U.S. Department of Transportation
Federal Highway Administration

ZERO IS OUR GOAL
A SAFE SYSTEM IS HOW WE GET THERE

North Dakota's US 85 Expansion

I-94 Interchange to Watford City Bypass

Themes featured in this case study:

- Stakeholder and Public Engagement
- Safety in Purpose and Need
- Highway Safety Manual Applications
- Safety and Environmental Stewardship

Introduction

North Dakota's US Highway 85 (US 85) expansion project is an example of how State departments of transportation (DOTs) can proactively address emerging system needs through the National Environmental Policy Act (NEPA) process and incorporate safety and minimize environmental impacts (figure 1). In the early 2010's, North Dakota experienced an economic boom as a result of the expansion of the oil and gas industry in the western part of the State. This economic engine spurred population and traffic growth (including heavy truck traffic) throughout North Dakota, but these impacts have strained rural communities and their transportation infrastructure.

The US 85 project corridor in western North Dakota is a two-lane major arterial connection between Watford City, the county seat of McKenzie County to the north, and Interstate 94 (I-94) in Belfield to the south. The context is highly rural, predominantly surrounded by cropland and pastureland, with two unincorporated communities located along the corridor. The corridor is also surrounded by public land managed by the National Park Service (NPS) and the United States Forest Service (USFS). Two notable natural areas include the Theodore Roosevelt National Park (TRNP)—North Unit and the Little Missouri Badlands and National Grasslands.

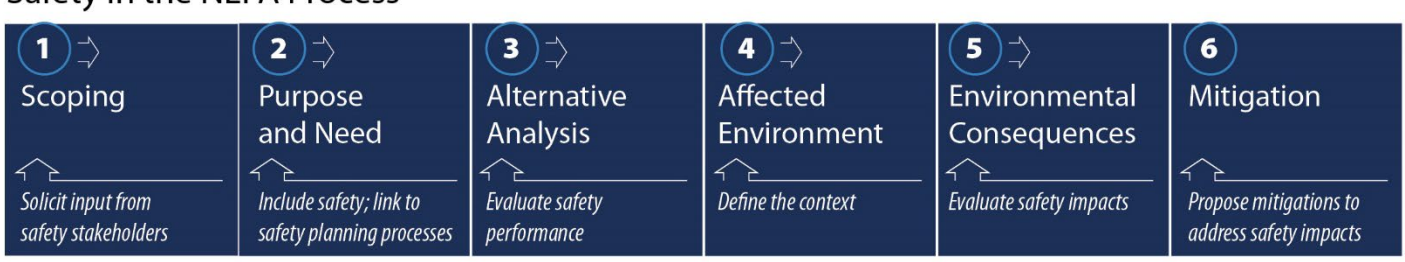

Figure 1. Graphic. Steps of the NEPA process covered by this case study.
Source: FHWA

FHWA-SA-22-046

Limited network connectivity underscores the rural nature of US 85 in this part of the State. North Dakota Highway 200 (ND-200) is the only paved connection along US 85 between Watford City and I-94 (figure 2), and it is a primary example of how societal concerns and economic changes in the State necessitated a major project.

Key points along the corridor required upgrades specifically to accommodate the increase in truck traffic. The Long X Bridge is a historic structure that spans the Little Missouri River and is a bottleneck based on its low vertical (i.e., overhead) clearance (figure 3). Although detours for over-height vehicles exist (albeit an additional 50 miles of highway travel one-way), there were 7 bridge strikes by over-height trucks between 2011 and 2019, often resulting in major closures. As a result, the North Dakota Department of Transportation (NDDOT) proposed to widen the 62-mile corridor of US 85 and replace the Long X Bridge to meet the needs of growing and shifting traffic patterns on this economically critical connection.

