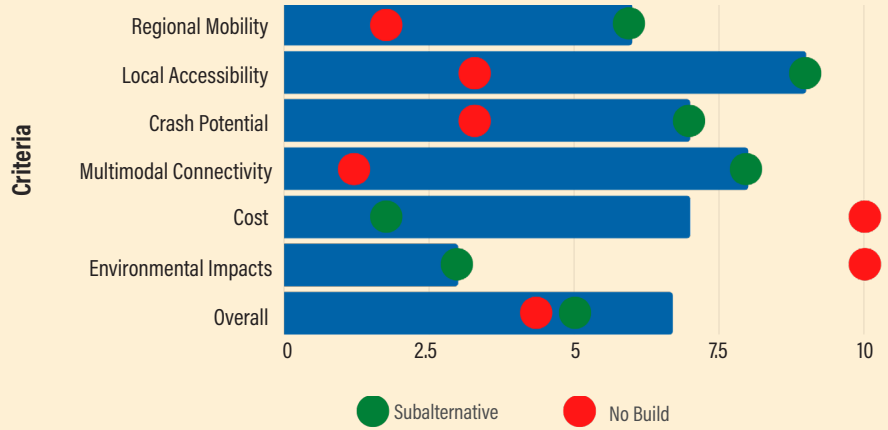
Preservation

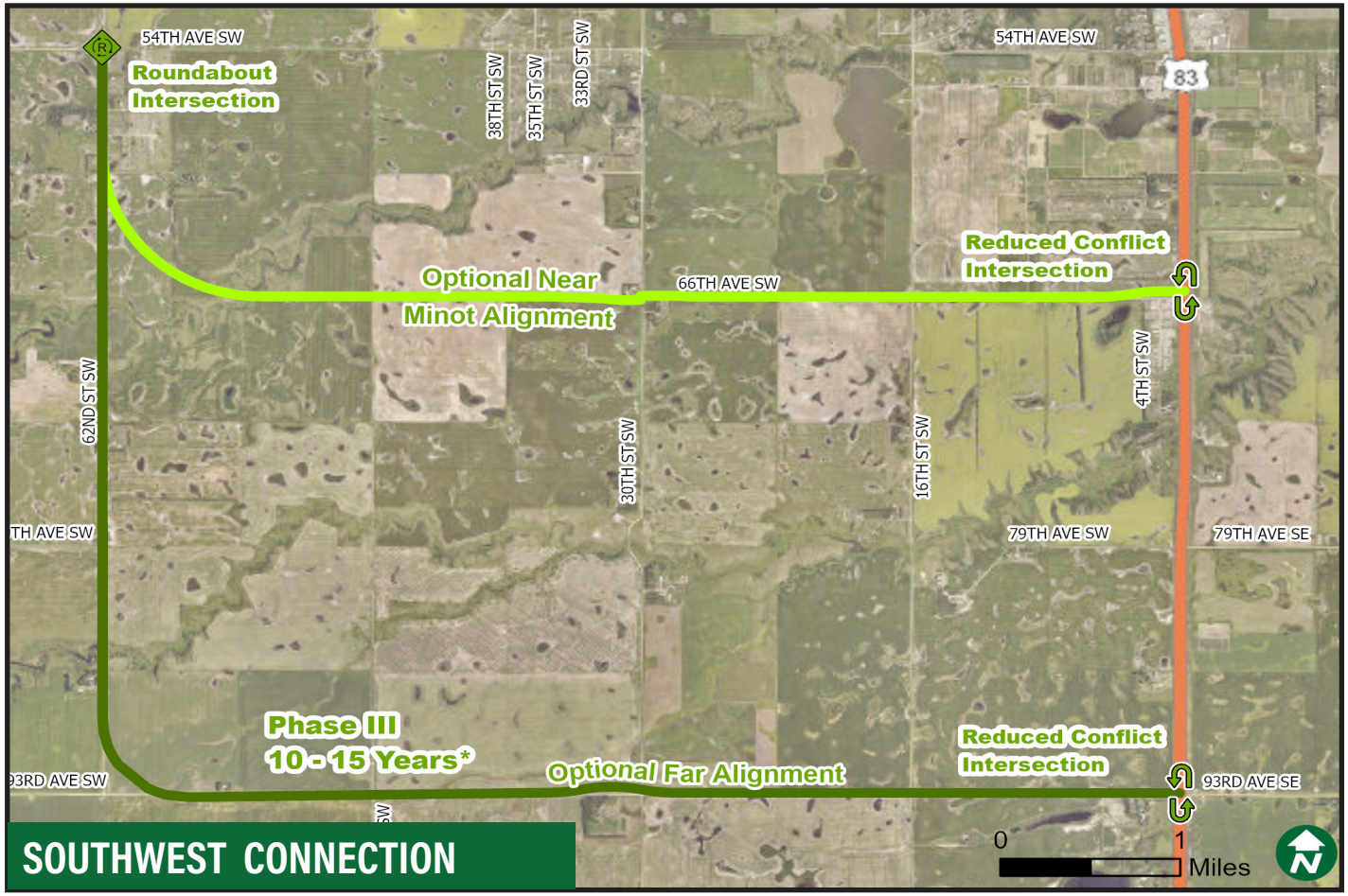
- Need to preserve the proposed alignment to avoid continued and future impacts.
- Discuss future jurisdictional ownership of this future arterial. Likely to become a City of Minot arterial.
- Actively manage future access requests along this corridor.
- With on-going development in the region, work with City of Minot on jurisdictional transfer of existing township roadways

