NORTH PLAINS CONNECTOR

A Grid United Project

Project Overview for the Montana Department of Environmental Quality

Submitted by:

North Plains Connector LLC, a Grid United LLC Company

GRID UNITED

July 2024

PROJECT OVERVIEW
FOR THE MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

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ACRONYMS AND ABBREVIATIONS

AC	alternating current
ARS	Agricultural Research Service
ASCE	American Society of Civil Engineers
BLM	Bureau of Land Management
BMP	best management practice
CITAP	Coordinated Interagency Transmission Authorization and Permits
CMRP	Construction Mitigation and Reclamation Plan
DC	direct current
DMR	dedicated metallic return
DOE	U.S. Department of Energy
EHV	extra high voltage
EI	Environmental Inspector
EIA	Energy Information Administration
ESA	Endangered Species Act
Fort Keogh	Fort Keogh Agricultural Research Station
GIS	geographic information system
GRSG	greater sage-grouse
HVDC	high-voltage direct current
kcmil	thousand circular mils
kV	kilovolt
MDEQ	Montana Department of Environmental Quality
MEPA	Montana Environmental Policy Act
MFSA	Major Facility Siting Act
MISO	Midcontinent Independent System Operator
MW	megawatt
NDPSC	North Dakota Public Service Commission
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NHPA	National Historic Preservation Act
North Plains	North Plains Connector LLC
NWPCC	Northwest Power and Conservation Council
OPGW	optical ground wire
POI	point of interconnection
Project	North Plains Connector Project
SPP	Southwest Power Pool
SWPPP	Stormwater Pollution Prevention Plan
THPO	Tribal Historic Preservation Officers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
VRM	Visual Resources Management
VSC	voltage source converter
WECC	Western Electricity Coordinating Council

1.0 INTRODUCTION

This document provides a preliminary project description for the North Plains Connector Project (Project), an interregional electric transmission line proposed by North Plains Connector LLC (North Plains). The Project is subject to numerous state and federal regulations, including the Montana Major Facility Siting Act (MFSA) under the jurisdiction of the Montana Department of Environmental Quality (MDEQ); the North Dakota Century Code Chapter 49-22.1 (Energy Conversion and Transmission Facilities) under the North Dakota Public Service Commission (NDPSC); the Federal Land Policy and Management Act under several federal land management agencies, and the Federal Power Act under the U.S. Department of Energy (DOE). North Plains is in the process of filing a MFSA application with the MDEQ to obtain the Montana Siting Certificate of Compliance in accordance with MFSA, as well as an application to the NDPSC to obtain a Certificate of Corridor Compatibility and Transmission Facility Route Permit. As the Project will cross federal lands, North Plains is also submitting right-of-way permit applications to the Bureau of Land Management (BLM), U.S. Forest Service (USFS), and U.S. Department of Agriculture (USDA).

In deciding whether to approve or permit the Project, the MDEQ and federal agencies will carry out an environmental review of the Project in compliance with the Montana Environmental Policy Act (MEPA) and National Environmental Policy Act (NEPA), respectively. The MDEQ will be the lead agency for MEPA and the DOE will be the lead agency for NEPA. The joint MEPA/NEPA review will consist of an environmental impact statement, which is meant to satisfy Montana and federal environmental review requirements. The NDPSC, BLM, USFS, and USDA will participate as cooperating agencies. North Plains is in the process of preparing an application to the MDEQ, applying for federal right-of-way permits, and preparing resource reports to submit to the DOE for preparation of the environmental impact statement.

The current document is being provided to the MDEQ to help inform a request for proposals to third parties to prepare the MEPA and NEPA documents. This document is not intended for public review and comment or to inform the MDEQ's future decision of whether to authorize the Project once an application is submitted. Project information detailed in this document is subject to change prior to filing the MFSA application and resource reports, anticipated in 2024.

2.0 GENERAL PROJECT DESCRIPTION

2.1 PROJECT OVERVIEW

North Plains is Delaware limited liability company formed pursuant to Section 18-201 of the Delaware Limited Liability Company Act. North Plains is a wholly owned, single-purpose subsidiary of Grid United LLC, a Houston, Texas-based company developing next generation energy infrastructure to power the future. Grid United LLC is focused on the infrastructure needed to make the United States power grid more modern, efficient, reliable, and secure.

As proposed, the Project will extend approximately 415 miles from near Colstrip, Montana to two separate end points in North Dakota—one near the town of Center and the other near St. Anthony (see Figures 2.1-1 and 2.1-2 below). The Project will consist of the following:

- A 339-mile up to 525-kilovolt (kV) high-voltage direct current (HVDC) transmission line (HVDC Transmission Line) from Montana into North Dakota with associated 200 -foot-wide right-of-way.

- Montana: North Plains will install approximately 172 miles of the HVDC Transmission Line in Rosebud, Custer, and Fallon counties. The line will extend east from the new alternating current (AC)/direct current (DC) Rosebud County Converter Station in Rosebud County near Colstrip, Montana to the Montana-North Dakota state line in Fallon County.

- North Dakota: North Plains will install approximately 167 miles of the HVDC Transmission Line in Golden Valley, Slope, Hettinger, Grant, and Morton counties. The line will extend east from the Montana-North Dakota state line in Golden Valley County to the new AC/DC Morton County Converter Station in Morton County, North Dakota.

- A 3-mile 500-kV extra high voltage (EHV) AC Rosebud Transmission Line in Rosebud County, Montana with an associated right-of-way approximately 200 feet wide. The Rosebud Transmission Line will connect the Rosebud County Converter Station to the existing Colstrip Substation owned by Northwestern Energy, also located in Rosebud County. The Colstrip Substation will serve as the interconnection point to the Western Electricity Coordinating Council (WECC) power system for the western grid.

- Approximately 51 miles of new 345-kV EHV AC Oliver Transmission Line located in Morton and Oliver counties, North Dakota with an associated right-of-way approximately 200 feet wide. The line will extend east and north from the Morton County Converter Station in Morton County to the planned Oliver County Substation in Oliver County, North Dakota. Minnesota Power has proposed and will develop the Oliver County Substation as part of a separate project. The Oliver County Substation will serve as the interconnection point to the Midcontinent Independent System Operator (MISO) for the eastern grid.

- Approximately 22 miles of new 345-kV EHV AC Morton Transmission Line in Morton County, North Dakota. The line will extend east and southeast from the Morton County Converter Station to the new Morton County Switchyard. The Morton County Switchyard will serve as the interconnection point for the Southwest Power Pool (SPP) system for the eastern grid.

The Project will also include appurtenances and associated equipment, including telecommunication systems and grounding components. The Project will require temporary workspaces during the construction phase to access the construction site, stage equipment and material, and install the various Project components. Sections 2.3, 2.4 and 2.5 provide a detailed description of these components and their locations, design considerations, and the construction process that will be used to develop the Project.

The Project is a bidirectional line to move electricity east or west between the Eastern and Western Interconnections (also referred to as the eastern and western grids) in response to the growing need to move power across long distances to improve the reliability and resiliency of the grid. Specifically, the Project will connect the MISO and SPP on the eastern grid with the WECC electrical power markets on the western grid. Regulations governing the electrical grid require the Project to sell capacity without preference towards a particular generation technology.

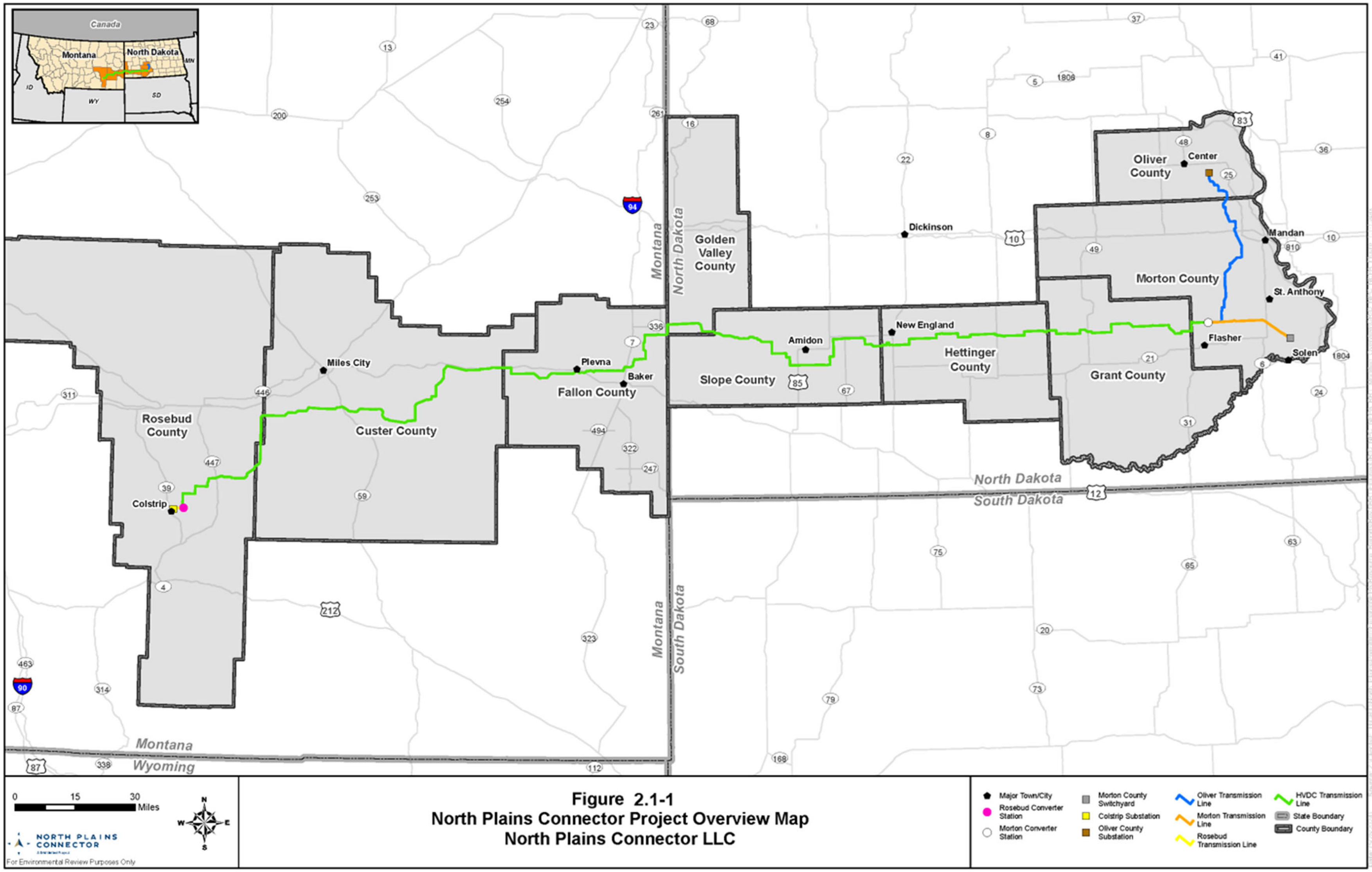

Figure 2.1-1
North Plains Connector Project Overview Map
North Plains Connector LLC

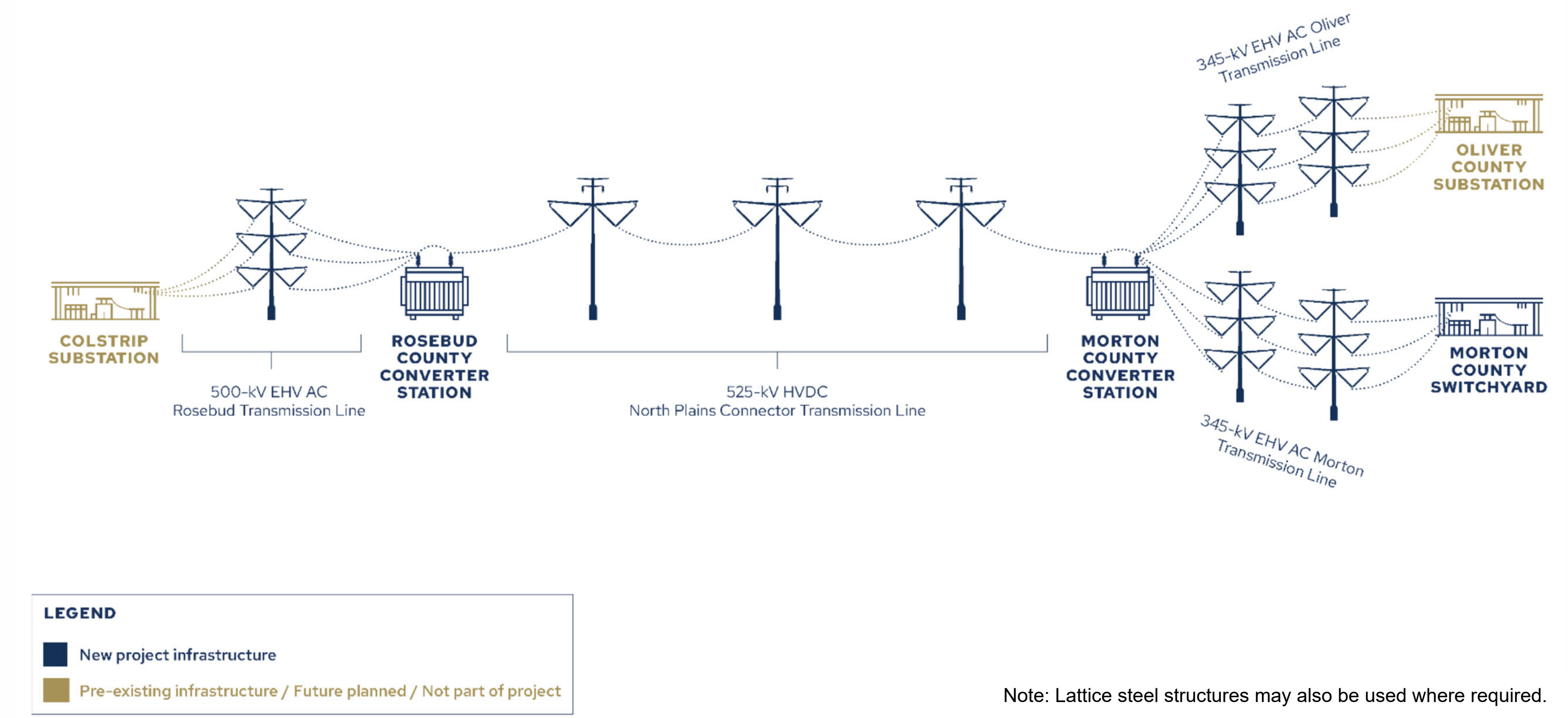

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Figure 2.1-2
Project Major Facility Components
North Plains Connector Project

Portions of the Project or capacity rights may be owned by electric utilities, cooperatives, government entities, corporate energy providers, or independent generators in the WECC, MISO, or SPP regional power systems and may deliver energy on a contractual basis. The Eastern and Western Interconnections are the two largest electrical grids in North America (see Figure 2.1-3). The Project will allow for leveling of price differentials in the geographically distinct markets and meteorologically dissimilar grids and will improve the use of energy resources across the northern United States.

2.2 REGULATORY FRAMEWORK

Project siting, construction, or operation requires several federal, state, and local approvals, consultations, or environmental reviews. The following subsections describe the primary federal and state regulations that are applicable to the Project, including relevant agencies acting in compliance with associated laws or guidance. Additional federal, state, and local consultations or authorizations are described in Sections 2.9 and 2.10.

2.2.1 Federal Process

The Project will traverse federal lands managed by the BLM, USFS, and USDA – Agricultural Research Service (ARS). Each of these crossings will require federal right-of way authorizations from BLM, USFS, and the USDA-ARS, respectively. These federal agency actions also allow for the application of the DOE's permitting and environmental review coordination authorities under Section 216(h) of the Federal Power Act. First established in the Energy Policy Act of 2005, FPA Section 216(h) provides DOE the authority to oversee and set binding schedules for the timely coordination of federal authorizations, including required federal environmental reviews and consultations. In addition, DOE may further coordinate with other federal agencies, Tribes, and state agencies to facilitate the overall siting and permitting for the Project. Under these authorities, DOE will be the Lead Federal Agency for the NEPA review, and consultations under Section 7 of the Endangered Species Act (ESA) and Section 106 of the National Historic Preservation Act (NHPA).

2.2.2 Purpose of the Project

The Project has been planned and designed to bridge the interregional gap between the Western Interconnection and SPP and MISO in the Eastern Interconnection. This high-capacity, bidirectional line is intended to:

- improve reliability and efficiency for both Interconnections by increasing transfer capacity and access to additional generation between markets;
- improve resiliency through the ability to tap regional dispatchable and inverter based generation, and to provide dynamic voltage and frequency support services to help maintain operational flexibility; and
- mitigate weather-driven system outages by providing a path to quickly and efficiently shift power to where it is needed most.

The Purpose, as well as the Needs outlined in Section 2.3, informed the proposed design of the facilities across Montana and North Dakota, including on private land, state lands, and federal lands managed by the BLM, USFS and USDA-ARS. The federal environmental reviews will

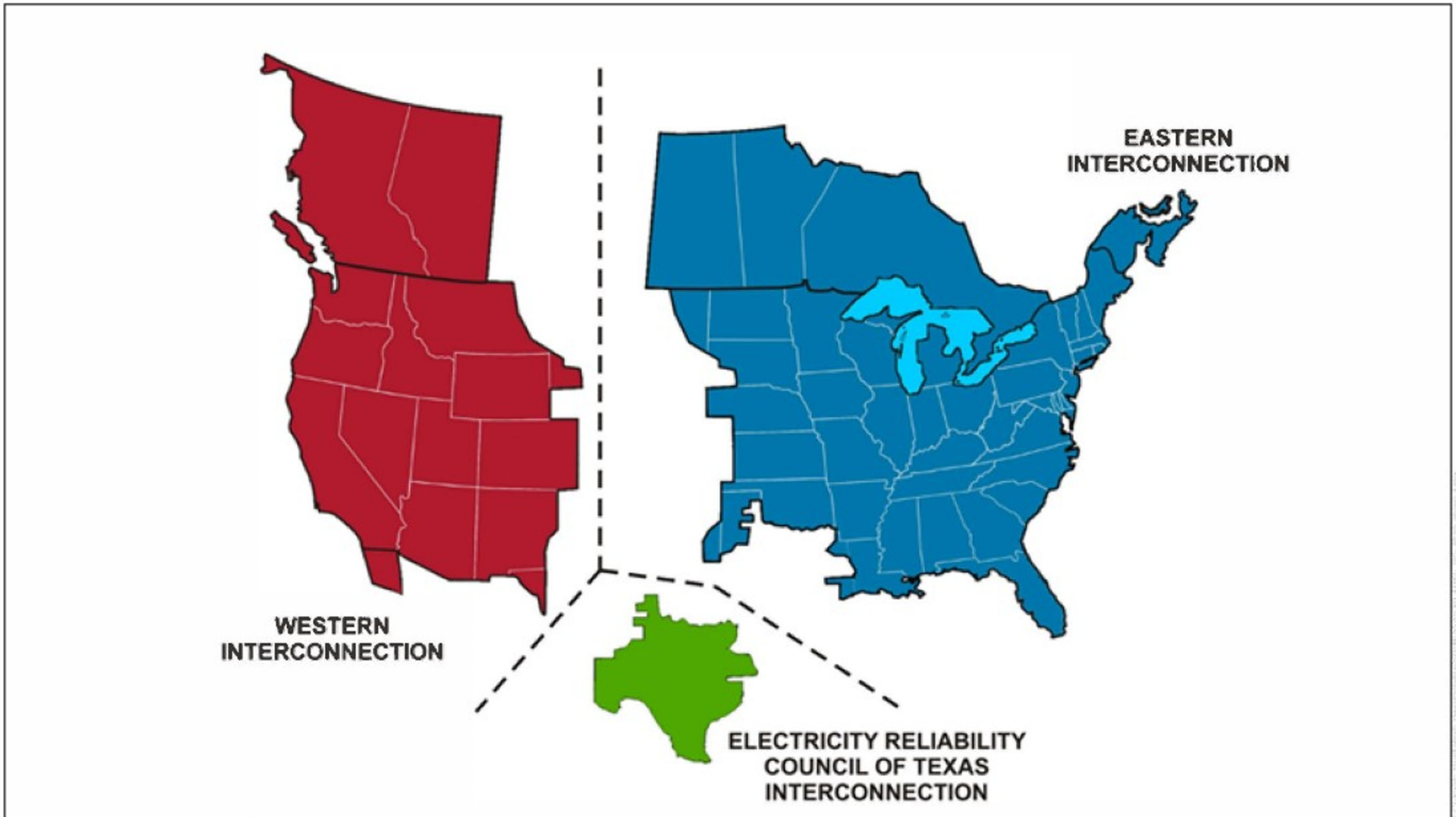

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Figure 2.1-3
North American Power Grid (Source: Energy.gov)
North Plains Connector Project

support each federal agency's consideration of a right-of-way authorization for siting, construction, and operation of identified Project facilities on federally managed lands.

2.2.3 State Processes

North Plains also will submit an Application for a Certificate of Compliance under the MFSA with the MDEQ and a Consolidated Application for a Certificate of Corridor Compatibility and Transmission Facility Route Permit with the NDPSC.

The MFSA review allows state agencies to review the Project and ensure protection of the state's environmental resources, consideration of socioeconomic impacts, provides for public participation in the siting decisions, and coordination amongst agencies and various required authorizations for the Project. This process requires compliance with MEPA, which includes an environmental review. To satisfy that requirement, the MDEQ will participate as Joint Preparer of the DOE NEPA/MEPA document. The DOE, BLM, USFS, and USDA-ARS have agreed to coordinate the federal environmental reviews with a state environmental review to be conducted under the Montana MFSA.

Similarly, the NDPSC process ensures that the location, construction, and operation of the Project will produce minimal adverse effects on the environment and welfare of the citizens. North Plains must select a route to minimize adverse human and environmental impacts while ensuring continuing system reliability and integrity, and meeting energy needs in a timely fashion. The NDPSC application process will be performed separately from the coordinated federal environmental review.

This Project also crosses state-managed public lands in both Montana and North Dakota.

2.2.4 Scope of Resource Reports for NEPA

Under its Section 216(h) coordinating role and pursuant to its NEPA lead agency responsibility, the DOE has requested that North Plains produce a series of Resource Reports that provide necessary information to enable the DOE to conduct the NEPA review and to support future consultations under the ESA Section 7, and NHPA Section 106. Resource Report 1 describes the Project, including its objectives and driving transmission needs, planned facilities, construction and operation plans, and stakeholder engagement efforts. In addition to the General Project Description, North Plains is providing the following Resource Reports:

- Resource Report 1: General project description
- Resource Report 2: Water use and quality
- Resource Report 3: Fish, wildlife, and vegetation
- Resource Report 4: Cultural resources
- Resource Report 5: Socioeconomics and Environmental Justice
- Resource Report 6: Geological resources
- Resource Report 7: Soils
- Resource Report 8: Land use, recreation, and aesthetics
- Resource Report 9: Alternatives
- Resource Report 10: Reliability and Safety
- Resource Report 11: Design and Engineering
- Resource Report 12: Air Quality and Noise Effects
- Resource Report 13: Tribal Resources

The DOE published a final transmission permitting reform rule on May 1, 2024 to establish the Coordinated Interagency Transmission Authorization and Permits (CITAP) Program (89 Federal Register 35312). This Program will be used by DOE to implement its Section 216(h) authorities This rule became effective starting May 31, 2024.

The North Plains federal agency permitting process and engagement with DOE under FPA Section 216(h) preceded the proposed and final CITAP rule—including the preparation of these draft resource reports. Based on input from DOE, North Plains prepared draft versions of these resource reports using templates developed for linear project by the Federal Energy Regulatory Commission (See 18 C.F.R. Part 380). These drafts are being submitted for review by the DOE and identified Federal entities to identify information gaps, potential issues, and facilitate a complete filing of the final resource reports during the official application submittal. The information gathered for these submitted draft resource reports follows a consistent resource identification framework that is substantially similar to the CITAP reporting framework.

2.3 NEED FOR THE PROJECT

Transmission infrastructure forms the backbone of the nation's power system, ensuring that Americans have constant access to affordable and reliable electricity to power homes, businesses, and communities.

Like other forms of infrastructure, such as transportation, municipal water/wastewater, and communications, the electrical grid needs significant investment in maintenance upgrades and modernization to meet rapidly changing market demands.

While the U.S. has an abundance of energy generation resources spread throughout the country, these resources are not always located in proximity to, or connected to load centers, thus the nation relies on a highly functioning, effectively connected grid to deliver reliable power from generation to load. Complicating the nation's electrical system, the United States contains not one but three separate grids, known as interconnections, as shown on Figure 2.1-3. These three systems—the Western Interconnection, Eastern Interconnection, and the Texas Interconnection (or Electric Reliability Council of Texas)—are managed independently and transfer very limited amounts of energy between each other.

As illustrated in Figure 2.3-1, there are currently seven "cross-seam" connections between the Western and Eastern Interconnections; however, these small back-to-back DC ties are located in remote locations at the very edge of the seam and serve localized needs. These ties were designed to meet the load obligations of nearby utilities or wholesale power providers rather than to realize larger-scale integration between the interconnections.

This grid structure has functioned for several decades, but changing market dynamics are forcing development of a more robust system. First, electrical energy consumption is increasing across the U.S. The U.S. Energy Information Administration's (EIA) Annual Energy Outlook from 2023 estimates that electricity consumption in the U.S. will increase by 17 percent by 2050 (EIA, 2023). Second, traditional capacity increases from performing minor system upgrades or adding new generation are unable to keep pace with the rapidly changing market demands. At least three primary factors affect the ability of the United States' electrical grid to reliably deliver energy to consumers and are hastening the need for significant transmission infrastructure investment. These effects arise from:

- changes in public policy that decrease baseload generation capacity, and hamper the ability of overall supply to meet growing energy demands;

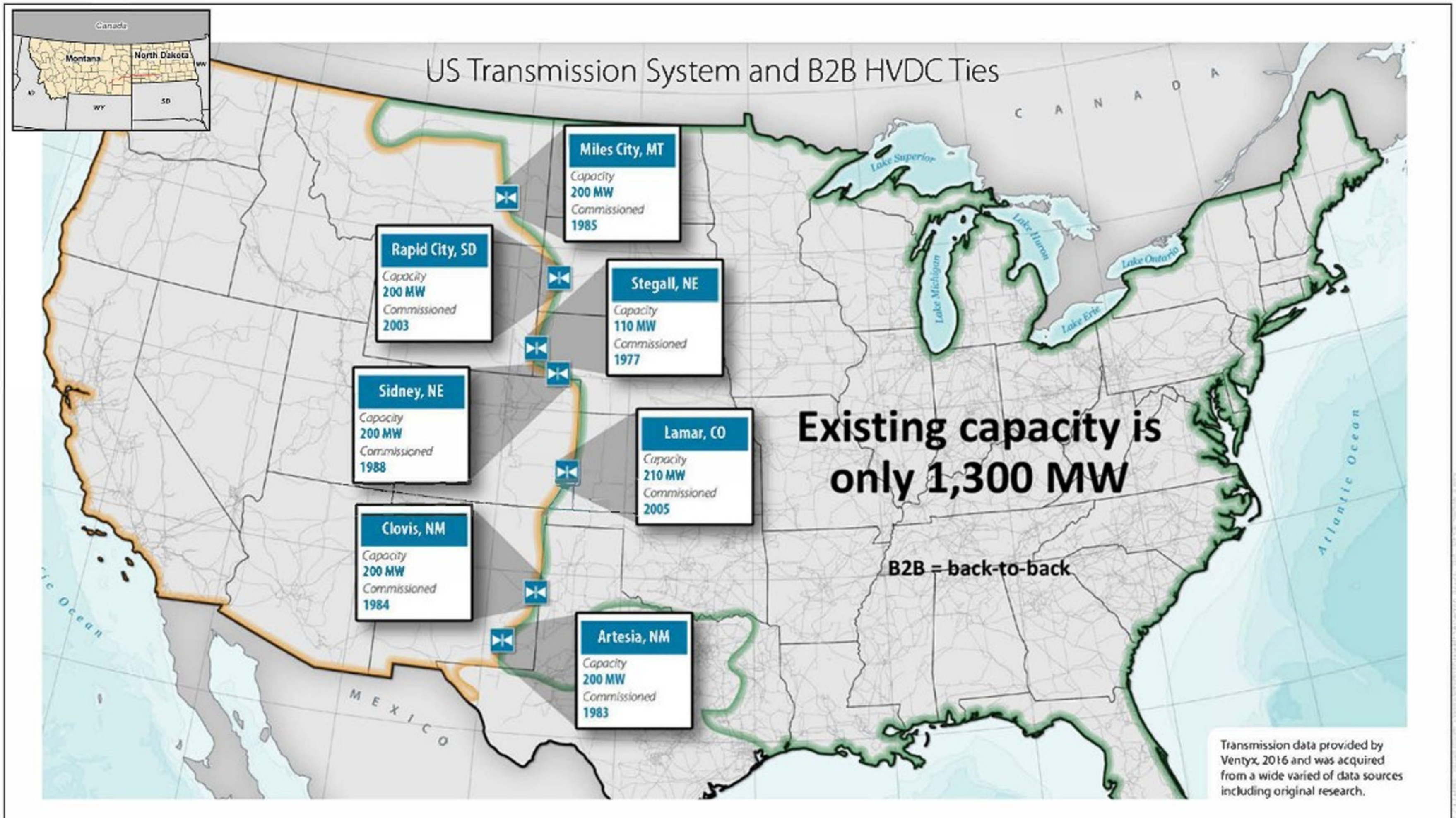

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Figure 2.3-1
Western and Eastern Interconnections Transfer Capacity
North Plains Connector Project

- rapid changes in the generation resource portfolio mix that affect reliability; and
- increasing frequency of extreme weather events that affect grid resiliency

2.3.1 Changing Public Policy

The energy sector is undergoing a transition due in large part to state and federal decarbonization policies that force early retirement of thermal generation and provide high incentives for the development of wind and solar generation. These policies, on top of growing demand, are affecting the availability and operating characteristics of supply, which then affects the reliability of the nation's grid system.

State-mandated decarbonization goals in Washington and Oregon are leading the majority of the West Coast owners of the Colstrip Generating Station, a coal-fired power plant in Montana, to seek lower emitting sources of generation in the near future. Oregon passed the Clean Electricity, Coal Transition Act that forces Oregon-based utilities to divest of coal-fired power in favor of renewables. Oregon's goal is to reduce emissions 80 percent below 1990 levels by 2050 (Oregon Office of the Governor, 2020). Similarly, Washington state has a goal to reduce emissions 95 percent below 1990 levels and to be at net-zero by 2050 (Washington Department of Ecology, 2024).

In the East, MISO's Future 2A load and resource mix, currently being used in the ongoing Long Range Transmission Plan Tranche 2 initiative, anticipates a dramatic push towards decarbonization and renewable resources in the coming years (MISO, 2023). A large share of the MISO region has either corporate or state-level goals for reducing carbon emissions by 80 percent or more by 2050 which will require substantial additions of decarbonized resources paired with retirement or reduced utilization of the existing dispatchable generation fleet. By 2042, Future 2A anticipates approximately 80 gigawatts (GW) of coal and gas plant retirements and 32 GW of peak demand growth. To meet this growing demand and shrinking base of resources, Future 2A adds 145 GW of wind generation and 102 megawatt (MW) of solar generation capacity by 2042.

SPP's ongoing 2023 loss of load study, which will inform the regional planning reserve margin for the region, is finding elevated levels of winter risk (SPP, 2023). To maintain a typical 1 day in 10 years loss of load standard, the study indicates that a winter planning reserve margin upwards of 30 percent is needed, compared to the 15 percent annual planning reserve margin in place today in SPP. The study results are sensitive both to the amount of wind and solar generation on the system and to assumptions about the performance of the thermal fleet during cold weather conditions, a major topic of discussion in recent years. While the final study and planning reserve margin recommendation are forthcoming, the results to date highlight the challenges facing grid operators today as they try to manage reliability on power grids that are increasingly weather-dependent.

At the federal level, policies enacted under the bipartisan Infrastructure Investment and Jobs Act and the Inflation Reduction Act have committed unprecedented amounts of money through grants, loans, Investment Tax Credits, and Production Tax Credits to encourage further private investment in renewable energy generation and related technologies.

While coal retirements and growth of renewables have been happening across the region for years, the pace and magnitude of change is intensifying, resulting in increased challenges for utilities to plan for and maintain an adequate and reliable power system while accommodating future market uncertainty.

In response to reduced demand from West Coast utilities, the Colstrip Generating Station's units 1 and 2 were retired in January 2020, reducing the plant's operating capacity from 2,000 MW to 1,480 MW. The Northwest Power and Conservation Council's (NWPCC) Power Supply Adequacy Assessment for 2024 of the Pacific Northwest cited coal retirements as a primary driver in Loss -of -Load probability results that exceed their five percent limit[1] beginning in 2021 (NWPCC, 2019). Replacing lost capacity due to coal retirements will be the major challenge in the region for several years.

In its 2023 Integrated Resource Plan, NorthWestern Energy indicates that it does not have adequate supply resources to fully serve peak loads throughout the year. Due to deficiency of power supply during peak demand, NorthWestern regularly relies on imported energy purchases to meet demand. NorthWestern states that it "cannot count on continued energy imports to serve our customers reliably during peak demand given the risk of declining capacity generation in the region."

Regionally, the Pacific Northwest is facing tight supply conditions which are expected to persist with projected coal retirements and a lack of adequate replacement power capacity resources.

Inverter-based resources, like wind, solar, and battery technology, are frequently proposed as replacements for legacy energy resources like coal. In fact, the NWPCC recommends acquisition of at least 3,500 MW of renewable resources in the region by 2027. Inverter-based resources create operational challenges due to their intermittency and uncertainty, which must be balanced with other dispatchable resources. During peak demand hours, renewables may not generate at a level that maintains reliable operations.

The combination of rapidly increasing demand and overall reduction in supply throughout the region is creating a need to invest in transmission connectivity to higher levels of diverse energy generation, and the current transmission constraints between the West Coast and the eastern boundary of the Western Interconnection make an interregional connection an attractive option.

2.3.2 Rapid Changes in Generation

The policies discussed above are affecting the availability and operating characteristics of supply, which in turn affects the reliability of the nation's grid system as demand continues to increase.

The existing grid was built to transport power from large, centralized, dispatchable power plants to load centers throughout the country. System operators, who keep the grid in balance, must ensure that generation matches load precisely and instantaneously. Neither the layout nor the technology used in the existing grid contemplated the high penetration of inverter-based resources being loaded onto the aging system. The early retirement of thermal generation and rapid increase in intermittent resources is creating threats to overall grid reliability.

The North American grid operates at a frequency of 60 Hertz and small differences between generation and load cause the frequency of the grid to deviate from this balance. If frequency deviations exceed plus or minus five percent, the grid can experience reliability challenges. Large, spinning thermal generators create "grid inertia" that can respond to frequency deviations

[1] The NWPCC's standard defines the regional power supply to be adequate when the likelihood of a shortfall for Loss-of-Load Probability is no more than 5 percent. The NWPCC assesses resource adequacy five years into the future to give utilities time to acquire new resources, if needed (NWPCC, 2019).

quickly and help to maintain the balance of the system. As thermal units are retired, the total amount of inertia on the grid – and subsequent voltage and frequency stability – declines. This condition will continue to decline as the grid becomes more dependent on inverter-based resources and there is a mounting body of research to indicate the near-term nature of this threat.