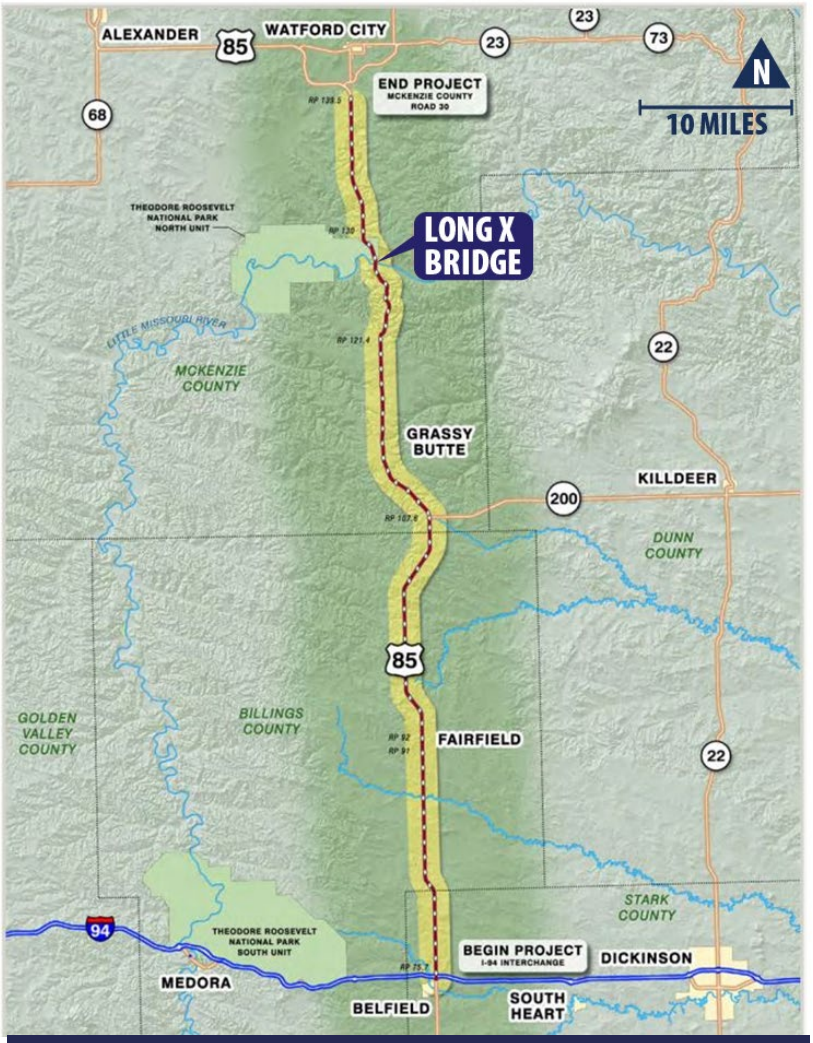

Figure 2. Graphic. US 85 project study area.
Source: NDDOT, 2019.

Figure 3. Photograph. Long X Bridge.
Source: NDDOT.

Project Timeline

NDDOT and the Federal Highway Administration (FHWA), as joint lead agencies, issued a Notice of Intent to prepare an Environmental Impact Statement (EIS) in October of 2015. An EIS is required by NEPA when significant impacts are anticipated on a Federal project. These impacts included potentially expanding the US 85 corridor with flexible design options where needed, as well as possibly replacing or expanding the structure associated with the existing Long X Bridge. The EIS process concluded with a signed Record of Decision in March 2019 (figure 4).

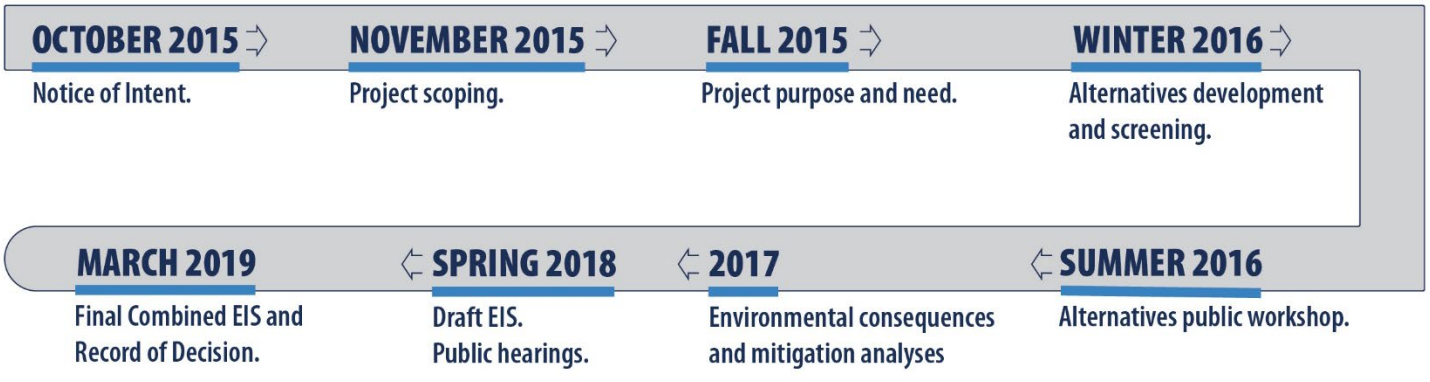

Figure 4. Graphic. US 85 project development process.

