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Office of Environmental Quality and Transboundary Issues

Final Supplemental Environmental Impact Statement for the Keystone XL Project

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Abstract:

The U.S. Department of State (the Department) has prepared this **Final** Supplemental Environmental Impact Statement (SEIS) for the 2014 Keystone XL Final SEIS consistent with the National Environmental Policy Act (NEPA) of 1969 (as implemented by the regulations of the Council on Environmental Quality [CEQ], found at 40 *Code of Federal Regulations* (CFR) 1500–1508).

This **Final** SEIS supplements the 2014 Keystone XL Final SEIS, considers the direct, indirect and cumulative impacts related to changes in the proposed Project since 2014 and incorporates updated information and new studies, as applicable. Specifically, this SEIS includes an update to the market analysis, analysis of the Mainline Alternative Route (MAR), new information related to cultural resources along the Keystone XL Project route, revised methodology for the greenhouse gas and climate change analysis, revised methodology for the accidental release analysis, and additional supporting analysis of the electrical **power infrastructure**. **The Department prepared this Final SEIS based on comments received during the Draft SEIS 45-day comment period (October 4, 2019 until November 18, 2019).**

Under the Proposed Action, Keystone would construct the Keystone XL Project. This would include approximately 162 miles of construction, connection, operation and maintenance along the MAR of the proposed new 36-inch diameter pipeline and related ancillary facilities within Nebraska that were not analyzed within the 2014 Keystone XL Final SEIS.

Public Participation: The Department encourages public participation in the environmental review process. A notice was published in the *Federal Register* (FR) on December 3, 2018, informing agencies and members of the public of its intent to prepare this SEIS.

Prior to this **Final** SEIS, the Department prepared a Draft Environmental Assessment (EA) and Draft SEIS regarding the MAR and published Notices of Availability that announced the availability of the draft documents in the FR (83 FR 36659 and 83 FR 48358, respectively). The public comment period extended from July 30 to August 29, 2018 on the Draft EA and from September 21 to November 8, 2018 for the Draft SEIS. The Department considered comments received during both the Draft EA and the Draft SEIS public comment periods in this new Draft SEIS document.

The Department published a Notice of Availability in the *Federal Register* **(84 FR 53215) on October 4, 2019** to announce the availability of **the Keystone XL Draft** SEIS **and to solicit public comments over a** 45-day period **and to announce a public meeting in Billings, Montana which was held on October 29, 2019**. **The purpose of the meeting was to collect verbal, written and electronic comments on the Draft SEIS, and to provide an opportunity for the public to speak with Department representatives and subject matter experts. During the public comment period, agencies, tribal governments, non-**

governmental organizations, and members of the public submitted either handwritten comments, electronic comments (through regulations.gov), e-mailed comments, or provided verbal comments to a stenographer (during the public meeting). The Department considered all comments received during the public comment period in preparation of this Final SEIS. The Comment Response Document (Appendix D to this SEIS) summarizes the public notification process and the public comments received during the comment period, along with Department responses to the comments.

The Department also published a notification advertisement in local newspapers; sent notification letters and e-mails; placed an electronic version of the document on the Department's website (https://keystonepipeline-xl.state.gov/); **distributed the Draft SEIS to other federal, state and local government agencies that may have expertise relevant to this environmental review;** and placed hard copies of the Draft SEIS at the **local** libraries **along the proposed pipeline route**.

Changes from the Draft SEIS: In this Final SEIS, bold text and vertical lines in the margin indicate where the Department has revised or supplemented the Draft SEIS (as exemplified by this paragraph). Deletions are not demarcated. The Department has added a second volume (Volume II) to contain the appendices, which includes the new Appendix D, Comment Response Document and Appendix E, Keystone XL Project Draft SEIS Official Comments Submitted by Agency, Tribal and Non-Governmental Organizations.

SUMMARY

FINAL
Supplemental Environmental Impact Statement
Keystone XL Project

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Acronyms

Acronym	Definition
BLM	Bureau of Land Management
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
CMRP	Construction Mitigation and Reclamation Plan
Con/Rec	**Construction/Reclamation**
Department	U.S. Department of State
DOE	U.S. Department of Energy
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FR	*Federal Register*
HDD	horizontal directional drill
MAR	Mainline Alternative Route
MBTA	Migratory Bird Treaty Act
MP	milepost
NDEQ	Nebraska Department of Natural Resources and Environmental Quality
NEPA	National Environmental Policy Act
NOA	Notice of Availability
NOI	Notice of Intent
NPPD	Nebraska Public Power District
NPS	National Park Service
NRHP	National Register of Historic Places
PCN	Pre-Construction Notification
PHMSA	Pipeline and Hazardous Materials Safety Administration
PSC	Public Service Commission
ROI	region of influence
ROW	right-of-way
RUS	Rural Utilities Service
SCADA	Supervisory Control and Data Acquisition
SEIS	Supplemental Environmental Impact Statement
SPCC	Spill Prevention, Control, and Countermeasure
TWA	temporary workspace area
U.S.	United States

Acronym	Definition
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WAPA	Western Area Power Administration
WCSB	Western Canadian Sedimentary Basin

SUMMARY

S.1 INTRODUCTION

TransCanada Keystone Pipeline, L.P. (Keystone) proposes to construct, connect, operate**,** maintain **and eventually decommission** a pipeline system and ancillary facilities (e.g., access roads, pump stations and construction camps) that would transport Western Canadian Sedimentary Basin (WCSB) heavy crude oil from its existing facilities in Hardisty, Alberta, Canada, and Bakken crude oil from an on-ramp in Baker, Montana, to Steele City, Nebraska (referred to as the Keystone XL Project, or Project). The proposed pipeline would connect to the existing Keystone Cushing Extension pipeline, which extends from Steele City, Nebraska, to Cushing, Oklahoma. In total, the proposed Project would consist of approximately 1,209 miles of new, 36-inch-diameter pipeline, with approximately 327 miles of pipeline in Canada and approximately 882 miles in the United States (U.S.). The proposed Project would cross the international border between Saskatchewan, Canada, and the U.S. near Morgan, Montana, and would include a pipeline generally within a 110-foot-wide temporary construction right-of-way (ROW) and a 50-foot-wide permanent ROW in Montana, South Dakota and Nebraska. The construction and operation of the Project would require certain federal approvals, including the grant of a 44.4-mile ROW across federal lands in the State of Montana by the U.S. Bureau of Land Management (BLM) and permission to alter public works by the U.S. Army Corps of Engineers (USACE). In addition, the proposed Project would require construction of electrical power lines (both transmission and distribution) by multiple **public** power **entities** and cooperatives necessary for Keystone to operate proposed pipeline pump stations. Three federal agencies, including the BLM, the U.S. Department of Energy's (DOE's) Western Area Power Administration (WAPA), and the U.S. Department of Agriculture's (USDA's) Rural Utilities Service (RUS), must make decisions related to providing a ROW across federal lands, expanding substations and interconnecting with the electrical grid and/or financing the construction and operation of the power lines.

The U.S. Department of State (the Department) has prepared this **Final** Supplemental Environmental Impact Statement (SEIS) for the 2014 Final Supplemental Environmental Impact Statement for the Keystone XL Project (2014 Keystone XL Final SEIS) consistent with the National Environmental Policy Act (NEPA) of 1969 (as implemented by the regulations of the Council on Environmental Quality [CEQ], found at 40 *Code of Federal Regulations* [CFR] 1500–1508).

S.1.1 Background

In 2008, Keystone filed an initial Presidential Permit application with the Secretary of State requesting authorization to construct, operate and maintain the Keystone XL crude oil pipeline and ancillary facilities at the U.S.-Canada border in Phillips County, Montana. This initial application was followed by Keystone XL route modifications, a new Presidential Permit application in 2012 and subsequent reviews by the Department. Table S-1 presents the sequence of actions pertaining to the Keystone XL pipeline leading up to the issuance of a Presidential Permit for the Keystone XL pipeline in March 2019.

Table S-1. Summary of Actions Related to the Keystone XL Pipeline

Date	Keystone and Department Actions
September 2008	Keystone filed an initial Presidential Permit application requesting authorization to build and operate the Keystone XL pipeline.
May 2009	**The Department holds the first of 10 meetings with agencies and tribes to discuss the Project and to draft a Section 106 Programmatic Agreement (May 2009 to December 2010).**
June 2011	**Programmatic Agreement signed.**
August 2011	The Department evaluated the original pipeline alignment and published a Final EIS.
January 2012	The President denied the Presidential Permit application for the Keystone XL pipeline.
April 2012	Keystone proposed a new alignment in Nebraska with the goal of avoiding the Sand Hills Region in Nebraska.
May 2012	Keystone filed a new application for a Presidential Permit for the Keystone XL pipeline that included a new alignment avoiding the Sand Hills Region of Nebraska.
October 2012	**The Department holds the first of four meetings and one teleconference with the agencies and tribes to discuss amending the 2011 Programmatic Agreement (October 2012 to July 2013).**
December 2013	**Programmatic Agreement amended and signed.**
January 2014	The Department evaluated the route modifications in an SEIS and published the 2014 Keystone XL Final SEIS.
November 2015	Secretary of State denied the Presidential Permit application for the Keystone XL pipeline.
January 2017	Presidential Memorandum Regarding Construction of the Keystone XL Pipeline issued January 24, 2017. Keystone resubmitted the application for a Presidential Permit. The re-submitted application included minor route alterations due to agreements with local property owners for specific rights-of-way and easement access, but the proposed route, herein referred to as the Preferred Route, remained entirely within the areas previously analyzed by the Department in the 2014 Keystone XL Final SEIS.
March 2017	Under Secretary of State for Political Affairs issued the Presidential Permit to Keystone.
May 2018	The Department published a Notice of Intent (NOI) in the *Federal Register* (FR) to solicit public comments regarding scope and content of an Environmental Assessment (EA) of the MAR over a 30-day period.
July 2018	The Department published a Notice of Availability (NOA) in the FR regarding availability of the Keystone XL MAR Draft EA and to solicit comments on the Draft EA over a 30-day public comment period.
August 2018	The U.S. District Court for the District of Montana ordered the 2014 Keystone XL Final SEIS be supplemented to consider the potential impacts of the MAR and related facilities.
September 2018	In response to the August 2018 Court Order, the Department published an NOI in the FR announcing its intent to prepare an SEIS on the MAR, which was followed by publication of an NOA in the FR announcing availability of the Keystone XL MAR Draft SEIS and a 45-day public comment period.
November 2018	The United States District Court for the District of Montana found that the 2014 Keystone XL Final SEIS largely complied with NEPA and specifically rejected challenges, among other things, its purpose and need, the range of alternatives, the no-action alternative, its discussion of the market demand for oil, impacts of the project in Canada, and the response to comments. It did find fault with narrow aspects of the 2014 SEIS and ordered that it be supplemented to account for new information that has become available since its publication, specifically including an updated market analysis, post-2014 cultural resource surveys and studies, revised greenhouse gas emissions modeling, and updates to the accidental release analysis based on post-2014 information.
December 2018	In response to the November 2018 Court Order, the Department published an NOI in the FR announcing their intent to prepare a new SEIS to the 2014 Keystone XL Final SEIS.

Table S-1. Summary of Actions Related to the Keystone XL Pipeline

Date	Keystone and Department Actions
March 2019	The President issued a Presidential Permit on March 29, 2019, authorizing construction, connection, maintenance and operation of the Project at the U.S.-Canada border. This permit removed the Secretary of State (or his delegate) from any action with respect to the Project. In June 2019, the November 2018 Court judgments were vacated.
October 2019	The Department published an NOA in the FR regarding availability of the 2019 Keystone XL Draft SEIS and to solicit comments on the Draft SEIS over a 45-day public comment period.
December 2019	**The Department published an NOA in the FR regarding availability of the 2019 Keystone XL Final SEIS.**

BLM = Bureau of Land Management; Department = U.S. Department of State; EA = Environmental Assessment; EIS = Environmental Impact Statement; FR = *Federal Register*; MAR = Mainline Alternative Route; NOA = Notice of Availability; NOI = Notice of Intent; SEIS = Supplemental Environmental Impact Statement; U.S. = United States

The only major alignment shift from the 2014 Keystone XL Final SEIS is related to the Mainline Alternative Route (MAR) in Nebraska. After resubmitting its Presidential Permit application for the Keystone XL pipeline in January 2017, Keystone filed an application for approval under Nebraska's Major Oil Pipeline Siting Act with the Nebraska Public Service Commission (PSC). Nebraska's Major Oil Pipeline Siting Act, which became law in 2011, requires applicants to provide evidence of consideration of alternative routes and whether any other utility corridors exist that are feasible and could be beneficially used. Keystone's application to the Nebraska PSC therefore included three routes through Nebraska: the Keystone XL Preferred Route (analyzed in the 2014 Keystone XL Final SEIS) that had been proposed for approval by the Nebraska PSC, and two alternative routes called the "Keystone XL MAR" and the "Sandhills Alternative Route." On November 20, 2017, the Nebraska PSC approved the MAR basing their decision on the application review, hearings and reviews of the MAR by Nebraska state agencies.

S.1.2 Scope of the SEIS

On November 8, 2018, the U.S. District Court for the District of Montana identified four deficiencies in the 2014 Keystone XL Final SEIS: the effects of current oil prices, cumulative effects of greenhouse gas emissions, cultural resources and accidental release modeling. This SEIS supplements the 2014 Keystone XL Final SEIS to address perceived deficiencies and consider the direct, indirect and cumulative impacts related to changes in the Project since 2014, and incorporate the following updated information and new studies:

- Update to the market analysis considering the effects of current market conditions and the viability of the proposed Keystone XL Project.
- Analysis of the Mainline Alternative Route (MAR), including existing resources, the potential for environmental impacts, and identification of any potential mitigation measures to address adverse environmental impacts. The Nebraska Public Service Commission (Nebraska PSC) approved the MAR on November 20, 2017, and on August 23, 2019, the Nebraska Supreme Court upheld that decision.
- New information related to the Keystone XL Project, including studies conducted of the proposed Keystone XL pipeline's crossing of the Missouri River, sensitive species surveys and agency data, and findings of cultural surveys completed since 2014.
- Revised methodology and analysis for greenhouse gas emissions using recently published lifecycle greenhouse gas emissions studies for WCSB and other crude oils as well as the Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model, and reevaluation of projected cumulative emissions using updated crude oil production and consumption estimates (e.g., U.S. Energy Information Administration (EIA), Canadian Association of Petroleum Producers [CAPP], and Canada National Energy Board [CNEB]

projections). The analysis also considers recent climate change reports including the U.S. Global Change Research Program's Fourth National Climate Assessment and the Intergovernmental Panel on Climate Change (IPCC) Special Report on Global Warming of 1.5ºC.

- Revised methodology for accidental releases, including updated modeling to account for industry- and Keystone-specific incident history since 2014, the latest findings and research related to oil spills, an updated analysis of potential for impacts from overland spills to sensitive resources along the entire alignment, and an updated analysis of potential for impacts to downstream receptors within 40 river-miles from the pipeline along connected hydraulic pathways.
- Additional supporting analysis of electrical power infrastructure required to support pipeline operations, including existing resources, the potential environmental effects, and identification of any potential mitigation measures to address the adverse environmental effects.

This SEIS analyzes the potential impacts of the proposed Project (see Section S.6 for a description of the proposed Project) based on the Federal Decisions (see Section S.3), including effects for potential construction, operation and maintenance of the proposed Project under the Proposed Action discussion and a No Action Alternative, where Keystone would not construct the proposed Project. Further, this SEIS incorporates by reference the 2011 Keystone XL Final EIS and the 2014 Keystone XL Final SEIS and previous analysis prepared by and incorporated into the Department's documentation relating to its compliance with NEPA.