Environmental Analysis

- Continued coordination with the local neighborhoods in this area to ease traffic concerns
- Shovel ready projects increase the potential for grant awards. Consider a tiered environmental document where portions of the project are programmed to facilitate project advancement. This will be critical to narrow the focus of the project as the various sub-alternatives have notable differences in terms of cost and constructibility.

Technical Findings





When and Why

When

- Mid-term: 10-15 years

Why

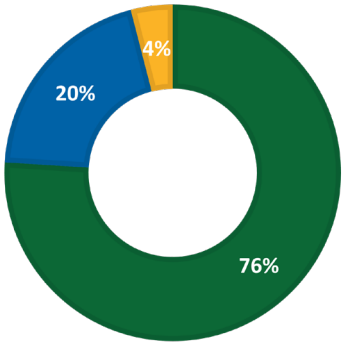
Region:

- Provides valuable east-west By Legal Weight connection for freight and agricultural users from US2/52 to US 83
- Potential to reduce freight delays and crash potential through busy urban areas
- These routes are expected to move around 2,400 new vehicles (540 trucks) on opening day and 3,300 new vehicles (950 trucks) by 2045 but deviation is expected by route and realized growth.

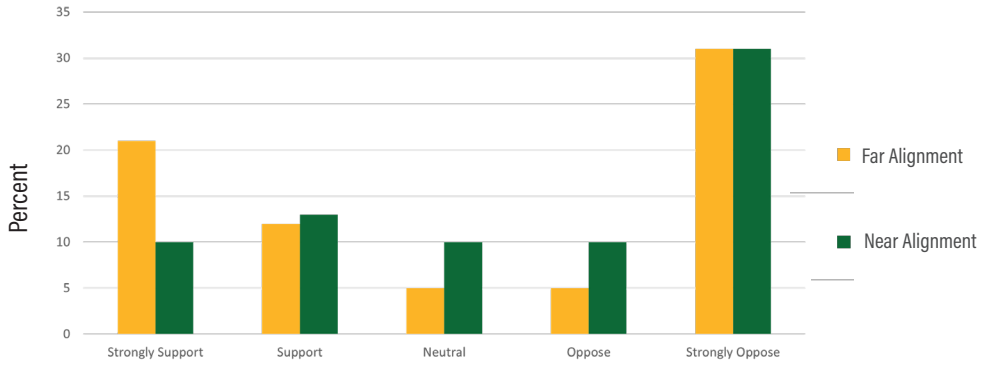
Locals:

- Improved intersection operations at existing regional intersections at County Road 14 and US 83.
- Upgrades to local roadway system that is currently gravel on 66th Avenue and 93rd Avenue without local investment.
- Opportunity for pedestrian and bicycle connections.