The North American Electric Reliability Corporation (NERC) 2022 Summer Reliability Assessment notes that energy risks exist in the western region as the resource mix changes and that dispatchable resources are relied on to "support balancing the increasingly weather-dependent load with the variable energy generation within the resource mix." NERC assessed the summer risk for the western states as "elevated," with the potential for insufficient operating reserves in above normal conditions. The assessment also cites risks of load interruption stemming from the growing reliance on transfers within the Western Interconnection, coupled with declining resource capacity in multiple adjacent areas (NERC, 2022).

During a July 2023 webinar hosted by the Western States Transmission Initiative, WECC Vice President of Strategic Engagement and External Affairs, Kris Rapper, referenced the Federal Energy Regulatory Commission's 2022 Western Assessment of Resource Adequacy which identified a risk of resource shortages in the 4- to 10-year timeframe based on the anticipated thermal generation retirements and introduction of higher levels of inverter-based resources. Rapper stated that, "the transition necessary to meet clean, green energy policies and the pace of electrification are creating a risk to reliability that we need to address... [and] it looks like adding transmission can help ameliorate some of that risk."

To further examine the Project's reliability impacts in more detail, the Project commissioned Astrape Consulting to perform a loss of load modeling study of WECC, SPP, and MISO to determine the reliability value of the Project. The study quantified the value that connecting diverse resources and load profiles across the interconnection seam contributes towards avoiding blackouts. The study found that the reliability attributes of the Project are roughly equivalent to approximately 1,800 MW of new generation in both the Western and the Eastern Interconnection, despite not being tied to any particular generating unit. This finding concludes that the Project will provide both regions with access to electricity when it is needed most, effectively leveraging allowing generation resources to provide reliability value to both regions by capitalizing on differences in when peak need occurs across the interconnection seam.

Aside from the inherent reliability benefits afforded by connectivity between the Western and Eastern Interconnections, new technologies provide additional opportunities for improved reliability and resiliency. For instance, the voltage source converter (VSC) technology employed on the Project can maintain voltage and frequency on the grid while transporting power between regions. VSC technology advantages include lower power losses on the line, and the ability to control the flow of power, acting as both the extension cord bringing electricity to customers impacted by disruptive events, and the jumper cables needed to restart grids suffering from outages.

VSC-based converters can be both switched on and switched off with an external control signal, enabling VSC-type converters to offer superior performance and control capabilities over older converter technology commonly in use. HVDC VSC high-capacity long-distance overhead transmission lines are also bi-directional and can instantaneously change direction of power flow, unlike AC systems. HVDC VSC can reverse the direction of flow in as little as 200 milliseconds.

As demonstrated through the quickly growing body of commercial experience (including over 30 GW of deployment in Europe), HVDC VSC is a proven cost-effective solution for many bulk-power transmission needs that offers important advantages compared to the conventional high-voltage and EHV AC technologies. Of particular interest to the Project, the ability to provide black start capability and system restoration in coordination with neighboring power systems or connected resources is a valuable aspect that can be used during extreme weather or other major grid events.

2.3.3 Changes in Weather

According to recent studies prepared independently by the DOE, NERC, and the American Society of Civil Engineers (ASCE), severe weather poses an increasing threat to grid resiliency.

The DOE's "National Transmission Needs Study," released by the Grid Deployment Office in October of 2023, notes the mounting pressure to expand transmission development driven by the need to improve grid reliability, resilience, and resource adequacy to address extreme weather events and significant load growth to support the electrification of heating and transportation systems (DOE, 2023). NERC also identified "significant evolving and interdependent risks" threatening grid reliability (NERC, 2022). The 2021 ASCE Infrastructure Report Card gave U.S. energy infrastructure a C-minus rating, stating "[extreme] weather remains an increasing threat." Severe weather was cited as the predominant cause of 638 transmission outage events from 2014 to 2018 (ASCE, 2021). More recently, Winter Storms Uri and Viola in February 2021, the Pacific Northwest heat dome in June of 2021, the heat wave that covered much of the country in September 2022, Winter Storm Elliott in December 2022, and most recently, Winter Storm Finn in January 2024, all tested the limits of our nation's existing electricity infrastructure.

One of the most dramatic weather events from a grid reliability standpoint involved Winter Storm Uri. In February of 2021, 69 percent of Texans lost power (Texas Comptroller, 2021) and an estimated 246 people lost their lives, many from cold exposure or "loss of power while on electricity dependent equipment required to sustain life" (Texas Department of State Health Services, 2021).

Winter Storm Elliott was another extremely cold weather event that slowly moved from the Pacific Northwest eastward in late December 2022. This storm event caused extremely cold temperatures across both the Western and Eastern Interconnections, but as illustrated in Figure 2.3.3-1, those extremes did not occur concurrently. North Dakota experienced temperatures as much as 25°F below historic averages for December 24, 2022, while the Pacific Northwest was warmer than average.

During this storm event, the Eastern Grid lost over 90 GW of generation capacity – 13 percent of total generating capacity – due to unplanned outages. Over 90 percent of the lost generating capacity would be considered dispatchable power under normal conditions; however, under such extraordinary circumstances the only truly dispatchable power was located outside of the areas experiencing extremely cold weather conditions, and unable to connect to the load.

In general, extreme weather events have broad geographic footprints affecting entire regions, but they do not typically affect multiple regions with the same intensity at the same time. For instance, MISO and SPP had adequate electric reserves during the September 2022 heat dome event that settled in on the Pacific Northwest; and the Pacific Northwest and Mountain west did not experience supply issues during the winter storm events at the same time as they strained supply

Departure from Average Daily Minimum
December 24, 2022

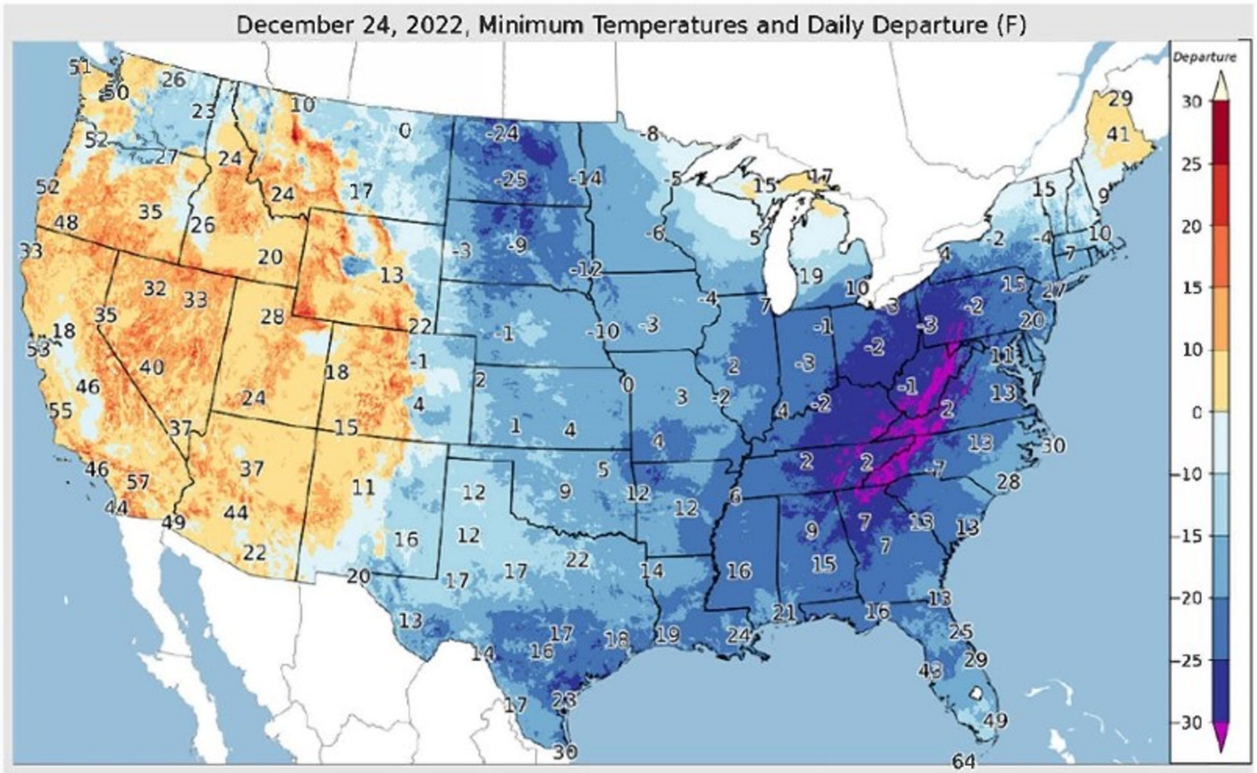

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Figure 2.3.3-1
Departure from Average Daily Minimum December 24, 2022 (Winter Storm Elliott)
North Plains Connector Project
North Plains Connector LLC

in the Midwest. This suggests that interregional grid connectivity and the ability to shift power quickly and efficiently back and forth could provide substantive reliability and resiliency benefits to both grids by making the grid “bigger than the weather.”

2.4 PROJECT DESCRIPTION AND LAND REQUIREMENTS

North Plains has designed the Project based on applicable federal and state regulatory routing criteria, routing experience, engineering and environmental considerations, technical and reliability considerations, constructability constraints, stakeholder feedback, and costs. North Plains is currently in the preliminary design phase [2] of the Project, and as further discussed in the following subsection, some Project components have not been developed. These components will be provided as the design process progresses.

Factors such as land availability, land use restrictions, and landowner preferences influence the feasibility and practicality of a particular route. Therefore, North Plains thoroughly evaluated different route alternatives and selected the Proposed Route based on the practicality of obtaining agreements with landowners, fostering community acceptance, and minimizing potential conflicts or regulatory obstacles. This approach prioritizes collaboration and cooperation with landowners, recognizing the importance of their consent and participation in the successful realization of the Project. Further, North Plains has identified sensitive resources through desktop review and ongoing field surveys. To the extent practicable, North Plains has attempted to reroute the transmission line alignments and associated workspaces to avoid these features. Additional discussion on the alternatives considered during this routing process is provided in detail in Section 3.0.

North Plains also designed the Project to minimize workspace requirements and operational footprints to the extent practicable. North Plains identified opportunities for paralleling or sharing existing utility or transportation rights-of-way, or portions thereof, including existing corridors associated with Interstate 94; U.S. Highway 12; Montana State Highways 39, 59, and 7; various county roads; and electrical transmission and distribution lines.

While paralleling existing rights-of-way can be desirable, longer paralleling opportunities may be limited because of already congested utility corridors, dense residential and commercial development surrounding the utility corridors, and existing exclusive easements that prohibit construction of additional transmission infrastructure on the involved parcels. North Plains designed the Project to avoid congested utility corridors, among other considerations, but parallels existing roads and transmission lines where possible to facilitate easier access during construction and operations, and to minimize environmental impacts.

Section 2.5 provides additional discussion regarding the engineering design considerations for the transmission line and facility components, and Section 2.6 presents the construction procedures that North Plains will use to develop the transmission line and facilities.

2.4.1 Proposed Centerline

Table 2.4.1-1 below provides the length of Proposed Centerline by state and county. The height and span of the pole structures along each transmission centerline will vary between the four line segments; however, the transmission line will generally consist of 100- to 195-foot monopole steel structures with average spans of 1,200 feet. Some lattice steel structures may be used where

[2] North Plains has completed the 10 percent design level; 30 percent design is anticipated end of 2025.

required for safe construction and operation, such as areas of steep topography. The foundation size associated with each structure will vary, but generally will have a 12-foot diameter or less.

TABLE 2.4.1-1

Length of Proposed Centerline by County and State

	Montana (length in miles)			North Dakota (length in miles)						Total Length (miles)
Facility	Rosebud	Custer	Fallon	Golden Valley	Slope	Hettinger	Grant	Morton	Oliver	
HVDC Transmission Line	35.1	81.1	55.5	13.1	56.9	48.8	42.3	6.6	0.0	**339.4**
Rosebud Transmission Line	2.7	0.0	0.0.	0.0	0.0	0.0	0.0	0.0	0.0	**2.7**
Oliver Transmission Line	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.1	10.1	**51.2**
Morton Transmission Line	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.8	**21.8**
PROJECT TOTAL	**37.8**	**81.1**	**55.5**	**13.1**	**56.9**	**48.8**	**42.3**	**47.7**	**31.9**	**415.1**

Table 2.4.1-2 provides the length of the HVDC Transmission Line across federally managed lands by county and state. The Rosebud, Oliver, and Morton Transmission Line segments do not cross federally managed lands.

TABLE 2.4.1-2

Length of the Proposed Centerline on Federal- and State-Managed Lands

	Montana (length in miles)			North Dakota (length in miles)					Total Length (miles)
Agency / Facility	Rosebud	Custer	Fallon	Golden Valley	Slope	Hettinger	Grant	Morton	
BUREAU OF LAND MANAGEMENT – MILES CITY FIELD OFFICE									
HVDC Transmission Line	0.3	4.1	5.3	0.0	0.0	0.0	0.0	0.0	9.8
U.S. FOREST SERVICE – LITTLE MISSOURI NATIONAL GRASSLAND									
HVDC Transmission Line	0.0	0.0	0.0	3.1	7.2	0.0	0.0	0.0	10.3
U.S. DEPARTMENT OF AGRICULTURE – AGRICULTURAL RESEARCH SERVICE – FORT KEOGH									
HVDC Transmission Line	0.0	7.9	0.0	0.0	0.0	0.0	0.0	0.0	7.9
Federal Lands Subtotal	0.3	12.0	5.3	3.1	7.2	0.0	0.0	0.0	28.0
MONTANA STATE TRUST LANDS									
HVDC Transmission Line	5.8	4.4	3.8	0.0	0.0	0.0	0.0	0.0	14.0
NORTH DAKOTA STATE TRUST LANDS									
HVDC Transmission Line	0.0	0.0	0.0	0.0	1.9	2.0	1.5	0.0	5.4
Oliver Transmission Line	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
State Lands Subtotal	5.8	4.4	3.8	0.0	1.9	2.0	1.5	0.1	19.5
PROJECT TOTAL	**6.1**	**16.4**	**9.1**	**3.1**	**9.1**	**2.0**	**1.5**	**0.1**	**47.4**

2.4.2 Proposed Alignment and Right-of-Way

The right-of-way is the physical land area along the Proposed Alignment that is needed to operate the energy facility. The Proposed Alignment is also referred to as, and is synonymous with, the Proposed Route. The right-of-way is the area that North Plains will maintain for the life of the Project. Maintenance will include routine inspections and periodic vegetation maintenance along the full right-of-way, which will include removing tall woody vegetation that could compromise the integrity of the transmission line (discussed further in Section 2.8). Operation of the Project will require easements which allow for a typical right-of-way width of 200 feet (typically 100 feet of each side of the Proposed Alignments). The Oliver and Morton Transmission Line segments are each double-circuit lines and are parallel for about 3.4 miles in Morton County, North Dakota. Where the Oliver and Morton Transmission Line segments are parallel the operational right-of-way is 150 feet wide for each line, for a total width of 300 feet. Table 2.4.2-1 provides the area occupied by the right-of-way associated with each transmission line by state and county.

North Plains will need new right-of-way easements for the transmission line. North Plains representatives are working directly with individual landowners to acquire the necessary easements for the Project.

North Plains does not plan on using the entire right-of-way to construct the transmission line. Instead, North Plains will perform construction activities within specific workspaces described in Sections 2.4.3 through 2.4.7, referred to collectively as the Project workspace. North Plains has identified where the workspace design is not currently available in these subsections. Some portions of the right-of-way cross steep topography that prevents safe travel down the right-of-way. Other areas of the right-of-way cross culturally or environmentally sensitive resources. North Plains has designed the Project workspace to avoid these areas.

Additionally, in forested areas of the right-of-way, North Plains will perform vegetation clearing activities during construction. As described above, North Plains will also periodically conduct vegetation maintenance during operation within the right-of-way to remove trees and tall vegetation (see Section 2.8); therefore, impacts to forested vegetation within the right -of-way will be a permanent impact. At this time, North Plains has not designed the workspace for the areas within the operational right-of-way that will require clearing.

TABLE 2.4.2-1

Transmission Line Right-of-Way Area by County and State

	Montana (acres)			North Dakota (acres)					
Facility	Rosebud	Custer	Fallon	Golden Valley	Slope	Hettinger	Grant	Morton	Oliver	Total Acres
HVDC Transmission Line	849.8	1,967.7	1,322.8	318.4	1,378.8	1,181.7	1,023.8	160	0.0	**8,203.0**
Rosebud Transmission Line	65.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**65.1**
Oliver Transmission Line	0.0	0.0	0.0	0.0	0.0	0.0	0.0	972.5	243.2	**1,215.7**
Morton Transmission Line	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	511.2	**511.2**
PROJECT TOTAL	**914.9**	**1,967.7**	**1,322.8**	**318.4**	**1,379.0**	**1,181.7**	**1,023.8**	**1,132.5**	**754.4**	**9,995.0**

Table 2.4.2-2 provides the area occupied by the transmission line right-of-way across federal- and state-managed lands by county and state. The Rosebud, Oliver, and Morton Transmission Line segments do not cross federally managed lands.

TABLE 2.4.2-2

HVDC Transmission Line Right-of-Way on Federal- and State-Managed Lands

Facility	Montana (acres)			North Dakota (acres)				Total Acres
	Rosebud	Custer	Fallon	Golden Valley	Slope	Hettinger	Grant	Morton	
BUREAU OF LAND MANAGEMENT – MILES CITY FIELD OFFICE									
HVDC Transmission Line	8.4	99.8	129.3	0.0	0.0	0.0	0.0	0.0	237.5
U.S. FOREST SERVICE LITTLE MISSOURI NATIONAL GRASSLAND									
HVDC Transmission Line	0.0	0.0	0.0	76.2	174.0	0.0	0.0	0.0	250.2
U.S. DEPARTMENT OF AGRICULTURE – AGRICULTURAL RESEARCH SERVICE – FORT KEOGH									
HVDC Transmission Line	0.0	191.6	0.0	0.0	0.0	0.0	0.0	0.0	191.6
Federal Lands Subtotal	8.4	291.4	129.3	76.2	174.0	0.0	0.0	0.0	679.3
MONTANA STATE TRUST LANDS									
HVDC Transmission Line	140.6	107.5	91.7	0.0	0.0	0.0	0.0	0.0	339.8
NORTH DAKOTA STATE TRUST LANDS									
HVDC Transmission Line	0.0	0.0	0.0	0.0	46.6	48.2	36.2	0.0	131.0
Oliver Transmission Line	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	3.8
State Lands Subtotal	140.6	107.5	91.7	0.0	46.6	48.2	36.2	3.8	474.6
PROJECT TOTAL	**149.0**	**398.9**	**221.0**	**76.2**	**220.6**	**48.2**	**36.2**	**3.8**	**1,153.9**

2.4.3 Facilities

In addition to the pole structures, the Project requires the following new facilities. These permanent facilities will remain in place for the life of the Project. Table 2.4.3-1 describes the area that the permanent facilities will occupy by state and county.

TABLE 2.4.3-1

Permanent Facility Land Requirements

Facility	Montana (acres)			North Dakota (acres)					Total Acres
	Rosebud	Custer	Fallon	Golden Valley	Slope	Hettinger	Grant	Morton	Oliver	
Rosebud County Converter Station	39.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.4
Morton County Converter Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.1	0.0	24.1
Morton County Switchyard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0	4.3
Repeater Stations – HVDC Transmission Line [a]	0.0	0.1	<0.1	0.0	<0.1	<0.1	<0.1	0.0	0.0	0.4
PROJECT TOTAL	**39.4**	**0.1**	**<0.1**	**0.0**	**<0.1**	**<0.1**	**<0.1**	**28.4**	**0.0**	**68.2**

[a] The locations of the fiber repeater stations along the HVDC Transmission Line are to be determined; however, North Plains estimates that one will be needed approximately every 50-60 miles and will occupy an area approximately 0.07 acres in size. Therefore, approximately 5 to 6 repeater stations will be required occupying approximately 0.4 acres in area along the HVDC Transmission Line.

2.4.3.1 Converter Stations

The Project requires converter stations at points where the DC and AC transmission lines connect in order to convert from DC to AC and vice versa (see Figure 2.1-2 above). The converter stations will also be capable of stepping up voltages and housing protection and control systems. Table 2.4.3-1 shows the permanent land requirements for the stations.

To provide DC to AC conversion capabilities between the HVDC Transmission Line and the Rosebud Transmission Line on the western end, North Plains will construct the Rosebud County Converter Station sited east of the existing Colstrip Substation in Rosebud County, Montana. The Rosebud Transmission Line will connect the Rosebud County Converter Station to the existing Colstrip Substation, providing the western Point of Interconnection (POI) with WECC (see Section 2.4.8 for further discussion on the Colstrip Substation).

On the eastern end, the Morton County Converter Station will connect the HVDC Transmission Line to both the Oliver Transmission Line and the Morton Transmission Line. The Morton County Converter Station will connect the Morton Transmission Line to the new Morton County Switchyard (see Section 2.4.3.2) and provide the eastern POI with SPP. The Oliver Transmission Line will connect the Morton County Converter Station with the third-party planned Oliver County Substation, providing the eastern POI with MISO (see Section 2.4.8 for further discussion on the Oliver County Substation).

Both converter stations will require construction of a permanent access road to the facility from a nearby roadway (see Section 2.4.5) and temporary workspace during construction for staging of equipment and material to build the facility (see Section 2.4.4).

2.4.3.2 Switchyard

The Morton County Switchyard connects or isolates lines for fault clearance and maintenance. This switchyard is the end point for the Morton Transmission Line and will serve as the eastern POI to SPP. North Plains submitted a Feasibility Study to the SPP Transmission Working Group, which accepted the results of the study in August 2023. North Plains is currently commencing the Planning Study Scope approved by the SPP Transmission Working Group in February 2024.

Table 2.4.3-1 shows permanent land requirements for this switchyard. The switchyard will require construction of a permanent access road to the facility from a nearby roadway (see Section 2.3.5), and temporary workspace during construction for staging of equipment and material to build the facility (see Section 2.4.4).

2.4.3.3 Fiber Repeater Stations

North Plains will install a telecommunications system via fiber optic cables used for high-speed communication and data transmission to control and monitor its power transmission system. Due to the remote nature of the Project and the length of the lines, the optical data signal will degrade with distance as it travels through the optical fiber due to attenuation of the optical fiber and distortion of the optical signal. Consequently, the Project requires fiber repeater stations along the HVDC Transmission Line to overcome signal loss.

Currently, North Plains estimates that the maximum distance between fiber repeater stations will be around 50 or 60 miles; therefore, the Project will include 5 or 6 fiber repeater stations on the HVDC Transmission Line. A typical fiber repeater station will occupy an area approximately 80 feet by 40 feet (0.07 acres). Figure 2.4.3-1 provides a photograph of a typical fiber repeater station for reference. North Plains will locate each fiber repeater station within the right-of-way. Table 2.4.3-1 shows the approximate permanent land requirements for these repeater stations. North Plains will perform fiber loss calculations to determine the exact location of fiber repeater stations and will provide this workspace design in supplemental filings.

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Figure 2.4.3-1
Photo of a Typical Fiber Repeater Station
North Plains Connector Project

2.4.4 Temporary Construction Workspace

As discussed above, North Plains does not plan on using the entire right-of-way to construct this Project. Therefore, North Plains has designed specific temporary workspace required at pole structures, along the transmission line, and at facilities to support construction activities. Field surveys are ongoing for this Project and may result in further refinement of the Project workspace.

Table 2.4.4-1 describes land requirements associated with temporary workspace required along the four transmission line segments and Figure 2.4.4-1 shows the typical layout of various workspaces on a construction spread. North Plains will need workspaces at each structure site, between structures, and at other locations on or adjacent to the right-of-way for other construction related purposes, including wire pulling and tensioning areas, fiber/line splicing sites, and guard structures at roads and railroads. North Plains will also need temporary workspace for the construction of the facilities presented in Section 2.4.4.5.

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TABLE 2.4.4-1

Temporary Workspace Land Requirements along the Transmission Line

	Montana (acres)			North Dakota (acres)						Total Acres
Facility	Rosebud	Custer	Fallon	Golden Valley	Slope	Hettinger	Grant	Morton	Oliver	
HVDC TRANSMISSION LINE										
Structure Pads [a]	208.7	366.9	265.9	54.9	239.9	202.9	181.8	30.3	0.0	1,551.3
Wire Pulling / Tensioning [a]	117.3	213.2	194.2	19.0	167.4	195.8	85.2	18.2	0.0	1,010.3
Fiber / Line Splicing [b]	24.6	56.8	38.9	9.2	39.8	34.2	29.6	4.6	0.0	237.6
Guard Structures [c]	0.2	0.4	0.3	0.1	0.3	0.2	0.2	<0.1	0.0	1.7
Subtotal										2,800.9
ROSEBUD TRANSMISSION LINE										
Structure Pads [a]	15.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.5
Wire Pulling / Tensioning [a]	6.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.8
Fiber / Line Splicing [b]	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9
Guard Structures [c]	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.1
Subtotal										24.2
OLIVER TRANSMISSION LINE										
Structure Pads [a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	173.9	48.4	222.3
Wire Pulling / Tensioning [a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	166.8	29.7	196.5
Fiber / Line Splicing [b]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.8	7.1	35.8
Guard Structures [c]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.3
Subtotal										454.9
MORTON TRANSMISSION LINE										
Structure Pads [a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	122.0	122.0
Wire Pulling / Tensioning [a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	76.4	76.4
Fiber / Line Splicing [b]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.3	15.3
Guard Structures [c]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Subtotal										213.8
PROJECT TOTAL	**347.8**	**636.9**	**499.0**	**83.1**	**447.1**	**432.9**	**296.6**	**422.6**	**298.9**	**3,943.9**

[a] There is some overlap between the temporary workspaces associated with the structure pads and the wire pulling/tensioning areas; therefore, the sum currently overestimates these impacts. North Plains is currently working to redesign these workspaces to eliminate this redundancy.

[b] The locations of the fiber/line splicing areas have not been identified; North Plains will provide this workspace design in supplemental filings. North Plains estimates a temporary workspace area measuring approximately 300 feet by 200 feet (1.4 acres) will be required every 2 miles on each transmission line. This estimate is calculated based on length of each transmission line by county and the approximated temporary workspace area.

[c] The locations of the guard structures have not been identified; North Plains is currently working to develop this workspace, which will be provided in the final resource reports. However, North Plain estimates that approximately 70 structures will be required across all transmission line segments occupying approximately 0.03 acre at each location for a total of approximately 2.1 acres. This has been split proportionality between each transmission line based on length by county.

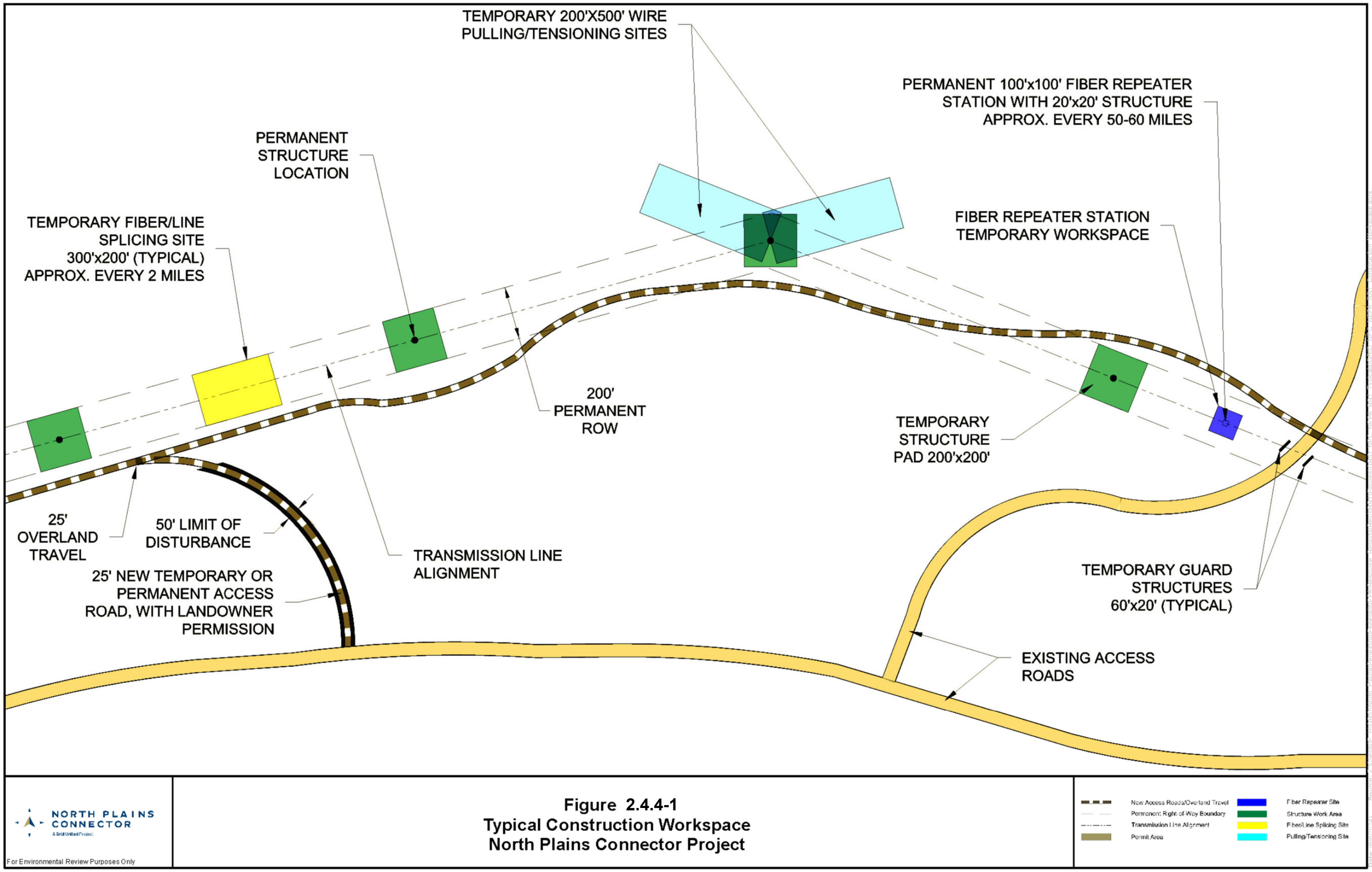

Figure 2.4.4-1
Typical Construction Workspace
North Plains Connector Project

Table 2.4.4-2 describes land requirements associated with temporary workspace required along the HVDC Transmission Line on federal- and state-managed lands.

TABLE 2.4.4-2

Temporary Workspace Land Requirements along the Transmission Line on Federal- and State-Managed Lands

Facility	Montana (acres)			North Dakota (acres)					Total Acres
	Rosebud	Custer	Fallon	Golden Valley	Slope	Hettinger	Grant	Morton	
BUREAU OF LAND MANAGEMENT – MILES CITY FIELD OFFICE									
HVDC Transmission Line									
Structure Pads [a]	1.9	21.7	28.1	0.0	0.0	0.0	0.0	0.0	51.7
Wire Pulling / Tensioning [a]	0.1	13.7	25.8	0.0	0.0	0.0	0.0	0.0	39.6
Fiber / Line Splicing [b]	0.2	2.9	3.7	0.0	0.0	0.0	0.0	0.0	6.8
Guard Structures [c]	<0.1	<0.1	<0.1	0.0	0.0	0.0	0.0	0.0	<0.1
Subtotal									98.1
U.S. FOREST SERVICE LITTLE MISSOURI NATIONAL GRASSLAND									
HVDC Transmission Line									
Structure Pads [a]	0.0	0.0	0.0	11.5	32.7	0.0	0.0	0.0	44.2
Wire Pulling / Tensioning [a]	0.0	0.0	0.0	0.0	33.9	0.0	0.0	0.0	33.9
Fiber / Line Splicing [b]	0.0	0.0	0.0	2.2	5.0	0.0	0.0	0.0	7.2
Guard Structures [c]	0.0	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0	<0.1
Subtotal									85.3
U.S. DEPARTMENT OF AGRICULTURE – AGRICULTURAL RESEARCH SERVICE – FORT KEOGH									
HVDC Transmission Line									
Structure Pads [a]	0.0	42.2	0.0	0.0	0.0	0.0	0.0	0.0	42.2
Wire Pulling / Tensioning [a]	0.0	18.2	0.0	0.0	0.0	0.0	0.0	0.0	18.2
Fiber / Line Splicing [b]	0.0	5.5	0.0	0.0	0.0	0.0	0.0	0.0	5.5
Guard Structures [c]	0.0	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	<0.1
Subtotal									65.9
Federal Lands Subtotal									249.3
MONTANA STATE TRUST LANDS									
HVDC Transmission Line									
Structure Pads [a]	29.1	22.0	19.7	0.0	0.0	0.0	0.0	0.0	70.8
Wire Pulling / Tensioning [a]	18.8	23.9	13.2	0.0	0.0	0.0	0.0	0.0	55.9
Fiber / Line Splicing [b]	4.1	3.1	2.7	0.0	0.0	0.0	0.0	0.0	9.8
Guard Structures [c]	<0.1	<0.1	<0.1	0.0	0.0	0.0	0.0	0.0	<0.1
Subtotal									136.6
NORTH DAKOTA STATE TRUST LANDS									
HVDC Transmission Line									
Structure Pads [a]	0.0	0.0	0.0	0.0	8.2	7.8	6.6	0.0	22.7
Wire Pulling / Tensioning [a]	0.0	0.0	0.0	0.0	4.7	0.0	0.0	0.0	4.7
Fiber / Line Splicing [b]	0.0	0.0	0.0	0.0	1.3	1.4	1.1	0.0	3.8
Guard Structures [c]	0.0	0.0	0.0	0.0	<0.1	<0.1	<0.1	0.0	<0.1
Subtotal									31.1
Oliver Transmission Line									
Structure Pads [a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.1
Wire Pulling / Tensioning [a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE 2.4.4-2

Temporary Workspace Land Requirements along the Transmission Line on Federal- and State-Managed Lands

Facility	Montana (acres)			North Dakota (acres)					Total Acres
	Rosebud	Custer	Fallon	Golden Valley	Slope	Hettinger	Grant	Morton	
Fiber / Line Splicing [b]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	<0.1
Guard Structures [c]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	<0.1
Subtotal									1.1
State Lands Subtotal									168.8
PROJECT TOTAL	**54.2**	**153.2**	**93.2**	**13.7**	**85.8**	**9.2**	**7.7**	**1.1**	**418.1**

[a] There is some overlap between the temporary workspaces associated with the structure pads and the wire pulling/tensioning areas; therefore, the sum currently overestimates these impacts. North Plains is currently working to redesign these workspaces to eliminate this redundancy.

[b] The locations of the fiber/line splicing areas have not been identified; North Plains will provide this workspace design in supplemental filings. North Plains estimates a temporary workspace area measuring approximately 300 feet by 200 feet (1.4 acres) will be required every 2 miles. This estimate is calculated based on length of the transmission line by federal- and state-managed property and county and the approximated temporary workspace area.

[c] The locations of the guard structures have not been identified; North Plains is currently working to develop this workspace, which will be provided with the final resource reports. However, North Plain estimates that approximately 70 structures will be required across all transmission line segments occupying approximately 0.03 acre at each location for a total of approximately 2.1 acres. This has been split proportionality for the transmission line based on length by federal and state-managed property and county.

2.4.4.1 Structure Pads

The Project will require structure pads around each pole structure to install the foundations and for the laydown, assembly, and erection of each structure. Within the right-of-way, each structure will typically require a 200-foot by 200-foot construction workspace (0.92 acre) approximately centered on the structure. Structures exceeding 170 feet in height will require a 250-foot by 200-foot workspace (1.15 acre). North Plains will adjust Project workspaces to avoid encroachment into sensitive resources, such as wetlands and waterbodies.