S.2 PURPOSE AND NEED

This SEIS is being prepared to update the evaluation of the Keystone XL Project presented in the 2014 Keystone XL Final SEIS based on changes to the Project including the MAR and consideration of new information available since the 2014 Keystone XL Final SEIS. Those previous impact statements included statements of Purpose and Need applicable to the Department. Due to the fact that the President issued a Presidential Permit on March 29, 2019 authorizing construction, connection, maintenance and operation of the Project at the U.S.-Canada border, there is no longer any action for the Secretary of State or his delegate to take in respect to the Project. Nothing in this SEIS is to the contrary or may be construed to the contrary. The Department, in cooperation with other agencies, completed this SEIS because it began work on the SEIS before the Presidential Permit issued on March 29, 2019 and it was useful and efficient for the Department to complete its work as applied to the "Facilities" defined in the March 29, 2019 Presidential Permit. Finally, nothing in this SEIS should be construed as the Department exercising authority over the "Border Facilities" as defined in the March 29, 2019 Presidential Permit. The construction, connection, operation, and maintenance of the Keystone XL Project's "Border Facilities" are governed by the authority of the March 29, 2019 Presidential Permit.

S.2.1 Project Purpose and Need

The primary purpose of the proposed Keystone XL pipeline is to provide the infrastructure to transport up to 830,000 barrels per day (bpd) of crude oil from the WCSB in Canada and the Bakken Shale Formation in the U.S. to existing pipeline facilities near Steele City, Nebraska for onward delivery to Cushing, Oklahoma and the U.S. Gulf Coast area.

As explained in detail in Section 1.4 of the 2014 Keystone XL Final SEIS, and supported in Section 1.4, Market Analysis, of this SEIS, there is continued long-term growing crude oil global demand forecasted through 2040 under most forecasting scenarios. Since the 2014 Keystone XL Final SEIS, the trend of global crude oil demand has shown a steady increase with daily oil demand up from 94 million barrels a day in 2014 to over 99 million bpd at the end of 2018. There is also an existing demand by Gulf Coast area refiners for secure sources of crude oil. Refiners in the Gulf Coast area are configured to efficiently process heavy crude oil into a wide range of qualities, from light sweet (low sulfur content) to heavy sour (higher sulfur content). Those refiners generally have access to a wide variety of crude oils through an extensive pipeline network for delivering domestic crude oils as well as waterborne imports from countries around the world. Currently, refiners in the Gulf Coast area obtain heavy crude oil primarily via waterborne foreign imports, but the reliability of those supplies is uncertain because of declining production and political uncertainty associated with the major traditional suppliers, notably Mexico and Venezuela.

Over the past year, crude oil supply disruptions internationally have continued to impact oil markets and availability of crude oil for U.S. refineries. While total unplanned disruptions have fallen to their lowest levels since 2012, the trends in decline of production from traditional suppliers has accelerated since 2017 and are likely to continue in the short term. As of the drafting of this update to the 2014 Keystone XL Final SEIS, oil production is sufficient for global demand, even with pressures on oil markets to replace Iranian exports, which the U.S. is committed to reducing to zero. The U.S. remains in consultations with major oil producers, as well as major oil consuming organizations to ensure that global energy markets are stable and adequately supplied. However, with crude oil constraints from Mexico, increasing since December 2018, and Venezuela-related sanctions presenting major disruptions in the flow of needed crude oil to the U.S., having reliable long-term sources of this vital commodity are more important than ever. The shortfalls in crude oil from Venezuela, Mexico and other traditional suppliers, coupled with their inability to raise output in the short term, increase U.S. energy security concerns. Impacts from anticipated decreases in production and exports from other major oil exporters, including Iran, also extend uncertainty and volatility. Thus, the lack of reliable supply of crude oil has increased insecurity.

The WCSB is projected to have significant increases in production, with much of this increase to come from the oil sands. Estimates predict a growth trend of increased production in the short term, with approximately 550,000 bpd in WCSB crude oil production growth through 2019 over 2017 production levels. The long-term additional crude oil production in the WCSB is projected to come to the market as heavy crude oil, in the form of diluted bitumen (dilbit). The exact mix volume and final destination of crude oil types that would be transported by the Keystone XL pipeline would be determined by market forces (U.S. Department of State 2014). During consideration of the January 2017 re-submitted application for its Presidential Permit, **and during the 2019 Draft SEIS comment period,** Keystone affirmed that it maintains shipping contracts that will be substantially similar to those represented in its 2012 application for a Presidential Permit to transport approximately 555,000 bpd of WCSB crude oil to existing Gulf Coast area delivery points and 155,000 bpd of WCSB crude oil to Cushing, Oklahoma.

The lack of pipeline capacity has resulted in WCSB crude oil being transported by rail. However, rail service as a form of crude oil transport is struggling to meet the increased demands by western Canadian crude oil producers. The current ability to move crude oil volumes by rail is being limited by insufficient access to locomotives, personnel and track space and due to rail being unable to accommodate sudden increases in demand caused by pipeline maintenance or extraordinary circumstances affecting pipelines.

S.2.2 Bureau of Land Management Purpose and Need

BLM has agreed to continue to be a cooperating agency for this SEIS **and will utilize the Department's NEPA documentation in issuing a decision on Keystone's proposed ROW to cross federal lands in Montana**. The proposed Keystone XL pipeline would cross **44.4 miles of** federal lands managed by the BLM and 1.88 **miles of lands managed by** USACE**, both** in Montana. The BLM's purpose and need is to respond to the Keystone application under Section 28 of the Mineral Leasing Act, as amended, for a ROW grant and Temporary Use Permit to construct, operate, maintain and decommission a crude oil pipeline and related facilities on federal lands in compliance with the Mineral Leasing Act, BLM ROW regulations and other applicable federal laws. The BLM must consider Keystone's ROW application in accordance with its multiple-use mandate and applicable land use plans. The ROW decision on the

Mineral Leasing Act ROW application would also require USACE permission under Section 14 of the Rivers and Harbors Act of 1899, 33 USC § 408, to make alterations to federal property administered by the USACE, provided it is determined the proposed alteration will not be injurious to the public interest and will not impair the usefulness of a Civil Works project.

The BLM will decide whether to approve, approve with modification or deny issuance of a ROW grant and Temporary Use Permit to Keystone for the proposed Keystone XL pipeline, and if approved, under what terms and conditions. The BLM's **decision on Keystone's Mineral Leasing Act ROW application to cross federal land in Montana will rely on the environmental analysis** in this SEIS**,** the 2011 Keystone XL Final Environmental Impact Statement (2011 Keystone XL Final EIS) and the 2014 Keystone XL Final SEIS, as well as other information **considered or included with** those documents. **Keystone's Mineral Leasing Act ROW application to use federal lands in Montana is analyzed in the 2011 Keystone XL FEIS and the 2014 Keystone XL Final SEIS. There have been no re-alignments or modifications of the proposed Mineral Leasing Act ROW on federal land in Montana since the 2014 Keystone XL Final SEIS. This SEIS primarily analyzes the impacts associated with the MAR as a new alternative. It also supplements the 2014 Keystone XL Final SEIS by providing additional analysis regarding the effects of current oil prices, cumulative effects of greenhouse gas emissions, cultural resources and accidental release modeling, consistent with the direction in the U.S. District Court for the District of Montana's November 18, 2018, decision. This SEIS also documents and considers additional cultural resource surveys that have been completed on BLM lands in Montana since publication of the 2014 Keystone XL Final SEIS. Finally, the BLM conducted an in-depth review of the federal actions associated with the proposed Project and connected actions in this SEIS to evaluate anticipated effects of the Project on federally protected and candidate species and federally designated critical habitat. Pursuant to Section 7 of the Endangered Species Act, BLM prepared a Biological Assessment, which updates the December 2012 Final Biological Assessment for the Keystone XL Project (see Appendix H of the 2014 Keystone XL Final SEIS). Accordingly, BLM will consider and rely on the 2011 Keystone XL FEIS, the 2014 Keystone XL Final SEIS, and this SEIS in issuing a decision on Keystone's application for Mineral Leasing Act ROW on federal lands in Montana.**

S.2.3 Western Area Power Administration Purpose and Need

WAPA has agreed to continue to be a cooperating agency for this SEIS (similar to its role for the 2014 Keystone XL Final SEIS) and intends to use this document as a basis for issuing a Record of Decision.

WAPA's mission allows open access to the federal transmission system. Any entity requesting interconnection to the federal transmission system must submit an application for interconnection. Local power cooperatives have submitted requests to interconnect with the WAPA transmission system in order to serve the electrical needs of Pump Stations 9 through 13 and Pump Stations 17 through 19, as well as Pump Station 21. WAPA's purpose and need is to consider and respond to these interconnection requests from the local power cooperatives, and the related construction or upgrading of any WAPA-owned facilities as a result of the requests.

S.2.4 Rural Utilities Service Purpose and Need

RUS has agreed to continue to be a cooperating agency for this SEIS and intends to use this document in support of issuing a Record Decision. RUS's purpose and need for taking action is to determine whether to provide federal financing to electric cooperatives through loans and loan guarantees for the construction, operation and improvement of electric transmission and generation facilities in rural areas. In regard to the proposed Keystone XL Project, this would include the Grand Electric Cooperative, West

Central Electric Cooperative and Rosebud Electric Cooperative in South Dakota, which have applied for RUS financing for the construction of power lines to deliver power to Pump Stations 15 through 21.

S.2.5 U.S. Army Corps of Engineers Purpose and Need

The USACE has agreed to continue to be a cooperating agency for this SEIS and intends to use this document to support its determination whether to grant permission for Keystone to modify lands administered by the USACE at the Fort Peck project by concurring with the BLM's inclusion of USACE project land in the proposed ROW grant to Keystone for the Keystone XL Project. In addition to the permits, approvals and regulatory requirements listed in Section 1.9 of the 2014 Keystone XL Final SEIS, the USACE is considering issuance of Section 408 Permission (River and Harbors Appropriation Act of 1899 (33 USC 408)) required for alterations proposed within the lands and real property interests identified and acquired for a USACE project and to lands available for USACE projects under the navigation servitude. Under Section 408, the Secretary of the Army may, on recommendation of the Chief of Engineers, grant permission for the alteration of a public work so long as that alteration is not injurious to the public interest and will not impair the usefulness of the work.

USACE's purpose and need is to determine whether USACE may allow the BLM to include federal land administered by USACE for the Fort Peck Project in a ROW granted by BLM to Keystone. In addition, USACE anticipates receiving and acting upon applications submitted by Keystone pursuant to Section 404 of the Clean Water Act of 1972 (33 USC 1344) (Section 404).

S.3 FEDERAL DECISIONS

S.3.1 Bureau of Land Management

BLM's Federal Decision includes whether to approve, approve with modification or deny issuance of a ROW grant and Temporary Use Permit to Keystone under Section 28 of the Mineral Leasing Act for the proposed Keystone XL pipeline, and if approved, under what terms and conditions. The ROW grant and Temporary Use Permit would cover the 44.4 miles of BLM land in Montana and **1.88 miles of lands administered by** USACE (described in Section 1.3.4.). **Keystone's Mineral Leasing Act ROW application to use federal lands in Montana is analyzed in the 2011 Keystone XL FEIS and the 2014 Keystone XL Final SEIS. There have been no re-alignments or modifications of the proposed Mineral Leasing Act ROW on federal land in Montana since the 2014 Keystone XL Final SEIS. This SEIS primarily analyzes the impacts associated with the MAR as a new alternative. It also supplements the 2014 Keystone XL Final SEIS by providing additional analysis regarding the effects of current oil prices, cumulative effects of greenhouse gas emissions, cultural resources and accidental release modeling, consistent with the direction in the U.S. District Court for the District of Montana's November 18, 2018, decision. This SEIS also documents and considers additional cultural resource surveys that have been completed on BLM lands in Montana since publication of the 2014 Keystone XL Final SEIS. Finally, the BLM conducted an in-depth review of the federal actions associated with the proposed Project and connected actions in this SEIS to evaluate anticipated effects of the Project on federally protected and candidate species and federally designated critical habitat. Pursuant to Section 7 of the Endangered Species Act, BLM prepared a Biological Assessment, which updates the December 2012 Final Biological Assessment for the Keystone XL Project (see Appendix H of the 2014 Keystone XL Final SEIS). Accordingly, BLM will consider and rely on the 2011 Keystone XL FEIS, the 2014 Keystone XL Final SEIS, and this SEIS in issuing a decision on Keystone's application for Mineral Leasing Act ROW on federal lands in Montana.**

BLM also is considering other ROW applications under Title V of the Federal Land Policy and Management Act, 43 U.S.C. § 1761, which were filed by other applicants, for transmission and distribution lines for the proposed electrical power lines associated with Pump Station 9 and 10 of the proposed Keystone XL pipeline in Montana. Although BLM is evaluating these ROW applications in separate environmental assessments (EAs), the potential environmental effects of these ROWs are analyzed in Chapter 6, Electric**al Power Infrastructure** and Chapter 7, Cumulative Impacts of this document **as connected actions**.

S.3.2 Western Area Power Administration

WAPA's Federal Decision includes whether to approve or deny electric cooperative interconnection requests and to complete any necessary work to WAPA's infrastructure to accommodate the interconnections[1]. These interconnection requests are for Pump Station 9 through 13 in Montana and Pump Station 17 through 19 and 21 in South Dakota. The following provides a summary of WAPA's federal activities that are part of the Proposed Action:

- Pump Station 09—Construction and ownership of a new substation (the Bowdoin Substation) and interconnection;
- Pump Station 10—An expansion of the existing Fort Peck Substation and interconnection;
- Pump Station 11—Construction and ownership of a new substation and interconnection;
- Pump Station 12—Interconnection and minimal work within the existing Circle Substation footprint to accommodate the interconnection;
- Pump Station 13—An expansion of the existing O'Fallon Substation and interconnection;
- Pump Station 17—Interconnection and minimal work within the existing Maurine Substation footprint to accommodate the interconnection;
- Pump Station 18—Interconnection and minimal work within the existing Philip Substation footprint to accommodate the interconnection;
- Pump Station 19—Expansion of the existing Midland Substation and interconnection; and
- Pump Station 21—Rebuilding of the existing Gregory Substation and interconnection.

S.3.3 Rural Utilities Service

RUS's Federal Decision includes whether or not to provide federal financing **through loans and loan guarantees** to electric cooperatives for the construction, operation and improvement of electric transmission and generation facilities in rural areas. This includes electric cooperatives in South Dakota which have applied for RUS financing for the construction of power lines to deliver power to Pump Stations 15 through 21.

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[1] Southwest Power Pool, Inc. (SPP) and WAPA have concluded that the Big Bend to Witten 230-kilovolt (kV) Transmission Line Project contained in the 2014 Keystone XL Final SEIS is no longer required. Upon further study, installation of a static var compensator (SVC) at the existing Rosebud Electric Cooperative Witten 115-kV Substation in Tripp County South Dakota, along with remedial action schemes (RAS) and other minor modifications to existing facilities (capacitors or other devices), would maintain stability and reliability within the affected footprint (see Section 6.3 for further information).

S.3.4 U.S. Army Corps of Engineers

USACE's Federal Decision is whether USACE may allow the BLM to include 1.88 miles of federal land administered by USACE for the Fort Peck Project in a ROW granted by BLM to Keystone for the installation of the proposed Keystone XL pipeline on Fort Peck Project land. USACE also anticipates receiving and acting upon applications submitted by Keystone pursuant to Section 404 of the Clean Water Act of 1972 (33 USC 1344).