Public Support

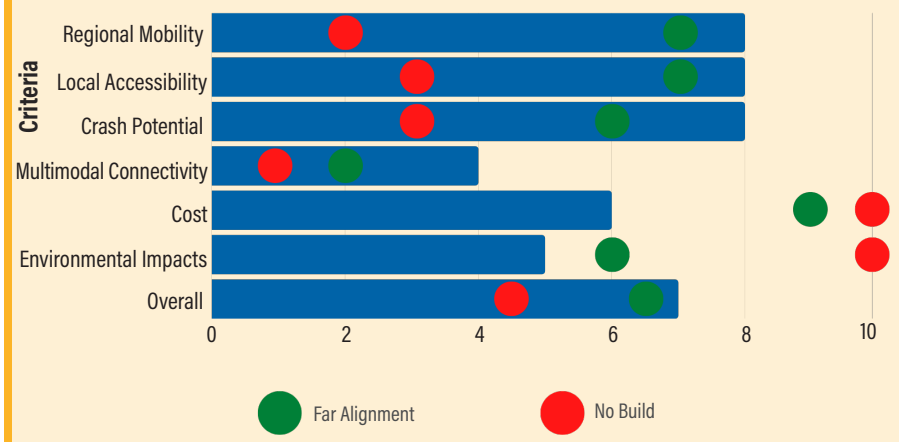


- Supportive of a Particular Route
- Not Supportive of Any Routes
- Supportive of All Routes

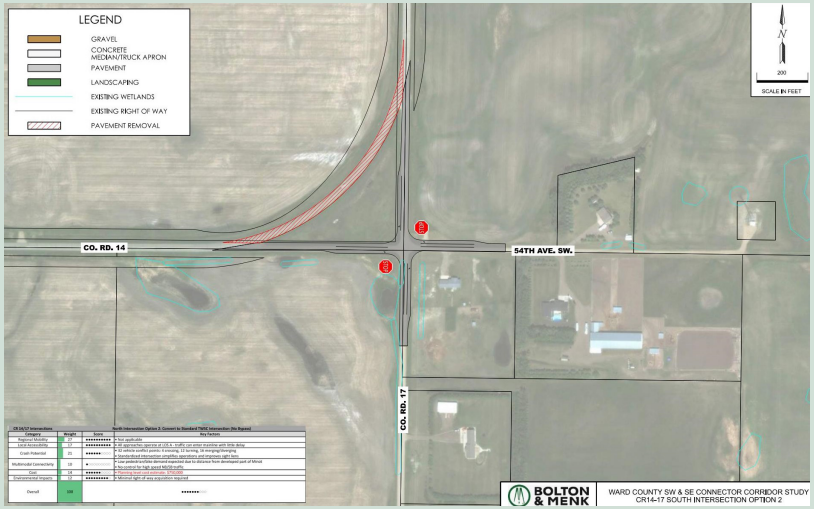


Ward County
SE/SW CONNECTOR STUDY

Technical Findings - Near Alignment (66th Ave S)



Alternatives



- Do Nothing
- Turn Lane Improvements at County Road 14
- Alignment Along 66th Avenue
- Alignment Along 93rd Avenue
- Traffic Signal at 66th Avenue and US 83
- Roundabout at 93rd Avenue and US 83

Next Steps

- Preserve Right-of-Way and protect against future development encroachments along the route.
- As Phases I and II are completed, revisit the vision for the Connector Corridor to determine if the Southwest Connection is still needed and desired.
- Reengage the public on the decision to complete the SW Connector Corridor Vision.
- Highway Safety Improvement Program for intersection improvements.
- Ward County Highway Sales Tax Fund for roadway improvements.
- Position project for US DOT Rural Opportunities to Use Transportation for Economic Success (Routes) by accentuating the benefits of commodity access to markets.
- Actively manage future access requests along this corridor.