Project Summary

Safety was a core component of the US 85 project early in the project development process, from a key consideration in project scoping through preparation of the Environmental Impact Statement (EIS). To support the Notice of Intent to prepare an EIS, NDDOT developed what was informally referred to as the "project charter." These guiding principles served as a statement of purpose early in the scoping process. NDDOT noted that a focus on "flexible design alternatives" would be a core principle of the US 85 EIS. This approach would help achieve the project's purpose and need of improved safety and operations along the corridor while also:

- Going beyond the minimum requirements in stakeholder engagement.
- Minimizing cultural resource impacts.
- Minimizing impacts on native species and preserving ecological connectivity.
- Reducing the likelihood of landslides or other geotechnical concerns.
- Using existing infrastructure to the extent possible.
- Staying within the current right-of-way (ROW) envelope as much as possible and avoiding sensitive areas.

The following sections document how NDDOT incorporated safety early in the NEPA EIS process to facilitate specific design decisions.

Safety in Project Scoping

Historic crash data did not indicate an exceptional safety concern compared to similar facilities in the State. However, public comment and perception of the rapidly changing conditions (conditions that may not be reflected in historical crash data) represented a need to proactively incorporate safety early in the project. NDDOT documented these findings in the project's *Scoping Report*.

Over one-third of public comments received during the public scoping process mentioned safety as a key need for the corridor. Primary concerns included unsafe passing conditions, wildlife-vehicle collisions (WVC), and speeding. The public noted that increased truck presence only seemed to exacerbate these concerns (figure 5). For instance, the mixture of heavy trucks and passenger vehicles was leading to near misses, unsafe passing by impatient vehicles, and "close calls one after another" (NDDOT, 2019; p. 8).

Figure 5. Photograph. Mixed traffic on US 85.
Source: NDDOT, 2019.

Some of these concerns were reflected in the crash data—6 out of 10 reported fatal crashes between 2010 and 2015 involved head-on collisions. Furthermore, the *Wildlife Crossing/Accommodation Volume I: Need and Feasibility Assessment* technical report cited wildlife carcass data that suggested WVCs were an issue for the corridor (NNDOT, 2017). Crash costs associated with deer species alone accounted for roughly $200,000 in societal costs annually, and the monitoring effort (2014/2015) also observed other species involved in vehicle collisions (e.g., Pronghorn, elk, coyotes, and bighorn sheep).

Stakeholder and Public Outreach

NDDOT recognized stakeholder engagement as a key component for helping build consensus and navigate potentially contentious issues. NDDOT engaged stakeholders in the project scoping process with a kickoff meeting and continued hosting meetings throughout the NEPA process. The cooperating agencies included the NPS, USFS, and United States Army Corps of Engineers (USACE), along with 16 participating agencies (table 1). Engaging stakeholders early and formally helped build trust and provide a forum to discuss decisions at key concurrence points. The rapport developed during these stakeholder meetings was critical for documenting tradeoffs and helping make the case for certain project design features. This helped NDDOT understand firm limitations from project stakeholders while also providing a forum to present the flexible design alternatives that would accomplish project needs.

Table 1. US 85 EIS participating agencies.

Federal	State	Local
Bureau of Indian Affairs	North Dakota Department of Health	City of Belfield
Bureau of Land Management	North Dakota Department of Mineral Resources	City of Watford City
U.S. Environmental Protection Agency	North Dakota Game and Fish Department	Billings County
U.S. Fish and Wildlife Service	North Dakota Highway Patrol	McKenzie County
Western Area Power Administration	North Dakota State Water Commission	Stark County
	State Historic Preservation Office	
	Tribal Consultation Committee	

The public outreach process also highlighted how key groups can provide insights that may not be visible to typical travelers. For instance, postal workers and bus drivers provided unique perspectives given their frequent use and intimate knowledge of the corridor. In addition to the near misses described by public comment, these users noted being "run off of the road" by other heavy vehicles. Furthermore, comments about limited or unsafe passing opportunities throughout the study area identified the potential issue of (increasing) slower moving truck traffic leading to more passing activity. Finally, commenters recognized that the US 85 corridor had narrow and varying shoulders; this represented potentially unsafe conditions for vehicles stopped on the side of the road.