S.4 AGENCY, TRIBAL AND PUBLIC INVOLVEMENT

S.4.1 Scoping

The Department published a Notice of Intent (NOI) in the *Federal Register* (FR) on December 3, 2018 to announce the intent for preparation of a new SEIS for the Keystone XL Project (83 FR 62398). Despite the fact that the President has since issued a Presidential Permit for the Project, thereby relieving the Secretary of State or his delegate of any further permitting action with regard to the Project, the Department nevertheless will continue its involvement in the assessment of environmental impacts of the Project.

Past scoping activities regarding the Keystone XL Project included publication of an NOI in the FR on May 25, 2018 to solicit public comments of the proposed MAR and related facilities (83 FR 24383). That public scoping period extended from May 25 to June 25, 2018, during which the Department received comments from stakeholders, including Indian tribes, non-governmental organizations and members of the public. The Department received 56 comment submissions, of which 10 were campaigns that provided a total of 212,604 signatures. The public scoping comments addressed a broad range of concerns, including the scope of the analysis, the role of the Department in the NEPA process, the need for the Project based on market conditions, potential cumulative and connected actions, pipeline safety and the potential for spills, spill incident records and corporate history, and the adequacy of regulatory oversight for pipelines and pipeline safety. Commenters also raised concerns about potential impacts on environmental and human resources, specifically including soil erosion, soil productivity, water resources (e.g., the Ogallala aquifer), biological resources (e.g., whooping cranes), Indian treaties, cultural and tribal resources, socioeconomic conditions, environmental justice, damage to property and landowner access. Commenters additionally expressed concerns about the potential for cumulative impacts associated with the Project that may adversely affect U.S. energy use and dependence on nonrenewable resources, and the contribution to greenhouse gases and global climate change. Many comments also requested a full SEIS be performed because the Project could cause significant impacts and stated that this NEPA review should encompass the whole Keystone XL pipeline. Finally, numerous stakeholders submitted comments simply expressing opposition for the Project. The Department considered these scoping comments in the preparation of this SEIS.

S.4.2 Draft EA and Draft SEIS Comment Period

Prior to this **Final** SEIS, the Department prepared a Draft EA and Draft SEIS regarding the MAR and published NOAs announcing the availability of the draft documents in the FR (83 FR 36659 and 83 FR 48358, respectively). The public comment period extended from July 30 to August 29, 2018 on the Draft EA and from September 21 to November 8, 2018 for the Draft SEIS. The Department considered comments received during both the Draft EA and the Draft SEIS public comment periods in this new Draft SEIS document.

The Department published a NOA in the *Federal Register* (84 FR 53215) on October 4, 2019 to announce availability of the Draft SEIS and to solicit public comments over a 45-day period and to announce a public meeting in Billings, Montana which was held on October 29, 2019. The Department also distributed the Draft SEIS to other federal, state and local government agencies that may have expertise relevant to this environmental review (see Appendix A, Indian Tribe, Agency and Elected Officials Coordination). The Department also published the Draft SEIS on its website, announced publication of this document in the FR and local newspapers, and invited public comments by mail or through http://www.regulations.gov. **Appendix D, Comment Response Document, provides a summary of comments and Department responses for substantive comments received over the 45--day comment period. Appendix E contains the full submissions from federal agencies, Indian tribes, elected officials and non-governmental organizations.**

S.4.3 Agency Coordination

The Department invited the following agencies who agreed to be cooperating agencies on the 2018 Keystone XL MAR Draft SEIS to remain as cooperating agencies for preparation of this SEIS:

FEDERAL AGENCIES

- U.S. National Park Service (NPS)
- Pipeline and Hazardous Materials Safety Administration (PHMSA)
- U.S. Army Corps of Engineers (USACE)
- U.S. Bureau of Land Management (BLM)
- U.S. Department of Agriculture (USDA), Rural Utilities Service (RUS)
- U.S. Fish and Wildlife Service (USFWS)
- Western Area Power Administration (WAPA)

STATE AGENCIES

- Nebraska Department of Natural Resources and Environmental Quality (NDEQ)

The U.S. Environmental Protection Agency (USEPA) agreed to participate in this SEIS as a coordinating agency. The Department coordinated with the USEPA telephonically and through email for this SEIS.

S.4.4 Indian Tribe Coordination

The Department invited the following Indian tribes involved in the Keystone XL Pipeline Programmatic Agreement to participate in the NEPA process for this SEIS (refer to Appendix A, Indian Tribe, Agency and Elected Officials Coordination, of this SEIS for a sample letter):

INDIAN TRIBES

- Absentee-Shawnee Tribe of Indians of Oklahoma
- Alabama-Coushatta Tribe of Texas
- Apache Tribe of Oklahoma
- Assiniboine & Sioux Tribes of the Fort Peck Indian Reservation
- Blackfeet Tribe of the Blackfeet Indian Reservation of Montana
- Cherokee Nation
- Cheyenne and Arapaho Tribes
- Cheyenne River Sioux Tribe of the Cheyenne River Reservation
- Chippewa Cree Indians of the Rocky Boy's Reservation
- Confederated Tribes of the Goshute Reservation
- Crow Creek Sioux Tribe of the Crow Creek Reservation
- Crow Tribe of Montana
- Delaware Tribe of Indians
- Duckwater Shoshone Tribe of the Duckwater Reservation
- Eastern Band of Cherokee Indians
- Ely Shoshone Tribe of Nevada

- Forest County Potawatomi Community
- Fort Belknap Indian Community
- Hannahville Indian Community
- Ho-Chunk Nation of Wisconsin
- Iowa Tribe of Kansas and Nebraska
- Kaw Nation, Oklahoma
- Kialegee Tribal Town
- Kickapoo Traditional Tribe of Texas
- Kickapoo Tribe in Kansas
- Kiowa Tribe
- **Little Shell Tribe of Chippewa Indians of Montana**
- Lower Brule Sioux Tribe of the Lower Brule Reservation
- Lower Sioux Indian Community in the State of Minnesota
- Match-e-be-nash-she-wish Band of Pottawatomi Indians of Michigan
- Nez Perce Tribe
- Northern Arapaho Tribe of the Wind River Reservation
- Northern Cheyenne Tribe
- Nottawaseppi Huron Band of the Potawatomi
- Oglala Sioux Tribe of the Pine Ridge Reservation
- Omaha Tribe of Nebraska
- Otoe-Missouria Tribe of Indians
- Pawnee Nation of Oklahoma
- Poarch Band of Creeks
- Pokagon Band of Potawatomi Indians
- Ponca Tribe of Indians of Oklahoma
- Ponca Tribe of Nebraska
- Prairie Band of Potawatomi Nation
- Red Lake Band of Chippewa Indians
- Rosebud Sioux Tribe of the Rosebud Indian Reservation
- Sac and Fox Nation of Missouri in Kansas and Nebraska
- Sac and Fox Nation
- Sac and Fox Tribe of the Mississippi in Iowa
- Santee Sioux Nation
- Shakopee Mdewakanton Sioux Community of Minnesota
- Shoshone-Bannock Tribes of the Fort Hall Reservation
- Shoshone Tribe of the Wind River Reservation
- Sisseton-Wahpeton Oyate of the Lake Traverse Reservation
- Skull Valley Band of Goshute Indians of Utah
- Southern Ute Indian Tribe
- Spirit Lake Tribe
- Standing Rock Sioux Tribe of North & South Dakota
- The Modoc Tribe of Oklahoma
- The Osage Nation
- Thlopthlocco Tribal Town
- Three Affiliated Tribes of the Fort Berthold Reservation
- Tonkawa Tribe of Indians of Oklahoma
- Turtle Mountain Band of Chippewa Indians of North Dakota
- Upper Sioux Community
- Ute Indian Tribe of the Uintah & Ouray Reservation
- Ute Mountain Ute Tribe
- Wichita and Affiliated Tribes
- Yankton Sioux Tribe of South Dakota
- Ysleta del Sur Pueblo

S.5 DESCRIPTION OF ALTERNATIVES

The Department considered and evaluated the direct, indirect and cumulative effects of three route alternatives in the 2014 Keystone XL Final SEIS, including the Preferred Route. An overview of the proposed Project and alternatives for the entire Keystone XL route outside of the MAR, including the Preferred Route, can be found in Chapter 2 of the 2014 Keystone XL Final SEIS.

The 2014 Keystone XL Final SEIS, however, does not address the MAR because the MAR was developed subsequently as part of the planning process and in support of Keystone's application to the Nebraska PSC for approval of a pipeline route. The development of alternatives considered within this SEIS focuses on the MAR and incorporates Chapter 2 of the 2014 Keystone XL Final SEIS with regard to the remainder of the Keystone XL route.

Keystone employed a multidisciplinary approach to identify potential pipeline corridor routes through Nebraska. This process produced the Preferred Route that was previously analyzed by the Department in the 2014 Keystone XL Final SEIS and two alternatives, including the MAR. In developing the range of reasonable alternatives for this SEIS, the Department considered the Nebraska PSC's review and approval of the MAR, and the following criteria that were used in its development:

- Site new pipeline and supporting facilities to minimize impacts to environmentally sensitive areas (e.g., surface waters, wetlands, protected species and their habitat, and heritage resources).
- Site new pipeline to maximize the use of existing ROW, access roadways and pipeline infrastructure to the greatest extent possible to minimize impacts to landowners and land uses.
- Minimize the route length and the construction of permanent aboveground facilities.
- Avoid wellhead protection areas.
- Cross the Niobrara River at a location not designated as scenic or recreational under the National Wild and Scenic River Act of 1968.

Based on the siting criteria and the approval of the MAR by the Nebraska PSC, this SEIS incorporates by reference the analysis of the Preferred Route from the 2014 Keystone XL Final SEIS and considers two alternatives for detailed analysis: the Proposed Action (Section 2.1) and the No Action Alternative (Section 2.2). Section 2.3, Alternatives Dismissed from Further Consideration, describes the alternatives considered but eliminated from detailed analysis during the screening process and explains the basis for elimination. The BLM will consider the analysis described within this SEIS, among other factors, when determining whether to approve, approve with modification or deny issuance of a ROW grant to Keystone for the Keystone XL Project, and if so, under what terms and conditions.

S.5.1 Proposed Action

The Department has carried forward a new Preferred Route that is analyzed within this SEIS under the Proposed Action and that serves as a basis for the Federal Decisions described in Section S.3. The new Preferred Route considered in this SEIS consists of the 2014 Keystone XL Final SEIS Preferred Route Alternative revised to follow the MAR through Nebraska (see Figure S-1). Keystone would construct and operate the Keystone XL Project. This would include approximately 162 miles of construction, connection, operation and maintenance along the MAR of the proposed new 36-inch diameter pipeline and related ancillary facilities within Nebraska that were not analyzed within the 2014 Keystone XL Final SEIS. See Figure S-1 for an overview of the proposed Keystone XL Project and Figure S-2 and Section 2.4 of this SEIS for a detailed description of the MAR.

S.5.2 No Action Alternative

Consistent with CEQ regulations for implementing NEPA, the Department is including the No Action Alternative for consideration. This SEIS analyzes the status quo baseline No Action Alternative to compare effects of the Proposed Action if the Keystone XL Project would not be constructed or operated.

The 2014 Keystone XL Final SEIS considered a range of potential scenarios that could occur under the No Action Alternative, including rail/pipeline, rail/tanker and rail direct to the Gulf Coast as alternate means of crude oil transport if the Keystone XL Project was not constructed or operated. In developing alternative transport scenarios, efforts were made to focus on reasonably likely scenarios by the oil and transportation industry in response to the crude oil transport constraints that would occur if the permit were denied. Among other factors, likelihood was determined by analyzing what would be practical (e.g., economically competitive), take advantage of existing infrastructure to the extent possible, use proven technologies, and are similar to transport options currently being utilized.

At present, Canada remains committed to developing the oil sands. Moreover, this SEIS updates the market analysis from the 2014 Keystone XL Final SEIS and finds that there is continued global crude oil market demand under most scenarios and that WCSB production is likely to continue to increase. The updated market analysis also shows despite the recent lower price of global crude oil (including WCSB crude oil) since 2014, the industry break-even point of WCSB crude oil has also dropped in tandem with production costs, indicating production of WCSB crude oil will continue. Additionally, transport capacity issue remains and rail is becoming a growing alternative to pipelines for transport of WCSB crude oil. These other No Action Alternative scenarios considered in the 2014 Keystone XL Final SEIS, therefore, remain viable. Impacts under these scenarios are anticipated to be consistent with the findings of the 2014 Keystone XL Final SEIS contained in Chapter 5, Alternatives, and are incorporated by reference.

S.5.3 Alternatives Dismissed From Further Consideration

The Department conducted a robust analysis of alternatives in both the 2014 Keystone XL Final SEIS and in the earlier 2011 Keystone XL Final EIS. This included consideration of transportation of crude oil by rail, trucking or use of existing pipelines, as well as use of alternative energy sources and energy conservation. Ultimately the Department dismissed each of these alternatives from detailed analysis as they failed to meet the purpose and need.

The environmental review process also involved shifting a portion of the proposed pipeline route in Nebraska (the proposed Steele City Segment analyzed in the 2011 Keystone XL Final EIS) further to the east to avoid the sensitive Sand Hills Region in Nebraska. This revised route is presented and analyzed as the Preferred Route in the 2014 Keystone XL Final SEIS. The Department dismissed the Steele City Segment Alternative (presented as the Sandhills Alternative Route in the Nebraska PSC application) as this alternative does not minimize impacts to environmentally sensitive areas (e.g., Sand Hills Region).

S.6 OVERVIEW OF KEYSTONE'S PROPOSED PROJECT

Section 2.1 of the 2014 Keystone XL Final SEIS contains a detailed description of Keystone's proposed Project for areas outside of the MAR. Section 2.4 of this SEIS describes the changes to the proposed Project with an emphasis on the MAR and changes to the proposed Project which have occurred since the 2014 Keystone XL Final SEIS (see Figure S-1 for the current proposed Project under consideration). Chapter 6, Electrical Power Infrastructure, provides updated descriptions for connected actions by electrical cooperatives associated with the proposed electrical power lines.

The MAR, as analyzed in this SEIS, is the portion of the pipeline route in Nebraska that deviates from the Preferred Route that was analyzed in the 2014 Keystone XL Final SEIS (see Figure S-2). The MAR consists of approximately 162 miles of new 36-inch diameter pipeline that traverses Antelope, Madison, Stanton, Platte, Colfax, Butler, Seward, Saline and Jefferson counties in Nebraska. As shown in Figure S-2, the MAR starts near milepost (MP) 711 in Antelope County and heads in a southeasterly direction across Madison and Stanton counties for approximately 43 miles. At proposed MP 754, the MAR then intercepts the existing ROW for the Keystone Mainline and heads towards the south paralleling the existing Keystone Mainline for approximately 50 miles, crossing Shell Creek and the Platte River in Colfax County. The MAR then shifts away from its co-location with the existing Keystone Mainline at proposed MP 804 for approximately 29 miles by routing west around the Seward County wellhead protection area. The MAR then rejoins the existing Keystone Mainline route at proposed MP 833 and continues south for an additional 40 miles through Saline County, terminating in Jefferson County where it rejoins the 2014 Keystone XL Preferred Route at MP 873. The MAR is not located on any federal or state lands.

Table S-2 summarizes key differences between the 2014 Keystone XL Preferred Route and the MAR in Nebraska.