2.4.4.2 Wire Pulling/Tensioning

After the structures are set, North Plains will need to pull or string the conductor from structure to structure by either a helicopter or land-operated equipment. This typically occurs at identified points of intersections. Workspace extending from pole intersections to allow for wire pulling/tensioning of the lines will typically measure 200 by 500 feet (2.3 acres) at each site.

2.4.4.3 Fiber/Line Splicing

North Plains will transport conductor wire to the Project on large reels. Construction crews will splice the conductor wire from separate reels together approximately every 9,000 feet. Splicing activities occur in workspaces about 300 feet long by 200 feet wide (1.38 acres). North Plains will space these workspaces about 2 miles apart.

2.4.4.4 Guard Structures

North Plains will erect temporary guard structures at road and railroad crossing locations where necessary to protect the public during stringing activities. Guard structures will typically consist of H-frame wood poles placed on either side of the road to prevent ground wires, conductors, or equipment from falling and disrupting road traffic. Equipment for erecting guard structures will include augers, trailers with lift, and pickup trucks. Guard structures may not be required for small roads. In such cases, North Plains will use other safety measures such as barriers, flagmen, or other traffic controls.

Typically, guard structures are installed just outside of the road right-of-way. Although North Plains' preference is for access to each of these guard structures to be located outside the road right-of-way, topography or the road authority with jurisdiction may require access to be located in the road right-of-way. Where the Project crosses interstate highways, North Plains will install temporary guard structures in medians between opposite-traffic-flow lanes.

Railroad crossing operations and procedures are controlled by the railroad company operating the affected rail line. Typically, stoppage of railroad traffic is not required during construction or conductor stringing and tensioning activities. Crossing activities are similar to those for road crossings and typically involve the use of guard structures, as discussed above. North Plains will perform stringing and tensioning activities in coordination with the appropriate railroad authorities. For safety and efficiency, stringing and tensioning activities will be performed during daylight periods and will be scheduled to coincide with times when railroad traffic is minimal. The railroad will typically provide a switchman to be present when work is being performed near or over railroad lines.

Guard structures typically will temporarily occupy an area 60 feet by 20 feet (0.03 acre). North Plains estimates that approximately 70 structures will be required across the Project at road and railroad crossings and other sensitive areas. Figure 2.4.4-2 provides a typical drawing of a guard structure. The temporary workspace design for the guard structures is not currently available but will be provided in the final resource reports.

2.4.4.5 Facilities

Table 2.4.4-3 shows the temporary workspace required for the storage of materials and equipment and to allow space to construct the facilities discussed in Section 2.4.3. The temporary workspace required to install the Rosebud County Converter Station has not yet been designed; however, North Plains estimates approximately 80 acres will be required for construction.

As discussed in Section 2.4.3.3, the location of each fiber repeater station along the HVDC Transmission Line has not been determined; however, North Plain estimates the Project will require 5 to 6 stations. Each station will require a temporary workspace area measuring approximately 100 feet by 100 feet (0.23 acre) for installation. North Plains will provide this workspace design in supplemental filings.

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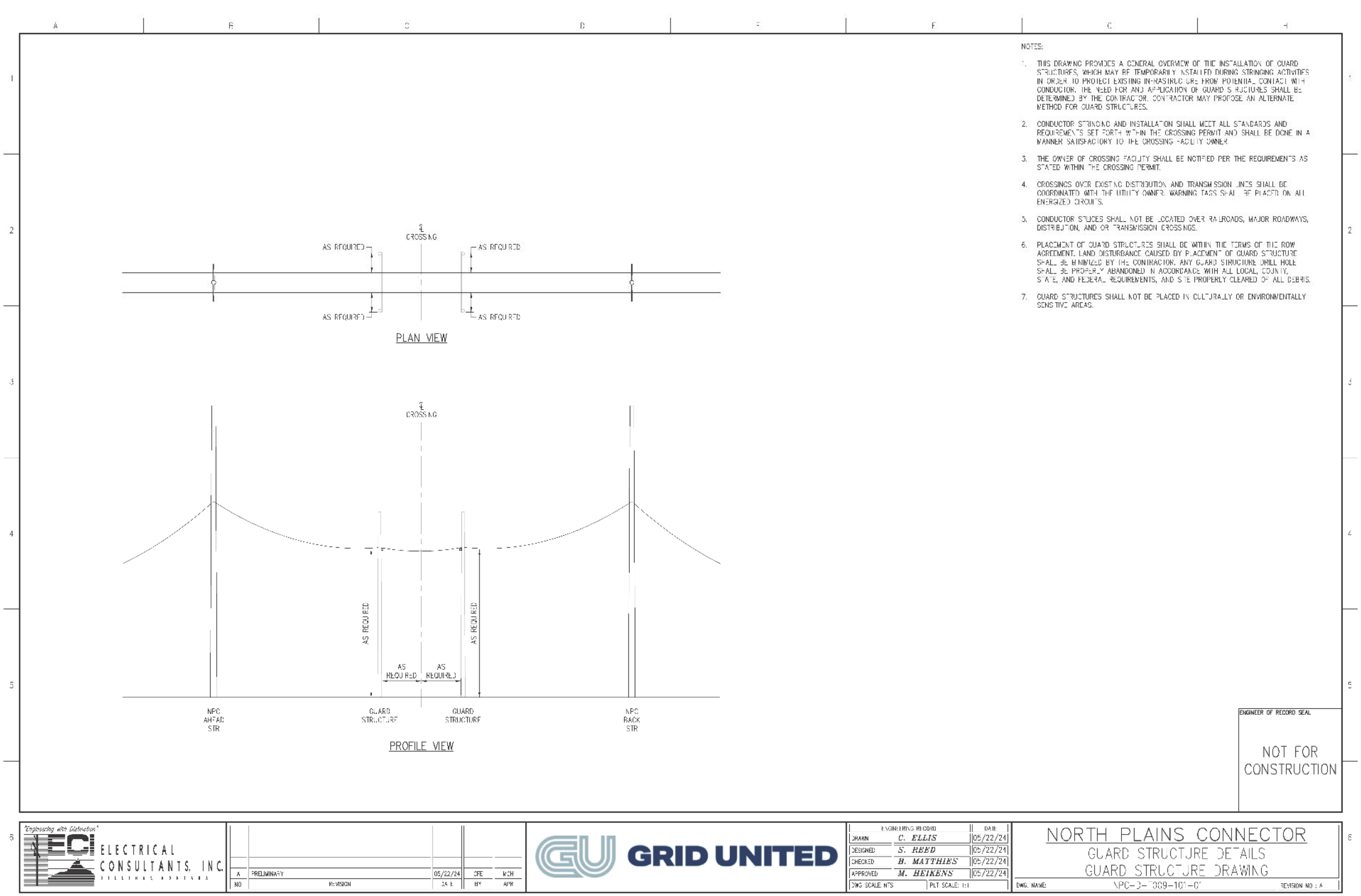


Figure 2.4.4-2: Guard Structure Typical Drawing

TABLE 2.4.4-3

Temporary Workspace Associated with Facilities

	Montana (acres)				North Dakota (acres)					
Facility	Rosebud	Custer	Fallon	Golden Valley	Slope	Hettinger	Grant	Morton	Oliver	Total Acres
Rosebud County Converter Station	80.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.0
Morton County Converter Station	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.6	0.0	40.6
Morton County Switchyard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	91.1	0.0	91.1
Repeater Stations – HVDC Transmission Line [a]	0.0	0.5	0.2	0.0	0.2	0.2	0.2	0.0	0.0	1.4
PROJECT TOTAL	**80.0**	**0.5**	**0.2**	**0.0**	**0.2**	**0.2**	**0.2**	**131.7**	**0.0**	**213.1**

[a] The locations of the fiber repeater stations along the HVDC Transmission Line are to be determined; however, North Plains estimates that one will be needed approximately every 50-60 miles and a temporary workspace area approximately 0.23 acres in size will be required to install each station. Therefore, approximately 5 to 6 repeater stations will be required occupying approximately 1.4 acres in area along the HVDC Transmission Line.

2.4.5 Access Roads

Access roads are essential during construction to provide adequate entry to structure sites and facility locations. Project access will rely on a variety of road types, including existing roads, new temporary or permanent access roads, and overland travel in areas where no road is currently present, and no improvements are necessary to provide Project access. Access roads are typically up to 25 feet wide, and widths may increase to allow for crane delivery, turns, and switchback areas. The following access road types are anticipated to be used on the Project.

- Existing Access Road – No Improvement. This access road type includes paved or all-weather surfaced roads and well-traversed and established dirt or gravel roads that will not require improvements for use. No new disturbance will be created outside of the established roadbed and shoulders. This access road type could require regular maintenance to keep the road passable throughout construction.

- Existing Access Road – Improvement. This access road type includes existing roads that will require improvement prior to Project use.

- Overland Travel. This road type consists of using a 25-foot-wide path within the right-of-way as the primary access between structure locations where there are no existing roads, and no road construction is necessary to move equipment.

- New Temporary Access Road. This access road type includes temporary access roads required for the construction of the Project that are not retained for operational use following Project construction.

- New Permanent Access Road. This access road type includes the construction of new permanent access roads where roads do not exist, with the purpose of allowing access to the right-of-way and permanent facilities.

North Plains has identified access roads to the construction workspace and pole locations to minimize traversing sensitive resources at site-specific locations; to avoid large waterway crossings; based on landowner preference communicated to North Plains for access across agricultural areas; and to provide the safest path to ascend steeply sloped areas. North Plains used aerial photography to accurately depict the centerline of existing access roads and has prioritized the use of existing cleared paths to the extent practicable. Tables 2.4.5-1 and 2.4.5-2 present the lengths and land requirements associated with access roads for each transmission line based on a 25-foot-wide road footprint.

The Project will require permanent access roads to access the Rosebud and Morton County Converter Stations and the Morton County Switchyard described in Section 2.4.3; however, North Plains has not yet designed these access roads. North Plains is currently working to develop these access roads and will include these roads in the final resource reports.

Tables 2.4.5-3 and 2.4.5-4 describe the lengths and land requirements associated with access roads requiring improvements, temporary and permanent access roads and overland travel along the transmission line on federal- and state-managed lands.

2.4.6 Contractor Laydown Yards

Contractor laydown yards will serve as field offices, reporting locations for workers, parking space for vehicles and equipment, and sites for material storage, fabrication assembly, portable concrete batch plants, and stations for equipment maintenance.

North Plains is currently finalizing details on the locations of contractor laydown yards. However, North Plains estimates requiring a 20-acre site approximately every 30 miles. Contractor laydown yards are typically located outside of the right-of-way. North Plains will provide final details on the locations of contractor laydown yards in supplemental filings. North Plains will locate contractor laydown yards in upland areas that have been previously disturbed such as existing yards, parking lots, or fields, and will avoid impacts to environmentally and culturally sensitive sites. Contractor yards will not be located on federal or state lands.

2.4.7 Helicopter Fly Yards and Landing Areas

Due to the remoteness and steep topography found in portions of the Project right-of-way, North Plains may use helicopters to facilitate structure setting and wire pulling and tensioning of the lines. Therefore, the Project may require helicopter fly yards and landing areas. North Plains will seek 5 acres for each helicopter fly yard, preferably adjacent to the contractor yards. North Plains will transport the structure sections and associated hardware including insulators, hardware, blocking, stringing sheaves to the fly yard by truck, where construction crews will assemble the structure in sections and stage the structure for transport to the right-of-way. Construction crews will stage and assemble the structures at the fly yard.

North Plains estimates that approximately one fly yard each will be needed in Rosebud, Custer, and Fallon counties in Montana. North Plains will provide final details on the locations of the helicopter fly yards to MDEQ and DOE in supplemental filings. North Plains will locate helicopter fly yards in upland areas that have been previously disturbed such as existing yards, parking lots, or fields, and will avoid impacts to environmentally and culturally sensitive sites. Contractor yards will not be located on federal or state lands.

TABLE 2.4.5-1

Access Road Lengths Along the Transmission Line

Transmission Line / Access Road Type	Montana (miles)			North Dakota (miles)						Total Miles
	Rosebud	Custer	Fallon	Golden Valley	Slope	Hettinger	Grant	Morton	Oliver	
HVDC TRANSMISSION LINE										
Existing Road, Improvements Needed	30.8	4.4	2.3	2.0	0.9	0.7	0.0	0.0	0.0	41.1
Overland Travel	16.2	29.5	48.8	8.4	44.2	47.8	41.6	4.2	0.0	240.7
Temporary Access Roads	25.8	32.5	13.8	5.2	12.0	0.0	0.0	2.4	0.0	91.7
Permanent Access Roads	2.4	52.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.6
Subtotal										428.1
ROSEBUD TRANSMISSION LINE										
Existing Road, Improvements Needed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overland Travel	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
Temporary Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Permanent Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal										3.0
OLIVER TRANSMISSION LINE										
Existing Road, Improvements Needed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.2	1.3
Overland Travel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.5	2.0	28.5
Temporary Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.7	8.8	21.5
Permanent Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal										51.3
MORTON TRANSMISSION LINE										
Existing Road, Improvements Needed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.9
Overland Travel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.8[a]	0.0	24.8
Temporary Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Permanent Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal										25.7
PROJECT TOTAL [a]	**78.2**	**118.6**	**64.9**	**15.6**	**57.1**	**48.5**	**41.6**	**71.6**	**12.0**	**508.1**

[a] Approximately 4.0 acres of access roads in Morton County would be used to construct both the Oliver Transmission Line and the Morton Transmission Line but has been included in the total of the Morton Transmission Line only.

TABLE 2.4.5-2

Access Road Land Requirements Along the Transmission Line

Transmission Line / Access Road Type	Montana (acres)				North Dakota (acres)					Total Acres
	Rosebud	Custer	Fallon	Golden Valley	Slope	Hettinger	Grant	Morton	Oliver	
HVDC TRANSMISSION LINE										
Existing Road, Improvements Needed	93.6	13.1	7.1	6.1	2.8	2.1	0.0	0.0	0.0	124.8
Overland Travel	47.5	89.3	147.8	25.4	133.9	144.7	125.9	12.6	0.0	727.2
Temporary Access Roads	78.0	97.9	41.3	15.8	36.1	0.0	0.0	7.2	0.0	276.2
Permanent Access Roads	8.0	157.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	165.7
Subtotal										1,293.9
ROSEBUD TRANSMISSION LINE										
Existing Road, Improvements Needed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overland Travel	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0
Temporary Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Permanent Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal										9.0
OLIVER TRANSMISSION LINE										
Existing Road, Improvements Needed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	3.8	4.1
Overland Travel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.1	6.1	86.1
Temporary Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.3	26.6	64.9
Permanent Access Roads	0.0	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal										155.3
MORTON TRANSMISSION LINE										
Existing Road, Improvements Needed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.0	2.8
Overland Travel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74.7 [b]	0.0	74.7
Temporary Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Permanent Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal										77.5
PROJECT TOTAL [a]	**236.1**	**358.0**	**196.2**	**47.3**	**172.8**	**146.8**	**125.9**	**216.1**	**36.5**	**1,535.6**

[a] There is some overlap between the access roads with temporary workspace areas; therefore, the sum currently overestimates these impacts. North Plains is currently working to redesign these workspaces to eliminate this redundancy.

[b] Approximately 12.0 acres of access roads in Morton County would be used to construct both the Oliver Transmission Line and the Morton Transmission Line but has been included in the total of the Morton Transmission Line only.

TABLE 2.4.5-3

Access Road Lengths along the Transmission Line on Federal- and State-Managed Lands

Agency / Facility / Access Road Type	Montana (miles)			North Dakota (miles)					Total Miles
	Rosebud	Custer	Fallon	Golden Valley	Slope	Hettinger	Grant	Morton	
BUREAU OF LAND MANAGEMENT – MILES CITY FIELD OFFICE									
HVDC Transmission Line									
Existing Road, No Improvements Needed	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
Existing Road, Improvements Needed	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Overland Travel	0.0	3.7	3.9	0.0	0.0	0.0	0.0	0.0	7.6
Temporary Access Roads	0.4	1.3	4.9	0.0	0.0	0.0	0.0	0.0	6.6
Permanent Access Roads	0.0	5.7	0.0	0.0	0.0	0.0	0.0	0.0	5.7
Subtotal									23.4
U.S. FOREST SERVICE – LITTLE MISSOURI NATIONAL GRASSLAND									
HVDC Transmission Line									
Existing Road, No Improvements Needed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Existing Road, Improvements Needed	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	1.2
Overland Travel	0.0	0.0	0.0	3.2	2.4	0.0	0.0	0.0	5.6
Temporary Access Roads	0.0	0.0	0.0	0.0	6.5	0.0	0.0	0.0	6.5
Permanent Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal									13.3
U.S. DEPARTMENT OF AGRICULTURE – AGRICULTURAL RESEARCH SERVICE – FORT KEOGH									
HVDC Transmission Line									
Existing Road, No Improvements Needed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Existing Road, Improvements Needed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overland Travel	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	1.3
Temporary Access Roads	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	3.8
Permanent Access Roads	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0
Subtotal									11.1
Federal Lands Subtotal									47.8
MONTANA STATE TRUST LANDS									
HVDC Transmission Line									
Existing Road, No Improvements Needed	<0.1	<0.1	<0.1	0.0	0.0	0.0	0.0	0.0	0.1
Existing Road, Improvements Needed	4.5	0.0	0.3	0.0	0.0	0.0	0.0	0.0	4.8
Overland Travel	1.9	0.8	4.6	0.0	0.0	0.0	0.0	0.0	7.3

TABLE 2.4.5-3

Access Road Lengths along the Transmission Line on Federal- and State-Managed Lands

	Montana (miles)			North Dakota (miles)					
Agency / Facility / Access Road Type	Rosebud	Custer	Fallon	Golden Valley	Slope	Hettinger	Grant	Morton	Total Miles
Temporary Access Roads	4.1	2.1	0.2	0.0	0.0	0.0	0.0	0.0	6.4
Permanent Access Roads	1.5	4.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5
Subtotal									24.1
NORTH DAKOTA STATE TRUST LANDS									
HVDC Transmission Line									
Existing Road, No Improvements Needed	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.2
Existing Road, Improvements Needed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overland Travel	0.0	0.0	0.0	0.0	1.9	2.1	2.1	0.0	6.1
Temporary Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Permanent Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal									6.3
Oliver Transmission Line									
Existing Road, No Improvements Needed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Existing Road, Improvements Needed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overland Travel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2
Temporary Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Permanent Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal									0.2
State Lands Subtotal									30.6
PROJECT TOTAL	**12.4**	**32.2**	**13.9**	**4.4**	**11.0**	**2.1**	**2.1**	**0.2**	**78.4**

TABLE 2.4.5-4

Access Road Land Requirements along the Transmission Line on Federal- and State-Managed Lands

	Montana (acres)			North Dakota (acres)					
Agency / Facility / Access Road Type	Rosebud	Custer	Fallon	Golden Valley	Slope	Hettinger	Grant	Morton	Total Acres
BUREAU OF LAND MANAGEMENT – MILES CITY FIELD OFFICE									
HVDC Transmission Line									
Existing Road, No Improvements Needed	0.0	9.1	0.0	0.0	0.0	0.0	0.0	0.0	9.1
Existing Road, Improvements Needed	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	1.6
Overland Travel	0.0	11.3	11.9	0.0	0.0	0.0	0.0	0.0	23.2
Temporary Access Roads	1.1	3.9	14.7	0.0	0.0	0.0	0.0	0.0	19.7
Permanent Access Roads	0.0	17.1	0.0	0.0	0.0	0.0	0.0	0.0	17.1
Subtotal									70.7
U.S. FOREST SERVICE – LITTLE MISSOURI NATIONAL GRASSLAND									
HVDC Transmission Line									
Existing Road, No Improvements Needed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Existing Road, Improvements Needed	0.0	0.0	0.0	3.7	0.0	0.0	0.0	0.0	3.7
Overland Travel	0.0	0.0	0.0	9.7	7.2	0.0	0.0	0.0	16.9
Temporary Access Roads	0.0	0.0	0.0	0.0	19.7	0.0	0.0	0.0	19.7
Permanent Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal									40.3
U.S. DEPARTMENT OF AGRICULTURE – AGRICULTURAL RESEARCH SERVICE – FORT KEOGH									
HVDC Transmission Line									
Existing Road, No Improvements Needed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Existing Road, Improvements Needed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overland Travel	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
Temporary Access Roads	0.0	11.6	0.0	0.0	0.0	0.0	0.0	0.0	11.6
Permanent Access Roads	0.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0
Subtotal									33.6
Federal Lands Subtotal									144.6
MONTANA STATE TRUST LANDS									
HVDC Transmission Line									
Existing Road, No Improvements Needed	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.4
Existing Road, Improvements Needed	14.1	0.0	1.0	0.0	0.0	0.0	0.0	0.0	15.1
Overland Travel	5.8	2.4	13.9	0.0	0.0	0.0	0.0	0.0	22.1

TABLE 2.4.5-4

Access Road Land Requirements along the Transmission Line on Federal- and State-Managed Lands

	Montana (acres)			North Dakota (acres)					
Agency / Facility / Access Road Type	Rosebud	Custer	Fallon	Golden Valley	Slope	Hettinger	Grant	Morton	Total Acres
Temporary Access Roads	12.4	6.4	0.7	0.0	0.0	0.0	0.0	0.0	19.5
Permanent Access Roads	4.4	12.1	0.0	0.0	0.0	0.0	0.0	0.0	16.5
Subtotal									73.6
NORTH DAKOTA STATE TRUST LANDS									
HVDC Transmission Line									
Existing Road, No Improvements Needed	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.6
Existing Road, Improvements Needed	0.0	0.0	0.0	0.0	<0.1	0.0	0.0	0.0	<0.1
Overland Travel	0.0	0.0	0.0	0.0	5.9	6.2	6.4	0.0	18.5
Temporary Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Permanent Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal									19.1
Oliver Transmission Line									
Existing Road, No Improvements Needed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Existing Road, Improvements Needed	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Overland Travel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
Temporary Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Permanent Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal									0.5
State Lands Subtotal									93.2
PROJECT TOTAL [a]	**37.9**	**97.7**	**42.3**	**13.4**	**33.4**	**6.2**	**6.4**	**0.5**	**237.8**

[a] There is some overlap between the access roads and the temporary workspaces; therefore, the sum currently overestimates these impacts. North Plains is currently working to redesign these workspaces to eliminate this redundancy.

Helicopter landing areas will need to occur adjacent to the right-of-way and near access roads to allow access for fueling trucks. Landing areas will be located in relatively flat areas, more than 100 feet from wetlands or waterbodies, and at least 1.25 miles from residences and other noise sensitive areas. Landing zones will also avoid environmental and culturally sensitive areas. North Plains will implement fire suppression and management best management practices (BMPs).

2.4.8 Interconnection Points

North Plains intends to interconnect to the existing Colstrip Substation in Rosebud County, Montana. This will be the POI to connect to the WECC power system. NorthWestern Energy will make modifications to the Colstrip Substation to allow for this interconnection. NorthWestern Energy completed a Facilities Study on behalf of Colstrip Transmission System on April 22, 2024, which North Plains reviewed and accepted on April 30, 2024. Currently, North Plains is working with Northwestern Energy to develop an Interconnection Agreement and initiate negotiations.

Minnesota Power plans to construct a new Oliver County Substation. This will be one of two POI into the eastern grid and the connection to the MISO system. MISO completed a Transmission Connection Request Study in September 2022. North Plains is currently coordinating with MISO on continuing this study for the interconnection.

The modifications to the Colstrip Substation and construction of the Oliver County Substation are not part of the proposed NPC Project.

The Project interconnections at SPP, MISO, and WECC will adhere to an outage plan and schedule for interconnection to energized facilities. North Plains will coordinate with the incumbent utilities on a specific timeline to interconnect the existing facilities to the new facilities. The outage plan will drive the Commercial Operation Date[3] of the line near the end of the construction phase.

2.4.9 Possible Future Components

North Plains does not plan or anticipate any future components along the Project. There is the possibility that additional power generation in Montana and North Dakota will seek to connect to the Project in the future. Future connections will need to be made at the Colstrip Substation, the Morton County Switchyard, or the Oliver County Substation, or will require the construction of additional converter stations and substations to facilitate a connection along the length of the HVDC Transmission Line. Other parties not controlled by North Plains will conduct any new generation, ancillary facilities, or connection to the Project. All future projects will be subject to additional reviews as appropriate under federal, state, and local regulations.

2.5 PROJECT COMPONENTS AND DESIGN CONSIDERATIONS

This section provides an overview of the design considerations and specifications of the transmission line structures and associated facilities.

2.5.1 Transmission Line Structures

North Plains designed the Project to adequately transmit power between the converter stations and POIs. The structures were designed to withstand a variety of weather and loading conditions to not only be structurally adequate, but also to maintain necessary clearances between

[3] North Plains currently estimates the Commercial Operation Date to be the end of 2032 (see Section 2.6).

conductors and the ground, other electric facilities, and aerial features such as buildings or structures.

North Plains evaluated both tubular steel structures and steel lattice structures for use on the Project. For most areas, North Plains anticipates using tubular steel structures. However, North Plains may use steel lattice tower structures in particular situations to address constructability issues, such as locations requiring long spans, where the alignment changes direction, or with difficult access for construction.

There are three main types of tubular and lattice structures: tangent, angle, and dead-end. North Plains will use tangent structures in straight-line segments, or with small line angles typically less than two degrees. They are the most common type of structure and will make up the majority of the transmission line. Where there is a change of direction in the route, an angle or dead-end structure will be used. Dead-end structures also will typically be needed where the line terminates at a converter station (or substation) or for extremely long spans or sharp angles.

Table 2.5.1-1 summarizes information on the Project voltage, capacity, circuit configuration, and preliminary structure details such as height, span, materials, and clearance requirements. Appendix A provides transmission line typical figures for the structures planned to be installed on each transmission line.

North Plains is currently examining the costs, constructability, and potential impacts associated with various structure designs. North Plains will make the final decision on structure design based on consultation with agencies and affected landowners. North Plains will submit this decision to DOE prior to construction. It is also important to note that physical, geologic, environmental, and landowner constraints will require adjustments in structure location and span length that will impact the height of any given structure along the proposed route.

2.5.1.1 Foundations

North Plains will typically install each HVDC tubular steel monopole structure on drilled pier concrete foundations. For tubular structures, foundation dimensions will be approximately 7 to 12 feet in diameter and 20 to 60 feet deep. For lattice structures on the HVDC Transmission Line, foundations will be installed for each of the four legs. The foundations for each leg will be approximately 3 to 6 feet in diameter and 20 to 50 feet deep. The approximate base of lattice towers at ground level will be between 30-feet by 30-feet and 55-feet by 55-feet in area (see Appendix A).

North Plains will typically install monopole structures on the Rosebud, Morton, and Oliver Transmission Line segments on drilled pier concrete foundations. Tangent monopole structures will have foundation dimensions 5 to 12 feet in diameter and 20 to 60 feet deep (see Appendix A).

The dead-end monopole structures for the Rosebud Transmission Line will consist of multi-pole structures to reduce steel and foundation sizes. Each individual pole will have a foundation approximately 6 to 12 feet in diameter and 20 to 60 feet deep (see Figure A-6 in Appendix A). The dead-end structures for the Oliver and Morton Transmission Line segments will be single self-supporting steel monopoles with a foundation of 6 to 12 feet in diameter and depth between 20 to 60 feet (see Appendix A).

TABLE 2.5.1-1

Typical Design Characteristics – Transmission Line

Voltage / Transmission Line	Circuit Configuration	Capacity (MW)	Minimum Ground Clearance (at 100 degrees C)	Structures				Conductor	Appendix A Figure Reference
				Number and Type	Height Range (feet)	Average Height (feet)	Average Span Length (feet)		
525-kV HVDC Transmission Line	2-phase, 3 subconductors per phase, 2 DMR conductors	up to 4,800	36	1,600 Tubular Steel Monopole and Lattice Steel Structures in difficult terrain	100-195	130-165	1,200	3-2156 Bluebird	A-1 through A-4
500-kV Rosebud Transmission Line	Double-circuit with 6 phases per structure and 3 subconductors per phase	3,000	34	20 Tubular Steel Monopole and Lattice Steel Structures in difficult terrain	90-195	110-195	1,200	3-1590 Lapwing	A-5 through A-8
345-kV Oliver Transmission Line	Double-circuit with 6 phases per structure and 2 subconductors per phase	1,500	30	270 Tubular Steel Monopole and Lattice Steel Structures in difficult terrain	120-195	140-190	1,200	2-1590 Lapwing	A-9 through A-12
345-kV Morton Transmission Line	Double-circuit with 6 phases per structure and 2 subconductors per phase	1,500	30	120 Tubular Steel Monopole and Lattice Steel Structures in difficult terrain	120-195	140-190	1,200	2-1590 Lapwing	A-9 through A-12

Note: DMR = dedicated metallic return and N/A = not applicable

For lattice structures on the Rosebud, Morton, and Oliver Transmission Line segments, North Plains will install foundations for each of the four legs. The dimensions of the foundations for each leg will be approximately 3 to 6 feet in diameter and 20 to 50 feet deep. The approximate base of lattice towers at ground level will be between 25-feet by 25-feet and 55-feet by 55-feet in area (see Appendix A).

Table 2.5.1-2 summarizes the foundation/installation specifications by structure type and transmission line.

TABLE 2.5.1-2

Foundation and Installation Specifications by Structure Type and Transmission Line

Transmission Line	Structure Type	Foundation / Installation Type	Approx. Diameter Range (feet)	Depth Range (feet)	Appendix A Figure Reference
HVDC Transmission Line	Tubular Steel Monopole (Tangent and dead-end)	Drilled Concrete Pier	7-12	20-60	A-1 and A-2
	Steel Lattice (Tangent and dead-end)	Drilled Concrete Pier (4 legs) with between 30 feet by 30 feet and 55 feet by 55 feet base	3-6	20-50	A-3 and A-4
Rosebud Transmission Line	Tubular Steel Monopole (Tangent)	Drilled Concrete Pier	5-10	20-60	A-5
	Tubular Steel – dead-end (multi-pole)	Drilled Concrete Pier	6-12	20-60	A-6
	Steel Lattice (Tangent and Dead-end)	Drilled Concrete Pier (4 legs) with between 25 feet by 25 feet and 55 feet by 55 feet base	3-6	20-50	A-7 and A-8
Oliver Transmission Line and Morton Transmission Line	Tubular Steel Monopole (Tangent)	Drilled Concrete Pier	5-10	20-60	A-9
	Tubular Steel – Dead-end	Drilled Concrete Pier	6-12	20-60	A-10
	Steel Lattice (Tangent and Dead-end)	Drilled Concrete Pier (4 legs) with between 25 feet by 25 feet and 55 feet by 55 feet base	3-6	20-50	A-11 and A-12

2.5.1.2 Conductors

Conductors are the wires used to transport electricity. Conductors on an HVDC transmission line are known as pole conductors. Bipolar HVDC transmission lines have two pole conductors, with one pole conductor being positive and the other being negative with respect to the earth. Conductors will generally be comprised of aluminum, which is where the electricity flows through the conductor, and steel, which gives the conductor strength. The HVDC Transmission Line will include both the main pole conductors and dedicated metallic return (DMR) conductors to provide redundancy and resiliency during a faulted condition or during asymmetrical loading. If a fault occurs with one of the main pole conductors, electricity can continue to flow through the DMR conductors to still provide power flow. The EHV AC lines will not use DMR conductors. North Plains will suspend conductors from pole structures by insulators. Insulators provide the conductors with sufficient clearance from the structure to prevent flashover and thereby prevent a phase-to-ground outage.

Conductors on overhead electric transmission lines can experience faults, including faults from events such as lightning strikes. Therefore, overhead electric transmission lines are also equipped with overhead shield wires to protect against lightning strikes. Shield wires also minimize corona effects,[4] audible noise, and radio and television interference. North Plains is proposing to use optical ground wire (OPGW) for the shield wires, which combines the functions of shielding and communications. The conductive part of the cable will be grounded adjacent to each structure and shield the conductors from lightning strikes. The optical fiber part of the cable will have fiber optic cables, which will be used for high-speed communication and data transmission necessary for Project telecommunications.

North Plains completed a detailed conductor optimization study for the HVDC portion of Project and selected 525-kV conductors and DMR conductors for the HVDC Transmission Line. Additionally, North Plains completed a PLS-CADD analysis and selected the triple-bundled 1590 thousand circular mils (kcmil) aluminum conductor steel reinforced Lapwing Conductor for the Rosebud Transmission Line and the twin-bundled 1590 kcmil aluminum conductor steel reinforced Lawping Conductor for the Oliver and Morton Transmission Line segments. Table 2.5.1-1 summarizes typical design characteristics, including conductor selections.

2.5.1.3 Ground Rods/Counterpoise

North Plains will install a grounding system at the base of each transmission structure. The grounding system will consist of copper ground rods embedded in the ground in immediate proximity to the structure foundation and connected to the structure by a buried copper lead. After the ground rods have been installed, North Plains will test the grounding to determine the resistance to ground. If the resistance to ground for a transmission structure is excessive, then North Plains will install counterpoise to lower the resistance. Counterpoise consists of a bare copper-clad or galvanized-steel cable buried a minimum of 12 inches deep (18 inches in cultivated land), extending from the structure for approximately 100 feet down the right-of-way with a ground rod driven in at the end.

2.5.2 Facilities

2.5.2.1 Converter Stations

Both the Rosebud County and Morton County Converter Stations will include: a DC switchyard; AC/DC conversion equipment; transformers; and equipment, control, maintenance, and administrative buildings. Buildings approximately 500-feet by 250-feet in area will house the AC/DC conversion equipment. Smaller buildings approximately 24-feet by 40-feet in area will house the control room, relay and communication panels, AC station power supply, battery racks, control and protection equipment, auxiliary equipment, cooling equipment, and administrative offices. The converter stations will use modern VSC technology. VSC is becoming the standard for HVDC transmission lines due to its many advantages including:

- near instantaneous change of direction of power flow;
- operation in weak regions of the grid with low short circuit ratios;
- independent control of active and reactive power with high dynamic response;

[4] Corona is a small electric discharge produced by a localized electric field near energized components and conductors. Corona is associated with audible noise, radio interference, and television interference.

- static synchronous compensator-like functionality with network equipment that provides dynamic voltage response to disturbances on the grid within milliseconds;
- the ability to provide a black start during a blackout;
- a grid-forming design providing inertial response to the grid, like conventional synchronous generators, if practical; and
- a smaller footprint and less audible noise than the traditional line commutated converter technology.

Figure 2.5.2-1 shows a diagram of a typical converter station.

2.5.2.2 Switchyard

The Morton County Switchyard will consist of a DC switchyard and equipment, control, maintenance, and administrative buildings. This switchyard will serve as the POI for the SPP Eastern Interconnection. The components of the Morton County Switchyard include control enclosure, ground grid, finish gravel, foundations, structural steel bus work, conduit, switches, breakers, security fence, gravel surfaced access road, and backup power system. The backup power system may consist of one or a combination of the following: station service transformer, backup battery bank, backup generator with liquid propane gas tank.