Safety in Project Purpose and Need

The purpose of the project was to address changing economic and societal concerns in the western part of the State. In practice, this refers to increases in traffic, particularly truck traffic, on the corridor. The project scoping process helped make the direct connection between the project purpose and safety needs. Safety is explicitly noted as a project need:

> *"Compared to other major highways throughout the State, the stretch of US Highway 85 along the project corridor is subject to a disproportionately high percentage of large truck traffic relative to the average daily traffic (ADT) (approximately 33 percent). On a two-lane highway with limited passing opportunities, this high percentage of truck traffic can result in drivers engaging in risk-taking behavior to maneuver around slower moving vehicles. During the public scoping process, 37 percent (57 out of 153) of commenters identified safety as a concern along the project corridor. Although crash data does not indicate that this segment of highway is statistically more dangerous than other highways within the state, public perception and user experiences highlight and heighten the need for a safer roadway."* (NDDOT, 2019; p. ES-6)

The EIS also noted several other key needs to support the project purpose, many of which also have connections to road user safety:

- Social demands and economic development.
- System linkage and connectivity.
- Capacity and traffic volumes.
- Transportation demand and roadway classification (i.e., part of the NHS and impact on interstate commerce).
- Slope instability and landslides.
- Ecological connectivity.

This provided additional opportunities for safety to be considered when evaluating potential environmental impacts (e.g., ecological connectivity and reducing WVCs).

Safety in Alternatives Analysis

By incorporating safety in the project purpose and need, NDDOT was able to justify design elements with anticipated safety benefits while accommodating other stakeholder needs. Project scoping established during the Notice of Intent and early stakeholder engagement are key examples of this success.

Traffic Safety Analysis for Alternatives

NDDOT refined dozens of potential alternatives into three major alignment alternatives for final evaluation (i.e., other than proposed alternatives for the Long X Bridge):

Alternative A

This represented a "no-build" alternative. The corridor would remain a two-lane undivided road and the Long X Bridge would not be rehabilitated or replaced. This alternative would not have met the project purpose and need, and so it was not considered for detailed safety analysis.

Alternative B

This alternative included an expansion of the US 85 corridor to a 4-lane divided highway with a 60-ft wide depressed median, and 8-ft outside shoulders. This design would have the largest footprint of the three alternatives.

Alternative C

This alternative would also widen the US 85 corridor to a 4-lane divided highway with a 20-ft flush paved median and 8-ft outside shoulders. Center line rumble strips would be installed along segments with no turn lanes.

NDDOT used the Interactive Highway Safety Design Model (IHSDM) software to evaluate the safety performance for alternatives B and C. IHSDM is a decision-support tool that applies the predictive models of the American Association of State Highway Transportation Officials' (AASHTO's) *Highway Safety Manual* (HSM) to evaluate the safety performance of geometric design decisions (FHWA, 2021; AASHTO, 2010).

Since IHSDM was a new tool to the agency at the time of the EIS, NDDOT used standard, uncalibrated models, known as safety performance functions (SPFs), found in the HSM for rural multilane divided arterials. Although this is an acceptable use of the HSM methodology, many States have State-specific SPFs or State-specific calibration factors for more accurate and reliable estimates of expected crash frequency and severity.

State-specific or calibrated SPFs reflect the conditions and context of the State in question, rather than the more generic national conditions documented in the HSM.

NDDOT, for purposes of the IHSDM analysis, divided the corridor into three sections, representing the three counties along the project corridor—McKenzie, Billings, and Stark. Analysts used forecasted annual average daily traffic (AADT) to predict total crashes between 2015 and 2040. NDDOT combined the results of the analysis in each county to summarize the total number of predicted crashes for each alternative. The IHSDM results showed that Alternative B would experience an estimated 4.3-percent fewer fatal and injury crashes over the 25-year study period. However, it had a wider footprint than Alternative C, and minimizing impacts to other resources were particularly important for stakeholders as identified early in the engagement process. NDDOT modified the Alternative B design to fit within the existing ROW as much as possible (i.e., rigidly adhered to in the national park boundaries and generally adhered to in other sensitive areas), to avoid any additional impacts beyond the area managed by NDDOT, and to improve safety performance of the design alternatives. These flexible design options included (NDDOT, 2019; p. 56):

- *"Modified ditch section and backslope in select locations.*
- *Shifted alignment in select locations to avoid sensitive resources.*
- *Curb and gutter, and flush, center median through Fairfield.*
- *Reduced speed limit through the Badlands.*
- *Use of retaining walls within the Badlands.*
- *Narrowed center median width in select locations within the Badlands.*
- *Flush, center median through the Badlands and south of Watford City."*

By demonstrating quantitative safety benefits through the use of IHSDM, NDDOT was able to work with USACE to identify Alternative B (figure 6) as the "Least Environmentally Damaging Practicable Alternative" (LEDPA) and the Selected Alternative (NDDOT, 2019).