Table S-2. Summary of Key Changes of the Proposed Keystone XL Pipeline in Nebraska

Project Component	Previous Nebraska Totals 2014 Keystone XL Final SEIS	Current Nebraska Totals (considering the MAR)	Net Difference of MAR
Pipeline Length (miles)	274	281	+7
Co-location of ROW (miles)[a]	2	107	+105
Required Pump Stations	5	6	+1

[a.] Co-location includes pipeline, utility and road ROW.
MAR = Mainline Alternative Route; ROW = right-of-way; SEIS = Supplemental Environmental Impact Statement

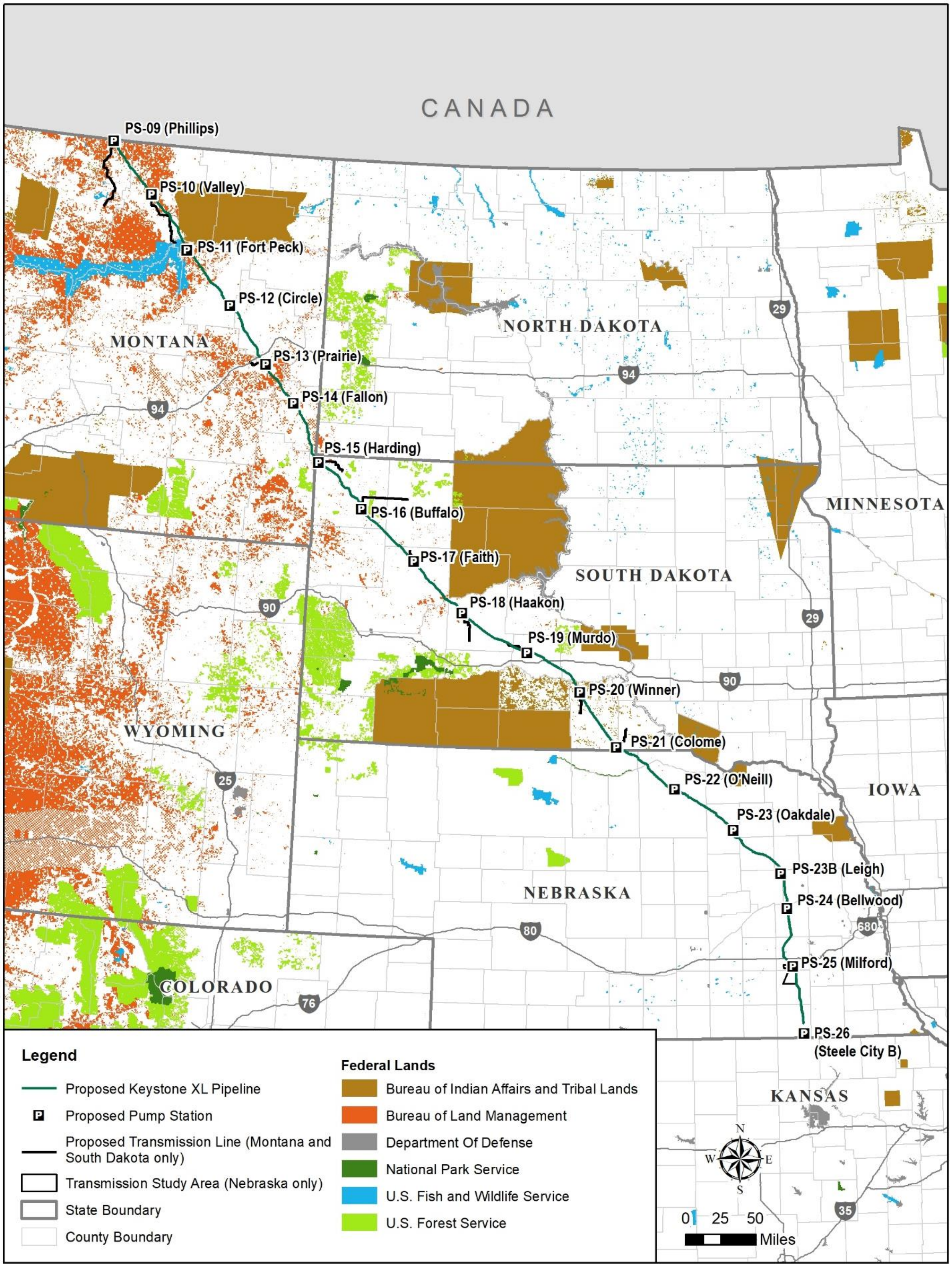

Figure S-1. Proposed Keystone XL Project

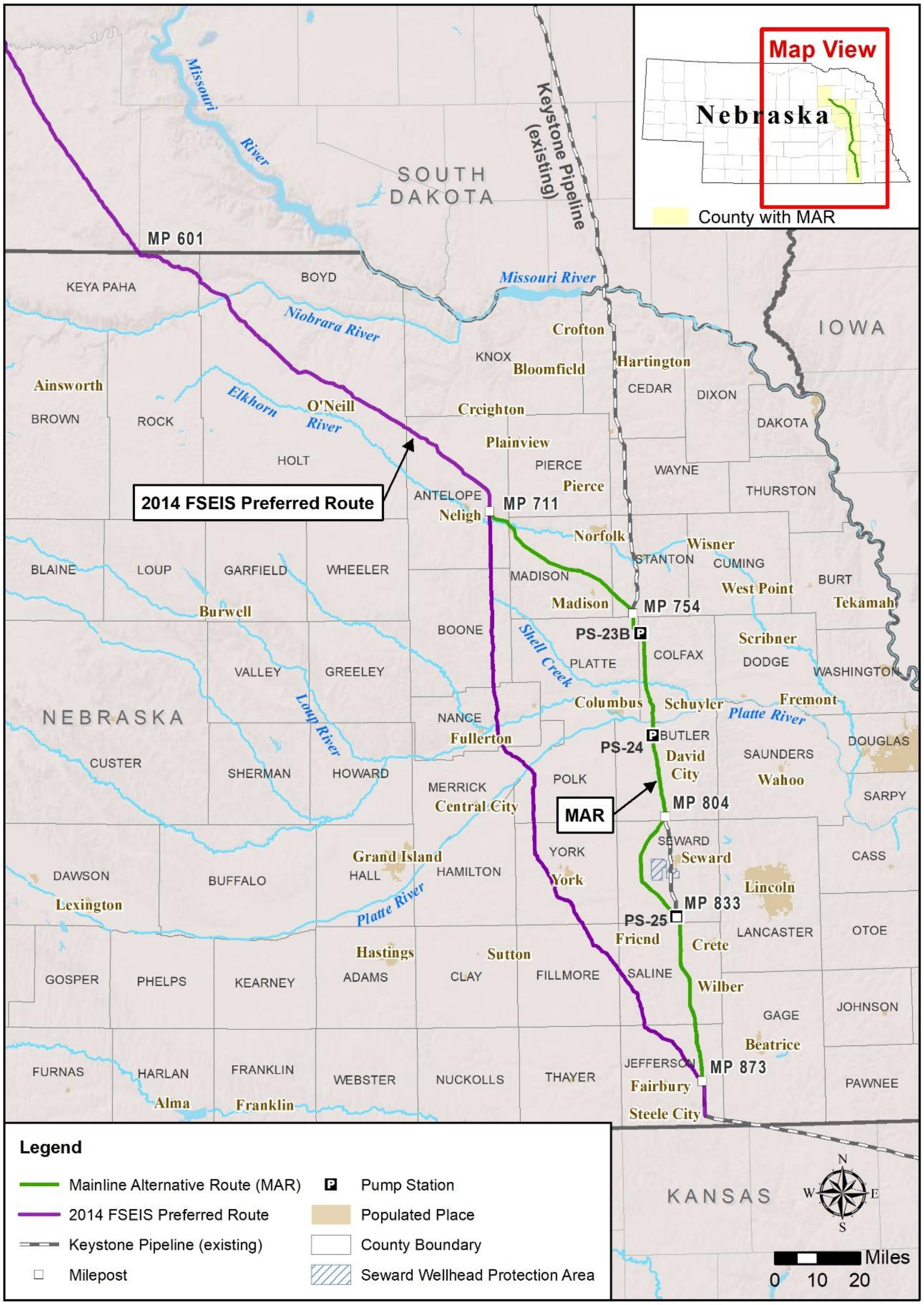

Figure S-2. Proposed MAR in Comparison with the 2014 Keystone XL Final SEIS Preferred Route

S.7 ENVIRONMENTAL EFFECTS

S.7.1 Summary of Environmental Effects of the Proposed Project from Construction and Normal Operations

The Department analyzed the potential effects of the proposed Project under the Proposed Action Alternative and the No Action Alternative. Table S-3 provides a summary of the level of potential environmental impacts discussed within this SEIS. These conclusions are based on the best management practices and impact avoidance measures contained within the Construction Mitigation and Reclamation Plan (CMRP) and outlined in Table S-4, Table S-5**,** Table S-6 **and Table S-7**. **The Department added Table S-7 in this Final SEIS to clearly describe the measures that are specific to the power infrastructure (power providers) versus the proposed Keystone XL pipeline and ancillary facilities (Keystone).** The following descriptors qualitatively characterize impacts on the respective resources:

- **Beneficial** – Impacts would improve or enhance the resource.
- **Negligible** – No apparent or measurable impacts are expected, and may also be described as "none," if appropriate.
- **Minor** – The action would have a barely noticeable or measurable adverse impact on the resource.
- **Moderate** – The action would have a noticeable or measurable adverse impact on the resource. This category could include potentially significant impacts that could be reduced by the implementation of mitigation measures.
- **Significant** – The action would have obvious and extensive adverse impacts that could result in potentially significant impacts on a resource, despite mitigation measures.

Table S-3. Comparison Summary of Impact Ratings during Construction and Normal Operations

Resource[a]	No Action Alternative	Proposed Project Construction	Proposed Project Operations & Maintenance	Cumulative Effects
Land Use, Recreation and Visual Resources	None	Minor to Moderate	Negligible to Minor	Negligible
Geology and Soils	None	Negligible (geology) Minor (soils)	Negligible (geology) Minor (soils)	Minor
Air Quality	None	Minor	Minor	Minor
Noise and Vibration	None	Minor to Moderate	Negligible to Minor	Minor to Moderate
Water Resources	None	None (wild and scenic rivers) Negligible (groundwater and floodplains) Minor (surface water and wetlands)	None (wild and scenic rivers) Negligible (floodplains and groundwater) Minor (surface water and wetlands)	Minor to Moderate
Biological Resources	None	Minor to Moderate	Minor to Moderate	Minor to Moderate
Socioeconomics and Environmental Justice	None	None to Minor Beneficial (Economic Base)	Negligible to Minor Beneficial (Economic Base and Tax Revenue)	Negligible to **Moderate** Beneficial
Cultural Resources	None	Minor to Moderate	Negligible to Minor	Minor
Greenhouse Gases and Climate Change	None	**Minor**[b]	**Significant (indirect lifecycle emissions)**[c] **Minor to moderate (direct and indirect project emissions)**[d]	**Significant**[e]
Reliability[f]	None	–	–	–

a. Refer to Section 4.1, Introduction, for a discussion of impact ratings.

b. **Construction e**missions **equal 0.26 million metric tons CO_2-eq.**

c. **Lifecycle emissions** estimates reflect transport of 830,000 bpd of WCSB crude oil **and would equal 37.3 to 120.5 million metric tons CO_2-eq per year if other crude oils are partially displaced from the market (i.e., each barrel of WCSB crude oil is assumed to displace 0.8 to 0.4 barrels of other medium to heavy crude oils). If other crude oils are fully displaced (i.e., one barrel of WCSB crude oil displaces one barrel of other medium to heavy crude oils), lifecycle emissions would equal 2.1 to 33.9 million metric tons CO_2-eq per year. If no displacement of other crude oils is assumed to occur, lifecycle emissions would equal 178.3 million metric tons CO_2-eq per year.**

d. **Direct and indirect project emissions equal 1.31 million metric tons CO_2-eq per year.**

e. **Cumulative greenhouse gas emissions include emissions from the proposed Project and other global sources.**

f. The impact intensity of an accidental release on a given resource is dependent on numerous factors including type of product released, size of the release, proximity of the resource to the point of release, weather conditions, response time and method of cleanup. Therefore, the analysis does not assign a specific impact rating. See Chapter 5, Environmental Consequences from Accidental Releases, for a more detailed description of impacts and the likelihood of an accidental release. See Chapter 7, Cumulative Impacts, for a more detailed description of cumulative impacts that could occur from current and planned crude oil pipelines within the cumulative impact ROI.

bpd = barrels per day; CO_2-eq = carbon dioxide equivalent; ROI = region of influence; WCSB = Western Canadian Sedimentary Basin

Table S-4. Summary of Resource Protection Measures for the Proposed Project

Resource	Project Phase	Description
Land Use, Recreation and Visual Resources	Construction	• Segregating the upper 12 inches of agricultural topsoil during construction and replacing it during site restoration. • Avoiding functional loss (stopping or obstructing) of active irrigation ditches during construction or providing alternate sources of water. • Avoiding or minimizing potential damage to drain tile systems and repairing damaged drain tiles using original or new material. • Restoring disturbed areas as per the Con/Rec units and landowner agreements. • Minimizing construction noise in the immediate vicinity of herds of livestock. • Installing temporary fences with gates around construction areas to prevent injury to livestock or workers. • Leaving hard plugs (short lengths of unexcavated trench) or installing soft plugs (areas where the trench is excavated and replaced with minimally compacted material) to allow livestock and wildlife to cross the trench safely where required by landowner. • Maintaining all existing improvements such as fences, gates, irrigation ditches, cattle guards and reservoirs to the degree practicable where required by the landowner agreement. • Routing the proposed pipeline along existing ROWs in forest lands, when practicable. • Felling trees toward the pipeline centerline to minimize additional tree disturbance. • Providing construction shielding for certain land improvements (e.g., fences and sheds) and to preserve landscaping and mature trees. • Restoring all fences, landscaping improvements, shrubs, lawn areas and other structures to landowner-agreed requirements following construction. • Where the transmission lines associated with pump stations would cross federal lands, following required mitigation measures according to current land or forest management plans. • Routing transmission lines and distribution lines along existing linear corridors such as existing power lines, roadways, fence lines, field lines, parcel boundaries, or section lines to reduce impacts to land use and visual resources **to the extent practicable**. • Working with individual landowners to minimize impacts to their property **to the extent practicable**. • Consulting with farm owners and operators to minimize impacts to irrigation equipment and farming practices **to the extent practicable**. • Providing compensation for crop damage associated with construction or maintenance of transmission and distribution lines that connect to pump stations. • Considering strategic structure placement and varying structure type (e.g., lattice, H-frame, or single-pole) and material (e.g., wood, steel, or weathered steel) to reduce potential impacts to visual resources **to the extent practicable**. • Where possible, utilizing topographic or vegetative screening to reduce visual impacts. • If possible, collocating transmission lines or distribution lines on the same structures to consolidate infrastructure.
Geology and Soils	Construction	• Construction of the pipeline to withstand probable seismic events within the seismic risk zones and in accordance with U.S. Department of Transportation regulations (49 CFR 195, Transportation of Hazardous Liquids by Pipeline) and all other applicable federal and state regulations.