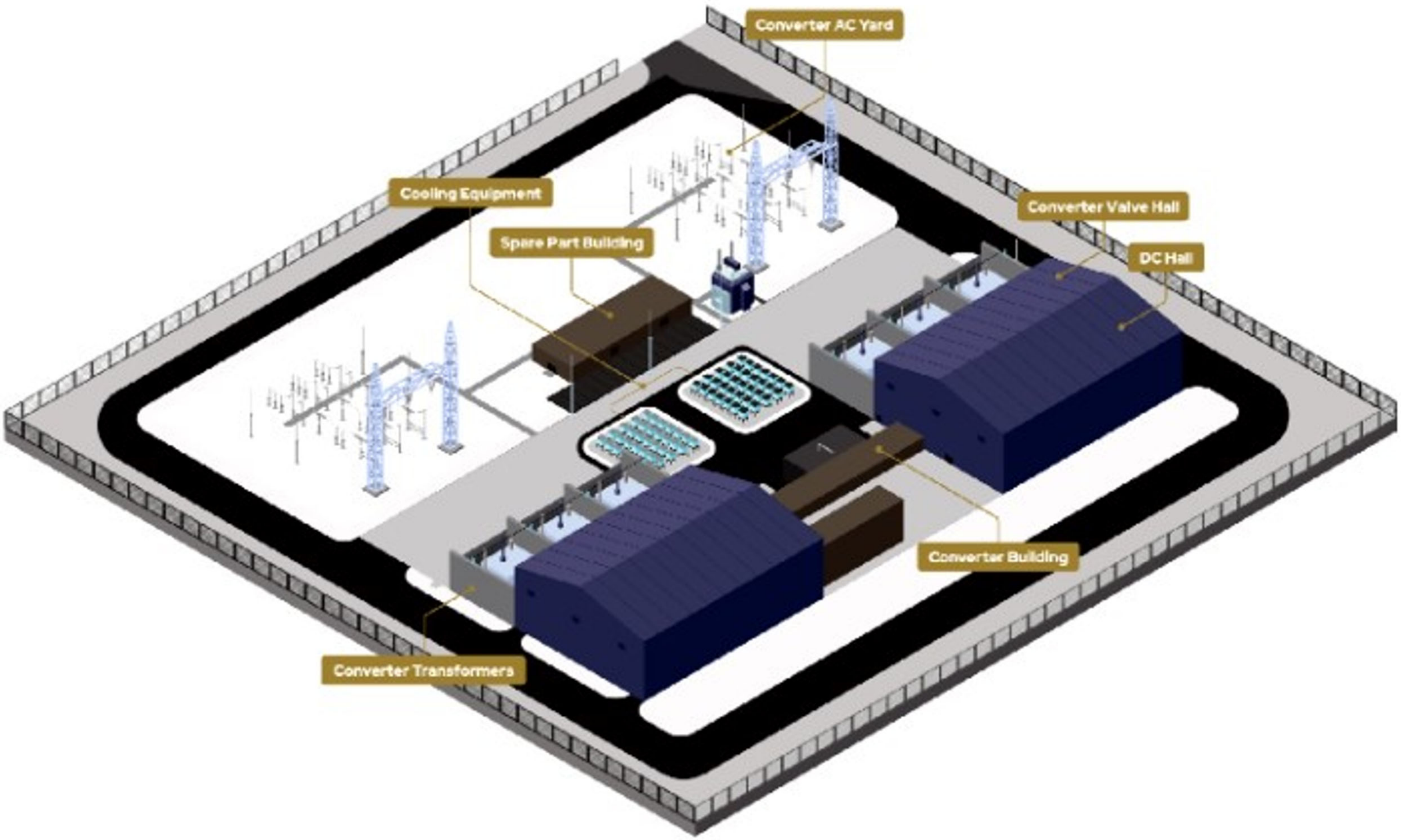
2.5.2.3 Fiber Repeater Stations

At each fiber repeater station, a small building, approximately 12 feet by 12 feet in area will house signal regeneration equipment. Each station will include a permanent access road and power supply via electric distribution line, likely 25-kV. Each fiber repeater station will house emergency backup generators with a liquified petroleum gas storage tank and a battery bank to provide power if the main power supply goes down.

2.6 CONSTRUCTION

Construction of an overhead transmission line requires several different activities at any given location. Figure 2.6 -1 and the following discussion describe the major construction activities and approximate sequence:

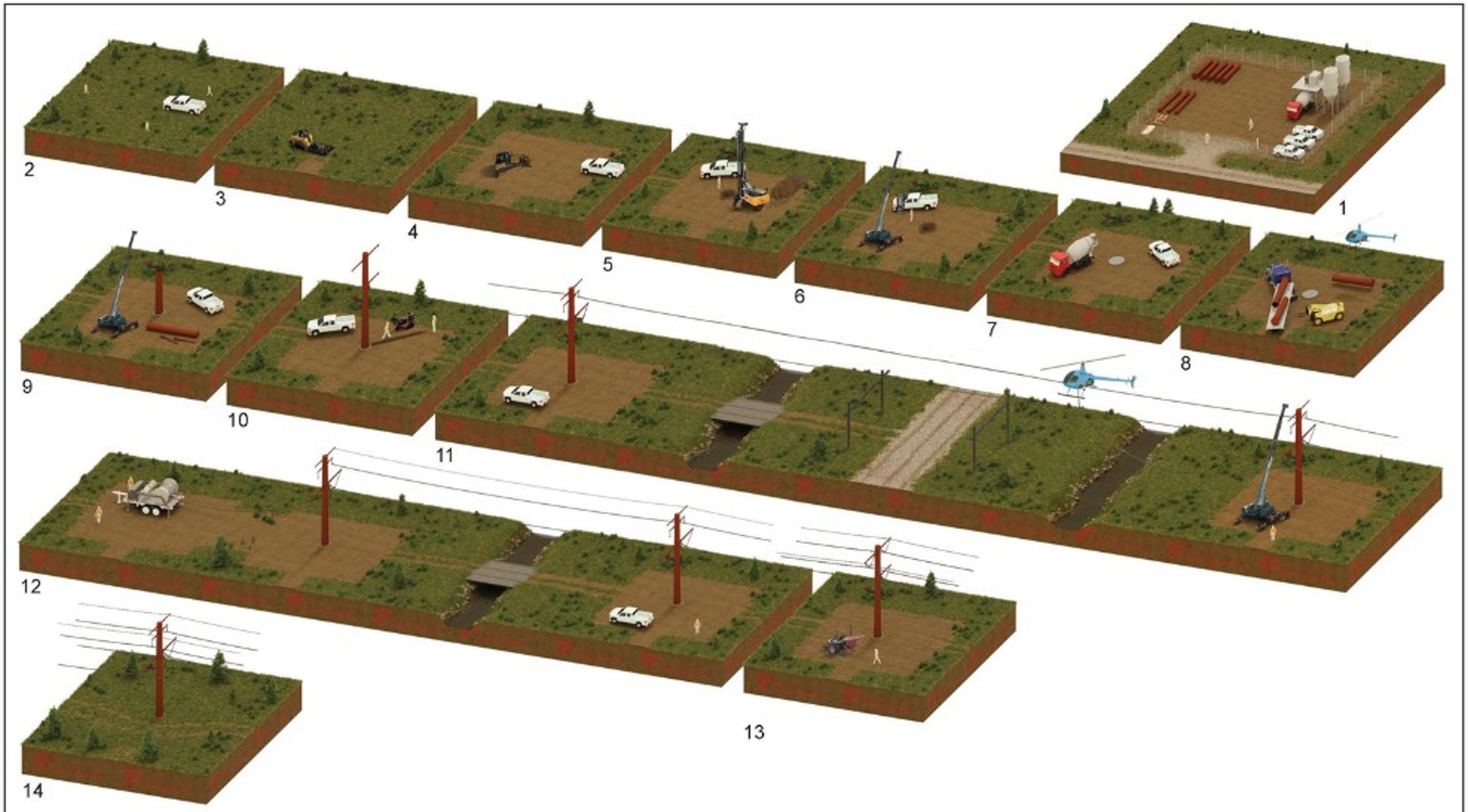
- Mobilization and preparation of contractor yards
- Surveying and staking
- Development of access roads and overland travel
- Vegetation clearing
- Install erosion and sediment control BMPs
- Foundation installation
- Structure setting
- Installation of ground rods or counterpoise
- Installation of conductors and OPGW
- Wire stringing and clipping
- Site cleanup and reclamation



NORTH PLAINS CONNECTOR

For Environmental Review Purposes Only

Figure 2.5.2-1
Diagram of a Typical Converter Station
North Plains Connector Project



NORTH PLAINS CONNECTOR
A Grid United Project

Graphic is not to scale and for environmental review purposes only.

Figure 2.6-1

Typical Construction Sequence North Plains Connector Project

1. Material yard and/or concrete batch plant
2. Survey and staking
3. Workspace clearing and access road construction
4. Grading and/or site preparation
5. Foundation hole drilling
6. Foundation cage installation
7. Concrete foundation poured
8. Material delivery to site
9. Tower structure assembly
10. Grounding system and guy wire installation
11. Conductor and optical ground wire stringing
12. Tensioning
13. Site cleanup and restoration
14. Operation and maintenance

North Plains will hire construction contractors to execute the Project. Currently, North Plains plans to conduct the activities identified above generally in sequential order. Several of these activities may occur concurrently during the construction process, with several construction crews operating simultaneously at different locations, and with each crew passing through any given area at least once. Different crews will work at different paces, but typically, assembly and erection of structures is the slowest activity. Crews can assemble and erect structures at an average pace of about 1 to 2 miles per day. Progress can be slowed if subsurface conditions are difficult and require a long-term drilling or blasting program or redesign of foundations. Conductor and OPGW installation can be completed at an average pace of about 2 miles per day.

Prior to construction, North Plains will obtain all necessary federal, state, and local permits; acquire relevant easements and right-of-way grants; and conduct pre-construction engineering, geotechnical testing, and environmental surveys.

2.6.1 Contractor Laydown Yards and Helicopter Fly Yards

As the first step in the construction process, North Plains will mobilize staff and equipment to prepare contractor laydown yards. The contractor laydown yards will house the Contractors' temporary trailer(s) and portable concrete batch plants, include space for helicopter fly yards, and serve as a delivery and staging area for construction materials. North Plains will receive the following materials at the contractor laydown yards: storage containers, portable toilets, dumpsters, construction mats, tools, and equipment.

North Plains will prepare the contractor laydown yards by installing erosion and sediment control BMPs; grading and leveling uneven surfaces; stripping and stockpiling of topsoil, if necessary; installing gravel or rock tracking pads near entry/exit points, if needed; installing culvert(s); and installing power, security measures, and fencing. North Plains will typically complete this work using standard construction equipment such as bulldozers and dump trucks.

Depending on landowner preferences, North Plains may leave contractor laydown yards in place or return the yards to prior conditions following completion of construction activities, as described in the Construction Mitigation and Reclamation Plan (CMRP).[5]

North Plains will use portable concrete batch plants at contractor laydown yards to dispense concrete for use in structure foundations. Equipment typically required at a batch plant site includes gas- or diesel-powered generators, concrete trucks, front-end loaders, Bobcat loaders, dump trucks, transport trucks and trailers, water tanks, concrete storage tanks, scales, and job site trailers. Contractors may use commercial ready-mix concrete instead of installing a concrete batch plant when access to structure construction sites is economically feasible.

North Plains may use helicopters to facilitate structure setting and/or wire pulling/tensioning of the lines. Therefore, North Plains may require helicopter fly yards. North Plains will preferably site helicopter fly yards adjacent to the contractor laydown yards. North Plains will prepare the helicopter fly yards in the same way as a contractor laydown yard, including grading or leveling of uneven surfaces; stripping and stockpiling of topsoil; installing gravel or rock tracking pads near entry and exit points; and installing culvert(s), power, and fencing.

[5] The CMRP is presently under development and is not included with this project overview. A draft CMRP will be provided to the MDEQ with North Plains' application for a Certificate of Compliance.

2.6.2 Survey and Staking

North Plains will confine all construction equipment and vehicles to the Project workspace described in Section 2.4. Crews will flag or stake the boundaries of the Project workspace in a manner that ensures all individuals can readily identify the boundaries of the Project workspace and to ensure that construction activities will only occur in areas authorized. In addition, North Plains will install signs or flagging for the following environmental features along the Project workspace and access roads so they can be easily identified by Project personnel and managed as described in applicable permit applications:

- wetland boundaries and approved waterway access crossing locations;
- drainages/drain tiles as identified by counties and landowners;
- hiking and hunter walking trails, snowmobile and all-terrain vehicle trails, winter access roads, or other recreational areas as required by permit conditions; and
- buffer zones for environmentally sensitive features, including archaeological and historic sites, rare plant or ecological communities, and other sensitive wildlife species and/or habitat per agency consultations. Signs will not disclose the specific location and/or species or feature type where laws require resource protection.

Contractors will contact the One Call system to locate, identify, and flag existing underground utilities to prevent accidental damage during construction. Utility companies generally complete these activities by a two-person crew travelling by foot, all-terrain vehicle, or pick-up truck.

2.6.3 Access Roads

North Plains will use existing roads, develop new temporary and permanent access roads, and use overland travel to access the Project.

North Plains will maintain existing roads, improve existing roads, or build new roads as needed and approved through applicable permits. Maintenance activities may include tree trimming, back-blading, and placement of fill or construction mats where needed on the existing road grade and as agreed upon with the road authority. North Plains may add dirt or gravel fill to maintain existing roads or to develop permanent access roads, if needed. Activities that occur beyond the existing road grade, such as widening and tree removal, placement of construction mats in wetlands, placement of structures within the ordinary high water mark of waterbodies, or development of a new road, are considered improvements requiring environmental survey and applicable permits and authorizations. Wetland and waterbody crossings are discussed in greater detail in the CMRP. North Plains will confine maintenance and improvements on existing roads to the legal road easement as established by the corresponding road authority. Construction mats or rock on top of geotextile fabric will be used for roads within wetlands and will be removed once construction is complete.

The Project will require overland travel in some locations to allow for the safe passage of construction vehicles and equipment to the Project workspace. Overland travel lanes will consist of a 25-foot-wide path within the right-of-way where there are no pre-existing roads and construction of a temporary access road, with corresponding vegetation clearing, and grading, is unnecessary.

North Plains will construct temporary access roads approximately 25 feet wide for use during construction. Temporary access road construction may include clearing of vegetation, rock, and debris; cutting-and-filling and grading; establishing drainage features; constructing bridge and culvert; laying aggregate; and performing other improvements to provide an adequate surface to support construction and maintenance vehicles. North Plains will use construction mats for roads within wetlands.

After construction, North Plains will return improved and temporary access roads and overland travel lanes to their pre-construction condition unless the road authority, landowner, or land-managing agency requests that the improvements be left in place and the following conditions are met:

- the access road does not cross wetland features, and
- North Plains did not install any new temporary crossing techniques such as bridges and culverts at waterbody features crossed by the road.

North Plains will perform restoration of improved and temporary access roads and overland travel lanes. Regardless of landowner, road authority, or land-managing agency preference, North Plains will remove all temporary infrastructure in wetlands or waterbodies such as bridges, construction mats, and other fill material as required by applicable permits and authorizations.

North Plains will maintain permanent access roads to facilities and to facilitate maintenance of the transmission line throughout Project operation. North Plains will design permanent access roads in accordance with state and local requirements. Permanent access roads may consist of dirt, gravel, asphalt, concrete, or another hard surface.

2.6.4 Vegetation Clearing

To facilitate construction equipment access and ensure safe clearances between vegetation and the transmission line during operations, North Plains will clear trees and tall vegetation will be from the right-of-way. North Plains will also clear vegetation, as needed, from the Project workspace including new and improved access roads. North Plains will perform clearing with mechanical equipment such as mechanized mowers, sky trips, process harvesters, feller bunchers, or brush cutters. In areas where clearing with large equipment is not viable, North Plains will clear with hand tools such as chain saws or other hand tools.

North Plains will conduct timber salvage operations using cut-off-type saw equipment. North Plains will undertake felling in a manner that minimizes shatter, breakage, and disturbance outside of the Project workspace. North Plains will use skid loaders or alternate equipment to transport salvaged logs to stacking sites. North Plains will fell trees to fall toward the Project workspace to avoid breaking trees and branches off outside of the Project workspace. North Plains will salvage leaners, which are felled trees that inadvertently fall into adjacent undisturbed vegetation. North Plains will recover trees and slash that fall outside the Project workspace. North Plains will dispose of this recovered material in accordance with landowner or land managing agency requirements. North Plains will limb and top salvaged logs before removal from the Project workspace. North Plains will orient any required log decks to best facilitate loading by picker trucks. North Plains will not allow Contractors to dispose of woody debris in wooded areas along the Project workspace.

Unless otherwise agreed upon between North Plains and the applicable landowner or land managing- agency, North Plains will dispose of non-merchantable timber and slash by mowing, cutting, chipping, mulching, and leaving in upland areas; hauling off-site to an approved location; or using to stabilize erodible slopes or construction entrances. In non-agricultural, non-wetland areas, North Plains may uniformly broadcast chips, mulch, or mechanically cut woody debris across the Project workspace in a manner that avoids inhibiting revegetation. North Plains may also incorporate this material into the topsoil layer during grading activities, with landowner approval. North Plains will not stockpile chips, mulch, or mechanically cut woody debris in a wetland, including agricultural wetlands.

During construction, North Plains will cut vegetation within the right-of-way and Project workspace at or slightly above the ground surface. To minimize soil impacts and erosion potential, North Plains will not typically grub stumps or roots; however, North Plains may need to remove stumps in some locations within the Project workspace to facilitate the movement of construction equipment, where excavation will occur, or when reasonably requested by the landowner.

The CMRP provides additional details regarding vegetation clearing activities.

2.6.5 Erosion and Sediment Control Best Management Practices

Ground disturbance activities may not occur across the entire Project workspace. North Plains will limit ground disturbance activities to the areas around pole structures, along access roads, and within temporary construction workspaces where needed, and at the new facilities. North Plains will prepare a Stormwater Pollution Prevention Plan (SWPPP) in accordance with the Storm Water Construction General Permits administered by the MDEQ and the North Dakota Department of Environmental Quality. As required by the Storm Water Construction General Permits, the SWPPP will describe the timing for installation of all erosion prevention and sediment control BMPs, include the location and type of temporary and permanent erosion and sediment control BMPs, along with the procedures used to establish additional temporary BMPs as necessary for the site conditions during construction. The SWPPP will identify all surface waters, existing wetlands, and stormwater ponds or basins that will receive stormwater from the construction site, during or after construction, and will identify special waters as designated by the agencies, or impaired waters. The SWPPP will also include a description of any permanent stormwater treatment systems required at the permanent facilities or permanent access roads.

The CMRP provides additional details on temporary and permanent erosion and sediment control BMPs.

2.6.6 Grading, Excavation, and Foundation Installation

Prior to foundation installation, North Plains will establish a structure pad around the structure location to ensure a level and safe working area. In areas with uneven terrain, North Plains may need to grade the area around the foundation. North Plains will not perform grading in wetland areas, unless grading is required to restore inadvertent disturbance to a wetland during placement or removal of timber access mats across the wetland. Where grading is required, North Plains will strip the topsoil layer and potentially into the subsoil layer and will separate the topsoil and subsoil in storage piles within the Project workspace. North Plains will leave gaps between the spoil piles and will install erosion and sediment control BMPs where stockpiled topsoil and subsoil piles intersect with water conveyances (i.e., ditches, swales) to maintain natural drainage. North Plains will maintain separation in the form of a gap or a physical barrier, such as a thick layer of mulch or silt fence between the topsoil and subsoil piles to prevent mixing.

The Project will require excavation for the drilled concrete pier foundations associated with the pole structures and foundations associated with the permanent facilities. In general, the excavated holes for each the tubular monopole structure type will range from 9 to 14 feet in diameter and 20 to 60 feet in depth, depending on soil conditions and structure heights. For lattice structures, the excavation for each of the four legs will be 5 to 8 feet in diameter and 20 to 50 feet deep. Each lattice structure will also have a concrete pad measuring between 30 feet by 30 feet up to 55 feet by 55 feet. North Plains will only use lattice structures in areas with engineering or constructability constraints.

To construct a cast-in-place foundation, construction crews first make a vertical hole using power drilling equipment, such as truck- or track-mounted augers of various sizes, depending on the diameter and depth requirements of the hole to be drilled. In rocky areas, North Plains may excavate the foundation holes by blasting or by installing special rock anchor or micro-pile type foundations. North Plains will cover augured structure holes if construction crews are unable to fill the hole in the same day. North Plains will not place excess spoils from augured structure holes in wetlands, waterbodies, drainages that lead to waterbodies, or other environmentally sensitive areas. North Plains will remove excess rocks and gravel from the right-of-way.

Once the hole is excavated, construction crews install reinforced-steel anchor bolt cages in the hole. These cages are designed to increase the structural integrity of the concrete. Typically, crews will assemble the cages at the nearest staging area and deliver the cages to the structure site via flatbed truck. Crews will insert these cages in the holes prior to pouring concrete. Next, crews will fill the excavated holes containing the reinforcing anchor bolt cages with concrete.

If construction crews encounter hard rock during grading or excavation for structure foundations, crews may need to perform blasting using explosives to loosen or fracture the rock to reach the required depth. Prior to blasting, contractors will prepare a Blasting Plan that is applicable to any locations where blasting will be necessary including adjacent to existing high-pressure pipeline, overhead or underground utilities, farm operations, or public crossings. North Plains requires Contractors and the blasting supervisor to be thoroughly familiar with and comply with the rules and regulations of Occupational Safety and Health Administration and all federal, state, county and local regulations governing blasting operations. The Blasting Plan will include measures for notifying landowners and tenants in advance of blasting, stipulate that blasting be conducted only during daylight hours, and prohibit blasting near sensitive areas, such as residences, wells, and septic systems. North Plains will file the Blasting Plan with applicable state or local jurisdictions, where required.

2.6.7 Assembly and Erection of Structures

Construction crews will transport monopole structures to each structure work area in sections by truck or helicopter, depending on topography and access. At the structure site, crews will place each pole section on wood blocking. First, crews will use a large crane to hoist the bottom pole section onto the structure foundation where crews will position the bottom section into place. Next, crews will lift the middle section(s) into place, using guide brackets to align the section. Crews will then climb the assembly to ensure proper alignment and secure the fitting. Finally, crews will guide and secure the top section into place to complete the structure.

Lattice tower assembly is similar to monopole structure assembly. Crews transport bundles of steel members and associated hardware and wood to each structure site by truck. Next, crews lay out wood blocking, open the structure steel bundles, and place the structure steel bundles on the wood blocking for assembly. Typically, crews assemble the leg extensions for the structures first using a small crane. Similar to monopole assembly, crews then assemble subsections and hoist the subsections into place with a large crane. Crews fasten the subsections together to form a complete structure. A follow-up crew then tightens the bolts in the joints.

North Plains may use helicopters to erect structures. The use of helicopters for structure erection is typically limited to areas that are difficult to access, either due to a lack of roads, rough terrain, or both. North Plains will consider several site- and region-specific factors when deciding whether to use helicopters, including access to structure locations, presence of sensitive resources, permitting restrictions, landowner needs and preferences, construction schedule, weight of structural components, time of year, elevation, availability of heavy lift helicopters, weather, and construction economics.

Contractors will transport the structure sections and associated hardware including insulators, hardware, blocking, stringing sheaves to the helicopter fly yard by truck, where construction crews will assemble sections of each structure and stage the structure sections for transport to the right-of-way. Once staged for transport, crews will attach structure sections by cables from the helicopter to the top of the structure section and will airlift the structure section to the structure location. Upon arrival, crews will place the section directly onto the foundation or stack on top of the previously erected structure section.

North Plains will plan and communicate the assembly and erection activities to landowners and other impacted stakeholders in advance of structure construction activities to provide a safe work area. North Plains will implement good housekeeping practices to contain and remove construction related waste and debris during these activities in accordance with the CMRP.

2.6.8 Installation of Conductors and Wire Pulling and Tensioning

North Plains will erect temporary guard structures at road and railroad crossing locations where necessary to protect the public during stringing activities, as described in Section 2.4.4.4. The erection and dismantling of these temporary guard structures may require short-term traffic diversions. Traffic impacts resulting from wire-stringing include short-term traffic diversions, traffic congestion, and brief road closures. North Plains will develop a Traffic and Transportation Management Plan for this Project.

North Plains will deliver insulators, hardware, and stringing sheaves to each structure site. North Plains will rig the structures with insulator strings and stringing sheaves at each conductor, DMR conductor, and OPGW position. For safety and efficiency reasons, construction crews typically perform wire stringing and tensioning activities during daylight hours and typically schedule these activities at roadway crossings to coincide with periods of minimal road traffic to minimize traffic disruptions.

North Plains will pull or string pilot lines from structure to structure by either a helicopter or land operated equipment, then thread the pilot line through the stringing sheaves at each structure. North Plains will use a helicopter to pull the pilot lines at roadway crossings to minimize or avoid impacts to road traffic.

Following pilot lines, North Plains will attach a stronger, larger-diameter line to conductors to pull them onto structures. North Plains will repeat this process until the conductor and OPGW are pulled through the sheaves. Stringing will use powered pulling equipment at one end and powered braking or tensioning equipment at the other end of a conductor segment. The tensioner, in concert with the puller, will maintain tension on the wires while they are fastened to the structures. Once each type of wire has been pulled in, North Plains will adjust the tension and sag, remove the stringing sheaves, and permanently attach the conductors to the insulators.

At tangent structures, North Plains will attach conductors to insulators using clamps, and at dead-end structures, North Plains will cut the conductors and attach the conductors to the insulator assemblies by “dead-ending” the conductors either with a compression fitting or an implosive-type fitting. Before proceeding with the implosive-type fitting, North Plains will notify appropriate land and resource management agencies, private landowners, and public safety organizations.

North Plains will plan and communicate the installation of conductors and wire pulling and tensioning activities to landowners and other impacted stakeholders in advance to provide a safe work area, avoid disruptions to adjacent activities, and to avoid environmental damage or the creation of nuisance conditions. North Plains will implement good housekeeping practices to contain and remove construction related waste and debris during these activities.

Following stringing and tensioning, North Plains will remove guard structures and reclaim the area.

2.6.9 Facility Construction

North Plains will implement safety precautions during converter station and switchyard modifications and construction to protect human health. North Plains will set up barriers between energized facilities and the active workspace, restrict untrained personnel from entering the Project site, and meet equipment clearance requirements. When construction commences at the facilities, North Plains will remove the existing fence around the expansion area, grade the expansion, and replace the fence prior to further work at the site.

2.6.9.1 Converter Station Construction

North Plains will begin construction of the converter stations by surveying and staking the site as described in Section 2.6.2. North Plains will conduct soil borings at the approximate location of large structures and equipment and obtain soil resistivity measurements to confirm site characteristics. North Plains will conduct borings with truck- or track-mounted equipment. These borings will be approximately 4 inches in diameter and will range from 20 to 50 feet deep. North Plains will backfill the boreholes upon completion of soil sampling. Depending on the soil characteristics, North Plains may backfill the boreholes with a bentonite plug to prevent subsidence. Next, a construction contractor will perform site preparation work, including vegetation clearing (see Section 2.6.4) and soil grading (see Section 2.6.6), to establish a clear and flat working surface. The construction contractor will also construct permanent and temporary access roads (see Section 2.6.3).

Construction crews will compact the area for the structure foundation to the densities required for foundations to support buildings and structures. North Plains will use three types of foundations, as described below.

- Spread footings are placed by excavating the foundation area; placing forms, reinforced steel, and anchor bolts; and pouring concrete into the forms. After the foundation has been poured, the forms are removed, and the surface of the foundation is finished.

- Drilled pier foundations are placed in a hole made by a track- or truck-mounted auger. Reinforced-steel and anchor bolts are placed into the hole using a track- or truck-mounted crane. The portion of the foundation above ground is formed. The portion below ground uses the undisturbed earth of the augured hole or a prefabricated cylinder as the form. After the concrete foundation has been poured, the form is removed, the excavation is backfilled, and the surface of the foundation finished.

- Slab-on-grade construction is like spread footing construction, except that a spread footing is a circular, square, or rectangular slab that is provided to support an individual column. Many spread footings may be needed to support a single large structure or building. A slab-on-grade foundation is a concrete slab that is poured at ground level and is used as the foundation of the entire building. Slab-on-grade foundations are typically used for smaller structures and prefabricated buildings.

Concurrent with or following foundation installation, North Plains will install oil containment structures, as required to prevent oil from transformers, reactors, circuit breakers, and other oil -containing equipment from seeping into the ground in the event of a rupture or leak. Then, construction crews will install underground electrical raceways and copper ground grid, followed by steel structure and area lighting. Crews will then erect the converter valve hall and ancillary buildings along with various high-voltage apparatus typical of a converter station. The installation of high-voltage transformers will require special, high-capacity cranes and specially trained crews for the unloading, setting into place, and final assembly of the transformers. Crews will place a final 4- to 6-inch-deep crushed rock surface on the ground to create a stable, all-weather working surface with high resistivity, which increases allowable step and touch voltages, reducing risk of shocks to humans near the grounding system during an earth fault.

North Plains will install a security fence around the portion of the site that will enclose the converter station. North Plains will install locked gates at appropriate locations along the security fence for authorized access. Construction crews may use the area outside the fence temporarily during construction to stage activities and store materials. Upon completion of construction, North Plains will restore this area in compliance with the CMRP.

After construction crews have installed the equipment, North Plains will test the converter station systems. North Plains will then complete electrical energization of the facility. North Plains will time the energization of the facility to take place with the completion of construction of the transmission line and other Project facilities. After construction is completed, North Plains will remove and dispose of debris and unused materials from the site and will restore disturbed areas within the temporary workspace.

2.6.9.2 Switchyard

It is expected that the utility Owner (Basin Electric Power Cooperative) will construct and operate the Morton County Switchyard. The construction of the Morton County Switchyard will be similar to converter station construction, but on a smaller scale. The Owner will perform soil borings, followed by clearing, grading, and site preparation. The Owner will install foundations, electrical raceways, interconnection apparatus, lighting, crushed rock, and security fence if needed depending on existing conditions. Once construction is completed, North Plains will remove and dispose of debris and unused materials from the site and will restore disturbed areas within the temporary workspace as described in the CMRP.

2.6.10 Site Cleanup and Reclamation

After construction activities have been completed, North Plains will initiate final cleanup activities, as described in the CMRP. For areas where grading and/or excavation has occurred, North Plains will conduct rough and final grading to restore the area to as near as practicable to pre-construction conditions.

North Plains will then prepare the seedbed, install or repair erosion and sediment control BMPs, and conduct restoration in accordance with the CMRP.

North Plains will remove construction mats and temporary bridges and culverts once construction crews complete restoration activities and no longer require access to the construction workspace.

North Plains will compensate landowners for damages in accordance with individual landowner agreements.

2.6.11 Construction Schedule and Workforce

North Plains anticipates the total construction timeframe for the Project to be approximately three to four years. North Plains will perform transmission line construction concurrent with converter stations and switchyard construction. North Plains anticipates starting construction in 2029 and placing the facility in service by the end of 2032. Construction is anticipated to occur year-round, weather permitting, with the exception of areas that have applicable timing restrictions to protect sensitive species and habitat. Delays due to weather, material delivery, and natural resource time of year restrictions may extend the construction timeline. Further, the start of construction will be dependent upon receipt of required permits and authorizations. North Plains will continue to provide schedule updates, including for construction activities on federally-managed lands, as the environmental review and permitting process progresses.

Construction on the Project will typically occur on a 6-day work week, Monday through Saturday, with a typical construction workday duration of at least 10 hours, occurring mostly during daytime hours between 7:00 a.m. and 7:00 p.m. However, weather conditions, site conditions, emergencies, or other atypical circumstances may necessitate extended work outside of typical workday hours, including work at night and on Sundays and holidays.

North Plains anticipates construction will require a peak temporary workforce of approximately 600-700 workers. Table 2.6.11-1 shows a list of typical construction personnel and equipment expected for the Project, assuming uninterrupted construction.

TABLE 2.6.11-1

Expected Construction Personnel and Equipment

Activity	Number of Personnel	Number of Crews	Type of Equipment	Quantity of Equipment per Crew
Survey	4	4	Pickup trucks	4
Site Management	6	4	Office Trailers	8
			Pickup trucks	6
			Generators	8
Site Development	10	4	Scrapers	1
			Dozers	2
			Motor Graders	1
			Roller Compactors	1

TABLE 2.6.11-1

Expected Construction Personnel and Equipment

Activity	Number of Personnel	Number of Crews	Type of Equipment	Quantity of Equipment per Crew
			Excavators	2
			Dump Trucks	2
			Water Trucks	1
			Mechanic Truck	1
			Fuel Truck	1
			Pickup trucks	6
			UTVs	2
Fence Installation	4	4	Pickup trucks	2
			UTVs	1
			Backhoe	1
			Small Drill	1
			Portable concrete mixer	1
			Reel Stand	1
			Skid Steer	2
Foundations	14	4	Augers	2
			Excavators	1
			Concrete Trucks	1
			Dump Truck	1
			Roller Compactors	1
			Plate Compactor	1
			Backhoe	1
			Skid Steer	2
			Mechanic Truck	1
			Fuel Truck	1
			Water Trucks	1
			Pickup trucks	4
			UTVs	1
			Concrete Batch Plant	1
Cable Trench	6	4	Trenchers	1
			Dozers	1
			Roller Compactors	1
			Plate Compactor	1
			Excavators	2
			Pickup trucks	3
			UTVs	1
			Air Compressor	2
			Backhoe	2
			Mechanic Truck	1
			Fuel Truck	1
			Reel Stand	1
Steel Structure	12	4	Cranes	2
			Boom Trucks	4
			Manlifts	2
			Welder Trucks	2
			UTVs	2
			Pickup trucks	6
			Mechanic Trucks	1
			Water Trucks	1

TABLE 2.6.11-1

Expected Construction Personnel and Equipment

Activity	Number of Personnel	Number of Crews	Type of Equipment	Quantity of Equipment per Crew
			Helicopters	TBD
Control Building	10	4	Wire Pullers	2
			Manlifts	1
			Reel Stand	1
			Pickup trucks	6
			UTVs	1
			Splicing Van	1
			Skid Steer	1
			Trenchers	1
			Plate Compactor	1
Ground Grid	5	4	Pickup trucks	3
			Fuel Truck	1
			Water Trucks	1
			Trenchers	2
			Drill rigs	1
			Boom Trucks	1
			Skid Steer	1
			Backhoe	1
			Mechanics Truck	1
			Air Compressor	1

2.7 ENVIRONMENTAL TRAINING AND MONITORING

2.7.1 Environmental Training

North Plains will develop an environmental training program tailored to this Project. Training will review environmental commitments identified in permit applications and additional environmental conditions required in permits issued by federal, state, or local agencies. North Plains will require all individuals to complete training prior to beginning work on the Project. North Plains will maintain records of training.

2.7.2 Environmental Inspectors

North Plains will employ Environmental Inspectors (EI) on the Project as further described in the CMRP. The EIs will review the Project activities daily for compliance with federal, state, and local regulatory requirements. EIs will have the authority to stop work as approved by the lead EI. EIs will work with North Plains to implement corrective action if construction activities are in non-compliance with environmental commitments, landowner requirements, or applicable permit requirements.

If required by permits and authorizations, North Plains will also employ Compliance Monitors that will report directly to the applicable agency.

2.8 OPERATION AND MAINTENANCE

North Plains will conduct routine and preventative maintenance activities to identify and repair any deficiencies recorded during routine monitoring and inspections. Additionally, although North

Plains will allow the right-of-way to revegetate with herbaceous and low growing brushy vegetation after construction; North Plains will periodically trim larger shrubs and trees from the right-of-way where they pose a risk of damage or interference with the transmission line. The CMRP further describes routine inspections and vegetation management during operations.

2.9 PERMITS AND APPROVALS

Project construction, operation, and maintenance will comply with applicable federal, state, and local permit requirements. Table 2.9-1 below summarizes the status of the major required permits, approvals, and consultations.