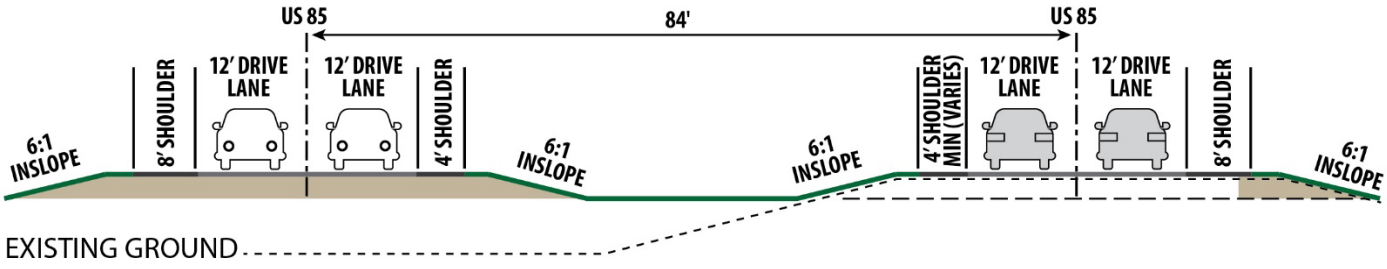

Figure 6. Graphic. Cross section of the selected alternative – Alternative B.
Source: NDDOT.

Safety and the Affected Environment

NDDOT identified several resources throughout the corridor that would be potentially affected by the project, including:

- Farmland and pastureland.
- Cultural resources.
- Public lands.
- Landslide-prone locations and other geologically sensitive areas.
- Paleontological resources.

In addition to the concerns noted in the project needs, the Affected Environment section of the EIS made a connection between safety and ecological connectivity (NDDOT, 2017; figure 7). This analysis informed mitigation measures related to WVCs documented in the EIS.

Figure 7. Photograph. Wildlife crossing the roadway along US 85.
Source: NDDOT, 2019.

Safety, Environmental Consequences, and Mitigation

A key feature of the EIS noted that wildlife connectivity would not be improved under the no-build option (i.e., Alternative A). In other words, highway expansion, although more environmentally impactful in certain ways, would have the ecological benefit of incorporating wildlife crossings and habitat connectivity measures (e.g., crossings, fencing, cattle guards, and jump outs). This would satisfy a key environmental need of the project, as well as reduce the potential for wildlife exposure to traffic and WVCs. These measures are part of the 56 environmental commitments that would be implemented before, during, and after construction. Examples that balanced safety and mitigation efforts include:

- Coordinate with participating agencies with respect to pronghorn crossings, including reanalyzing the crossings during final design.
- Monitor effectiveness, manage, and maintain wildlife crossings with cooperating and participating agencies.
- Clear vegetation to maintain sight lines for bighorn sheep at underpass crossings.

Record of Decision

As a result of the EIS and NEPA process, NDDOT and FHWA identified Alternative B as the Selected Alternative. This alternative met the project purpose by satisfying the documented social, economic, environmental, and other planning factor needs. The IHSDM analysis demonstrated an anticipated reduction in crashes that helped meet the safety need of the project, while the flexible design options (e.g., shifted alignments, reduced speed limits, and narrowed medians in the Badlands) helped balance safety with the environmental goals of the project.

Project Themes

The US 85 EIS touches on several themes noted in the FHWA's *Integrating Road Safety into NEPA Analysis: A Practitioner's Primer* guidance (FHWA, 2011). These themes are also key takeaways for future NEPA studies that plan to effectively incorporate safety early in the NEPA and project development process.