Project Cost

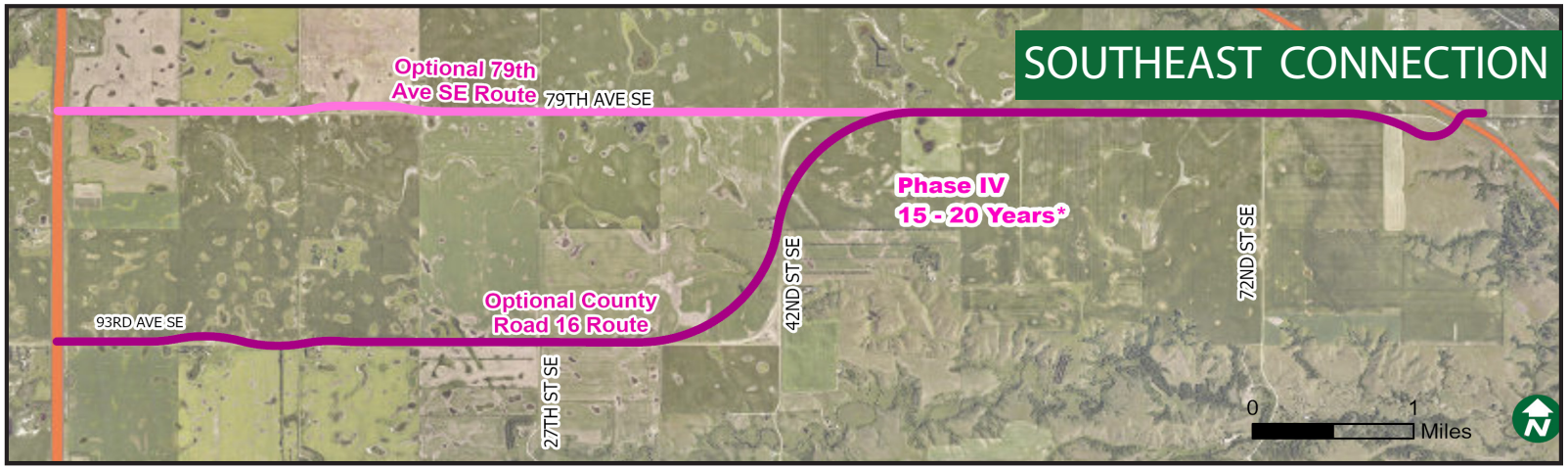
$ 35-40 M

Ward County
SE/SW CONNECTOR STUDY

Implementation Plan - Phase 4

Next Steps

- Preserve Right-of-Way and protect against future development encroachments along the route
- As Phase III is completed, revisit the vision for the Connector Corridor to determine if the Southeast Connection is still needed and desired.
- Actively manage future access requests along this corridor.



When and Why

When

- Long-term: 15-20 years

Why

Region:

- Completes a full southern connection which nearly doubles the utility of the SW Connector by allowing for traffic to connect from US 2/52 west of Minot to US 52 Southeast of Minot.
- Potential to reduce freight delays and crash potential through busy urban area
- With connectivity to the SW Connector, this route is expected to add an additional 1,320 vehicles (420 trucks) by 2040. Those numbers would be closer to 380 vehicles (100 trucks) if this concept were built sooner.
- Provide vital east-west By Legal Weight freight route supporting agricultural and freight users.

Closes 16-mile gap in east-west freight routes that connect US Highway 83 and US 52.

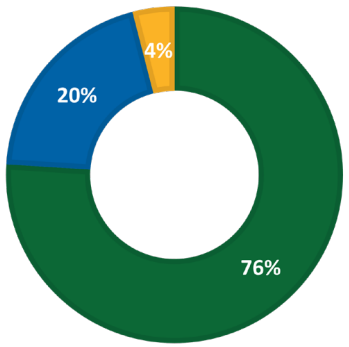
Locals:

- Provides further roadway improvements to County Road 16 or new connectivity to the properties along 79th Avenue SE, which currently do not have a roadway.
- Improved safety at existing intersections
- Opportunity for pedestrian and bicycle improvements.