TABLE 2.9-1

Major Environmental Authorizations and Consultations

Agency/Tribe	Description of Permit, Approval, or Consultation	Submittal (Anticipated)	Approval (Anticipated)
FEDERAL			
U.S. Department of Energy (Lead Federal Agency)	National Environmental Policy Act (NEPA) Review	(August 2024)	(October 2026)
Bureau of Land Management	Right-of-Way Grant and Temporary Use Permit with Plan of Development	(September 2024)	(October 2026)
U.S. Department of Agriculture – Agricultural Research Service	Revocable Right-of-Way Permit	(September 2024)	(October 2026)
U.S. Forest Service	Special Use Permit	(September 2024)	(October 2026)
	Applicant-Prepared Biological Evaluation	(February 2026)	(October 2026)
U.S. Fish and Wildlife Service	Endangered Species Act Consultation	(August 2024)	(October 2025)
	Applicant-Prepared Biological Assessment / USFWS Issues Biological Opinion	(June 2025)	(June 2026)
	Migratory Bird Treaty Plan	(February 2025)	(April 2025)
	Non-Purposeful Take Permit for Bald/Golden Eagles	(January 2025)	(February 2026)
U.S. Army Corps of Engineers – Omaha District	Section 404 Permit	(January 2025)	(October 2026)
Federal Lead Agency, Federal and State Land-Managing Agencies, State Historic Preservation Offices, Tribal Historic Preservation Offices, and Consulting Parties	Section 106 of the National Historic Preservation Act Consultation	(August 2024)	(October 2026)
Federal Lead Agency, Tribal Governments	Government-to Government Consultation	(August 2024)	(October 2026)
Federal Aviation Administration	Notice of Construction or Alteration	(at least 45 days prior to Construction)	NA
MONTANA			
Montana Department of Environmental Quality	Certificate of Compliance	(August 2024)	(October 2026)
	Water Quality Certification under Section 401 of the Clean Water Act (associated with Section 404 Permit)	(January 2025)	(August 2025)
	Short-Term Water Quality Standard for Turbidity Related to Construction Activity (318)	(January 2025)	(August 2025)
	General Permit for Storm Water Discharges Associated with Construction Activity (MTR100000)	(June 2027)	(July 2027)
	Construction Dewatering General Permit (MTG070000)	(June 2027)	(July 2027)

TABLE 2.9-1

Major Environmental Authorizations and Consultations

Agency/Tribe	Description of Permit, Approval, or Consultation	Submittal (Anticipated)	Approval (Anticipated)
Montana Sage Grouse Habitat Conservation Program, Montana Sage Grouse Oversight team	Sage Grouse Avoidance and Mitigation Plan	(August 2025)	(October 2025)
Montana Department of Natural Resources and Conservation, State Board of Land Commissioners	Right-of-way grant or easement for State Trust Land crossings	(September 2024)	(December 2025)
	Natural Streambed and Land Preservation Act (310)	(January 2025)	(August 2025)
	Montana Land-Use License or Easement on Navigable Waters	(January 2025)	(August 2025)
Montana State Historic Preservation Office	Section 106 of NHPA Consultation	(August 2024)	(October 2026)
NORTH DAKOTA			
North Dakota Public Service Commission	Certificate of Corridor Compatibility and Transmission Facility Route Permit	(April 2025)	(February 2026)
North Dakota Department of Trust Lands	Right-of-way easement for crossing state trust lands	April 2022	(June 2026)
North Dakota Department of Water Resources	Sovereign Lands Permit	(January 2025)	(April 2025)
North Dakota Department of Environmental Quality	Water Quality Certification under Section 401 of the Clean Water Act (associated with Section 404 Permit)	(February 2025)	(May 2025)
	Temporary Discharge Permit	(June 2027)	(July 2027)
	Authorization to Discharge under the North Dakota Pollutant Discharge Elimination System (NDR11-0000)	(June 2027)	(July 2027)
State Historical Society of North Dakota	Section 106 of NHPA Consultation	(August 2024)	(October 2026)

2.10 AFFECTED LANDOWNERS AND STAKEHOLDER OUTREACH

Core to North Plains' development philosophy is the integration of stakeholder input prior to officially entering the regulatory process. North Plains has engaged federal, state, Tribal, and local stakeholders throughout the development of the Project to incorporate feedback into Project siting.

2.10.1 Agency and Tribal Engagement

Starting in the fall of 2021, North Plains initiated agency coordination efforts to ensure effective communication with various governmental agencies. These agencies include state, federal, Tribal, and local authorities responsible for overseeing environmental regulations and land management. The initial meetings served as introductions, allowing North Plains to establish connections, provide an overview of the Project, and discuss the Project objectives and scope. As Project development progressed, subsequent meetings further explored specific topics, such as environmental impact assessment, permitting, and compliance requirements. These ongoing stakeholder coordination efforts have been crucial in fostering a cooperative environment and ensuring that the Project complies with the relevant regulations and guidelines. North Plains anticipates that agency coordination will continue throughout the environmental review and permitting processes to address concerns or challenges, and ensure applications are prepared in accordance with applicable laws and agencies' requirements. North Plains has engaged the following federal and state entities:

- Federal
  - U.S. Department of Energy
  - U.S. Department of Interior
  - Bureau of Land Management
  - U.S. Forest Service
  - U.S. Department of Agriculture – Agricultural Research Service
  - U.S. Fish and Wildlife Service
  - U.S. Army Corps of Engineers
  - National Park Service
  - Bonneville Power Administration
  - Western Area Power Administration
- State
  - North Dakota Game and Fish Department
  - North Dakota Department of Water Resources
  - Montana and North Dakota Departments of Transportation
  - North Dakota Transmission Authority
  - Montana Fish, Wildlife, and Parks
  - Montana Department of Environmental Quality
  - Montana Natural Heritage Program
  - North Dakota Public Service Commissions
  - Montana and North Dakota State Senators
  - Montana and North Dakota State Representatives
  - Montana and North Dakota Departments of Commerce
  - Montana and North Dakota State Trust Lands
  - Montana and North Dakota State Historic Preservation Offices
  - Montana Sage Grouse Oversight Team
  - Montana Department of Natural Resources and Conservation

North Plains has engaged over 20 Tribal governments. North Plains identified Tribal governments by considering tribal areas of cultural importance, treaty areas, and trust lands. North Plains has sought the participation of tribal governments during the routing process and the development of cultural reports. North Plains introduced the Project to Tribal Historic Preservation Officers (THPO) from participating tribes while seeking their participation in routing activities. The Project also had Traditional Cultural Specialists from 18 interested tribes participate in fieldwork during the 2022, 2023, and 2024 survey seasons. THPO field visits helped design mitigation techniques for Tribally-identified sites along the Project route.

2.10.2 Public and Landowner Engagement

North Plains conducted public engagement events and open houses accessible to residents and landowners near the Project. North Plains specifically engaged landowners and local government officials in the Project routing process at these open houses. North Plains presented the Project in detail, addressed concerns raised by participants, presented the need for the Project, and gathered valuable feedback on the route.

North Plains held multiple rounds of public engagement, including open houses, as shown in Table 2.10.2-1.

TABLE 2.10.2-1
Public Engagement Events

State / Date	Event	Location
MONTANA		
June 08, 2022	Fallon County Landowner Open House	Baker
June 09, 2022	Custer County Landowner Open House	Miles
June 09, 2022	Rosebud County Landowner Open House	Forsyth
October 25, 2022	Rosebud County Landowner Open House	Colstrip
October 25, 2022	Custer County Landowner Open House	Miles City
October 26, 2022	Fallon County Landowner Open House	Baker
April 29, 2024	Rosebud County Landowner Dinner	Colstrip
April 30, 2024	Rosebud County Public Information Breakfast	Colstrip
April 30, 2024	Custer County Landowner Dinner	Miles City
May 01, 2024	Custer County Public Information Breakfast	Miles City
May 01, 2024	Fallon County Landowner Dinner	Baker
May 02, 2024	Fallon County Public Information Breakfast	Baker
NORTH DAKOTA		
April 25, 2022	Golden Valley/Slope County Landowner Open House	Dickinson
April 25, 2022	Hettinger/Grant Landowner Open House	Mott
April 26, 2022	Oliver/Morton County Landowner Open House	St. Anthony
October 26, 2022	Golden Valley/ Slope County Landowner Open House	Amidon
October 27, 2022	Hettinger/Grant County Landowner Open House	Mott
October 27, 2022	Oliver/Morton County Landowner Open House	Mandan
April 15, 2024	Oliver/Morton County Landowner Dinner	Mandan
April 16, 2024	Oliver/Morton County Public Information Breakfast	New Salem
April 16, 2024	Hettinger County Landowner Dinner	Regent
April 17, 2024	Hettinger County Public Information Breakfast	Mott
April 17, 2024	Slope/Golden Valley County Landowner Dinner	Amidon
April 18, 2024	Slope/Golden Valley County Public Information Breakfast	Amidon
April 18, 2024	Grant County Landowner Dinner	Carson
April 19, 2024	Grant County Public Information Breakfast	Elgin

The open houses summarized in Table 2.10.2-1 played a crucial role in promoting transparency, fostering dialogue, and incorporating public input into the decision-making process.

North Plains is currently developing a mailing list of affected landowners, in accordance with 18 State Wildlife Action Plan CFR 380.16(c)(7).

3.0 ALTERNATIVES

3.1 ANALYSIS CRITERIA

This alternatives analysis includes discussions of the no-action alternative; alternative energy sources; energy efficiency and conservation; system alternatives; and route alternatives; and converter station site alternatives. For an alternative to be viable, it must meet the stated purpose of the Project , be technically practical and economically feasible, and provide a material environmental advantage over the proposal. If the alternative does not meet any one of these criteria, the alternative is either not viable or not preferable.

As stated in more detail in Section 2.3, the need for the Project stems from decreases in reliable generation capacity, rapid changes in the generation portfolio affecting reliability, and extreme weather events affecting grid resiliency. Thus, the purpose of the Project is to improve reliability by increasing transfer capacity between markets, to improve resiliency by tapping a mix of regional generation while utilizing dynamic voltage and frequency support services for greater flexibility, and to provide a system that can shift power quicky and efficiently to mitigate weather-driven outages. An alternative that does not meet the established purpose and needs would not be considered viable. A technically practical alternative is often one that uses common construction methods. An alternative that would require the use of a new, unique, or experimental construction method may not be technically practical because the required technology is not available or is unproven. Economically feasible alternatives are generally those alternatives that maintain the price competitive nature of the Project. An alternative that is not technically practical or economically feasible is not viable.

An analysis of the environmental impacts of an alternative is necessary to determine if the alternative provides a material environmental advantage over the proposed Project. This analysis compares impacts of the alternative routes and Proposed Route to a set list of resources such as acres of wetlands crossed and number of nearby residences. North Plains based the magnitude of impacts on common assumptions (e.g., the same right-of-way widths and workspace requirements). North Plains used publicly available desktop data such as geographic information systems (GIS) data and aerial imagery to ensure a fair and consistent comparison of alternatives to the Proposed Route. Field data may be used if it is available for both the alternative and the Proposed Route. Ultimately, an alternative that has a similar level of impact or has only minor advantages does not justify shifting the impacts from one area or landowner to another; therefore, alternatives that do not provide a material environmental advantage over the Proposed Route were not preferred or adopted.

3.2 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Project would not be approved or constructed, resulting in the inability to achieve the desired enhancements to grid reliability, resilience between service areas with different weather patterns, and cross-grid market access for electricity generators in the region. The existing transmission system in Montana and North Dakota would remain unchanged. The beneficial and adverse impacts associated with the Project would not occur. Other developers could propose and construct projects in the future to fill the need that would be satisfied by the Project. These other projects would require construction of new electric transmission line facilities in the same or other locations to connect the eastern and western grids and would result in their own set of impacts that would be less than, equal to, or greater than those associated with the Project. Those other projects are entirely speculative and are outside the scope of this analysis.

3.3 ENERGY EFFICIENCY AND CONSERVATION

Energy efficiency and conservation are often raised as alternatives to energy projects because they are perceived as a means of reducing or eliminating the need for a project. Energy efficiency and conservation do, in fact, play an important role in reducing energy demand in the United States. At the federal level, the Energy Policy Act of 2005 includes guidelines to diversify America’s energy supply, reduce dependence on foreign sources of energy, and increase residential and commercial energy efficiency and conservation such as the Energy Star Program, improve vehicular energy efficiency, and modernize domestic energy infrastructure. Several laws enacted since the Energy Policy Act of 2005 have enhanced the federal role in energy conservation and efficiency, including the Energy Independence and Security Act of 2007, the Energy Improvement and Extension Act of 2008, the American Recovery and Reinvestment Act of 2009, the Infrastructure Investment and

Jobs Act of 2021, and the Inflation Reduction Act of 2022. State-led initiatives also have contributed to or encouraged energy efficiency and conservation. For example, Montana has an energy efficiency and conservation block grant program and state-wide building codes that include measures for energy efficiency. Likewise, North Dakota has an energy conservation grant program and energy efficiency measures in its building codes. According to the EIA, utilities had efficiency programs that resulted in a savings of 28.2 billion kilowatt-hours in total annual electricity consumption in 2022 (EIA, 2024).

Although energy efficiency and conservation help alleviate some of the growing demand for energy in the United States, the federal and state energy initiatives are not expected to fully satisfy the increased demand for energy. The EIA reports that, despite efficiency and conservation efforts, electricity use in the United Stated is expected to increase by 17 percent by 2050 (EIA, 2023). The implementation and success of energy conservation and efficiency programs in curtailing energy use is a long-term goal requiring large-scale public education efforts, significant incentives, and government intervention extending well beyond the scope and timeframe of the Project. As such, energy efficiency or conservation is not considered a viable standalone alternative.

3.4 ALTERNATIVE ENERGY SOURCES

Electricity is essential to modern life and is used nationwide for lighting, heating, and cooling; and for operating equipment, such as computers, electronics, machinery, and automobiles, among other things. Usable electricity does not exist in nature as a raw fuel. Electricity must be derived from other energy sources, such as coal, natural gas, nuclear reactions, sunlight, wind, or water. These other energy sources are called primary energy sources. Primary energy sources are raw fuels that have not been converted by people into another type of energy, such as electricity.

Because electricity does not exist in nature as a raw fuel, electricity is considered a secondary energy source. Secondary energy sources move energy in a usable form from one place to another. For this reason, secondary energy sources are also called energy carriers. The most common examples of other secondary energy sources, or energy carriers, include refined fuels, such as gasoline, jet fuel, and propane; and synthetic fuels such as hydrogen. These energy sources are typically moved by pipelines, railcars, trucks, or tankers.

Part of the purpose of the Project is to move energy between the eastern and western electric grids to enhance reliability. While alternative energy sources could increase overall energy supply, they still rely on additional investments in infrastructure to move them from place to place, and therefore do not meet the purpose of the Project to improve transfer capacity or provide improved paths to shift power quickly and efficiently.

3.5 DESIGN ALTERNATIVES

Design alternatives are alternatives that would substantively change the design of the Project while still meeting the Project purpose and need. Design alternatives are often identified early in project planning or can sometimes are raised later by stakeholders or agency staff during their review of the Project. Because design alternatives are often radical, they frequently need to be evaluated for technical practicality and economic feasibility. As with other types of alternatives, a design alternative also needs to result in materially less environmental impact than the Proposed Route if it is to be adopted. This analysis considers two design alternatives: AC transmission in lieu of DC transmission and underground transmission in lieu of aboveground transmission.

3.5.1 AC Transmission in Lieu of DC Transmission

AC transmission technology can sometimes be a viable alternative to DC technology, subject to certain constraints, such as the need to connect to asynchronous grids or provide bidirectional flow. Both AC and DC transmission systems are designed to transmit electricity over long distances. One of the main benefits of AC technology is its widespread use and flexibility. Most electricity in the United States is generated, transmitted, and distributed as AC power. Therefore, AC transmission lines can more easily integrate into the existing infrastructure and accommodate future connections to other grids, power generators, and load centers along the system.

DC transmission technology is not as ubiquitous. It is generally used only in special applications, such as long-haul transmission, connecting asynchronous AC grids, or where bidirectional flow is necessary. For long-haul transmission, DC technology is generally considered to have several advantages. When compared to an AC line, a DC line is simpler in design, requires fewer materials, and operates with less power loss. However, DC transmission requires high-cost converter stations to connect to the AC grid. The additional cost of the converter stations can weigh against DC technology. Normally, a DC transmission line will need to be a few hundred miles long without interposing AC connections before achieving favorable economics. Notwithstanding cost, DC transmission lines may still be desirable because of technical advantages: they can more easily connect asynchronous grids and they can provide bidirectional flow.

Constructing an AC transmission line in lieu of a DC transmission line on the Project is notionally possible, although the design of the line would require more materials and infrastructure to provide the same capacity and operational characteristics. For example, an additional conductor would be required to be strung on the towers to achieve the same power transmission. This, in turn, would necessitate installing more robust towers, which also, in turn, may require more workspace. Overall, the economics of the additional materials and construction costs weigh against AC transmission technology for an approximately 400-mile-long line such as the Project. Further, one requirement of the Project is to provide bidirectional flow between the Eastern and Western Interconnection regions. Although AC transmission lines can theoretically provide bidirectional flow, managing such a system presents unique technical challenges that are still being addressed by ongoing research and development (Jordan, 2017). Hence, bidirectional power flow on an AC transmission line is presently not considered to be technically practicable.

3.5.2 Underground Transmission in Lieu of Aboveground Transmission

Underground transmission lines can, in some circumstances, be an alternative to aboveground transmission lines. Electric transmission lines are usually constructed above ground because aboveground lines are easier and cheaper to build, inspect, maintain, and repair. Transmission lines are typically only installed underground in visually sensitive areas or where there are obstacles that make aboveground construction exceptionally challenging. For these reasons, only about one-half of one percent of high-voltage transmission lines in the United States are underground (Xcel Energy, 2021).

Aboveground transmission lines are known for their efficiency in transmitting electrical power over long distances. Compared to underground transmission lines, the conductors used in aboveground transmission lines have lower resistance, resulting in fewer losses during transmission. This higher efficiency contributes to reduced energy waste, improved overall system performance, and lower operational costs. Underground conductors, on the other hand, have higher transmission losses than aboveground transmission lines due to the inherent resistance of the cable insulation and the additional cooling requirements. This leads to a decrease in overall system efficiency. However, the higher losses associated with underground conductors can sometimes be offset by using reduced line length due to shorter transmission distances and improved voltage regulation.

Aboveground transmission lines are known to be very reliable because of the ease of inspection, maintenance, and repair. Routine inspection of aboveground lines involves open air visual assessments of the conductors, insulators, and support structures. Maintenance, repair, and replacement can be carried out easily and quickly as the affected section can be isolated and repaired without significant downtime or operational disruptions in the transmission network. Underground transmission lines can also offer reliability by reducing susceptibility to weather-related damage and reducing risk of accidental contact. However, their reliability can be compromised due to faults caused by ground movement, water ingress, and insulation degradation over time. Damage to underground transmission lines is difficult to pinpoint. Repairs may take a few weeks to several months to complete and may potentially affect a wider area of the transmission network than similar work on aboveground transmission lines. Additional components associated with underground transmission lines, such as duct banks, vaults, splices, and terminations, can also reduce overall system reliability.

Aboveground transmission lines generally have a longer lifespan compared to underground transmission lines. With proper maintenance and occasional component replacements, aboveground transmission lines have a life expectancy of about 80 years (Xcel Energy, 2021). Moreover, the open nature of aboveground transmission lines allows for easier upgrades or modifications to accommodate changes in power demand or technological advancements. Underground transmission lines have a shorter lifespan compared to aboveground transmission lines due to factors such as insulation degradation over time. Environmental conditions, such as soil moisture and temperature, can also influence the lifespan of underground transmission lines. The average lifespan of an underground transmission line is estimated at about 50 years (Xcel Energy, 2021). Further, modifications and upgrades to underground transmission lines is more challenging and expensive than aboveground transmission lines, often requiring extensive excavation and replacement of cable sections.

Accidents involving aboveground transmission lines can pose risks to the public and maintenance personnel. Contact with live conductors can result in severe injuries or fatalities. However, the visibility of aboveground transmission lines is a deterrent, reducing the likelihood of accidental contact by providing a clear visual indication of their presence. Safety measures such as public awareness efforts, warning signs, and barriers help mitigate the risks associated with aboveground lines and associated equipment. In contrast, underground transmission lines eliminate the risk of accidental contact with live open-air conductors. The practice of burying conductors can enhance safety, especially in areas with high population density or where the transmission lines pass through residential neighborhoods. However, third-party excavation in the vicinity of underground lines presents a notable risk. Therefore, it is essential to implement effective warning systems and accurate cable mapping to prevent accidental damage during excavation.

The conductor and structural materials required for aboveground transmission are typically less complex, less expensive, and require less specialized equipment and labor than underground transmission lines to install. Underground cable material, such as insulated conductors and protective sheaths, are costlier, and a greater number of cables are often required to match the capacity of a similar aboveground circuit. The installation process for underground transmission lines is also costlier because it involves trenching and the need for specialized equipment, increasing labor and material costs, as well as longer and costlier land reclamation. An underground transmission line typically requires a continuous trench measuring at least 3 feet wide at the bottom and 5 feet deep, with a total surface disturbance area between 30 and 50 feet wide. An underground transmission line also requires large buried concrete splice vaults about every half mile with permanent operational access for maintenance and repair. As a result, the initial investment required for underground transmission lines is considerably, if not exponentially, higher than that of aboveground lines.

Some sources estimate the cost of constructing an underground transmission line is 10 to 15 times the cost of an aboveground transmission line due to time, materials, processes, the need to include transition substations, and the use of specialized labor (Xcel Energy, 2021). Other estimates place the cost at about seven times the cost of an aboveground line (EIA, 2018). Even advocates of underground HVDC transmission lines acknowledge that that the cost of installing underground transmission lines can be two to four times as much as aboveground transmission lines. As such, cost is often a leading factor in deciding if and where to bury a transmission line.

The environmental impacts of constructing and operating an aboveground transmission line are different than those for an underground transmission line. For example, an aboveground transmission line is typically considered to have greater impacts on birds, bats, and visual resources. Birds and bats are known to have collisions with transmission lines, which sometimes lead to injury or are fatal. An aboveground transmission line can also be a conspicuous feature in an otherwise natural landscape. Aboveground transmission lines, however, have lesser impacts on other resources, such as archaeological sites, paleontological sites, and certain wildlife habitat. This is because an aboveground transmission line can frequently span these resources with no physical intrusion, whereas an underground transmission line requires a continuous trench and buried splice vaults. Overall, aboveground transmission lines and underground transmission lines each have their own set of environmental advantages and disadvantages. Categorically selecting one design over another typically results in merely shifting environmental impacts from one set of resources to another.

Because of the lack of a clear, material environmental advantage to an underground transmission, and because of the reduced transmission efficiency and system performance; increased difficulty in repair and upgrade; risk of prolonged downtime in the event of an outage; overall shorter lifespan; and substantial additional cost, North Plains eliminated adopting underground transmission on a Project-wide basis as a viable alternative.

3.6 MAJOR ROUTE ALTERNATIVES

North Plains completed an engineering analysis and transmission line study to identify the most suitable means for connecting the Eastern and Western Interconnection regions of the U.S. electric grid. Based on this evaluation, North Plains determined the Project must connect the existing Colstrip Substation in Rosebud County, Montana to a new Oliver County Substation approximately 6 miles southeast of Center, North Dakota and a new Morton County Switchyard near St. Anthony, North Dakota. There are no other reasonable locations where connections could be made. The other nearest potential endpoint in Montana, the existing Broadview Substation in Yellowstone County, would add about 100 miles of transmission line to the Project. Similarly in North Dakota, the Project endpoints represent the most reasonable connection locations to existing infrastructure on the Eastern Interconnection grid without adding considerable length.

After establishing the Project endpoints, North Plains conducted routing studies to find a constructible route that meets the purpose of the Project, minimizes adverse environmental impacts, and meets applicable regulatory requirements. As part of this process, North Plains used routing software to develop an initial route between the Project endpoints. The routing software used publicly available GIS datasets that included routing opportunities and constraints, such as other utilities corridors, residential development, wildlife habitat, and cultural resources. After the initial software analysis, North Plains presented the preliminary route to affected landowners and federal, state, tribal, and local agencies/entities to obtain feedback. North Plains then adjusted and refined the route based on that feedback. Stakeholder meetings and feedback continued throughout 2021, 2022, and 2023, and the route continued to be refined as necessary.

Ultimately, North Plains identified its proposed route. As compared to alternative routes evaluated throughout this process, North Plains believes the proposed route best balances use of existing road and transmission line corridors while avoiding national and state parks; national historic landmarks and National Register of Historic Places-listed or -eligible archaeological sites; inventoried roadless areas; most major waterbodies; greater sage-grouse (GRSG) habitat; visually sensitive areas; congested utility corridors; and urban development. The following analysis describes the five major route alternatives evaluated during Project planning and compares each alternative to the proposed route. Figure 3.6-1 illustrates the proposed route and the route alternatives. Additional maps illustrating the proposed route relative to each alternative are provided in Appendix B.

- Northern Route Alternative (Rosebud, Custer, and Fallon counties, Montana)
- Central Route Alternative (Rosebud, Custer, and Fallon counties, Montana)
- Southern Route Alternative (Rosebud, Custer, and Fallon counties, Montana)
- Tongue River Route Alternative (Custer County, Montana)
- Eastern Route Alternative (Slope, Stark, Morton, and Oliver counties, North Dakota)

3.6.1 Proposed Route

One of North Plains' main goals in developing its proposed route in Montana was to minimize the fragmentation of GRSG General Habitat Management Areas in accordance with the BLM's Miles City Field Office Approved Resource Management Plan. Another main goal was to avoid overly congested utility corridors. Although one of the benefits of paralleling existing infrastructure can be that it minimizes impacts on sensitive resources; paralleling a congested corridor can create safety hazards and greatly complicate construction and operation of new facilities. Further, the existing infrastructure has typically already used the most desirable terrain, leaving obstructions and sensitive resources that cannot be avoided without diverting from the corridor. While a corridor defined by one existing road or utility can be advantageous, a corridor with multiple roads and/or utilities often is not.

As depicted in Figure 3.6-1, North Plains' proposed route begins near Colstrip and heads in a northeast direction alternating north and east along parcel boundaries until near Rosebud Creek. From there, the route continues east and then eventually heads straight north along the Custer and Rosebud County lines to Graveyard Creek Road. From there, the route heads east where it skirts within the southern boundary of the USDA-ARS Fort Keogh Agricultural Research

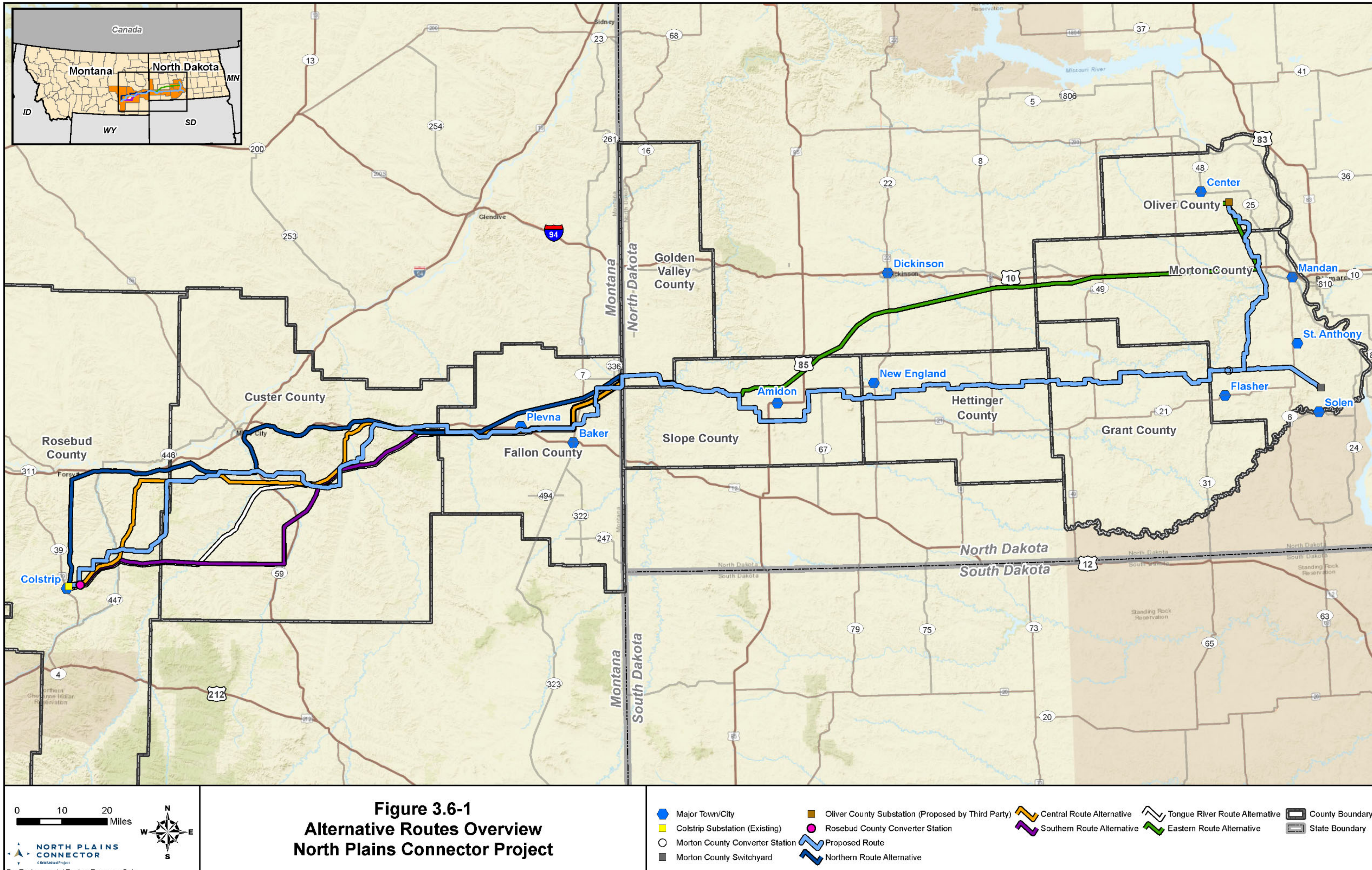


Figure 3.6-1
Alternative Routes Overview
North Plains Connector Project

Station (Fort Keogh) until the southeast corner. From the southeast corner of the Fort Keogh boundary, near the confluence of the Tongue River and Pumpkin Creek, the route continues east until near the Powder River where it turns north towards U.S. Highway 12. From there, the route generally parallels U.S. Highway 12 and an existing transmission line eastward, reaching a point approximately 3 miles north of Baker. The route then heads northeast of Baker in an alternating north and east direction generally along parcel boundaries until the Montana-North Dakota state line.

North Plain's proposed route minimizes fragmentation of GRSG General Habitat Management Areas and avoids GRSG No Surface Occupancy Zones. The proposed route also parallels existing roads and transmission lines where possible to facilitate easier access during construction and operations and to minimize environmental impacts. However, it avoids several constraints associated with the Yellowstone River as well as avoids paralleling several other river and creek corridors, congested utility corridors, and urban development areas.

3.6.2 Northern Route Alternative

North Plains developed the Northern Route based on a recommendation from the BLM to maximize co-location with existing linear utilities near Interstate 94 and to minimize routing within the GRSG General Habitat Management Area in accordance with the BLM's Miles City Field Office Approved Resource Management Plan. The Northern Route Alternative is the only alternative based solely on the recommendation of an agency and not derived from the initial routing software analysis.

Northern Route Alternative diverges from the proposed route at the Colstrip Substation at milepost 0.0 where it heads straight north out of Colstrip directly toward Interstate 94. Once near Interstate 94 at Forsyth, the route parallels the interstate highway, the Yellowstone River, and existing linear utilities such as transmission lines, natural gas pipelines, and fiber optic lines until it reaches the boundary of Fort Keogh. Once near Fort Keogh, the route diverges from Interstate 94 to avoid bisecting Fort Keogh but does encroach into Fort Keogh on its southern boundary. From Fort Keogh, near the confluence of the Tongue River and Pumpkin Creek, the route begins to parallel U.S. Highway 59 and the Tongue River and travels north-northwest to Miles City. Here the route parallels Interstate 94 and abuts the eastern side of Miles City and then heads east and parallels U.S. Highway 12 and an existing transmission line to roughly 9 miles west of Plevna. At this point, the route deviates from existing linear utilities and major roads to head straight northeast to the Montana-North Dakota state line where it joins back up with the proposed route at the state line at milepost 171.7.

A comparison of the Northern Route Alternative to the Proposed Route indicates that they are similar in that they both cross only one railroad and neither crosses USFS-administered land, GRSG core habitat, nor conservation lands/easements.

The benefits of the Northern Route Alternative are that it is 8.5 miles shorter than the Proposed Route and crosses 4.0 miles less BLM-administered land, 7.7 miles less state-owned land, 19.2 miles less open land and pasture, 2 fewer perennial waterbodies, 37.7 miles less GRSG general habitat, and 14.4 miles less land within 2.0 miles of a GRSG lek.

The drawbacks of the Northern Route Alternative are that it crosses 2.8 miles more of USDA-ARS-administered land (Fort Keogh), 0.7 mile more private land, 9.7 miles more agricultural land, 1.3 miles more forested land, 21.6 miles more prime farmland soils, 0.1 mile more forested wetland, and 0.4 mile more non-forested wetland. The Northern Route Alternative also crosses

24 more intermittent/ephemeral waterbodies, 1.0 mile more land within 0.25 mile of a GRSG no surface occupancy zone, and 0.4 mile more BLM-administered Visual Resources Management (VRM) Class II land. Further, the Northern Route Alternative is within 1.0 mile of 59 more cultural resources sites; is within 0.5 mile of 1 designated recreation areas (Strawberry Hill Recreation Area); and crosses 2 more highways, 14 more county and local roads, and 9 more transmission lines.

The Northern Route Alternative is particularly challenging because, as it extends north out of Colstrip, it crosses several parcels with underlying energy easements that would conflict with siting an electric transmission line, which could make obtaining the required easements difficult. Further, routing the transmission line along Interstate 94 is challenging due to the presence of developed areas associated with Interstate 94 along with the natural environment of the Yellowstone River. The mixture of utility infrastructure, populated areas, agricultural regions, cultural and tribal resources, land easements, public land, as well as concerns about sensitive species and environmental conservation, present additional obstacles. In fact, the Yellowstone River Valley plays a vital role in regional agriculture practices, leading to congestion of farmsteads, residences, and concerns from landowners about pole placement within agricultural fields, especially those fields with irrigation. The Yellowstone River itself contains numerous occurrences of sensitive species, including bats, fish, and eagles, as well as sensitive riparian habitats. Increased tribal and cultural concerns associated with the Yellowstone River were also factors that influenced the decision to exclude the route from further consideration.

Fort Keogh, spanning 55,000 acres, serves as a USDA-ARS rangeland beef cattle research center. The center is situated on both sides of the Yellowstone River. Routing the transmission line along the southern boundary of Fort Keogh, avoiding all but the very edge of the property, would involve following the course of the Tongue River to align with Interstate 94. However, this introduces challenges like those encountered with the Yellowstone River. The Tongue River, like the Yellowstone River, comprises a blend of human development and natural environment components that present challenges for the transmission line route. The Tongue River corridor is characterized by a mix of utility infrastructure, populated areas, agricultural zones, cultural and tribal resources, and sensitive wildlife concerns areas. Following this part of the Tongue River would entail navigating through areas with linear infrastructure such as roads, canals, and transmission lines. Moreover, the corridor encompasses residences, farmsteads, and towns, posing obstacles to the route. Urban development areas, particularly near Miles City, would present challenges like those encountered along Interstate 94. Further, the Tongue River hosts sensitive species occurrences and sensitive riparian habitats. Preserving the ecological balance and integrity of these habitats is paramount, adding an additional layer of complexity to the route design. The Tongue River corridor also holds areas of cultural and tribal significance, which necessitates careful consideration and respect for the associated resources and concerns. Incidentally, the Proposed Route also follows the south boundary of Fort Keogh and Tongue River through this area and encounters similar constraints, although to a lesser extent.