Stakeholder and Public Engagement

In addition to traditional stakeholder engagement, public outreach was instrumental in project scoping and incorporating safety into the NEPA process. Historical crash data alone did not indicate that safety was a major concern. However, rapidly changing economic and demographic conditions in the region spurred overwhelming traffic growth (more than doubling in only five years), including a substantially high percentage of truck traffic. Public engagement revealed numerous first-hand accounts, primarily from individuals familiar with the corridor (e.g., postal workers and bus drivers), of unsafe passing, speeding, and other near-miss incidents. This allowed NDDOT to proactively consider safety rather than waiting for crash data to reflect the emerging conditions.

Safety in Purpose and Need

The project scoping process established safety as a critical project need. Furthermore, many other project needs (e.g., improving ecological connectivity) have safety as a secondary purpose of that need (e.g., reducing WVCs and improving slope stability). Formal documentation and stakeholder engagement was important in justifying the larger footprint as part of the typical cross-section. When considering Alternatives B and C, NDDOT used the reduced number of predicted crashes in Alternative B as an indicator of an improved human environment. By demonstrating this improvement while staying within the existing available ROW to the extent possible, NDDOT and USACE agreed that Alternative B was the LEDPA.

The HSM in the NEPA Process

NDDOT used IHSDM, an HSM based tool, as part of the alternatives analysis to document and evaluate the safety effects of proposed design decisions. Specifically, it allowed NDDOT to compare the predicted number of crashes for the alternatives alongside other transportation performance measures, such as capacity level of service and environmental impacts. The results of the analysis helped justify an alternative that considered safety as part of the human environment. Although IHSDM is not yet widely used by NDDOT, the agency's experience showed its potential for multi-disciplinary planning. NDDOT plans to use IHSDM and the HSM in future project development.

Safety and Environmental Stewardship

The diversity of participating agencies potentially impacted by the project meant that safety would need to be incorporated in an environmentally sensitive context (table 1). The project's guiding principles focused on the

concept of flexible design alternatives because NDDOT recognized that environmentally sensitive designs would be an essential part of a successful EIS. The final EIS noted several environmental concerns as part of the project needs, including slope instability and landslides, as well as ecological connectivity. Within these broader project needs, NDDOT documented several important details that needed to be addressed by flexible design alternatives:

- The corridor touches publicly-managed lands, including the TRNP—North Unit and the Little Missouri Badlands and National Grasslands.
- The Little Missouri Badlands are both an environmentally and culturally sensitive area.
    - In addition to preservation concerns, the area is geologically unstable and needed innovative geotechnical designs.
- Any new corridor design, particularly one that proposed to widen US 85, would need to consider ecological connectivity and the impact on WVCs.

By incorporating safety early in the process through proactive stakeholder engagement and scoping, NDDOT developed a defined need for safety as part of the project that encouraged data-driven evaluation of project alternatives. This allowed NDDOT to arrive at a design that accommodated both the safety and environmental needs of the project.

References & Additional Information

- American Association of State Highway and Transportation Officials. (2010). *Highway Safety Manual: 1st Edition*, Washington, D.C. Resources available online: http://www.highwaysafetymanual.org/Pages/default.aspx.
- Federal Highway Administration. (2011). *Integrating Road Safety into NEPA Analysis: A Primer for Safety and Environmental Professionals*, Report No. FHWA-SA-11-36, Washington D.C. Available online: https://rosap.ntl.bts.gov/view/dot/42549.
- Federal Highway Administration. (2021). *Interactive Highway Safety Design Model*. Available online: https://highways.dot.gov/research/safety/interactive-highway-safety-design-model/interactive-highway-safety-design-model-ihsdm-overview.
- North Dakota Department of Transportation. (2017). *Wildlife Crossing/Accommodation Volume I: Need and Feasibility Assessment*, Bismarck, North Dakota.
- North Dakota Department of Transportation. (2019). *U.S. Highway 85: I-94 Interchange to Watford City Bypass (McKenzie County Road 30) Final Environmental Impact Statement and Record of Decision*, Bismarck, North Dakota. Available online: https://www.dot.nd.gov/projects/williston/US85I94/docs/FEIS-ROD%20US%20Highway%2085%20030619_20046.pdf.
- Phone Interview on January 23, 2022, with Matt Linneman (NDDOT) and Kevin Brodie (FHWA).

Project Contacts

Matt Linneman, Project Manager
North Dakota Department of Transportation
(701) 328-6904
mlinneman@nd.gov

Kevin Brodie, Transportation Engineer
Federal Highway Administration – North Dakota Division
(701) 221-9467
kevin.brodie@dot.gov