Table S-4. Summary of Resource Protection Measures for the Proposed Project

Resource	Project Phase	Description
Geology and Soils (continued)	Construction	• Design and construction of the pipeline in accordance with 49 CFR 192 and 193, which require pipeline facilities to be designed and constructed in a manner to provide adequate protection from washouts, floods, unstable soils, landslides or other hazards that could cause the proposed pipeline facilities to move or sustain abnormal loads. Keystone also proposes to use specialized pipeline installation techniques, such as padding and the use of rock-free backfill, which are designed to effectively insulate the proposed pipeline from minor earth movements. • Installation of sediment barriers (e.g., silt fencing, straw or hay bales and sand bags), trench plugs, temporary slope breakers, drainage channels or ditches and use of mulching in areas of high erosion potential as outlined in the CMRP. • Restoration and revegetation of areas disturbed by construction along the pipeline ROW consistent with the CMRP and specific landowner requirements. • Implementation of compaction control measures, including ripping (loosening of compacted soils with a dozer equipped with a ripper blade or deep plow) to relieve compaction, particularly in areas where topsoil has been removed. • Restricting power line work during wet conditions to minimize rutting. • Monitoring the ROW following construction for erosion, settling and landslide activity, and, in areas of prime farmland, monitoring for any degradation in soil productivity. • Removal and segregation of **up to** 12 inches of topsoil in non-forested agricultural areas located within prime farmland during excavation to a windrow along the edge of the ROW, with care taken to minimize the potential for mixing topsoil and subsoil. • Compensation of landowners in the event that agricultural productivity is impaired by vehicular compaction for demonstrated losses associated with decreased productivity.
	Operations	• Implementation of erosion and sediment control and reclamation (including revegetation) procedures similar to those described for construction activities and also as described in the CMRP for operations wherever soil is exposed and steep slopes are present or erosion potential is high.
Air Quality	Construction	• Employing water trucks, sprinklers or calcium chloride (limited to roads) to control dust levels during construction activities. • Controlling speed of all contractor vehicles in work areas and on roads. • Controlling emissions from construction equipment combustion, open burning and temporary fuel transfer systems and associated tanks to the extent required by state and local agencies through the permit process. • Prevention of wind-blown particles from sand blasting operations from reaching any residence or public building by placement of curtains of suitable material, as necessary. • Compliance with all applicable state regulations and local ordinances with respect to truck transportation and fugitive dust emissions.
Noise and Vibration	Construction	• Coordinating pipeline work schedules in areas near residences and businesses where construction activities or noise levels may be considered disruptive to minimize disruption. • Minimizing noise during non-daylight hours and within 1 mile of residences or other noise sensitive areas such as hospitals, motels, campgrounds or state and federal parks.

Table S-4. Summary of Resource Protection Measures for the Proposed Project

Resource	Project Phase	Description
Noise and Vibration (continued)	Construction	• Providing advance notice to landowners within 500 feet of the ROW prior to construction, limiting the hours during which construction activities with high decibel noise levels are conducted, and ensuring construction proceeds quickly through such areas. • Minimizing noise in the immediate vicinity of herds of livestock or poultry operations, which are particularly sensitive to noise through use of noise control measures identified above. • Establishing a toll-free telephone line for landowners to report any construction noise-related issues and follow-up on appropriate mitigation measures, as necessary.
	Operations	• Implementing a three-step noise control plan for pump station operations in a progressive order when noise reductions are required: (1) install pipe lagging for all pipe suction pipes and discharge pipes; (2) install acoustic blankets for all pumps; and (3) upgrade enclosure for all motors, which would provide 3 decibels noise attenuation for each motor compared with a standard motor enclosure.
Water Resources	Construction	• Implementing the Project's SPCC Plan to avoid or minimize the potential impact of harmful spills and leaks during construction. • Compliance with requirements of all permits issued for the waterbody and wetland crossings by federal, state or local agencies. This includes requirements imposed by USACE **for general permit verifications or required permit approvals**. USACE will determine compliance with the ESA and Section 106 within permit areas using information from the SEIS documents and any additional supporting information provided by the applicant. • Installation of sediment barriers immediately after initial disturbance of the waterbody, wetland or adjacent upland per the CMRP. • Selection of most appropriate method at each crossing based on site-specific conditions (i.e., environmental sensitivity of the waterbody, depth, rate of flow, subsurface soil conditions and the expected time and duration of construction) at the time of crossing. • Use of non-toxic drilling fluids and additives during horizontal directional drill (HDD) activities. • Development of a contingency plan to address a frac-out during an HDD. The plan shall include instructions for monitoring during the directional drill and mitigation in the event that there is a release of drilling fluids. Additionally, the waterbody shall be monitored downstream for any signs of drilling fluid. • Re-establishment of the streambank contour and stabilization of streambanks and installation of temporary sediment barriers following the measures provided in the CMRP and applicable permits. • Reduction of construction ROW crossing widths to 85 feet or less in standard wetlands unless non-cohesive soil conditions require utilization of a greater width and unless the USACE during review of pre-construction notifications or other regulatory authority authorizes a greater width. • Limiting the duration of construction-related disturbance within wetlands in accordance with USACE **permit requirements**. • Performing all equipment maintenance and repairs on upland locations at least 100 feet from waterbodies and wetlands. • As much as is feasible, replace topsoil and restore original contours with no crown over the trench. Remove excess spoil and stabilize wetland edges and adjacent upland areas by establishing permanent erosion control measures and revegetation, as applicable, during final clean up. • As much as is feasible, locating transmission line structures outside of wetlands, waterbodies and floodplains.

Table S-4. Summary of Resource Protection Measures for the Proposed Project

Resource	Project Phase	Description
Water Resources (continued)	Construction	• In areas with a shallow water table, installing transmission line structures using caissons to prevent poles from contacting groundwater. • As described in the CMRP, restoring wetlands affected by construction activities to the extent practicable.
	Operations	• After a flood event, inspecting transmission line structures in floodplains and removing accumulated debris.
Biological Resources	Construction	• Limiting construction traffic to the ROW, existing roads, newly constructed roads and approved private roads. • Clearly staking construction ROW boundaries, including pre-approved temporary workspace areas (TWAs), to prevent disturbance to unauthorized areas. • Implementing reclamation and revegetation measures as described in the proposed CMRP and Con/Rec units. • Using certified seed mixes to limit the introduction of noxious weeds within 12 months of seed germination testing, and adjusting seeding rates based on test results per the Con/Rec units. • Seeding at a rate appropriate for the region and for the stability of the reclaimed surface based on pure live seed **as per the Con/Rec Units**. • Develop and adhere to a weed control plan for Nebraska in consultation with County Weed Boards. • Using pre-construction treatment such as mowing prior to seed development or herbicide application (in consultation with county or state regulatory agencies, and landowners) for areas of noxious weed infestations prior to clearing grading, trenching or other soil disturbing work to weed infestation locations identified on construction drawings. • Stripping and storing topsoil contaminated with weed populations separately from clean topsoil and subsoil. • On BLM lands, avoiding construction within identified big game winter ranges from December 1 to May 15 of each year. • Using mulch and straw or hay bales that are free of noxious weeds for temporary erosion and sediment control. • Cleaning all construction equipment, including timber mats, with air or high-pressure washing equipment prior to moving equipment to the next job site; cleaning the tracks, tires and blades of equipment by hand or compressed air to remove excess soil prior to movement of equipment out of weed infested areas; or use cleaning stations to remove vegetative materials with high pressure washing equipment. • Implementing weed control measures as required by **the state-specific Weed Management Plan** and in conjunction with the landowner. • Reseeding disturbed native range with native seed mixes after topsoil replacement consistent with applicable Con/Rec and landowner requirements. • Keystone would develop a Conservation Plan consistent with the December 2017 **Interior Solicitor's Opinion M-37050** and current applicable USFWS guidance. • If applicable, develop construction timing restrictions and buffer zones through consultation with regulatory agencies. • If construction would occur during the bald or golden eagle nesting season during January to August, complete pre-construction surveys to locate active nest sites. • Installation of sediment barriers immediately after initial disturbance of waterbodies or adjacent uplands. • Maintaining the ROW width and limiting the extent of riparian vegetation loss. • Minimization of grading and grubbing along streambanks.

Table S-4. Summary of Resource Protection Measures for the Proposed Project

Resource	Project Phase	Description
Biological Resources (continued)	Construction	• Minimizing in-stream use of equipment, locating workspaces at least 10 feet from waterbodies to the extent practicable. • Using dry-ditch techniques at crossings where the timing of construction does not adequately protect environmentally sensitive waterbodies, as determined by the appropriate regulatory authority. • Installing BFDs on power lines across and for 0.25 mile on either side of large rivers.
Socioeconomics and Environmental Justice	Construction	• Identifying and documenting routes that would be used for moving materials and equipment, which would minimize potential impacts. • Constructing pipeline crossings of paved roads by boring beneath the roads, allowing traffic activity to continue. • During the construction phase, maintaining roads used for construction in a condition that is safe for both members of the public and the workforce. • After construction is complete, restoring the roads used to their preconstruction conditions or better. • Submitting a road use plan prior to mobilization and coordinating with the appropriate state and county representatives to develop a mutually acceptable plan.
Cultural Resources	Construction and Operations	• Implementation of the existing Programmatic Agreement for the Keystone XL pipeline along the proposed pipeline route and along new power lines to avoid, if possible, or mitigate adverse effects on historic properties. If impacts to **historic** properties could not be avoided, mitigation plans would be reviewed by the Department and the consulting parties following the protocols outlined in the Programmatic Agreement. • Implementation of an HDD contingency plan to reduce the potential for and effects of a frac-out during an HDD. This would reduce the potential for indirect effects on **historic properties** if present near HDD sites. • Avoidance of direct impacts to Ponca corn by construction during post-harvest or use of alternate construction methods such as boring the planted lands. Following the terms of the Unanticipated Discoveries Plan should any unanticipated discoveries of **historic properties** be made during construction or operation of the pipeline or power lines.
Greenhouse Gases	Construction	• Controlling speed of all contractor vehicles in work areas and on roads. • Controlling emissions from construction equipment combustion, open burning and temporary fuel transfer systems and associated tanks to the extent required by state and local agencies through the permit process.

BFD = bird flight diverter; BLM = Bureau of Land Management; CFR = *Code of Federal Regulations*; CMRP = Construction Mitigation and Reclamation Plan; **Con/Rec = Construction/Reclamation;** ESA = Endangered Species Act; HDD = horizontal directional drill; MAR = Mainline Alternative Route; SPCC = Spill Prevention, Control, and Countermeasure; ROW = right-of-way; TWA = temporary workspace area; USACE = U.S. Army Corps of Engineers; USFWS = U.S. Fish and Wildlife Service

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Bird: Interior least tern (*Sternula antillarum)*
• Crossings of major rivers and riverine habitat will be completed using HDD, resulting in a pipeline burial depth of 25 feet or greater, regardless of the season. • Keystone will implement measures identified in the HDD contingency plan, including monitoring of the HDD bore, monitoring downstream of the HDD site for evidence of drilling fluids, and mitigation measures should a frac-out occur. • Where practicable, vegetative screening at HDD sites will be maintained to prevent disturbance of interior least terns. • Should HDD activities occur at night, lights will be down-shielded when the site is within 0.25 mile of potentially suitable habitat and vegetative screening is lacking. • Pre-construction presence/probable absence surveys of pipeline crossings will occur within 0.25 mile of potentially suitable breeding habitat at the Platte, Elkhorn, and Niobrara rivers in Nebraska; the Cheyenne River in South Dakota; and the Yellowstone River in Montana during the interior least tern nesting season (April 15 to September 1) to ensure that there are no nesting pairs within 0.25 mile of the construction area. If interior least tern nests are found at the crossings, Keystone will: (1) adhere to a 0.25-mile buffer of no pipeline construction activity and (2) continue to monitor nests if any are within 0.25 mile of the construction footprint until young have fledged. • Daily surveys for nesting terns will be conducted during the nesting season when construction activities occur within 0.25 mile of potential nesting habitat. • If nesting terns are present, Keystone will make minor adjustments to the pipeline corridor, if practicable, to avoid nesting interior least terns, in coordination with USFWS. This may involve shifting the pipeline corridor away from nests to avoid disturbances to interior least tern nests or other modifications depending on the circumstances. • To the extent practicable, construction will occur mostly during daytime hours and will comply with any local noise regulations. • Construction equipment will be properly equipped with mufflers to lessen noise impacts. • Keystone will prepare and implement a project-specific SPCC Plan. • Keystone will mark and maintain a 100-foot buffer from river crossings, free from hazardous materials, fuel storage, and vehicle fuel transfers. These buffers will be maintained during construction except when fueling and refueling the water pump near the river edge, which is required for the HDD crossing and hydrostatic test water withdrawal. Water pump fueling will be completed by trained personnel and will use secondary containment; a spill kit will be onsite. • Refueling and lubrication of construction equipment will occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup will conduct these activities. • All equipment maintenance and repairs will be performed in upland locations at least 100 feet from waterbodies and wetlands. • All equipment will be parked at least 100 feet from a watercourse or wetland overnight, if possible. • Equipment will not be washed in streams or wetlands. • Construction and restoration activities will be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials. • Each construction crew and cleanup crew will have sufficient tools and materials on hand to stop leaks, including supplies of absorbent and barrier materials that will allow for rapid containment and recovery of spilled materials. • Water withdrawal for hydrostatic testing will be less than 10 percent of the baseline daily flow. • Keystone will minimize temporary water reductions by withdrawing only the volume of water needed for hydrostatic testing as outlined in its permits. Water will be returned to its source within a 30-day period except where the hydrostatic test water is used to test multiple spreads. At the conclusion of hydrostatic testing, the remaining water will be returned to the source. • During aerial surveillance, aircraft will maintain at least 1,000 feet of elevation.

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- If construction of power lines occurs during the interior least tern nesting season, surveys of potentially suitable riverine and/or sand pit nesting habitat within 0.25 mile of new power lines will be conducted within 2 weeks of construction to determine presence of nesting pairs. If nesting interior least terns are present, construction will cease until chicks fledge from the site.
- Power providers will install anti-perching measures on all structures within 0.1 mile of either side of the proposed crossings of the Platte, Elkhorn, Niobrara, Cheyenne, Yellowstone, Milk and Missouri rivers.

Bird: Piping plover (*Charadrius melodus*)

- Crossings of major rivers and riverine habitat will be completed using HDD, resulting in a pipeline burial depth of 25 feet or greater, regardless of the season.
- Keystone will implement measures identified in the HDD contingency plan, including monitoring of the HDD bore, monitoring downstream of the HDD site for evidence of drilling fluids, and mitigation measures should a frac-out occur.
- Where practicable, vegetative screening at HDD sites will be maintained to prevent disturbance of piping plovers.
- Should HDD activities occur at night, lights will be down-shielded when the site is within 0.25 miles of potentially suitable habitat and vegetative screening is lacking.
- Pre-construction presence/probable absence surveys of pipeline crossings will occur within 0.25 mile of potentially suitable breeding habitat at the Platte, Elkhorn, and Niobrara rivers in Nebraska; the Cheyenne River in South Dakota; and the Yellowstone River in Montana during the piping plover nesting season (April 15 to September 1) to ensure that there are no nesting pairs within 0.25 mile of the construction area. If piping plover nests are found at the crossings, Keystone will: (1) adhere to a 0.25-mile buffer of no pipeline construction activity and (2) continue to monitor nests if any are within 0.25 mile of the construction footprint until young have fledged.
- Daily surveys for nesting piping plovers will be conducted during the nesting season when construction activities occur within 0.25 mile of potential nesting habitat.
- If nesting piping plovers are present, Keystone will make minor adjustments to the pipeline corridor, if practicable, to avoid nesting plovers, in coordination with USFWS. This may involve shifting the pipeline corridor away from nests to avoid disturbances to piping plover nests or other modifications depending on the circumstances.
- To the extent practicable, construction within 0.25 mile of a piping plover nest will occur mostly during daytime hours and will comply with any local noise regulations.
- Construction equipment will be properly equipped with mufflers to lessen noise impacts.
- Keystone will prepare and implement a project-specific SPCC Plan.
- Keystone will mark and maintain a 100-foot buffer from river crossings, free from hazardous materials, fuel storage, and vehicle fuel transfers. These buffers will be maintained during construction except when fueling and refueling the water pump near the river edge that is required for the HDD crossing and hydrostatic test water withdrawal. Water pump fueling will be completed by trained personnel and will use secondary containment and a spill kit will be onsite.
- Refueling and lubrication of construction equipment will occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup will conduct these activities.
- All equipment maintenance and repairs will be performed in upland locations at least 100 feet from waterbodies and wetlands.
- All equipment will be parked at least 100 feet from a watercourse or wetland overnight, if possible.
- Equipment will not be washed in streams or wetlands.
- Construction and restoration activities will be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials.
- Each construction crew and cleanup crew will have sufficient tools and materials on hand to stop leaks, including supplies of absorbent and barrier materials that will allow for rapid containment and recovery of spilled materials.
- Water withdrawal for hydrostatic testing will be less than 10 percent of the baseline daily flow.