The Northern Route Alternative navigates the eastern boundary of Miles City to bypass routing through the town itself. As the route skirts along the east side of Miles City, it traverses through a varied landscape that includes a mix of existing utilities, roads, and residences. By avoiding a direct route through the town, the Proposed Route minimizes impacts to the natural environment while also recognizing the existing built environment and community investments.

Past Miles City, the route alternative diverges from Interstate 94 and instead travels east along U.S. Highway 12. This decision was driven by the challenges associated with crossing populated areas like Glendive, Wibaux, Beach, and Medora and recreation areas like Makoshika State Park and Theodore Roosevelt National Park along the interstate. Cultural resources are also known to be present in the vicinity based on a review of state records. Despite avoiding these areas, the alternative route within the shared U.S. Highway 12 and existing transmission line corridor east of Miles City also has challenges. The corridor contains a mix of subdivisions, utility infrastructure, and recreation areas. On the north side of the highway, approximately 6 miles east of Miles City, is within 0.5 mile of the BLM-managed Strawberry Hill Recreation Area near the alternative route.

Considering all the above-listed factors, North Plains determined that the Northern Route Alternative does not offer a material environmental benefit over the Proposed Route and, therefore, North Plains dismissed the Northern Route Alternative from further consideration.

3.6.3 Central Route Alternative

North Plains designed the Central Route Alternative to strategically avoid the challenges associated with the Yellowstone River valley, congested highway corridors, and urban development areas near Miles City. The Central Route Alternative maintains a generally central alignment between the Northern Route Alternative and the Southern Route Alternative. While not directly parallel to Interstate 94, the Central Route Alternative aims to strike a balance by incorporating stakeholder feedback associated with co-location and integrating elements from the initial software analysis route.

The Central Route Alternative diverges from the Proposed Route near the Colstrip Substation near milepost 0.0 and initially heads northeast from Colstrip before diverting north near Rosebud Creek to avoid the underlying energy easements north of Colstrip and align more closely with Interstate 94. Although the Central Route Alternative avoids the easements north of Colstrip, it crosses conservation easements to conserve, protect, and enhance native wildlife habitat. As the Central Route Alternative nears Interstate 94, it veers straight east, skirting just south of Fort Keogh. The Central Route Alternative crosses the Tongue River just south of 12 Mile Dam, which is a state fishing access site and campground. This area also contains subdivisions for residential development and irrigated cropland. Continuing east, the Central Route Alternative skirts north of the Pumpkin Creek Ranch Recreation Area along the Tongue River Road. From there, the Central Route Alternative heads north just west of the Powder River before paralleling U.S. Highway 12 and an existing transmission line eastward, reaching a point approximately 3 miles north of Baker. The Central Route Alternative then begins to run parallel to Montana Highway 7 north of Baker before deviating from the highway to proceed straight northeast toward the Montana-North Dakota state line where it joins back up with the Proposed Route at the state line at milepost 171.7.

A comparison of the Central Route Alternative to the Proposed Route indicates that they are similar in that they both cross only one railroad and neither cross USFS-administered land, forested wetlands, or GRSG core habitat. Further, neither route is within 0.25 mile of a GRSG no occupancy zone or is within 0.5 miles of a designated recreation area.

The benefits of the Central Route Alternative are that it is 17.8 miles shorter than the Proposed Route and does not cross USDA-ARS-administered land. The Central Route Alternative also crosses 16.9 miles less private land, 0.2 mile less agricultural land, 14.0 mile less open land and pasture, 3.2 miles less forested land, and 13.5 miles less GRSG general habitat. Further, the Central Route Alternative crosses 1 fewer perennial waterbody, 13 fewer intermittent/ephemeral waterbodies, 2 fewer highways, and 6 fewer transmission lines.

The drawbacks of the Central Route Alternative are that it crosses 4.7 miles more BLM-administered land, 2.5 miles more state-owned land, 1.2 miles more prime farmland soils, 7.2 miles more land within 2.0 miles of a GRSG lek, 0.4 mile more BLM VRM Class II land, and is within 1.0 mile of 22 more cultural resources sites. The alternative route also crosses one more conservation land/easement, and six more county and local roads.

The Central Route Alternative from Colstrip to U.S. Highway 12 generally travels open country with limited opportunities to parallel with other linear infrastructure. The Central Route Alternative does, however, parallel Severson Road 538 for approximately 10 miles and Butte Creek Road for approximately 3 miles. The Central Route Alternative avoids the GRSG No Surface Occupancy Zone; however, the Central Route Alternative crosses 7.2 miles more land within 2 miles of an active lek.

North Plains ultimately dismissed the Central Route Alternative from further consideration due to a combination of particularly challenging constraints, with two main reasons leading to the route Central Route Alternative's dismissal. First, the presence of conservation easements northeast of Colstrip presented a barrier. The conservation easements feature terms that are incompatible with the construction of a transmission line, rendering a block of land north of Butte Creek Road and west of Sweeney Creek Road inappropriate for the route. Second, crossing the Tongue River near 12 Mile Dam (a heavily used recreational area for fishing and camping about 0.6 mile to the north), existing residential development, and an abundance of irrigated cropland also weighed against the Central Route Alternative as a viable option.

Considering all the above-listed factors, North Plains determined that the Central Route Alternative does not offer a material environmental benefit over the Proposed Route and, therefore, the Central Route Alternative was dismissed from further consideration.

3.6.4 Southern Route Alternative

North Plains designed the Southern Route Alternative to take advantage of the gentler topography east of Colstrip compared to the other routes that either head straight north of Colstrip (the Northern Route Alternative) or head north or northeast past Rosebud Creek (the Central Route Alternative and the Proposed Route).

The Southern Route Alternative diverges from the Proposed Route near the Colstrip Substation near milepost 0.0. To achieve a route that benefits from the gentler topography in the region (e.g., reduced cost, increased safety, and smaller footprint), North Plains designed the Southern Route Alternative to head northeast out of Colstrip similar to the Central Route Alternative and the Proposed Route, but then diverge near Rosebud Creek and heading straight east to Pumpkin Creek and Montana Highway 59. From there, the Southern Route Alternative heads north generally parallel to Pumpkin Creek and Montana Highway 59 until it deviates northeast towards U.S. Highway 12 where it parallels the highway and an existing transmission line eastward, reaching a point approximately 3 miles north of Baker. The Southern Route Alternative then begins to run parallel to Montana Highway 7 north of Baker before deviating from the highway to proceed straight northeast toward the Montana-North Dakota state line where it joins back up with the Proposed Route at the state line at milepost 171.7.

A comparison of the Southern Route Alternative to the Proposed Route indicates that they are similar in that they both cross only one railroad and neither cross USFS-administered land, forested wetlands, or GRSG core habitat. Further, neither route is within 0.5 miles of a designated recreation area.

The benefits of the Southern Route Alternative are that it is 25.1 miles shorter than the Proposed Route and does not cross USDA-ARS-administered land. The Southern Route Alternative also crosses 3.0 miles less state-owned land, 14.1 miles less private land, 25.0 miles less open land and pasture, 0.2 mile less forested land, 26.2 miles less GRSG general habitat, and 6.2 miles less land within 2.0 miles of a GRSG lek. Further, Southern Route Alternative crosses 1 fewer perennial waterbody, 26 fewer intermittent/ephemeral waterbodies, 2 fewer highways, and 6 fewer transmission lines.

The drawbacks of the Southern Route Alternative are that it crosses 0.2 mile more BLM-administered land, 1.2 miles more agricultural land, 2.9 miles more prime farmland soils, 0.3 mile more non-forested wetlands, and 0.4 mile more land within 0.25 mile of a GRSG no occupancy zone. The Southern Route Alternative also crosses 1.5 mile more BLM VRM Class II land, is within 1.0 mile of 54 more cultural resource sites, crosses 2 more conservation lands/easement, and crosses 33 more county and local roads.

The segment of the Southern Route Alternative between Colstrip and U.S. Highway 12 predominantly traverses open country characterized by limited opportunities for parallel alignment with existing linear features. Nonetheless, the Southern Route Alternative does parallel Cherry Creek Road for approximately 7 miles and briefly aligns with several other roadways for shorter distances.

Initially, North Plains considered a portion of the Southern Route Alternative that more closely followed Montana Highway 59 along Pumpkin Creek. However, North Plains dismissed this portion of the Southern Route Alternative from consideration due to constraints including the increased likelihood of potential impacts to tribal and cultural resources and sensitive species, as these resources are generally found at high densities near rivers and streams. Setbacks to residences and farms located along the highway also further reduce the routing options and parallel opportunities along Montana Highway 59.

North Plains ultimately dismissed the Southern Route Alternative from consideration due to constraints such as adjacency to BLM Class II VRM parcels near the Tongue River, Pumpkin Creek, and east of the Powder River in Custer County, Montana, which limits development that would degrade the viewshed in these areas. There are also accessibility constraints east of the Powder River that would require engineered roadways and long access roads, which would increase the Project impacts during construction and operation. Further, the Southern Route Alternative passes through an area known to have more cultural resources sites than the Proposed Route and passes within 0.25 mile of GRSG No Surface Occupancy Zone whereas the Proposed Route does not.

Considering all the above-listed factors, North Plains determined that the Southern Route Alternative does not offer a material environmental benefit over the Proposed Route and, therefore, North Plains dismissed the Southern Route Alternative from further consideration.

3.6.5 Tongue River Route Alternative

The Tongue River Route Alternative is essentially a derivative of the Southern Route Alternative that passes through the Tongue River Valley.

The Tongue River Alternative begins at milepost 0.0 then follows the Southern Route Alternative until diverges to the north near the Tongue River and Tongue River Road where it begins to parallel both the road and the river northeast. Once the Tongue River Route Alternative nears the west side of Pumpkin Creek Ranch Recreation Area, it turns east near the confluence of Pumpkin Creek and Tongue River. From there, the Tongue River Route Alternative continues east and crosses Montana Highway 59, then parallels Road 538 before merging back with Southern Route Alternative and then eventually joins back up with the Proposed Route at the Montana-North Dakota state line at milepost 171.7.

A comparison of the Tongue River Route Alternative to the Proposed Route indicates that they are similar in that they both cross only one railroad and neither cross USFS-administered land, forested wetlands, or GRSG core habitat. Further, neither route is within 0.25 mile of a GRSG no occupancy zone or is within 0.5 miles of a designated recreation area.

The benefits of the Tongue River Route Alternative are that it is 29.8 miles shorter than the Proposed Route and does not cross USDA-ARS-administered land. The Tongue River Route Alternative also crosses 4.6 miles less state-owned land, 20.0 miles less private land, 31.1 miles less open land and pasture, and 2.2 miles less forested land. Further, Tongue River Route Alternative crosses 1 fewer perennial waterbody, 21 fewer intermittent/ephemeral waterbodies, 49.3 miles less GRSG general habitat, 6.2 miles less land within 2.0 miles of a GRSG lek, 2 fewer highways, and 4 fewer transmission lines.

The drawbacks of the Tongue River Route Alternative are that it crosses 3.0 mile more BLM-administered land, 2.1 miles more agricultural land, and 4.3 miles more prime farmland soils. The Tongue River Route Alternative also crosses 5.3 miles more BLM VRM Class II land, is within 1.0 mile of 110 more cultural resource sites, crosses 2 more conservation lands/easement, and crosses 40 more county and local roads.

Routing the transmission line within the Tongue River Valley proved challenging due to a combination of factors. The presence of the built environment and developed areas associated with highway, along with the natural environment of the river, added complexity to the route. The mixture of residences, farmsteads, agricultural regions, canals, utilities, cultural and tribal resources, public land, as well as concerns about sensitive species and environmental conservation, presented substantial obstacles. During discussions of the Project with various agencies, agency staff indicated to North Plains the presence of several tribal resources and protected species concerns related to nearby prairie dog towns along the Tongue River that had been identified during siting surveys for another project that was never built due to environmental conflicts and controversy. Agency staff noted that it would be difficult to avoid these sensitive areas. As a result, agency staff recommended that North Plains consider an adjustment to the route that followed another path north, such as along Montana Highway 59 near Pumpkin Creek. This recommendation was incorporated into the development of the Southern Route Alternative.

Considering all the above-listed factors, North Plains determined that the Tongue River Route Alternative does not offer a material environmental benefit over the Proposed Route and, therefore, North Plains dismissed the Tongue River Route Alternative from further consideration.

3.6.6 Eastern Route Alternative

North Plains developed the Eastern Route Alternative prior to the addition of the Morton Transmission Line to the Project scope and objectives. Therefore, the Eastern Route Alternative did not consider the designated SPP interconnection near St. Anthony. The primary considerations for the Eastern Route Alternative design were aligning with existing linear utilities, paralleling Interstate 94, direct routes, adhering to the recommendation provided by the USFS to cross the Little Missouri River on private lands, and avoidance of designated GRSG primary range per the North Dakota Game and Fish Department.

The Eastern Route Alternative diverges from the Proposed Route at milepost 200.4 in North Dakota. To achieve a route that combines all the primary considerations, the Eastern Route Alternative heads slightly northeast and east from the North Dakota-Montana state line before it heads southwest to cross the Little Missouri River and generally east through the North Dakota badlands. Once near U.S. Highway 85, the Eastern Route Alternative generally heads northeast and stays south of Dickinson and the Dickinson Theodore Roosevelt Regional Airport. Once it reaches Interstate 94 near Richardton, the Eastern Route Alternative diverges from the transmission line and begins to parallel both Interstate 94 and U.S. Highway 10 and some existing transmission lines. Once the Eastern Route Alternative heads north toward the Center Substation, it parallels an existing transmission line to its terminus near the Oliver County Substation. The Eastern Route Alternative is approximately 169 miles long.

A comparative analysis of the two routes is misleading because the alternative route is not capable of serving both endpoints in North Dakota. As explained above, the Eastern Route Alternative was developed prior to the addition of the Morton County Switchyard. The Eastern Route Alternative would need to be extended to the switchyard to be considered viable. Even if the Eastern Route Alternative were to be extended, it would be dismissed because it poses serious challenges and limitations on the eastern third of the route where it parallels Interstate 94 and Highway 10. This area contains a large concentration of farmsteads and residential properties, making routing exceptionally challenging. Furthermore, where the Eastern Route Alternative follows the existing transmission line, the route is constrained by existing landowner easements and agreements that are not compatible. The mixture of small towns, residences, farmsteads, and utility infrastructure present obstacles. North Plains dismissed the Eastern Route Alternative for these reasons.

3.7 MINOR ROUTE VARIATIONS

During project planning, North Plains incorporated many minor route variations into its Proposed Route. Minor route variations are different from major route alternatives in that they are usually shorter and are often designed to accommodate a particular landowner request on their property or to avoid a site-specific environmental resource or engineering constraint. Minor route variations also typically remain within the same area as the Proposed Route. Examples of route variations include realigning the route from the center of a cultivated field to its edge to minimize disruption to agricultural activities; moving a structure location a few hundred feet in one direction or another to avoid placing it in a wetland; and adjusting the centerline alignment along a slope to improve constructability.

3.8 CONVERTER STATION ALTERNATIVES

As discussed in Section 3.2, North Plains determined the Project must connect the existing Colstrip Substation in Rosebud County, Montana to a new Oliver County Substation approximately 6 miles southeast of Center, North Dakota and a new Morton County Switchyard near St. Anthony, North Dakota. There are no other reasonable locations where connections could be made while meeting the Project objectives. The other nearest potential endpoint in Montana, the existing Broadview Substation in Yellowstone County, would add about 100 miles of transmission line to the Project. Similarly in North Dakota, the Project endpoints represent the most reasonable connection locations to existing infrastructure on the Eastern Interconnection grid without adding considerable length. For these reasons, North Plains did not evaluate any alternatives for the substations or switchyard.

North Plains will construct two converter stations near the Project endpoints. One converter station will be near the Colstrip Substation in Montana and the other will be between the Oliver County Substation and Morton County Switchyard in North Dakota. The siting of converter stations is constrained insofar as the stations need to be located near the Project endpoints and they must occur along the transmission line route. A converter station site that is not on the proposed transmission line route necessitates proposing a new transmission line route. North Plains is in the process of evaluating alternatives to its proposed converter station sites. Finding suitable sites is exceedingly difficult. In Montana, rugged terrain, industrial development, and underlying energy easements in the proximity of the Colstrip Substation are difficult factors to overcome. In North Dakota, landowner approval has been a restrictive factor. Currently, North Plains has not identified any reasonable alternatives to its converter station sites.

4.0 POTENTIALLY AFFECTED RESOURCES

Construction and/or operation of the Project are expected to affect a number of resources. A number of these resources will likely experience more substantial impacts and/or require specialized knowledge in carrying out the MEPA/NEPA analysis, including land use, special status species, cultural resources, and visual resources (specifically BLM VRM Class II Areas). A list of potentially affected resources is included in Appendix C.

5.0 REFERENCES

American Society of Civil Engineers. 2021. *2021 Report Card for America's Infrastructure*. Available online at: https://infrastructurereportcard.org/. Accessed February 2024.

Energy Information Administration (EIA). 2018. *Assessing HVDC Transmission for Impacts of Non-Dispatchable Generation*. Available online at: https://www.eia.gov/analysis/studies/electricity/hvdctransmission/pdf/transmission.pdf.Accessed May 2024.

EIA. 2023. *Annual Energy Outlook 2023*. Available online at: https://www.eia.gov/outlooks/aeo/. Accessed February 2024.

EIA. 2024. *Use of energy explained. Energy efficiency and conservation*. Available online at: https://www.eia.gov/energyexplained/use-of-energy/efficiency-and-conservation.php. Accessed May 2024.

Jordan, Arthur. 2017. *EE Power: The Benefits of Bi-Directional Power Design.* Available online at: https://eepower.com/technical-articles/the-benefits-of-bi-directional-power-design/. Accessed May 2024.

Midcontinent Independent System Operator, Inc. (MISO). 2023. *MISO Futures Report Series 1A*. Available online at: https://cdn.misoenergy.org/Series1A_Futures_Report630735.pdf. Accessed June 2023.

North American Electric Reliability Corporation. 2022. *2022 Summer Reliability Assessment*. Available online at: https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SRA_2022.pdf. Accessed February 2024.

Northwest Power and Conservation Council. 2019. *Pacific Northwest Power Supply Adequacy Assessment for 2024*. Council Document Number: 2019-11. Published October 31, 2019. Available online at: https://www.nwcouncil.org/reports/pacific-northwest-power-supply-adequacy-assessment-2024/#:~:text=Every%20year%2C%20the%20Council%20assesses%20resource%20adequacy%20five,retirement%20of%201%2C619%20megawatts%20of%20coal-fired%20generating%20capacity.

Oregon Office of the Governor. 2020. *Executive Order 20-04: Directing State Agencies to Take Actions to Reduce and Regulate Greenhouse Gas Emissions.* Available online at: https://www.oregon.gov/gov/eo/eo_20-04.pdf. Accessed July 2024.

Southwest Power Pool (SPP). 2023. *2023 Loss of Load Expectation Scope. SPP Resource Adequacy*. Available online at: https://www.spp.org/documents/68726/2023%20spp%20lole%20study%20scope.pdf. Accessed June 2024.

Texas Comptroller. 2021. *Winter Storm Uri 2021, The Economic Impact of the Storm*. Available online at: https://comptroller.texas.gov/economy/fiscal-notes/archive/2021/oct/winter-storm-impact.php. Accessed February 2024.

Texas Department of State Health Services. 2021. *February 2021 Winter Storm-Related Deaths – Texas.* Available online at: https://www.dshs.texas.gov/sites/default/files/news/updates/SMOC_FebWinterStorm_MortalitySurvReport_12-30-21.pdf. Accessed February 2024.

U.S. Department of Energy (DOE). 2023. *National Transmission Needs Study Draft for Public Comment*.

DOE Grid Deployment Office. 2023. *National Transmission Needs Study*. Available online at: https://www.energy.gov/gdo/national-transmission-needs-study. Accessed February 2024.

Washington Department of Ecology. 2024. *Greenhouse Gases.* Available online at: https://ecology.wa.gov/air-climate/reducing-greenhouse-gas-emissions/tracking-greenhouse-gases. Accessed July 2024.

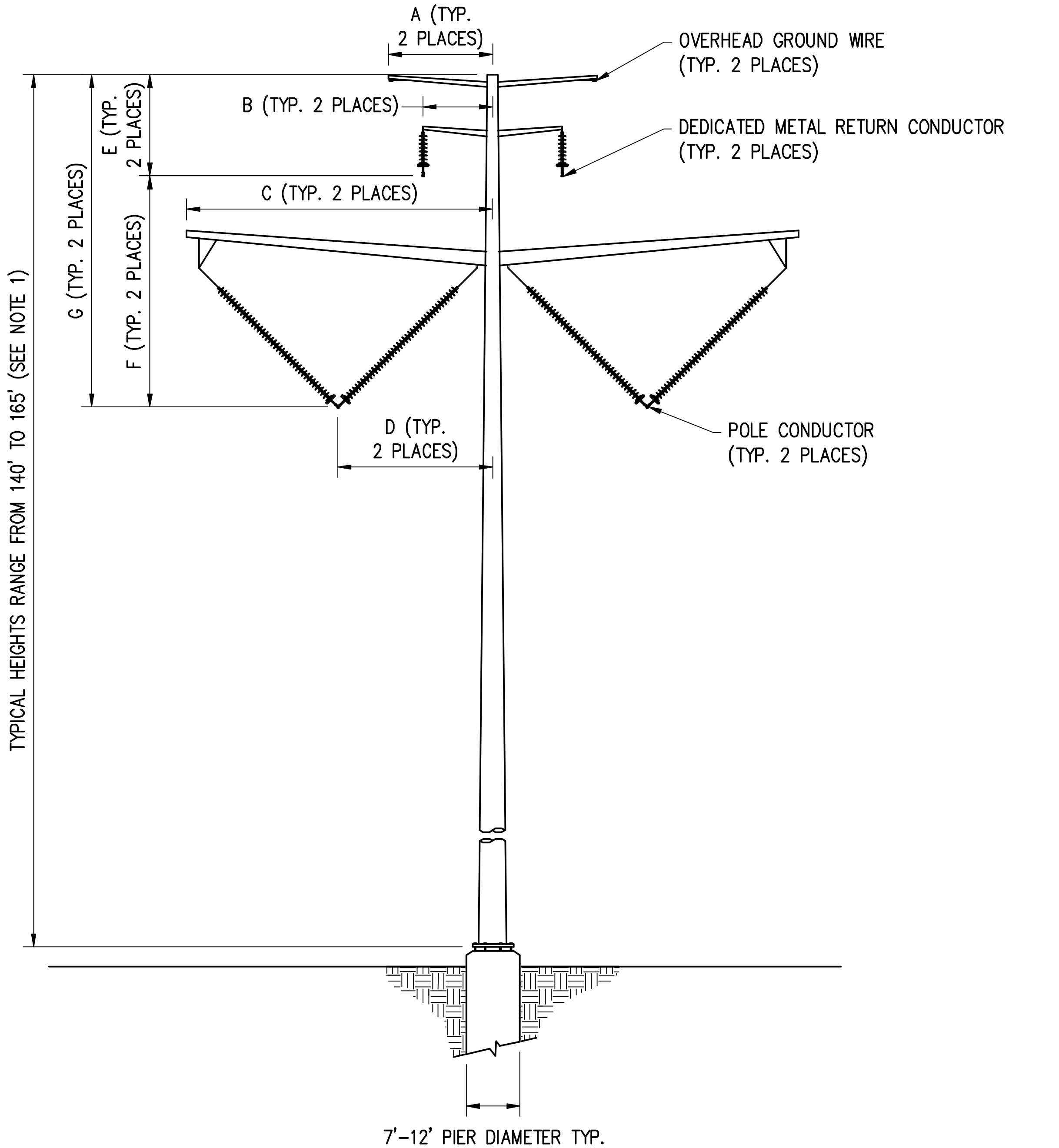
Xcel Energy. 2021. *Overhead vs. Underground Information About Burying High-Voltage Transmission Lines*. Available online at: https://www.transmission.xcelenergy.com/staticfiles/microsites/Transmission/Files/PDF/Projects/CO/Avery/Transmission-CO-Avery-Substation-Overhead-Vs-Underground-Info-Sheet.pdf. Accessed May 2024.

NORTH PLAINS CONNECTOR PROJECT

APPENDIX A

Preliminary Transmission Line Typical Figures

Figure A-1. 525-kV HVDC Transmission Line - Tangent Monopole Structure



Dimension	Description	Range (ft)
A	OPGW Horizontal Offset from Structure Centerline	15-25
B	Dedicated Metal Return Conductor Horizontal Offset from Structure Centerline	10-20
C	Pole Conductor Support Arm Length from Structure Centerline	40-50
D	Pole Conductor Horizontal Offset from Structure Centerline	20-30
E	OPGW / Dedicated Metal Return Conductor Vertical Separation at Structure	10-20
F	Dedicated Metal Return Conductor / Pole Conductor Vertical Separation at Structure	30-40
G	OPGW / Pole Conductor Vertical Separation at Structure	40-50

NOTES:

1. MOST STRUCTURE HEIGHTS RANGE FROM 140' TO 165'. HOWEVER, ANTICIPATED STRUCTURE HEIGHTS CAN BE AS LOW AS 100' OR AS HIGH AS 195'.

DISCLAIMER: FINAL FRAMING DIMENSIONS SUBJECT TO CHANGE PENDING DETAILED ENGINEERING.

ISSUED FOR REVIEW

"Engineering with Distinction"
ECI ELECTRICAL CONSULTANTS, INC. BILLINGS MONTANA

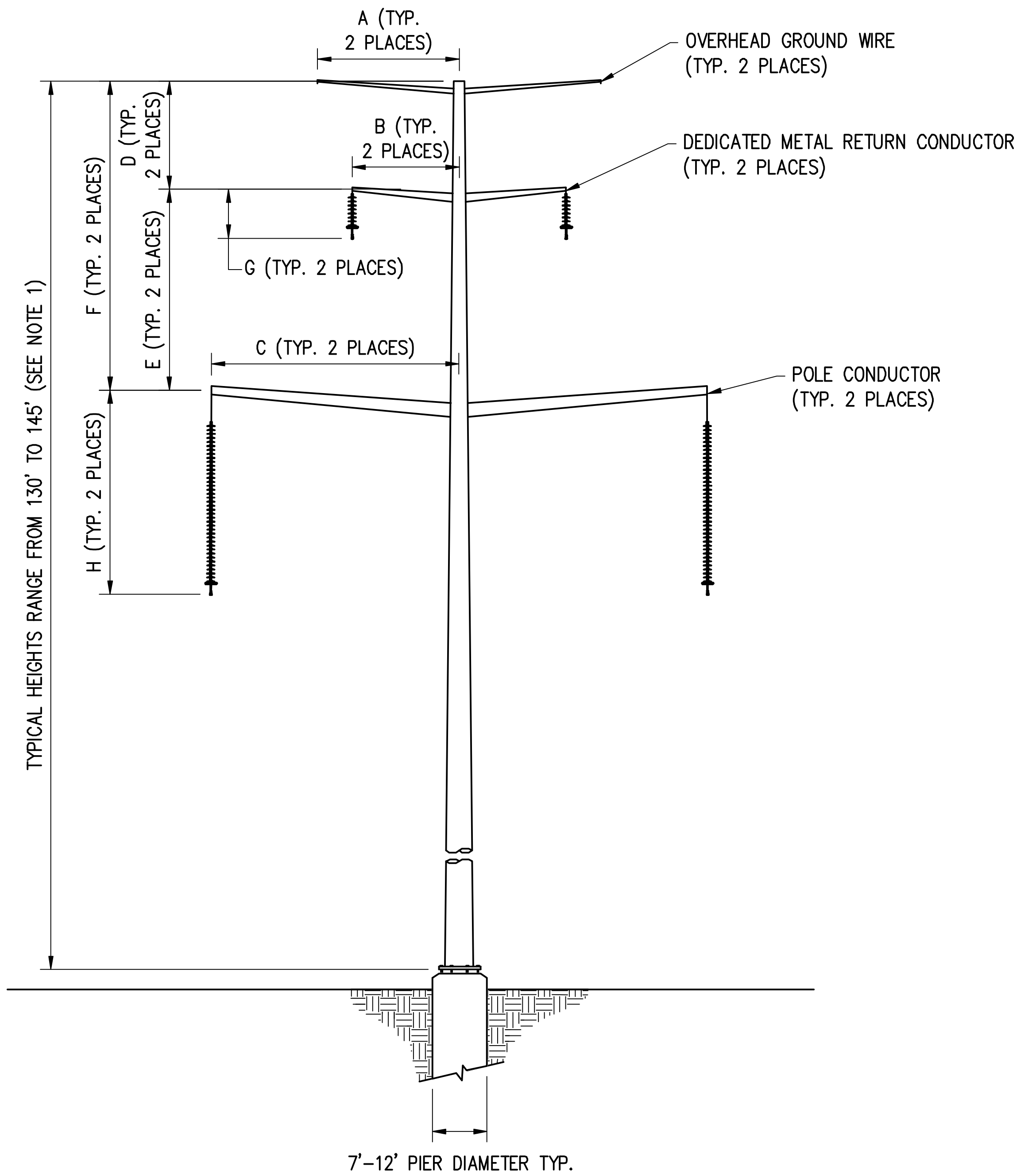
GRID UNITED

ENGINEERING RECORD		DATE
DRAWN	C. ELLIS	06/06/24
DESIGNED	S. REED	06/06/24
CHECKED	B. MATTHIES	06/06/24
APPROVED	M. HEIKENS	06/06/24
DWG SCALE: NTS	PLT SCALE: 1:1	

NORTH PLAINS CONNECTOR
SELF SUPPORTING STEEL MONOPOLE
TYPICAL +/- 525kV HVDC TANGENT

DWG. NAME: NPC-A-T009-501 | REVISION NO: D

Figure A-2. 525-kV HVDC Transmission Line - Deadend Monopole Structure



Dimension	Description	Range (ft)
A	OPGW Horizontal Offset from Structure Centerline	15-25
B	Dedicated Metal Return Conductor Horizontal Offset from Structure Centerline	10-20
C	Pole Conductor Horizontal Offset from Structure Centerline	20-30
D	OPGW / Dedicated Metal Return Conductor Vertical Separation at Structure	10-20
E	Dedicated Metal Return Conductor / Pole Conductor Vertical Separation at Structure	30-40
F	OPGW / Pole Conductor Vertical Separation at Structure	40-50
G	Dedicated Metal Return Conductor Jumper String Length	5-10
H	Pole Conductor Jumper String Length	25-30

NOTES:

1. MOST STRUCTURE HEIGHTS RANGE FROM 130' TO 145'. HOWEVER, ANTICIPATED STRUCTURE HEIGHTS CAN BE AS LOW AS 120' OR AS HIGH AS 195'.

DISCLAIMER: FINAL FRAMING DIMENSIONS SUBJECT TO CHANGE PENDING DETAILED ENGINEERING.

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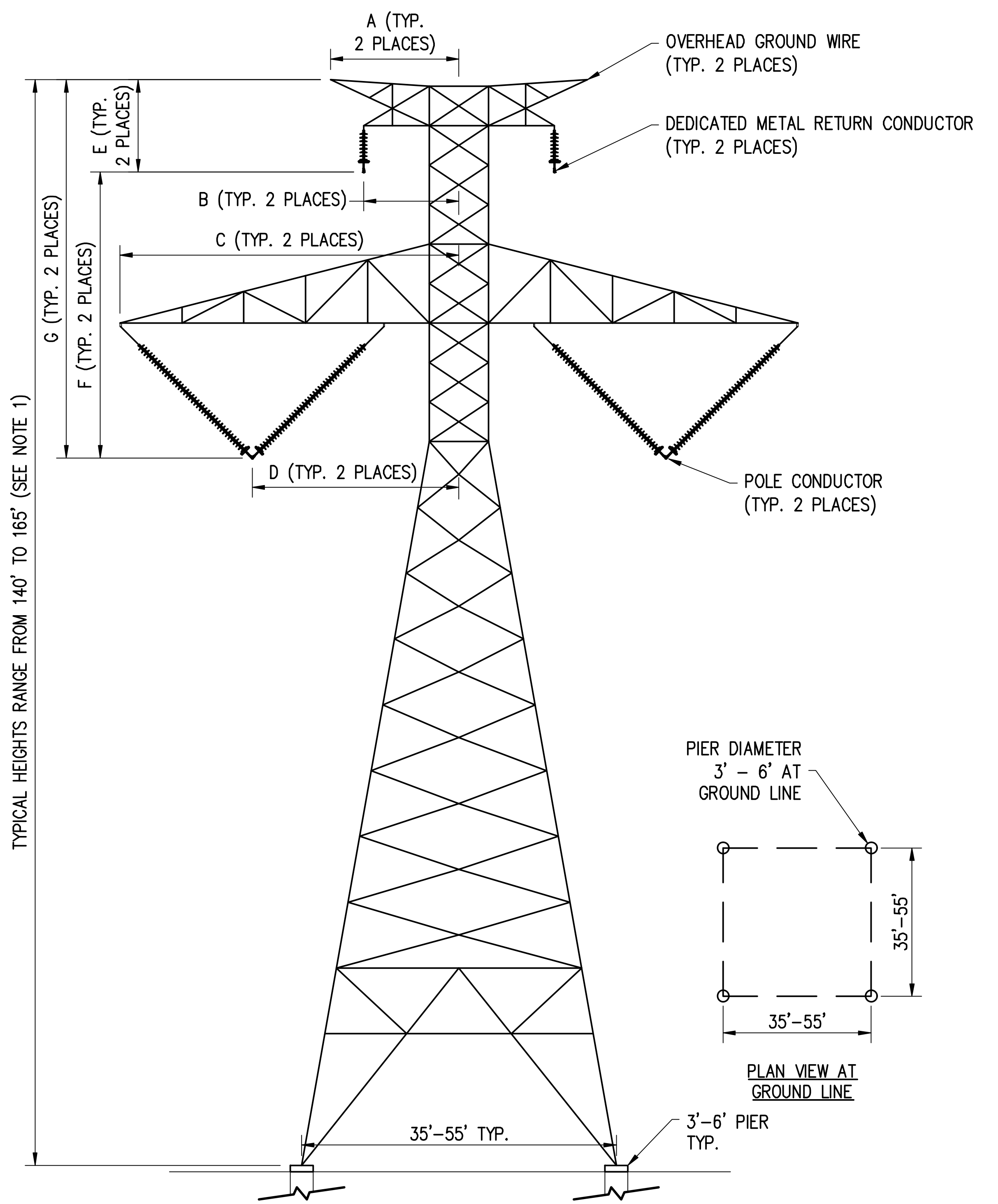
CHECKED	B. MATTHIES	06/06/24
APPROVED	M. HEIKENS	06/06/24
DWG SCALE: NTS	PLT SCALE: 1:1	

NORTH PLAINS CONNECTOR

SELF SUPPORTING STEEL MONOPOLE
TYPICAL +/– 525kV HVDC DEADEND

DWG. NAME: NPC–A–T009–505 REVISION NO: D

Figure A-3. 525-kV HVDC Transmission Line - Tangent Lattice Structure



Dimension	Description	Range (ft)
A	OPGW Horizontal Offset from Structure Centerline	15-30
B	Dedicated Metal Return Conductor Horizontal Offset from Structure Centerline	10-20
C	Pole Conductor Support Arm Length from Structure Centerline	40-50
D	Pole Conductor Horizontal Offset from Structure Centerline	20-35
E	OPGW / Dedicated Metal Return Conductor Vertical Separation at Structure	10-20
F	Dedicated Metal Return Conductor / Pole Conductor Vertical Separation at Structure	30-40
G	OPGW / Pole Conductor Vertical Separation at Structure	40-50

NOTES:

1. MOST STRUCTURE HEIGHTS RANGE FROM 140' TO 165'. HOWEVER, ANTICIPATED STRUCTURE HEIGHTS CAN BE AS LOW AS 100' OR AS HIGH AS 195'.