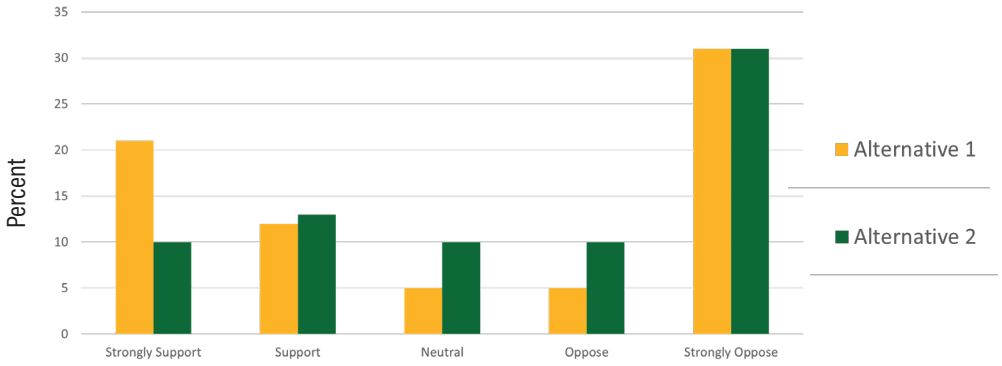
Project Cost

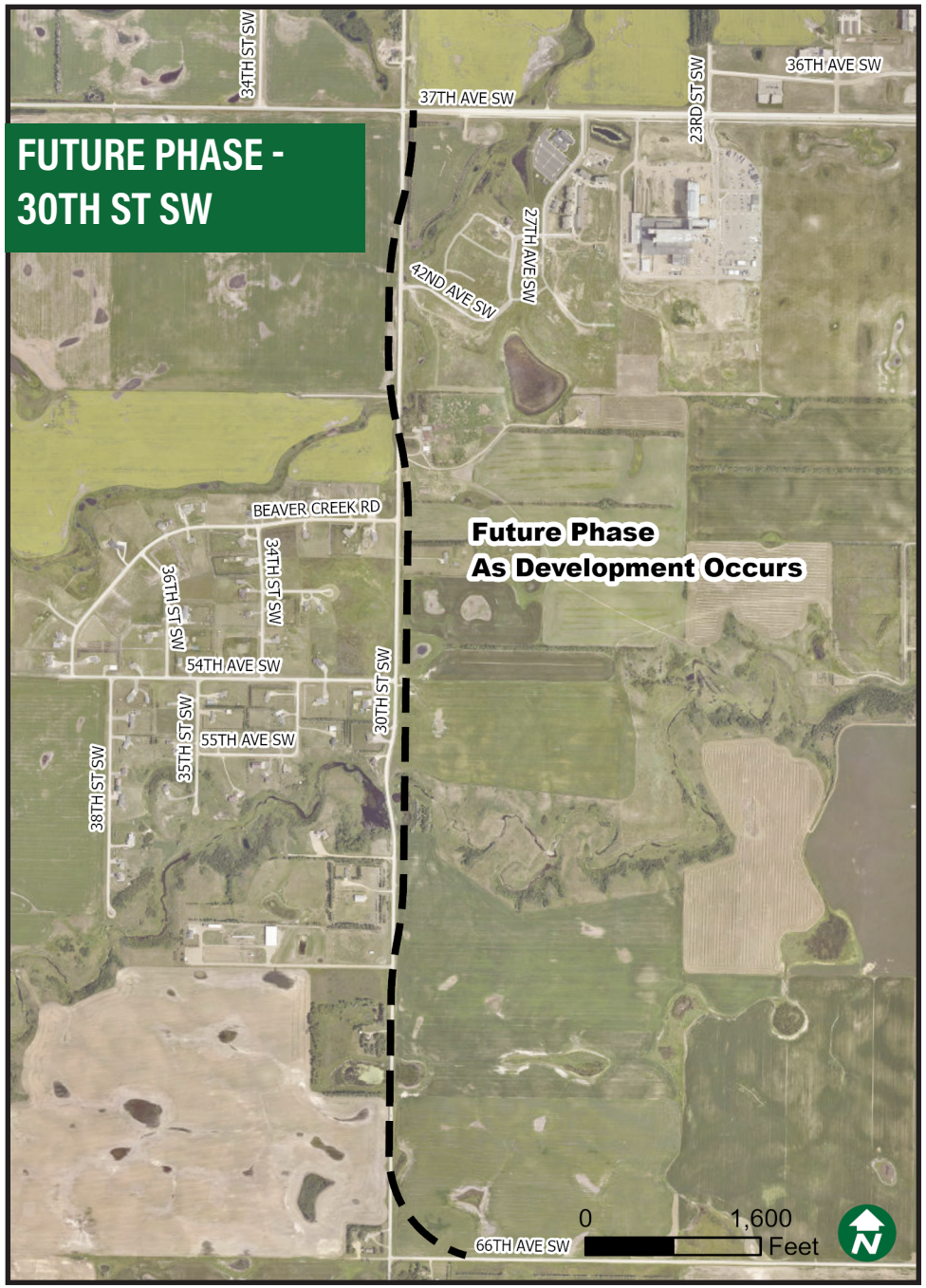
$35-40 M

Public Support



- Supportive of a Particular Route
- Not Supportive of Any Routes
- Supportive of All Routes





When and Why

When

- As local development impacts travel demand on County Road 17 a natural connection may be required from County Road 14 north-south connecting Phase II and Phase II improvements. Local growth may naturally make this connection to the connector corridor route.

Why

Region:

- Provide a north-south connection from County Road 14 to a potentially constructed Phase III southwest connection
- This connection unlocks the US Highway system to the south and east.

Locals:

- 30th Street Southwest South of County Road 14 has historically been difficult to maintain. A future roadway improvement on this corridor can provide improved driving conditions for rural developments such as Beaver Creek.

Next Steps

- Preserve Right-of-Way and protect against future development encroachments along the route
- Actively manage future access requests along this corridor.