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• Keystone will minimize temporary water reductions by withdrawing only the volume of water needed for hydrostatic testing as outlined in its permits. Water will be returned to its source within a 30-day period except where the hydrostatic test water is used to test multiple spreads. At the conclusion of hydrostatic testing, the remaining water will be returned to the source. • During aerial surveillance, aircraft will maintain at least 1,000 feet of elevation. • If construction of power lines occurs during the piping plover nesting season, surveys of potentially suitable riverine and/or sand pit plover nesting habitat within 0.25 mile of new power lines will be conducted within 2 weeks of construction to determine presence of nesting pairs. If nesting plovers are present, construction will cease until all chicks fledge from the site. • Power providers will install anti-perching measures on all structures within 0.1 mile of either side of the proposed crossings of the Platte, Elkhorn, Niobrara, Cheyenne, Yellowstone, Milk and Missouri rivers. • Should potentially suitable breeding or foraging habitat for piping plover be identified near the proposed Project at a later time, power lines near breeding habitat (and within 0.25 mile of each side) and lines that will be built between rivers and sand and gravel mining areas will be marked with BFDs to reduce potential injury or mortality to piping plovers. • Power lines will be routed to avoid construction within 0.50 mile of potentially suitable piping plover nesting habitat in alkali wetlands in Montana. • NorVal Electric Cooperative will install BFDs in all locations where the power line to PS-10 comes within 0.25 mile of either side of the Milk River. Additionally, BFDs will be installed for 0.25 mile on either side of two unnamed reservoirs crossed by the proposed power line to PS-10.
Bird: Rufa red knot (*Calidris canutus rufa)*
• Crossings of major rivers and riverine habitat will be completed using HDD, resulting in a pipeline burial depth of 25 feet or greater, regardless of the season. • Keystone will implement measures identified in the HDD contingency plan, including monitoring of the HDD bore, monitoring downstream of the HDD site for evidence of drilling fluids, and mitigation measures should a frac-out occur. • Keystone will prepare and implement a project-specific SPCC Plan. • To the extent practicable, construction will occur mostly during daytime hours and will comply with any local noise regulations. • Construction equipment will be properly equipped with mufflers to lessen noise impacts. • Keystone will mark and maintain a 100-foot buffer from river crossings, free from hazardous materials, fuel storage, and vehicle fuel transfers. These buffers will be maintained during construction except when fueling and refueling the water pump near the river edge that is required for the HDD crossing and hydrostatic test water withdrawal. Water pump fueling will be completed by trained personnel and will use secondary containment and a spill kit will be onsite. • Refueling of lubrication of construction equipment will occur in uplands and greater than100feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup will conduct these activities. • All equipment maintenance and repairs will be performed in upland locations at least 100 feet from waterbodies and wetlands. • All equipment will be parked at least 100 feet from a watercourse or wetland overnight, if possible. • Equipment will not be washed in streams or wetlands. • Construction and restoration activities will be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials. • Each construction crew and cleanup crew will have sufficient tools and materials on hand to stop leaks, including supplies of absorbent and barrier materials that will allow for rapid containment and recovery of spilled materials. • Water withdrawal for hydrostatic testing will be less than 10 percent of the baseline daily flow. • Keystone will minimize temporary water reductions by withdrawing only the volume of water needed for hydrostatic testing as outlined in their permits. Water will be returned to its source within a 30-day period except where hydrostatic test water is used to test multiple spreads. At the conclusion of hydrostatic testing, the remaining water will be returned to the source.

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Bird: Whooping crane (*Grus americana*)
• Crossings of major rivers and riverine habitat will be completed using HDD, resulting in a pipeline burial depth of 25 feet or greater, regardless of the season. • Keystone will implement measures identified in the HDD contingency plan, including monitoring of the HDD bore, monitoring downstream of the HDD site for evidence of drilling fluids, and mitigation measures should a frac-out occur. • Should HDD activities occur at night, lights will be down-shielded during the spring and fall whooping crane migration seasons in areas that provide potentially suitable habitat. • Where practicable, vegetative screening at HDD sites will be maintained to prevent disturbance of whooping cranes. • During spring (March–May) and fall (October–November) whooping crane migration periods, environmental monitors will complete a daily brief survey of any wetland or riverine habitat areas potentially used by whooping cranes in the morning and afternoon before starting equipment and following the Whooping Crane Survey Protocol previously developed by the USFWS and NGPC. If whooping cranes are sighted, the environmental monitor will immediately contact the USFWS and respective state agency in Nebraska, South Dakota, and/or Montana for further instruction and require that all human activity and equipment start-up be delayed. Work could proceed if whooping crane(s) leave the area. The compliance manager will record the sighting, bird departure time, and work start time on the survey form. The USFWS will notify the compliance manager of whooping crane migration locations during the spring and fall migrations through information gathered from the whooping crane tracking program. • Keystone will re-vegetate disturbed areas (particularly within riparian zones and in wetland habitats) in accordance with the CMRP and USACE permit requirements. • Use of helicopters within 0.5 mile of any whooping crane(s) will be prohibited. • Keystone will prepare and implement a project-specific SPCC Plan. • Keystone will mark and maintain a 100-foot buffer from river crossings, free from hazardous materials, fuel storage, and vehicle fuel transfers. These buffers will be maintained during construction except when fueling and refueling the water pump near the river edge that is required for the HDD crossing and hydrostatic test water withdrawal. Water pump fueling will be completed by trained personnel and will use secondary containment and a spill kit will be onsite. • Refueling and lubrication of construction equipment will occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup will conduct these activities. • All equipment maintenance and repairs will be performed in upland locations at least 100 feet from waterbodies and wetlands. • All equipment will be parked at least 100 feet from a watercourse or wetland overnight, if possible. • Equipment will not be washed in streams or wetlands. • Construction and restoration activities will be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials. • Each construction crew and cleanup crew will have sufficient tools and materials on hand to stop leaks, including supplies of absorbent and barrier materials that will allow for rapid containment and recovery of spilled materials. • Water withdrawal for hydrostatic testing will be less than 10 percent of the baseline daily flow. • Keystone will minimize temporary water reductions by withdrawing only the volume of water needed for hydrostatic testing as outlined in its permits. Water will be returned to its source within a 30-day period except where the hydrostatic test water is used to test multiple spreads. At the conclusion of hydrostatic testing, the remaining water will be returned to the source. • During aerial surveillance, aircraft will maintain at least 1,000 feet of elevation. • Should power line routes be adjusted, they will be sited greater than 5 miles from Designated Critical Habitat and/or documented high-use areas. • Power providers will mark new lines within 1 mile of potentially suitable habitat within the 95-percent migration corridor.

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• Power providers will mark new lines near potentially suitable habitat outside the 95-percent migration corridor at the discretion of the local USFWS Ecological Services Field Office, based on the biological needs of the whooping crane. Thus far, this will include the following: o The power line to PS-09 will be marked with BFDs within 0.25 mile of crossings of the Milk River. o The power line to PS-10 will be marked with BFDs within 0.25 mile of crossings of the Milk River and within 0.25 mile of two unnamed reservoirs crossed by the line. o The power line to PS-12 will be marked with BFDs within 0.25 mile of crossings of the Redwater River and Buffalo Springs Creek. o The power line to PS-14 will be marked with BFDs within 0.25 mile of crossings of Pennel Creek and an unnamed pond in the northwest corner of section 35, township 9 north, range 58 east, in Fallon County, Montana. • Keystone will develop a compliance monitoring plan that requires written confirmation that the power lines have been marked and that the markers are maintained in working condition. • Power providers will complete daily presence/probable absence surveys in potentially suitable habitat according to the Project's protocol described above if construction occurs during the spring and fall migration periods. Should a whooping crane be sighted within 0.5 mile of a work area, all work will cease until the whooping crane leaves that immediate area. USFWS and NGPC will be contacted immediately and notified of the presence of whooping crane.
Mammal: Black-footed ferret (*Mustela nigripes*)
• Keystone will provide USFWS with the results of Montana prairie dog town surveys and continue to coordinate with the Montana USFWS Ecological Services Office to determine the need for black-footed ferret surveys, in accordance with the USFWS Black-footed Ferret Survey Guidelines. • Workers will be prohibited from keeping domestic pets in construction camps and/or worksites. • Workers will be made aware of how canine distemper and sylvatic plague diseases are spread (domestic pets and fleas). • Workers will be prohibited from feeding wildlife. • Concentrations of dead and/or apparently diseased animals (prairie dogs, ground squirrels, others) will be reported to the appropriate state and federal agencies. • Keystone will prepare and implement a Project-specific SPCC Plan. • Electrical service providers will implement protection measures to minimize raptor perching in accordance with the APLIC, Suggested Practices for Avian Protection on Power Lines. • Big Flat Electric Cooperative will provide immediate notification to the USFWS in the unlikely event that a black-footed ferret is sighted during construction of the power line to PS-09.
Mammal: Northern long-eared bat *(Myotis septentrionalis)*
• Keystone will implement measures identified in the HDD contingency plan, including monitoring of the HDD bore, monitoring downstream of the HDD site for evidence of drilling fluids, and mitigation measures should a frac-out occur. • Should HDD activities occur at night, lights will be down-shielded. • Where practicable, vegetative screening at HDD sites will be maintained to prevent disturbance of northern long-eared bats. • No tree removal will occur within 0.25 miles of a known occupied hibernaculum. • No tree removal will occur within 150 feet of a known occupied maternity roost tree during the pup season (June 1 to July 31). • Pre-construction presence/absence surveys will be completed if there is a need to remove potentially suitable habitat within the proposed action area during the pup season (June 1 to July 31). If required, surveys will be conducted pursuant to local USFWS field office and state resource agency requirements and the need for any additional tree clearing restrictions, if any, will be determined in coordination with applicable state and federal resource agencies pending survey results. • During aerial surveillance, aircraft will maintain at least 1,000 feet of elevation. • Keystone will prepare and implement a project-specific SPCC Plan.

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Fish: Pallid sturgeon (*Scaphirhynchus albus*)

- **HDD would be used under the Milk, Missouri, Yellowstone, and Platte rivers.**
- **At least a 100-foot setback from the water's edge for the HDD drill pads would be used at the HDD crossings at the Milk, Yellowstone, Missouri, and Platte rivers.**
- **Potential releases during HDD (frac-outs) would be contained by BMPs that are described within the HDD contingency plans required for drilled crossings.**
- **Broadcast applications of pesticides or herbicides would be avoided within 0.25 mile of water bodies.**
- **Upstream and downstream fish passage would be maintained during any stream habitat disturbance.**
- **The intake end of any water withdrawal pump would be screened with mesh having openings no larger than 0.125 inch, a floating surface intake would be used to avoid the benthic habitat used by the sturgeon; water velocity at the screen would not exceed 12 centimeters per second to prevent entrainment of larval fish, and the intake screens would be periodically checked for fish impingement. Should a sturgeon become impinged against the screen, all pumping operations would immediately cease and the compliance manager for Keystone would immediately contact the USFWS to determine if additional protection measures would be required.**
- **Water withdrawal from the Milk, Missouri, and Yellowstone rivers for any purpose would be avoided from May 15 through July 15 of any year to avoid pallid spawning periods and the impingement and entrainment of free embryos and larval pallid sturgeon that drift with the current during that time of year.**
- **Water withdrawal from the Platte River for any purpose would be avoided March 1 through June 30 of any year to avoid pallid spawning periods and the impingement and entrainment of free embryos and larval pallid sturgeon that drift with the current during that time of year.**
- **Care would be taken during the discharge to prevent erosion or scouring of the waterbody bed and banks to avoid impacts to spawning habitat for the species. Hydrostatic test discharge would be in upland locations near the source of the water. Water would be discharged over several days and through a hay bale apparatus or other velocity reduction and erosion control device.**
- **Temporary water reductions would be avoided based on Keystone's plan to withdraw the volume needed and to return water back to its source within a 30-day period for the Platte River.**
- **Major rivers would be crossed using the HDD method with a pipeline burial depth of 25 feet or greater below the river bed to avoid direct impacts to habitat.**
- **Proposed HDD entry and exit points are more than 600 feet from the Platte River; if these points are changed, at least a 100-foot setback from the water's edge would be maintained.**
- **Measures identified in a required HDD contingency plan would be implemented, including monitoring of the directional drill bore, monitoring downstream for evidence of drilling fluids, and mitigation measures to address a frac-out should one occur.**
- **Major river crossings are subject to an intensive integrity management program stipulated by the USDOT (Integrity Management Rule, 49 CFR 195) and require heavier wall pipe be used for the HDD method.**

Fish: Topeka shiner (*Notropis topeka*)

- **Crossing of Union Creek will be completed using HDD, resulting in a pipeline burial depth of 25 feet or greater.**
- **Keystone will implement measures identified in the HDD contingency plan, including monitoring of the HDD bore, monitoring downstream of the HDD site for evidence of drilling fluids, and mitigation measures should a frac-out occur.**
- **Pre-construction presence/probable absence surveys of Union and Taylor creeks will be completed during the year of construction.**
- **A dry crossing method or HDD will be used if the Topeka shiner is identified during pre-construction surveys.**
- **Keystone will ensure that water required for HDD operations or hydrostatic testing will be sourced from locations without Topeka shiner presence.**

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- **Keystone will maintain at least a 100-foot setback from the water's edge for any HDD drill pads, should the HDD method be used.**
- **Keystone will implement BMPs outlined in the CMRP to prevent and minimize sediment runoff from construction areas from entering receiving streams that may provide potentially suitable Topeka shiner habitat.**
- **Broadcast applications of pesticides or herbicides will be avoided near water bodies.**
- **Keystone will avoid water depletions within occupied river basins.**
- **Upstream and downstream fish passage will be maintained during any stream habitat disturbance.**
- **The intake end of any water withdrawal pump will be screened with mesh having openings no larger than 0.125 inch. Water velocity at the screen will not exceed 0.5 feet per second, and the intake screens will be checked periodically for fish impingement. Should a Topeka shiner become impinged against the screen, all pumping operations will immediately cease and the compliance manager for Keystone will immediately contact the USFWS to determine if additional protection measures will be required. An environmental inspector will be present every day during water withdrawals to ensure compliance with permit conditions and to ensure that Keystone's commitments are met.**