DISCLAIMER: FINAL FRAMING DIMENSIONS SUBJECT TO CHANGE PENDING DETAILED ENGINEERING.

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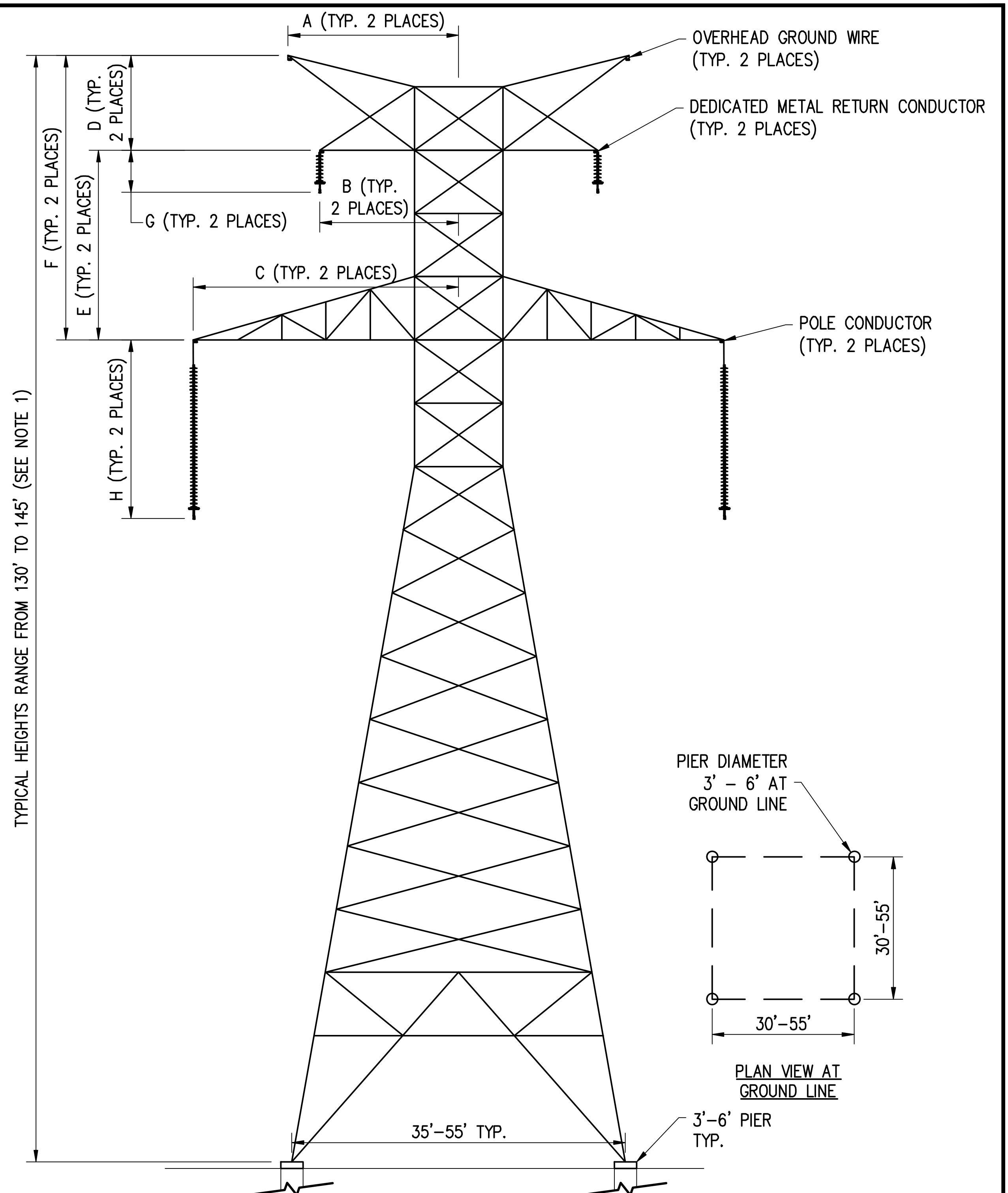
CHECKED	B. MATTHIES	06/06/24
APPROVED	M. HEIKENS	06/06/24
DWG SCALE: NTS	PLT SCALE: 1:1	

NORTH PLAINS CONNECTOR
SELF SUPPORTING STEEL LATTICE TOWER
TYPICAL +/– 525kV HVDC TANGENT

DWG. NAME: NPC–A–T009–511 REVISION NO: D

Figure A-4. 525-kV HVDC Transmission Line - Deadend Lattice Structure



Dimension	Description	Range (ft)
A	OPGW Horizontal Offset from Structure Centerline	15-30
B	Dedicated Metal Return Conductor Horizontal Offset from Structure Centerline	10-20
C	Pole Conductor Horizontal Offset from Structure Centerline	35-50
D	OPGW / Dedicated Metal Return Conductor Vertical Separation at Structure	10-20
E	Dedicated Metal Return Conductor / Pole Conductor Vertical Separation at Structure	30-40
F	OPGW / Pole Conductor Vertical Separation at Structure	40-50
G	Dedicated Metal Return Conductor Jumper String Length	5-10
H	Pole Conductor Jumper String Length	25-30

NOTES:

1. MOST STRUCTURE HEIGHTS RANGE FROM 130' TO 145'. HOWEVER, ANTICIPATED STRUCTURE HEIGHTS CAN BE AS LOW AS 120' OR AS HIGH AS 195'.

DISCLAIMER: FINAL FRAMING DIMENSIONS SUBJECT TO CHANGE PENDING DETAILED ENGINEERING.

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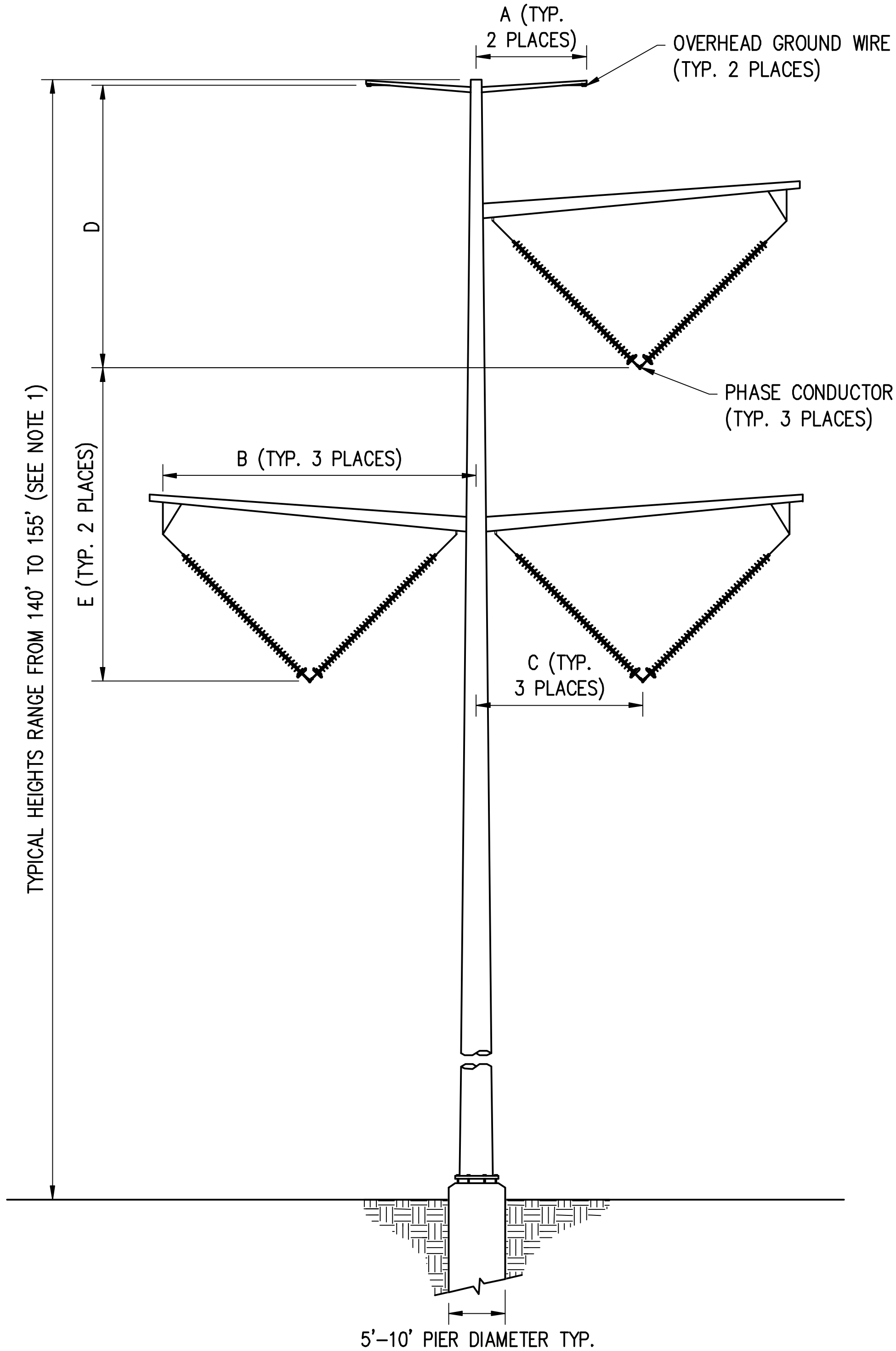
CHECKED	B. MATTHIES	06/06/24
APPROVED	M. HEIKENS	06/06/24
DWG SCALE: NTS	PLT SCALE: 1:1	

NORTH PLAINS CONNECTOR
SELF SUPPORTING STEEL LATTICE TOWER
TYPICAL +/– 525kV HVDC DEADEND

DWG. NAME: NPC-A-T009-515 REVISION NO: D

Figure A-5. 500-kV Rosebud Transmission Line - Tangent Monopole Structure



Dimension	Description	Range (ft)
A	OPGW Horizontal Offset from Structure Centerline	15-30
B	Phase Conductor Support Arm Length from Structure Centerline	40-50
C	Phase Conductor Horizontal Offset from Structure Centerline	20-35
D	OPGW / Phase Conductor Vertical Separation at Structure	20-35
E	Phase Conductor / Phase Conductor Vertical Separation at Structure	30-45

NOTES:

1. MOST STRUCTURE HEIGHTS RANGE FROM 140' TO 155'. HOWEVER, ANTICIPATED STRUCTURE HEIGHTS CAN BE AS LOW AS 120' OR AS HIGH AS 195'.

DISCLAIMER: FINAL FRAMING DIMENSIONS SUBJECT TO CHANGE PENDING DETAILED ENGINEERING.

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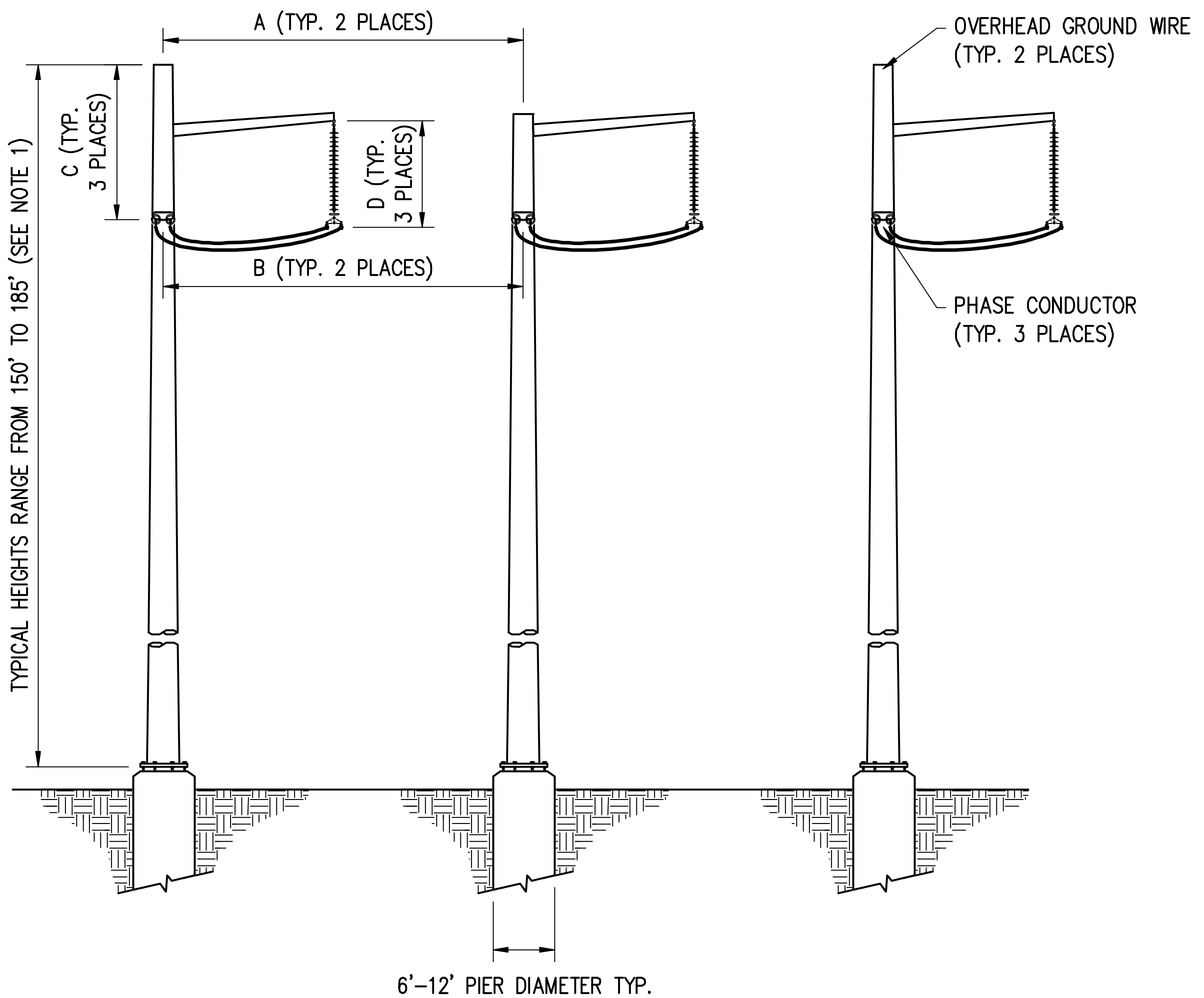
DESIGNED	S. REED	06/06/24
CHECKED	B. MATTHIES	06/06/24
APPROVED	M. HEIKENS	06/06/24
DWG SCALE: NTS	PLT SCALE: 1:1	

NORTH PLAINS CONNECTOR

SELF SUPPORTING STEEL MONOPOLE
TYPICAL 500kV EHV AC TANGENT

DWG. NAME: NPC-A-T009-411 REVISION NO : C

Figure A-6. 500-kV Rosebud Transmission Line - Deadend Monopole Structure



NOTES:

1. MOST STRUCTURE HEIGHTS RANGE FROM 150' TO 185'. HOWEVER, ANTICIPATED STRUCTURE HEIGHTS CAN BE AS LOW AS 130' OR AS HIGH AS 195'.

Dimension	Description	Range (ft)
A	OPGW Horizontal Offset from Structure Centerline	40-55
B	Phase Conductor Horizontal Offset from Structure Centerline	40-55
C	OPGW / Phase Conductor Vertical Separation at Structure	20-30
D	Phase Conductor Jumper String Length	15-25

DISCLAIMER: FINAL FRAMING DIMENSIONS SUBJECT TO CHANGE PENDING DETAILED ENGINEERING.

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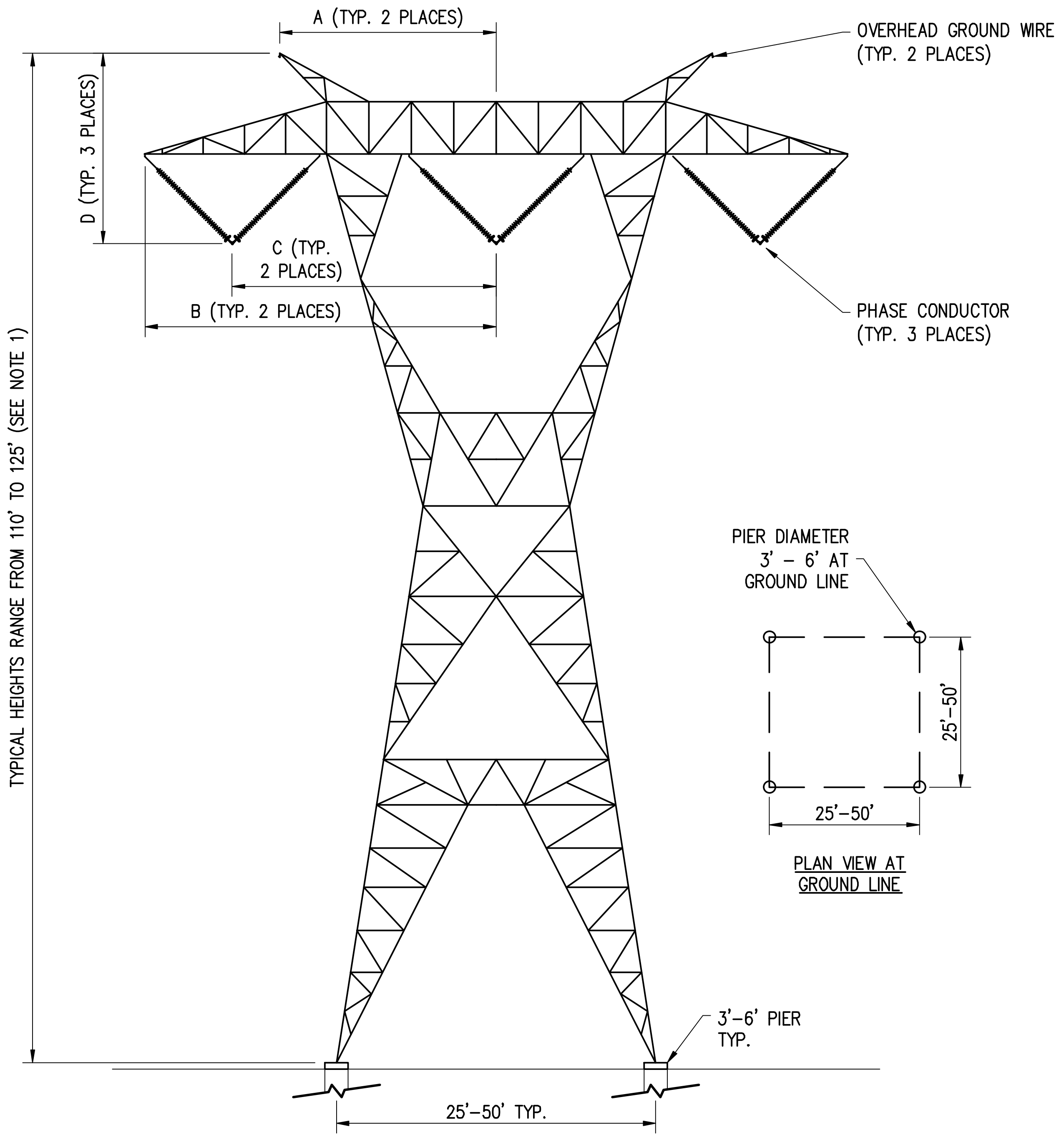
DESIGNED	S. REED	11/15/23
CHECKED	B. MATTHIES	11/15/23
APPROVED	M. HEIKENS	11/15/23
DWG SCALE: NTS	PLT SCALE: 1:1	

NORTH PLAINS CONNECTOR
SELF SUPPORTING STEEL MONOPOLE
TYPICAL 500kV EHV AC DEADEND

DWG. NAME: NPC-A-T009-415 REVISION NO: C

Figure A-7. 500-kV Rosebud Transmission Line - Tangent Lattice Structure



Dimension	Description	Range (ft)
A	OPGW Horizontal Offset from Structure Centerline	20-40
B	Phase Conductor Support Arm Length from Structure Centerline	35-55
C	Phase Conductor Horizontal Offset from Structure Centerline	35-50
D	OPGW / Phase Conductor Vertical Separation at Structure	20-30

NOTES:

1. MOST STRUCTURE HEIGHTS RANGE FROM 110' TO 125'. HOWEVER, ANTICIPATED STRUCTURE HEIGHTS CAN BE AS LOW AS 90' OR AS HIGH AS 195'.

DISCLAIMER: FINAL FRAMING DIMENSIONS SUBJECT TO CHANGE PENDING DETAILED ENGINEERING.

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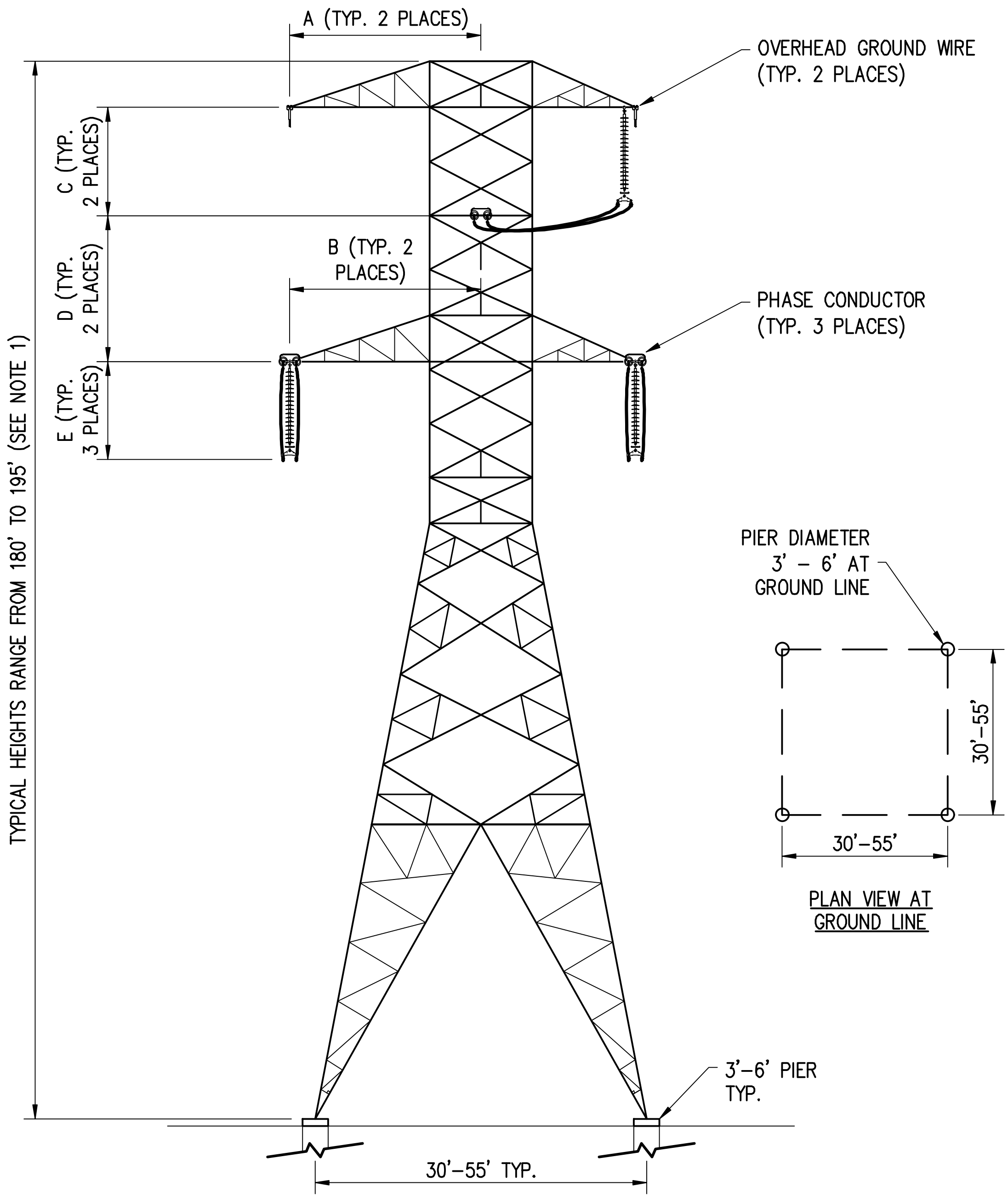
DESIGNED	S. REED	06/06/24
CHECKED	B. MATTHIES	06/06/24
APPROVED	M. HEIKENS	06/06/24
DWG SCALE: NTS	PLT SCALE: 1:1	

NORTH PLAINS CONNECTOR

SELF SUPPORTING STEEL LATTICE TOWER TYPICAL 500kV EHV AC TANGENT

DWG. NAME: NPC-A-T009-421 REVISION NO.: C

Figure A-8. 500-kV Rosebud Transmission Line - Deadend Lattice Structure



Dimension	Description	Range (ft)
A	OPGW Horizontal Offset from Structure Centerline	30-45
B	Phase Conductor Horizontal Offset from Structure Centerline	30-45
C	OPGW / Phase Conductor Vertical Separation at Structure	20-30
D	Phase Conductor / Phase Conductor Vertical Separation at Structure	25-35
E	Phase Conductor Jumper String Length	15-25

NOTES:

1. MOST STRUCTURE HEIGHTS RANGE FROM 180' TO 195'. HOWEVER, ANTICIPATED STRUCTURE HEIGHTS CAN BE AS LOW AS 130' OR AS HIGH AS 195'.

DISCLAIMER: FINAL FRAMING DIMENSIONS SUBJECT TO CHANGE PENDING DETAILED ENGINEERING.

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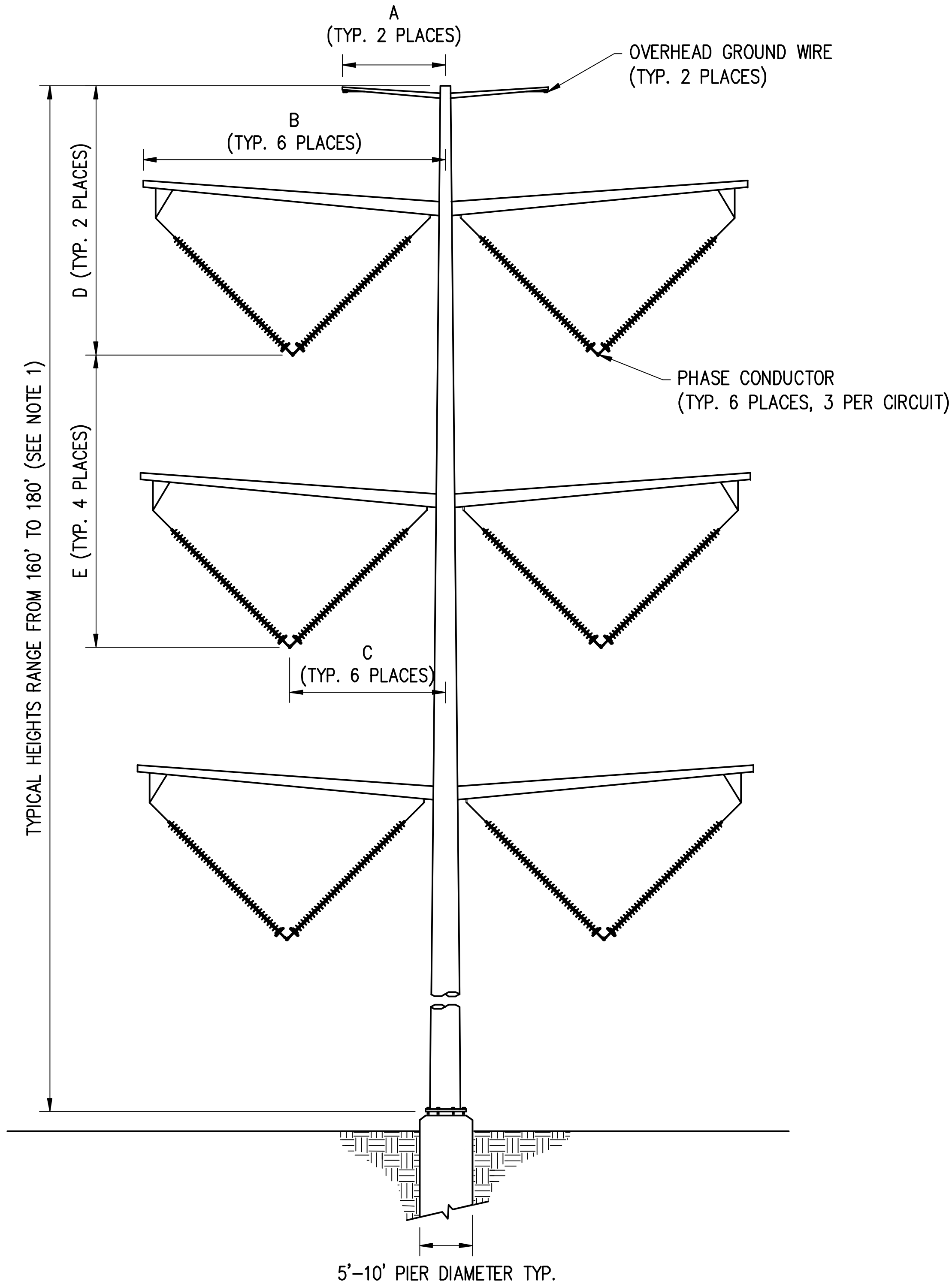
DESIGNED	S. REED	06/06/24
CHECKED	B. MATTHIES	06/06/24
APPROVED	M. HEIKENS	06/06/24
DWG SCALE: NTS	PLT SCALE: 1:1	

NORTH PLAINS CONNECTOR
SELF SUPPORTING STEEL LATTICE TOWER
TYPICAL 500kV EHV AC DEADEND

DWG. NAME: NPC–A–T009–425 | REVISION NO.: C

Figure A-9. 345-kV Oliver and Morton Transmission Lines - Tangent Monopole Structure



NOTES:

1. MOST STRUCTURE HEIGHTS RANGE FROM 160' TO 180'. HOWEVER, ANTICIPATED STRUCTURE HEIGHTS CAN BE AS LOW AS 120' OR AS HIGH AS 195'.

Dimension	Description	Range (ft)
A	OPGW Horizontal Offset from Structure Centerline	10-20
B	Phase Conductor Support Arm Length from Structure Centerline	25-35
C	Phase Conductor Horizontal Offset from Structure Centerline	15-25
D	OPGW / Phase Conductor Vertical Separation at Structure	15-30
E	Phase Conductor / Phase Conductor Vertical Separation at Structure	20-35

DISCLAIMER: FINAL FRAMING DIMENSIONS SUBJECT TO CHANGE PENDING DETAILED ENGINEERING.

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"Engineering with Distinction" ECI ELECTRICAL CONSULTANTS, INC. BILLINGS MONTANA

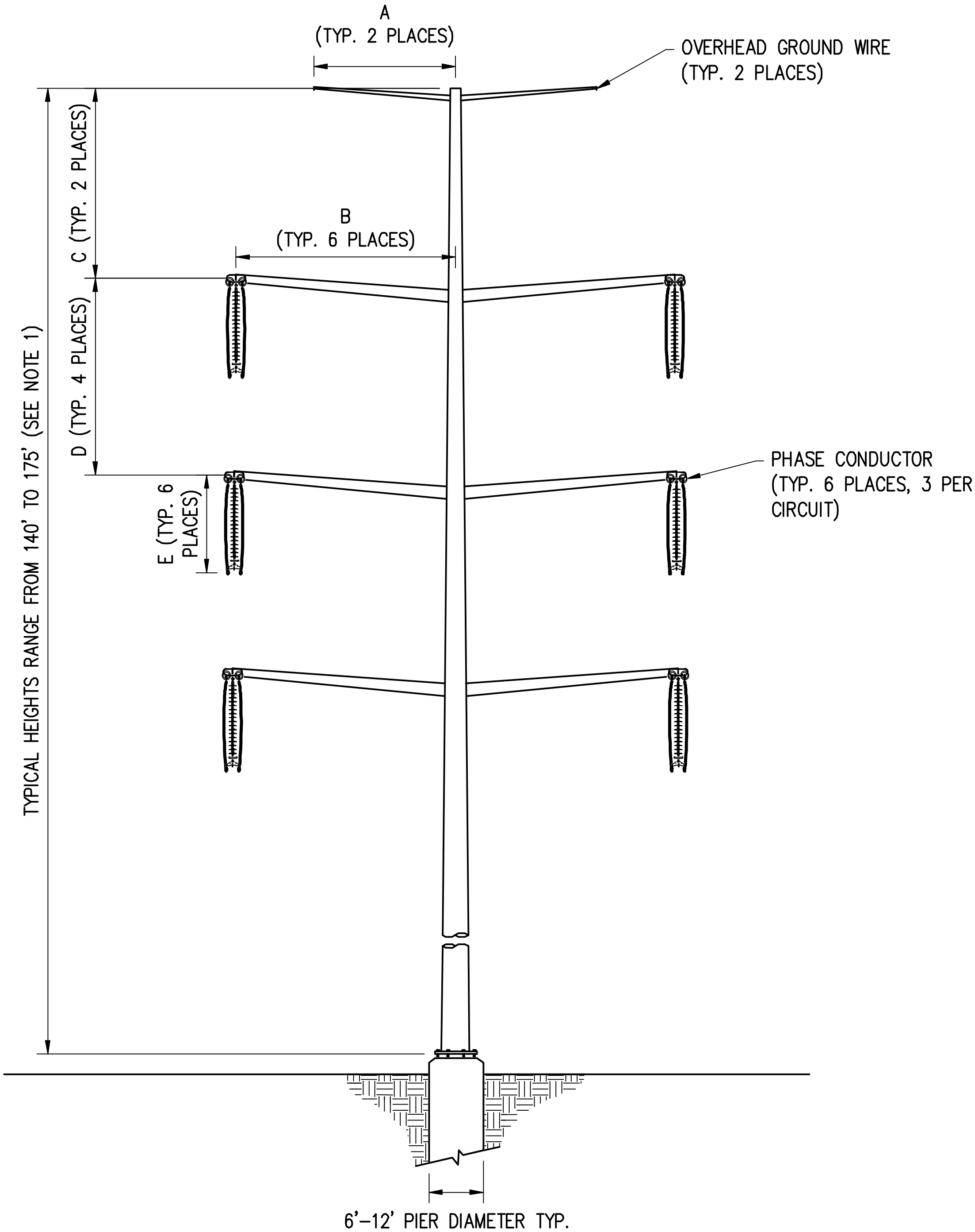
GRID UNITED

ENGINEERING RECORD		DATE
DRAWN	C. ELLIS	06/06/24
DESIGNED	S. REED	06/06/24
CHECKED	B. MATTHIES	06/06/24
APPROVED	M. HEIKENS	06/06/24
DWG SCALE: NTS	PLT SCALE: 1:1	

NORTH PLAINS CONNECTOR
SELF SUPPORTING STEEL MONOPOLE
TYPICAL 345kV EHV AC DOUBLE CIRCUIT TANGENT

DWG. NAME: NPC-A-T009-311 REVISION NO: D

Figure A-10. 345-kV Oliver and Morton Transmission Lines - Deadend Monopole Structure



Dimension	Description	Range (ft)
A	OPGW Horizontal Offset from Structure Centerline	10-20
B	Phase Conductor Horizontal Offset from Structure Centerline	15-25
C	OPGW / Phase Conductor Vertical Separation at Structure	15-25
D	Phase Conductor / Phase Conductor Vertical Separation at Structure	20-30
E	Phase Conductor Jumper String Length	15-20

NOTES:

1. MOST STRUCTURE HEIGHTS RANGE FROM 140' TO 175'. HOWEVER, ANTICIPATED STRUCTURE HEIGHTS CAN BE AS LOW AS 120' OR AS HIGH AS 195'.

DISCLAIMER: FINAL FRAMING DIMENSIONS SUBJECT TO CHANGE PENDING DETAILED ENGINEERING.

ISSUED FOR REVIEW

"Engineering with Distinction" ECI ELECTRICAL CONSULTANTS, INC. BILLINGS, MONTANA

GRID UNITED

ENGINEERING RECORD		DATE
DRAWN	C. ELLIS	06/06/24
DESIGNED	S. REED	06/06/24
CHECKED	B. MATTHIES	06/06/24
APPROVED	M. HEIKENS	06/06/24
DWG SCALE: NTS	PLT SCALE: 1:1	

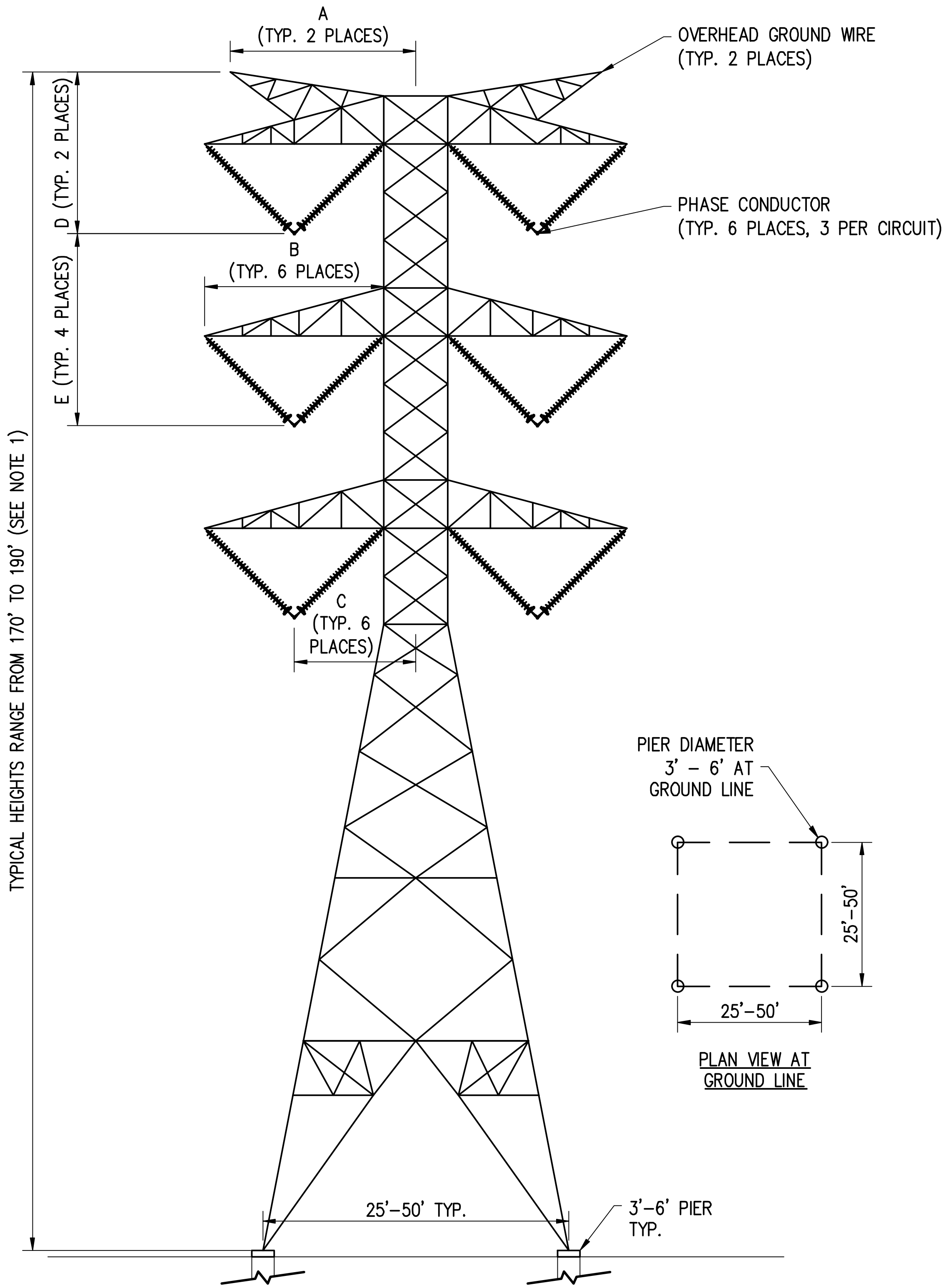
NORTH PLAINS CONNECTOR

SELF SUPPORTING STEEL MONOPOLE

TYPICAL 345kV EHV AC DOUBLE CIRCUIT DEADEND

DWG. NAME: NPC-A-T009-315 REVISION NO: D

Figure A-11. 345-kV Oliver and Morton Transmission Lines - Tangent Lattice Structure



Dimension	Description	Range (ft)
A	OPGW Horizontal Offset from Structure Centerline	10-30
B	Phase Conductor Support Arm Length from Structure Centerline	25-30
C	Phase Conductor Horizontal Offset from Structure Centerline	18-23
D	OPGW / Phase Conductor Vertical Separation at Structure	20-25
E	Phase Conductor / Phase Conductor Vertical Separation at Structure	25-35

NOTES:

1. MOST STRUCTURE HEIGHTS RANGE FROM 170' TO 190'. HOWEVER, ANTICIPATED STRUCTURE HEIGHTS CAN BE AS LOW AS 130' OR AS HIGH AS 195'.

DISCLAIMER: FINAL FRAMING DIMENSIONS SUBJECT TO CHANGE PENDING DETAILED ENGINEERING.

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ECI ELECTRICAL CONSULTANTS, INC.
BILLINGS MONTANA

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ENGINEERING RECORD		DATE
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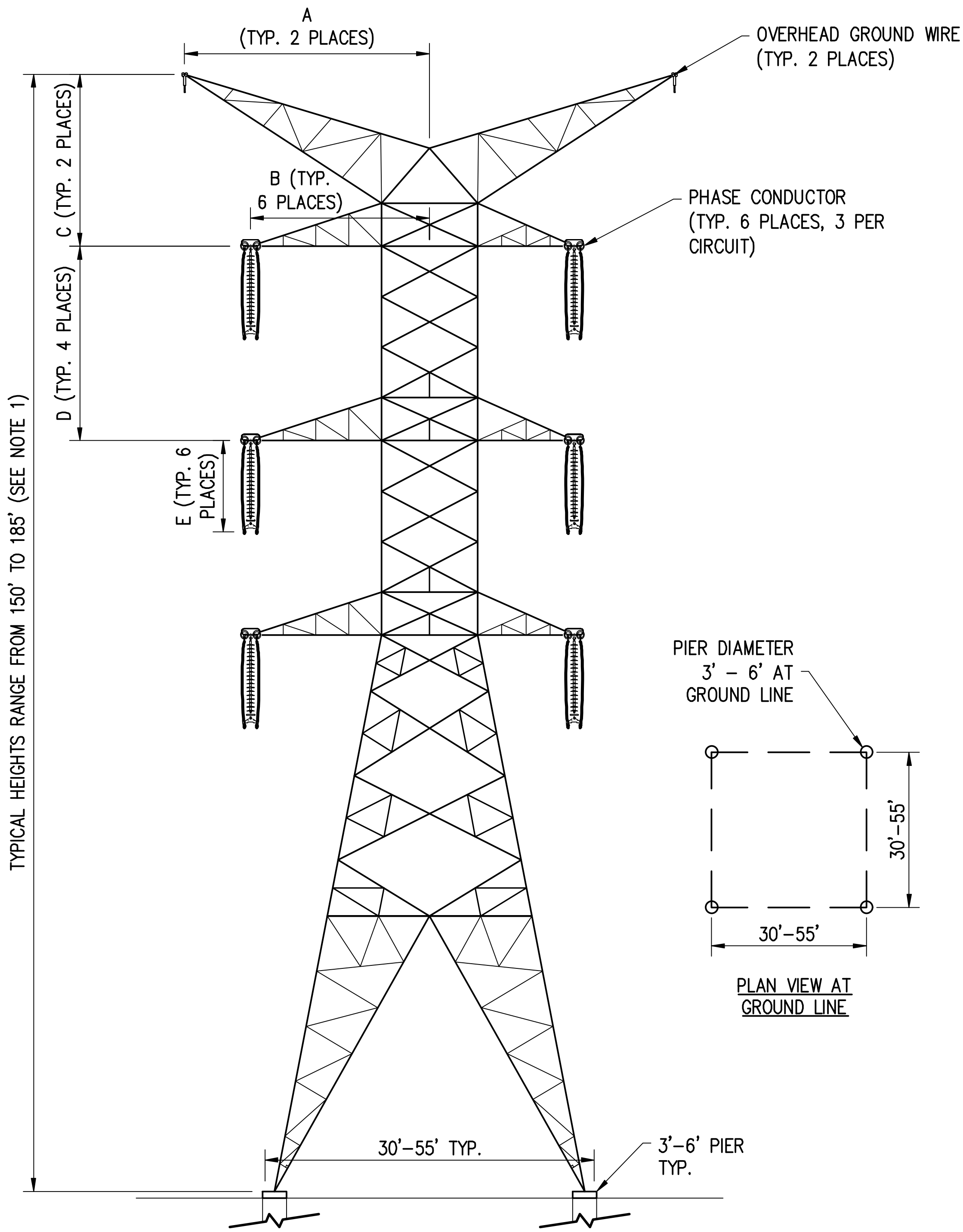
DESIGNED	S. REED	06/06/24
CHECKED	B. MATTHIES	06/06/24
APPROVED	M. HEIKENS	06/06/24
DWG SCALE: NTS	PLT SCALE: 1:1	

NORTH PLAINS CONNECTOR
SELF SUPPORTING STEEL LATTICE TOWER
TYPICAL 345kV EHV AC DOUBLE CIRCUIT TANGENT

DWG. NAME: NPC–A–T009–321 REVISION NO: D

Figure A-12. 345-kV Oliver and Morton Transmission Lines - Deadend Lattice Structure



Dimension	Description	Range (ft)
A	OPGW Horizontal Offset from Structure Centerline	10-30
B	Phase Conductor Horizontal Offset from Structure Centerline	23-32
C	OPGW / Phase Conductor Vertical Separation at Structure	20-25
D	Phase Conductor / Phase Conductor Vertical Separation at Structure	25-35
E	Phase Conductor Jumper String Length	15-20

NOTES:

1. MOST STRUCTURE HEIGHTS RANGE FROM 150' TO 185'. HOWEVER, ANTICIPATED STRUCTURE HEIGHTS CAN BE AS LOW AS 130' OR AS HIGH AS 195'.

DISCLAIMER: FINAL FRAMING DIMENSIONS SUBJECT TO CHANGE PENDING DETAILED ENGINEERING.

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DESIGNED	S. REED	06/06/24
CHECKED	B. MATTHIES	06/06/24
APPROVED	M. HEIKENS	06/06/24
DWG SCALE: NTS	PLT SCALE: 1:1	

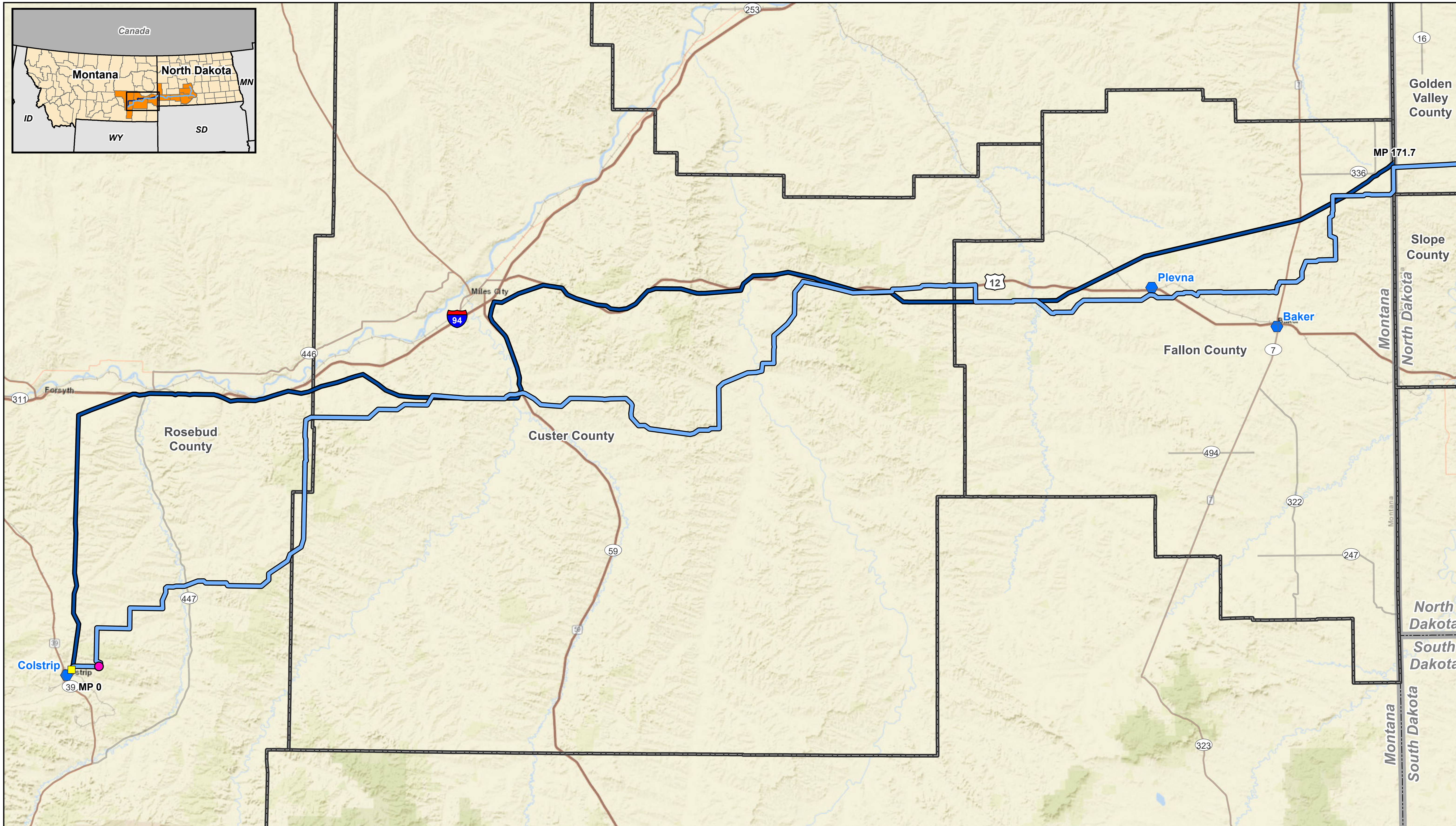
NORTH PLAINS CONNECTOR
SELF SUPPORTING STEEL LATTICE TOWER
TYPICAL 345kV EHV AC DOUBLE CIRCUIT DEADEND

DWG. NAME: NPC-A-T009-325 | REVISION NO : D

NORTH PLAINS CONNECTOR PROJECT

APPENDIX B

Route Alternative Maps



NORTH PLAINS CONNECTOR

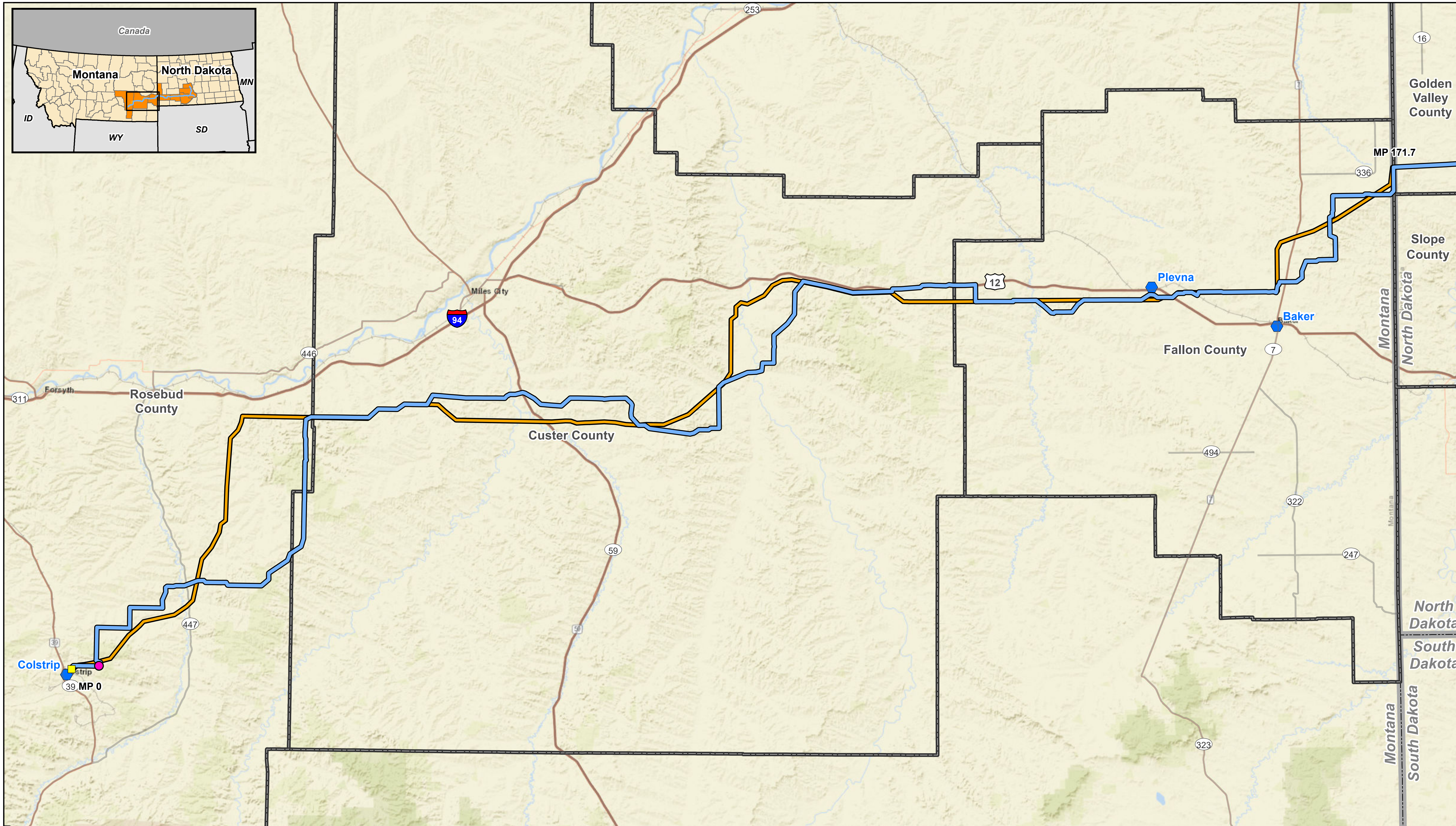
For Environmental Review Purposes Only

Figure B-1

Northern Route Alternative

North Plains Connector Project

Major Town/City
Colstrip Substation (Existing)
Rosebud County Converter Station
Proposed Route
Northern Route Alternative
County Boundary
State Boundary

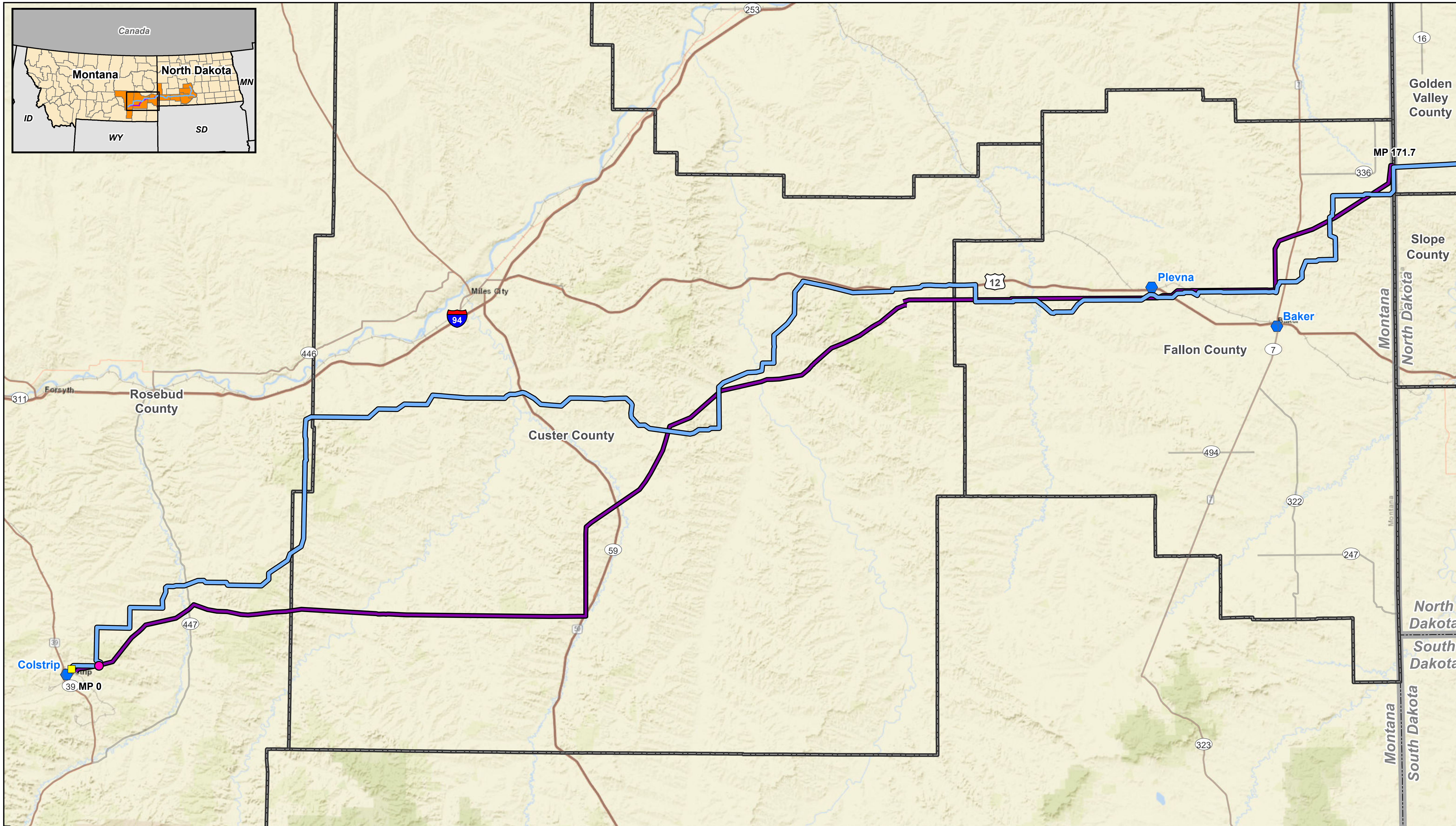


NORTH PLAINS CONNECTOR

For Environmental Review Purposes Only

Figure B-2
Central Route Alternative
North Plains Connector Project

Major Town/City
Colstrip Substation (Existing)
Rosebud County Converter Station
Proposed Route
Central Route Alternative
County Boundary
State Boundary



NORTH PLAINS CONNECTOR

For Environmental Review Purposes Only

Figure B-3
Southern Route Alternative
North Plains Connector Project

Major Town/City
Colstrip Substation (Existing)
Rosebud County Converter Station
Proposed Route
Southern Route Alternative
County Boundary
State Boundary

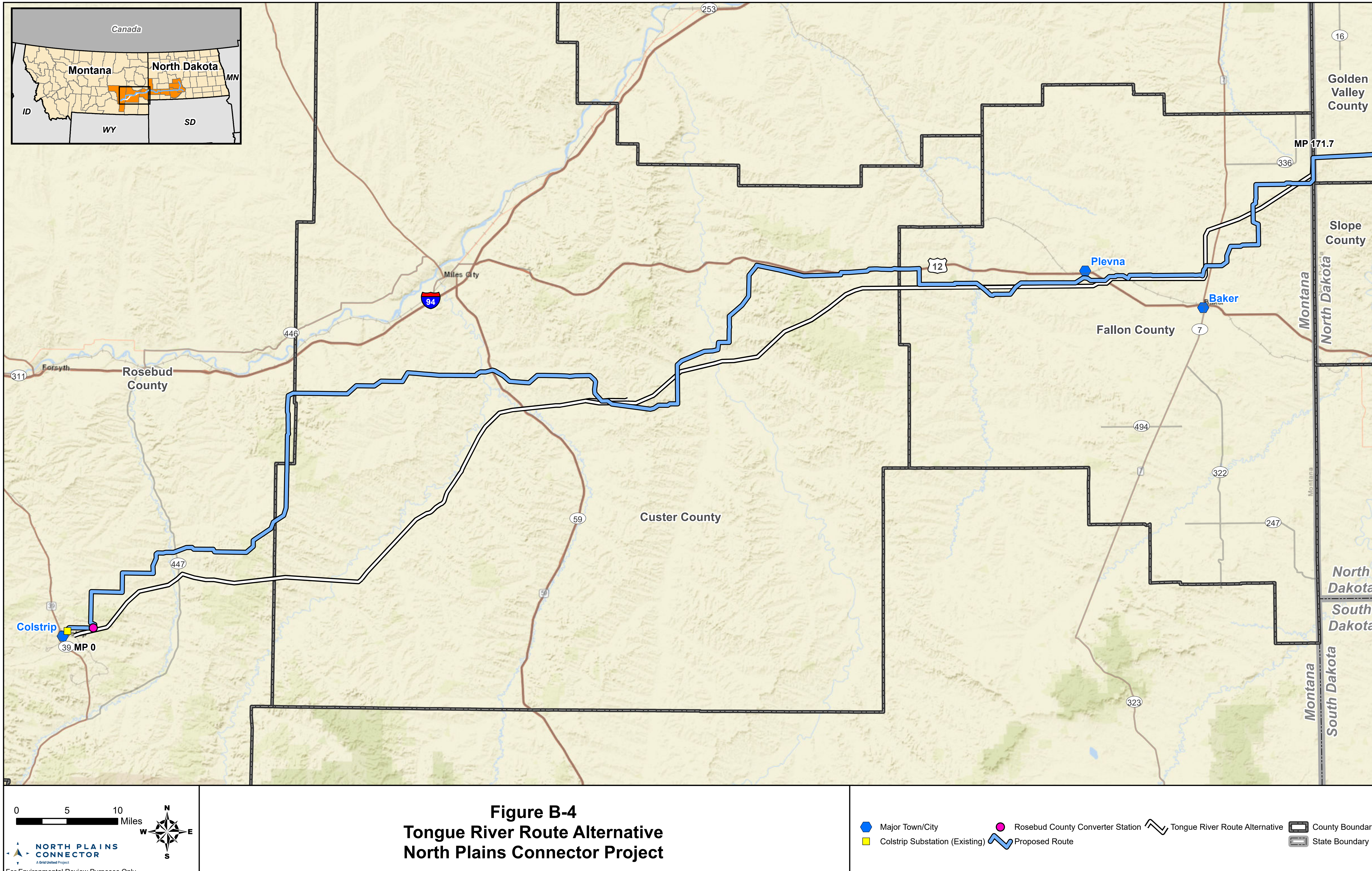


Figure B-4
Tongue River Route Alternative
North Plains Connector Project

For Environmental Review Purposes Only

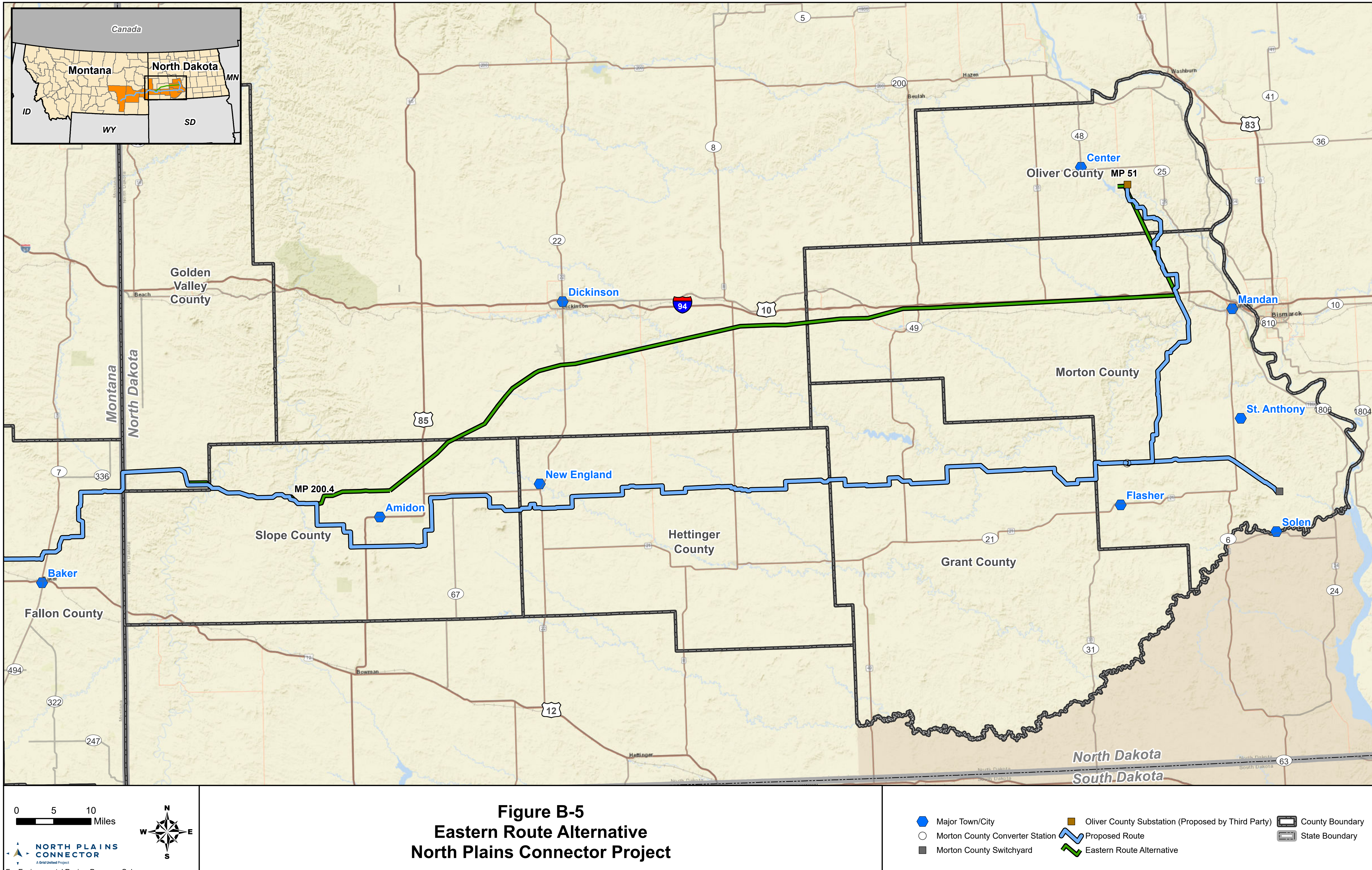


Figure B-5
Eastern Route Alternative
North Plains Connector Project

NORTH PLAINS CONNECTOR PROJECT

APPENDIX C

List of Potentially Affected Resources

Land Ownership:

- Federal Lands
  - Bureau of Land Management
  - U.S. Bureau of Reclamation
  - U.S. Department of Agriculture (Agricultural Research Service's Fort Keogh)
  - U.S. Forest Service
- State Lands
  - Montana
    - Department of Corrections
    - Department of Military Affairs
    - Department of Natural Resources and Conservation
    - Department of Transportation
    - Montana Fish, Wildlife & Parks
    - Montana University System
    - State Trust Lands
    - Local Public Lands
    - Private
  - North Dakota
    - State Trust Lands
    - North Dakota Game and Fish Department
    - Local Public Lands
    - Private Lands

Land Use and Land Cover:

- Rangeland/Open Land
- Agriculture
- Forested/Timber Production
- Developed Land
  - Residential and Urban Areas
  - Non-residential Developed Land
- Wetlands/Open Water
- Recreational and Special Interest Areas
  - Private Preservation Lands
  - Game Management Areas
  - Remnant Prairies
  - Scenic Byways and Rivers
- Non-recreational Lands
  - Mines/Mining and Resource Extraction
  - Electronic Installations
  - Airstrips
  - Hazardous Sites

Earth Resources

- Geology
  - Mineral Resources
    - Oil and Gass Production
    - Coal Mining
    - Sand and Gravel Aggregate Mines

- Soils
    - Prime and Unique Farmland and Farmland of Statewide Importance
    - Erodible Soils
        - Highly Wind Erodible Soils
        - Highly Water Erodible Soils
        - Sloped Ground
    - Soil with Low Productivity and Low Revegetation Potential
        - Hydric Soils
        - Compaction Prone Soils
        - Shallow Bedrock
        - Rocky Soils

Water Resources

- Surface Water
    - Surface Water Features
    - Surface Water Quality and Use
- Ground Water
- Water Supplies and Wells
    - Principle Aquifers
    - Sole Source Aquifers
    - Public Wells and Wellhead Protection Areas
    - Water Supply Wells
    - Springs
- Floodplains
- Wetlands and Riparian Areas

Vegetation

- Grassland
- Shrubland, Steppe, and Savanna
- Forest
- Recently Disturbed or Modified Land
- Sparse or Barren Land
- Noxious and Invasive Weeds
- Special Status Plant Species
    - Federally Protected
        - Bureau of Land Management Special Status Species
        - U.S. Forest Service Regional Forester’s Sensitive Species
    - Montana Species of Concern
    - North Dakota Species of Conservation Priority

Wildlife

- General Wildlife Habitats and Nongame Species
- Special Interest Areas
- Big Game Species
- Small Game Species
- Special Status Wildlife
    - Federally Protected
        - Endangered Species Act Federally Listed Species
        - Bureau of Land Management Special Status Species
        - U.S. Forest Service Regional Forester’s Sensitive Species

        - Bald and Golden Eagles
        - Migratory Birds
    - State Protected Species
        - Montana:
            - Greater Sage Grouse
    - Montana Species of Concern and Sharp-tailed Grouse
    - North Dakota Species of Conservation Priority
    - Waterfowl and Waterbirds

<u>Fisheries:</u>

- Fresh Water Fish and Mussels
- Aquatic Invasive Species and Aquatic Nuisance Species
- High Value Fish Habitat
- Special Status Fish Species
    - Federally Protected
        - Endangered Species Act Federally Listed Species
        - Bureau of Land Management Special Status Species
        - U.S. Forest Service Regional Forester's Sensitive Species
    - Montana Species of Concern
    - North Dakota Species of Conservation Priority

<u>Cultural, Historical, and Paleontological Resources:</u>

- Archeological and Architectural Sites
- Paleontological Resources

<u>Visual Resources:</u>

- Scenic Quality
    - Recreation and Transportation Viewpoints
    - Residential Viewpoints
    - BLM VRM Class II Areas

<u>Socioeconomic</u>

<u>Environmental Justice</u>

<u>Noise, Radio, and Television Interference and Electrical Effects:</u>

- Noise, Radio, and TV Interference