Insect: American burying beetle (*Nicrophorus americanus)*

- **Mowing: The purpose of mowing construction areas is to ensure that the American burying beetle is not attracted to the active construction site. Mowing occurs when the American burying beetle is active, so depending on the ground disturbance timeframe, the period when these procedures will be implemented is from March 15 through October 31, based on NGPC guidance. NGPC recommends mowing construction areas 2 weeks prior to the commencement of ground disturbing activities between these dates. For winter construction activities (October 31 to March 31) mowing would occur by October 15. Mowing and raking away grass clippings allows the ground to dry out. In accordance with NGPC guidance, construction areas will be mowed such that the vegetation is as low as possible without causing erosion (less than 8 inches). Hand clearing or mechanical mowing will be used to mow uplands. Forested uplands will not be cleared ahead of mainline construction and wetlands and streams will also be avoided. This short vegetation height will be maintained for the duration of active construction during the American burying beetle overall active period (until October 31) or until construction in the vicinity is completed, whichever is earlier. Mowing will be completed every 2 weeks, if necessary, to ensure vegetation is kept less than 8 inches tall until grading commences. Once mowed, clippings will be removed. Possible methods include raking, windrowing, or baling. If the grass has stopped growing, or grading commences, mowing can stop. All construction, work vehicles and personal vehicles will be staged in mowed areas. If it is not possible to maintain vegetation under 8 inches in height, construction will avoid such areas until the vegetation can be mowed to less than 8 inches in height. For power line construction in potentially suitable American burying beetle habitat, mowing will be done only in construction areas with soil disturbance (pole installation), as recommended by the USFWS and NGPC. Once mowing procedures have been initiated, weekly reports will be kept and submitted to USFWS, NGPC, and SDGFP. These reports will demonstrate that the conservation measures are being implemented and become part of the records. Weekly reports are only required during the American burying beetle active period (April 1 to October 31) while construction on the project is active. Photos documenting grass heights will be provided.**
- **Carrion removal: Removing carrion (essential for American burying beetle feeding and reproduction) will make the work area less attractive to the American burying beetle. By removing carrion in areas where construction would occur, this ensures that American burying beetle would not be feeding or burying carcasses in an area where they could encounter construction equipment. In accordance with NGPC guidance, the work area will be prepared by removing any and all carcasses prior to construction. Carcasses as small as songbirds, snakes, and rodents are ideal food for the American burying beetle; therefore, this removal activity will be thorough. Carcass removal will occur between March 15 and October 31 or until construction is completed, whichever is earlier. Personnel will survey the ROW daily to remove carrion. Carcass removal can be done at any time throughout the day; however, the preferred timing is in the late afternoon, since the American burying beetle is active at night. This will ensure that American burying beetles are not drawn to the area by roadkill caused by daytime traffic. Disposal of carcasses will be at least 0.5 miles away from the work site. For power line construction in potentially suitable American burying beetle habitat, carrion removal will be done only in construction areas with soil disturbance (pole installation), as recommended by the USFWS and NGPC. Carrion removal reports will be submitted as with the mowing reports. Once carrion removal procedures have been initiated, weekly reports will be kept and**

Table S-5. Specific Measures for Species Protected under the ESA

submitted to USFWS, NGPC, and SDGFP, as well as the designated Environmental Inspector for filing. These reports demonstrate that the conservation measures are being implemented and become part of the records. Weekly reports are only required during the American burying beetle active period (April 1 to October 31) while construction on the project is active. If the number and species of carrion can be easily identified (for example, deer carcass, bull snake, mouse, etc.), this information will be included in the report. Photo documentation of carrion removed will be provided.
• During the construction phase, most construction activity will take place in daylight hours. Construction activities taking place at night would require artificial lighting and could thereby have an effect on American burying beetle by disruption of normal behavior patterns. Construction at night and the use of lights will be limited to specific situations requiring this activity such as critical tie-ins, HDDs, and during certain weather conditions. Where such activities require lighting, the lights will be down shielded and utilize warm amber-colored lights with a color temperature of 3000 Kelvin or less and intensity no greater than 70,000 lumens. Lighting required for contractor yards and pump stations will also be down shielded, except where required for safety and security, and will utilize sodium vapor or LED lighting meeting the above specifications.
• Keystone will implement an education program for construction personnel engaged in the proposed Project. This will include a presentation focused on identifying the American burying beetle, explaining its life history, its current range, and its habitat requirements. Construction personnel will be instructed to report any sightings of American burying beetle or brood chambers if encountered. Education cards will be provided to all construction personnel. Signs will be placed at construction entrances identifying the area as potential American burying beetle habitat.
• Immediately following construction, disturbed areas will be ripped to a depth of 24 inches to relieve soil compaction existing at the site from the use of heavy equipment. This effort will improve or enhance American burying beetle habitat by making soils easier for beetles to bury in. Keystone's CMRP provides further details with regard to relief of soil compaction within ROWs following construction.
• Erosion control techniques such as silt fencing, hay bales, water bars, and other efforts will be used to prevent washing away of topsoil, formation of gullies, or other erosion that could negatively affect American burying beetle habitat through the action of surface water. Keystone's CMRP provides further details with regard to erosion control following construction.
• Immediately following construction, disturbed areas will be temporarily stabilized by broadcasting cool season species such as annual rye grass or wheat seed. Where necessary, clean, weed-free wheat straw will be used as mulch to protect seed and increase soil moisture. These grasses are annual species that senesce when temperatures warm during summer; they will not become permanently established. During the spring, a mixture of native warm season grasses will be planted within the ROW. This will include species such as little bluestem, big bluestem, Indiangrass, and switchgrass. Natural recruitment of other native grasses and forbs will also occur. It should be noted that some portions of the ROW, in response to landowner requirements, will be revegetated using non-native species such as smooth brome. This type of re-vegetation will likely be restricted to areas that are currently dominated by improved grass pastures and will therefore not lead to a reduction of habitat dominated by native species. In the limited circumstance where landowners request re-vegetation of previously native vegetation to non-native vegetation, Keystone will consider this as a permanent effect on habitat and will provide appropriate mitigation for those areas. Keystone's CMRP provides further details with regard to restoration of ROWs following construction.
• Keystone is committed to habitat restoration following construction. The American burying beetle monitoring program will provide assurances that the acres disturbed would be restored appropriately. Failure is unlikely due to Keystone's commitment to re-seed in subsequent years if unsuccessful after the first growing season. Criteria for successful reclamation are: 1) reclamation will be measured 4 years after the commencement of construction; 2) for reclamation to be deemed successful, native grasslands restored on the ROW must be comparable to those on adjacent undisturbed lands; 3) 70 percent of the dominant species on the ROW must be the same as those that occur on adjacent off-ROW lands.
• WAPA and the power providers would endeavor to reduce the likelihood of American burying beetles occurring in the potentially affected area by mowing vegetation to less than 8 inches in height, removing grass clippings, and inspecting the work area daily to remove all carcasses; these measures would be in force from March 15 through October 31 or until construction in the vicinity is completed, whichever is earlier.
• The NPPD and Rosebud Electric Cooperative will schedule power line and switching station construction activities during the American burying beetle dormant or inactive time (October 31 to March 31). The power providers will coordinate with USFWS and NGPC to determine appropriate measures to minimize potential effects if such scheduling cannot be accomplished due to unexpected circumstances, including weather delays.

Table S-5. Specific Measures for Species Protected under the ESA

Plant: Western prairie fringed orchid *(Platanthera praeclara)*
• Pre-construction presence/probable absence surveys will be conducted within potentially suitable habitat that was not previously surveyed, including the power line route to PS-21. Survey results will be submitted to the USFWS for review. Species presence will be assumed in potentially suitable habitat if surveys cannot be conducted during the flowering period. • The Project alignment will be adjusted to avoid any identified populations as practicable and/or approved by the landowner. • To the greatest extent practicable, the width of the construction ROW will be reduced in areas where western prairie fringed orchid populations have been identified. • Keystone will develop and implement a noxious and invasive weed control program consistent with the CMRP to reduce the potential for spread or invasion of weeds. • Herbicide application will occur by spot spraying. • Use of herbicides within 100 feet of documented western prairie fringed orchid occurrence will be restricted. • Keystone will minimize the potential for altered hydrology (e.g., surface water flow, infiltration and groundwater levels) in potentially suitable habitat through BMPs outlined in the CMRP. • Keystone will salvage and segregate topsoil appropriately where populations have been identified to preserve native seed sources in the soil for use in revegetation efforts in the ROW. • Keystone will restore wet meadow habitat using a USFWS- and NGPC-approved seed mix. • Potentially suitable wet meadow habitats will be restored following Project construction. • Restoration of construction-related impacts on wet meadow habitats identified as potentially suitable for the western prairie fringed orchid will be monitored for a 5-year period, per USACE guidelines. • Keystone has sited aboveground facilities to avoid potentially suitable western prairie fringed orchid wetland habitat. • Keystone will prepare and implement a project-specific SPCC Plan. • Keystone will mark and maintain a 100-foot buffer from river crossings, free from hazardous materials, fuel storage, and vehicle fuel transfers. These buffers will be maintained during construction except when fueling and refueling the water pump near the river edge that is required for the HDD crossing and hydrostatic test water withdrawal. Water pump fueling will be completed by trained personnel and will use secondary containment and a spill kit will be onsite. • Refueling and lubrication of construction equipment will occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup will conduct these activities. • All equipment maintenance and repairs will be performed in upland locations at least 100 feet from waterbodies and wetlands. • All equipment will be parked at least 100 feet from a watercourse or wetland overnight, if possible. • Equipment will not be washed in streams or wetlands. • Construction and restoration activities will be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials. • Each construction crew and cleanup crew will have sufficient tools and materials on hand to stop leaks, including supplies of absorbent and barrier materials that will allow for rapid containment and recovery of spilled materials. • Water withdrawal for hydrostatic testing will be less than 10 percent of the baseline daily flow. • Keystone will minimize temporary water reductions by withdrawing only the volume of water needed for hydrostatic testing as outlined in its permits. Water will be returned to its source within a 30-day period except where hydrostatic test water is used to test multiple spreads. At the conclusion of hydrostatic testing, the remaining water will be returned to the source.

Table S-5. Specific Measures for Species Protected under the ESA

- **Pre-construction presence/probable absence surveys will be conducted in potentially suitable habitat along the power line routes to PS-22 through PS-25, during the appropriate flowering period. The NPPD will delineate and designate areas where western prairie fringed orchid habitat is present as “avoidance areas” where placement of structures and construction traffic will not occur.**

APLIC = Avian Power Line Interaction Committee; BA = Biological Assessment; BFD = bird flight diverter; CMRP = Construction Mitigation and Reclamation Plan; ESA = Endangered Species Act; HDD = horizontal directional drill; NGPC = Nebraska Game and Parks Commission; NPPD = Nebraska Public Power District; PS = Pump Station; ROW = right-of-way; SDGFP = South Dakota Game Fish and Parks; SEIS = Supplemental Environmental Impact Statement; SPCC = Spill Prevention, Control, and Countermeasure; USACE = U.S. Army Corps of Engineers; USFWS = U.S. Fish and Wildlife Service; WAPA = Western Area Power Administration

Table S-6. BLM Sensitive Species, State Protected Species, and Animals and Plants of Conservation Concern

Species	Conservation Measures
Bald eagle (*Haliaeetus leucocephalus*)	• Conduct additional nest/roost surveys within 1 mile of the ROW prior to construction. Aerial surveys (preferably by helicopter) would be conducted between March 1 and May 15, before tree leaf-out to ensure nests are more visible. These aerial surveys would use helicopters instead of fixed-wing aircraft when possible because helicopters have the ability to hover and facilitate ground observations. • Regardless of aircraft, whenever possible, two observers would conduct the surveys. Experienced observers may only find 50 percent of nests on a flight; therefore, two flights would be performed prior to any on-the-ground activities of the proposed Project, including other biological surveys. • Record observations of any eagles and/or nest sites using geographic positioning system equipment. The date, location, nest condition, activity status, raptor species and habitat would be recorded for each sighting. • Submit the biologist(s) qualifications, survey methods and survey results to the USFWS. • Report the location of any active bald eagle nests identified during nest/roost surveys to the USFWS and appropriate state agencies; if possible, reroute the pipeline to avoid any nests that occur within 600 feet of the proposed ROW. • Maintain a no-disturbance buffer of at least 600 feet around active nests during the nesting season (January 1 through August 15). • Consult with USFWS under the Bald and Golden Eagle Protection Act regarding required buffers and construction activities within 600 feet of active winter roost sites during the winter roosting season (November 1 through April 1) and the ability to conduct construction activities within 600 feet of active winter roosts between 10 a.m. and 3 p.m. • Implement measures in the Montana Bald Eagle Management Plan, if applicable, or apply current guidance from the USFWS. • Restrict construction activities within 0.62 mile of all active territories from March 15 to July 15, including documented sites within 0.5 mile of the proposed Project route on the Missouri River in Montana.

Table S-6. BLM Sensitive Species, State Protected Species, and Animals and Plants of Conservation Concern

Species	Conservation Measures
Blacknose shiner (*Notropis heterolepis*)	• Suitable habitat determinations along the route would be made by SDGFP. • Conduct presence/absence surveys if suitable habitat is present. • If surveys results are negative for these minnows, no further conservation measures would be required. • If survey results are positive for these minnows, exclude construction activities during the spawning period (to be provided by SDGFP), and/or salvage and relocate the minnows • Conduct presence/absence surveys in tributaries of the Niobrara and main stem Elkhorn rivers. • Keystone will re-consult with NGPC to identify additional conservation measures if the species is found in surveyed streams.
Finescale dace (***Chrosomus** neogaeus*)	• Suitable habitat determinations along the route would be made by SDGFP. • Conduct presence/absence surveys if suitable habitat is present. • If surveys results are negative for these minnows, no further conservation measures would be required. • If survey results are positive for these minnows, exclude construction activities during the spawning period (to be provided by SDGFP), and/or salvage and relocate the minnows. • Conduct presence/absence surveys in tributaries of the Niobrara and main stem Elkhorn rivers. • Keystone will re-consult with NGPC to identify additional conservation measures if the species is found in surveyed streams.
Golden eagle (*Aquilla chryaetos*)	• Conduct pre-construction raptor surveys prior to March 15. • Restrict construction activity with 0.62 mile of active nests from March 15 to July 15 in Montana.
Greater sage-grouse (*Centrocercus urophasianus*)	• Conduct surveys of greater sage-grouse leks prior to construction using approved methods to determine lek locations and peak number of males in attendance within 3 miles of the facility, unless the facility is screened by topography; also survey leks identified by MFWP, BLM and SDGFP more than 3 miles from the facility for use as a baseline to determine construction effects on sage-grouse abundance. • Implement the conservation plan developed in coordination with MFWP, Montana Sage-Grouse Habitat Conservation Program, SDGFP, USFWS and BLM to address impacts to greater sage-grouse, including construction timing restrictions, habitat enhancement and any mitigation measures that would be necessary to maintain the integrity of designated habitat areas (W**estech** 201**7**), including lek habitats as well as other important habitat necessary for greater sage-grouse to meet life requisites. • Along power lines necessary to serve the pump stations in Montana, implement the three sage-grouse mitigation plans approved by the Montana Sage-Grouse Oversight Team on December 18, 2018. • For proposed power lines in Montana that would serve Pump Station 9, Pump Station 10 and Pump Station 13, local power providers would implement specific measures to avoid, minimize and mitigate impacts to sagebrush habitat in coordination with the Montana Sage-Grouse Habitat Conservation Program. For one or more of these projects, such measures include considering alternate routes, burying distribution lines, observing seasonal stipulations for construction activities, installing poles to minimize disturbance to sagebrush cluster locations, using non-nest supporting poles and conducting monthly inspections for avian impacts.

Table S-6. BLM Sensitive Species, State Protected Species, and Animals and Plants of Conservation Concern

Species	Conservation Measures
Greater sage-grouse (*Centrocercus urophasianus*) (continued)	• For proposed power lines in Montana that would serve Pump Station 9 and Pump Station 10, local power providers would compensate for residual impacts to habitat by completing habitat credit projects approved through the Montana Mitigation System, by obtaining credits from other entities, or by making in lieu fee payments to the State of Montana Greater Sage-Grouse Stewardship Fund. • Follow all protection and mitigation efforts as identified by USFWS, MFWP and SDGFP including identify all greater sage-grouse leks within the buffer distances from the construction ROW set forth for the greater sage-grouse by USFWS, and avoid or restrict construction activities as specified by USFWS within buffer zones between March 1 and June 15, unless the facility is screened by topography. • Prohibit construction during March 1 to June 15 within 3 miles of active greater sage-grouse leks in suitable nesting habitat not screened by topography, with an allowance made for onetime equipment movement during midday hours through ROW areas with a timing restriction that does not require grading for equipment passage to lessen disturbance to greater sage-grouse leks. • Prohibit construction within 2 miles of active greater sage-grouse leks on federal land during March 1 to June 15. • Reduce the mound left over the trench in areas where settling would not present a path for funneling runoff down slopes in sagebrush habitat; additional measures would be taken to compact backfilled spoils to reduce settling. • TransCanada would make an in lieu fee payment to the State of Montana Greater Sage-Grouse Stewardship Fund for $761,519 for a habitat conservation project, according to a plan approved by the Montana Sage-Grouse Oversight Team on September 14, 2018. • Limit inspection over-flights to afternoons from March 1 to June 15 during operations as practicable in sagebrush habitat designated by MFWP • Fund a 4-year study under the direction of MDEQ, MFWP and BLM that would show whether the presence of the facility has affected greater sage-grouse numbers based on the peak number of male sage-grouse in attendance at leks. • Implement restoration measures (i.e., application of mulch or compaction of soil after broadcast seeding, and reduced seeding rates for non-native grasses and forbs) that favor the establishment of silver sagebrush and big sagebrush in disturbed areas where compatible with the surrounding land use and habitats unless otherwise requested by the affected landowner. • Prior to construction, conduct studies along the route to identify areas that support stands of silver sagebrush and big sagebrush and incorporate these data into restoration activities to prioritize reestablishment of sagebrush communities. • Monitor and report on establishment of sagebrush on reclaimed areas, unless otherwise requested by the landowner, annually for at least 4 years to ensure that sagebrush plants become established at densities similar to densities in adjacent sagebrush communities, and implement additional sagebrush seeding or planting if necessary. • Establish criteria in conjunction with MDEQ, MFWP and BLM to determine when restoration of sagebrush communities has been successful based on pre- and post-construction studies in addition to revegetation standards. • Use locally adapted sagebrush seed collected within 100 miles of the areas to be reclaimed, unless otherwise requested by the affected landowner (seed would be collected as close to the proposed Project as practicable as determined by regional seed production and availability). • Monitor cover and densities of native forbs and perennial grasses exclusive of noxious weeds on reclaimed areas and reseed with native forbs and grasses where densities are not comparable to adjacent communities.

Table S-6. BLM Sensitive Species, State Protected Species, and Animals and Plants of Conservation Concern

Species	Conservation Measures
Greater sage-grouse (*Centrocercus urophasianus*) (continued)	• Work in conjunction with the landowner to appropriately manage livestock grazing of reclaimed areas until successful restoration of sagebrush communities has been achieved (livestock grazing in restored sagebrush communities may promote establishment of sagebrush). • Implement measures to reduce or eliminate colonization of reclaimed areas by noxious weeds and invasive annual grasses such as cheatgrass to the extent that these plants do not exist in undisturbed areas adjacent to the ROW (noxious weed management plans would be developed and reviewed by appropriate county weed specialists and land management agencies for each state crossed by the proposed Project). • Establish a compensatory mitigation fund in consultation with SDGFP, managed by a third party, for temporary and permanent impacts to greater sage-grouse habitat. The fund would be used by SDGFP to enhance and preserve sagebrush communities within the sagebrush ecosystem in South Dakota, which is found within the following counties: Butte, Custer, Fall River, Harding, Perkins and Meade counties. • As part of the compensatory mitigation fund, implement a research fund in consultation with SDGFP, which would be managed by a third party to evaluate the effects of pipeline construction on greater sage-grouse. • Monitor leks that are within 3 miles of the proposed Project footprint in South Dakota and are within the viewshed of the construction ROW if construction were to take place between March 1 and June 15. • In consultation with SDGFP, implement a modified 3-mile buffer between March 1 and June 15 around active greater sage-grouse leks. The buffer would be modified on a lek-by lek basis to account for differences in topography, habitat, existing land uses, proximity of the proposed Project to the lek, and line-of-sight between the proposed Project and each lek. • Restrict construction equipment activity in South Dakota to occur only between 10 a.m. and 2 p.m. to avoid impacts to breeding greater sage-grouse from March 1 through June 15 in areas where a lek is either within 3 miles of the ROW and visible from the ROW or within 1 mile of the ROW.
Massasauga (*Sistrurus catenatus*)	• Complete surveys of suitable habitats to identify areas potentially containing the massasauga along the proposed Project route in Jefferson County, Nebraska, to clear the area for the massasauga prior to construction. • Continue consultations with the NGPC. • Locate the power line to Pump Station 26 in Jefferson County, Nebraska next to a road.
Mountain plover (*Charadrius montanus*)	• Prohibit construction, reclamation and other ground disturbing activities from April 10 to July 10 to minimize destruction of nests and disturbance of breeding mountain plovers unless surveys consistent with the Plover Guidelines or other methods approved by the USFWS find that no plovers are nesting in the area. Potential mountain plover habitat must be surveyed three times between April 10 and July 10, with each survey separated by at least 14 days. The earlier date will facilitate detection of early-breeding plovers. • Schedule routine maintenance activities outside the April 10 to July 10 period in mountain plover nesting habitat unless surveys were conducted that indicate that no plovers were nesting in the area and that flightless chicks were not present. • Delay construction activities within 0.25 mile of active nests for 37 days (i.e., the typical incubation and fledging duration) or until fledging, whichever is sooner. • Delay construction activities in the vicinity of a brood of flightless chicks for at least 7 days or until fledging, whichever is sooner.

Table S-6. BLM Sensitive Species, State Protected Species, and Animals and Plants of Conservation Concern

Species	Conservation Measures
Northern redbelly dace (***Chrosomus** eos*)	• Suitable habitat determinations along the route would be made by SDGFP. • Conduct presence/absence surveys if suitable habitat is present. • If surveys results are negative for these minnows, no further conservation measures would be required. • If survey results are positive for these minnows, exclude construction activities during the spawning period (to be provided by SDGFP), and/or salvage and relocate the minnows. • Conduct presence/absence surveys in tributaries of the Niobrara and main stem Elkhorn rivers. • Keystone will re-consult with NGPC to identify additional conservation measures if the species is found in surveyed streams.
Northern Pearl dace (***Margariscus nachtriebi***)	• Suitable habitat determinations along the route would be made by SDGFP. • Conduct presence/absence surveys if suitable habitat is present. • If surveys results are negative for these minnows, no further conservation measures would be required. • If survey results are positive for these minnows, exclude construction activities during the spawning period (to be provided by SDGFP), and/or salvage and relocate the minnows. • Conduct presence/absence surveys in tributaries of the Niobrara and main stem Elkhorn rivers. • Keystone will re-consult with NGPC to identify additional conservation measures if the species is found in surveyed streams.
River otter (*Lontra canadensis*)	• Conduct river otter surveys prior to proposed Project construction along the Bad River, the White River and the Cheyenne River in South Dakota and along the Niobrara River, the Loup River, the main stem of the Elkhorn River and the Platte River in Nebraska (if suitable den habitat occurs near the river crossings and if construction would occur during the denning period). • Restrict construction activities within 0.25 mile of active natal dens. • Use the HDD method to cross under all of the rivers identified as potentially supporting river otters. This would avoid impacts to shoreline habitats that could potentially be used by denning river otters.
Sicklefin chub (*Macrhybopsis meeki*)	• Suitable habitat determinations along the route would be made by SDGFP. • Conduct presence/absence surveys if suitable habitat is present. • If surveys results are negative for these minnows, no further conservation measures would be required. • If survey results are positive for these minnows, exclude construction activities during the spawning period (to be provided by SDGFP), and/or salvage and relocate the minnows. • Conduct presence/absence surveys in tributaries of the Niobrara and main stem Elkhorn rivers. • Keystone will re-consult with NGPC to identify additional conservation measures if the species is found in surveyed streams.
Small white lady's slipper (*Cypripedium candidum*)	• Conduct presence/absence surveys within suitable habitat prior to the proposed Project construction in Antelope, Boyd, Holt, Keya Paha, Nance and Merrick counties in Nebraska. If this plant is observed within the proposed Project ROW in Nebraska, appropriate mitigation measures would be developed and implemented in consultation with the NGPC.

Table S-6. BLM Sensitive Species, State Protected Species, and Animals and Plants of Conservation Concern

Species	Conservation Measures
Sprague's pipit (*Anthus spragueii*)	• Seed disturbance areas in native range with native seed mix after topsoil replacement. • Monitor the ROW to determine the success of revegetation after the first growing season and, for areas in which vegetation has not been successfully re-established, reseed the area. • Control unauthorized off-road vehicle access to the construction ROW through the use of signs; fences with locking gates; slash and timber barriers, pipe barriers, or boulders lined across the construction ROW; or plant conifers or other appropriate trees or shrubs in accordance with landowner or manager request. • Develop and implement a migratory bird conservation plan in consultation USFWS, consistent with the MBTA and the Bald and Golden Eagle Protection Act and consistent with provisions of Executive Order 13186. The conservation plan would include avoidance and mitigation measures for migratory birds and bald and golden eagles and their habitats within the states where the proposed Project would be constructed, operated and maintained. • If construction would occur during the April 15 to July 15 grassland ground-nesting bird nesting season, complete nest-drag surveys to determine the presence or absence of nests on federal land in eastern Montana. • Delay construction activity from April 15 to July 15 within 330 feet of discovered active nests in eastern Montana (MDEQ and MFWP).
Sturgeon chub (*Macrybopsis gelida*)	• Suitable habitat determinations along the route would be made by SDGFP. • Conduct presence/absence surveys if suitable habitat is present. • If surveys results are negative for these minnows, no further conservation measures would be required. • If survey results are positive for these minnows, exclude construction activities during the spawning period (to be provided by SDGFP), and/or salvage and relocate the minnows.
Swift fox (*Vulpes velox*)	• Revegetate the ROW to support small mammal and insect prey. • Conduct surveys of potential den sites on federal land and within suitable habitat in the proposed Project footprint in South Dakota. • Restrict construction activities within 0.25 mile of active natal dens between April 1 and August 31. • Conduct surveys of potential den sites between February 15 and July 31 in suitable habitat in the proposed Project footprint Phillips, Valley, Prairie, Dawson and Fallon counties in Montana (MDEQ and MFWP). • Restrict construction activities within 0.31 mile of active dens from February 15 to July 31 in Montana on state or federal land (MDEQ and MFWP).

BLM = Bureau of Land Management; HDD = horizontal directional drill; MBTA = Migratory Bird Treaty Act; MDEQ = Montana Department of Environmental Quality; MFWP = Montana Fish, Wildlife, and Parks; NGPC = Nebraska Game and Parks Commission; ROW = right-of-way; SDGFP = South Dakota Department of Game, Fish, and Parks; USFWS = U.S. Fish and Wildlife Service

Table S-7. Summary of Resource Protection Measures for the Proposed Electrical Power Infrastructure

Resource	Description
Land Use and Recreation	• If construction is planned for agricultural areas, measures would be taken to avoid or minimize crop damage, restore the disturbed land to its prior condition, and to compensate landowners for any damages. • In accordance with BLM requirements, each power line that crosses BLM-managed lands would submit a BLM-Specific Construction, Mitigation, and Reclamation Plan. • Where the power infrastructure associated with pump stations would cross federal lands, required mitigation measures would be followed according to current land or forest management plans. • Power providers would attempt to route power infrastructure along existing linear corridors such as existing power lines, roadways, fence lines, field lines, parcel boundaries, or section lines to reduce impacts to land use and visual resources.
Soils	• To minimize soil impacts, work would be restricted during wet conditions to minimize rutting; compaction would be relieved by disking, chiseling or ripping; stones would be removed; topsoil or soil amendments may be added; and industry standard soil erosion and sedimentation controls would be used.
Air Quality	• Power providers will comply with all applicable state regulations and local ordinances with respect to truck transportation and fugitive dust emissions.
Noise	• Construction equipment would be properly equipped with mufflers to lessen noise impacts.
Water Resources	• To minimize impacts on surface water, industry standard soil erosion and sedimentation controls would be used during construction. • When feasible, power pole structures would be located outside of wetlands, waterbodies, and floodplains. • In areas with a shallow water table, power pole structures would be installed using caissons to prevent poles from contacting groundwater. • After a flood event, power pole structures would be inspected in floodplains and accumulated debris would be removed. • Refueling and lubrication of construction equipment would occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup would conduct these activities. • All equipment maintenance and repairs would be performed in upland locations at least 100 feet from waterbodies and wetlands. • All equipment would be parked at least 100 feet from a watercourse or wetland overnight, where possible. • Equipment would not be washed in streams or wetlands. • Broadcast applications of pesticides or herbicides would be avoided within 0.25 miles of water bodies.

Table S-7. Summary of Resource Protection Measures for the Proposed Electrical Power Infrastructure

Resource	Description
Wetlands	• When feasible, power pole structures would be located outside of wetlands, waterbodies, and floodplains. • Refueling and lubrication of construction equipment would occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup would conduct these activities. • All equipment maintenance and repairs would be performed in upland locations at least 100 feet from waterbodies and wetlands. • All equipment would be parked at least 100 feet from a watercourse or wetland overnight, where possible. • Equipment would not be washed in streams or wetlands. • Wetlands affected by construction activities, if any, would be restored to the extent practicable. • Construction in wetland areas would utilize protective matting or be restricted to frozen conditions to help minimize rutting. • Emergent wetlands would be allowed to persist within the permanent ROW outside of access roads and power pole structure locations.
Terrestrial Vegetation	• During the construction phase, equipment and support vehicles would be power washed before entering or leaving a work area where noxious weeds are present. • If noxious or invasive plant species are detected in the ROW at any time during the life of the proposed Project and connected actions, the appropriate local weed and pest control agency would be contacted to ensure that proper methods are used for eradication of the noxious or invasive plants. • Herbicides would not be applied broadly to the ROW, but could be applied to individual tree stumps to eliminate re-sprouting.
Wildlife	• Workers would be prohibited from feeding wildlife. • Workers would be prohibited from keeping domestic pets at worksites. • Concentrations of dead and/or apparently diseased animals (prairie dogs, ground squirrels, others) would be reported to the appropriate state and federal agencies. • To the extent practicable, construction would occur during daytime hours and comply with any local noise regulations. • Construction equipment would be properly equipped with mufflers to lessen noise impacts. • Construction within identified big game habitat priority areas would be avoided from December 1 to May 15 of each year. This measure would be mandatory on all BLM-managed lands and may be implemented on other portions of the proposed infrastructure, as well. • Perch deterrents would be installed under certain circumstances where the structure configuration allows and risk to wildlife from increased avian predation would be high.
Protected and Special Status Species[a]	• The power provider for PS-09 would provide immediate notification to the USFWS in the unlikely event that a black-footed ferret is sighted during construction of the power line to PS-09. • Workers would be prohibited from keeping domestic pets at worksites. • Workers would be informed of how canine distemper and sylvatic plague diseases are spread (namely, domestic pets and fleas).

Table S-7. Summary of Resource Protection Measures for the Proposed Electrical Power Infrastructure

Resource	Description
Protected and Special Status Species (continued)	• Workers would be prohibited from feeding wildlife. • Concentrations of dead and/or apparently diseased animals (prairie dogs, ground squirrels, others) would be reported to the appropriate state and federal agencies. • Power providers would implement protection measures to minimize raptor perching in accordance with the Avian Power Line Interaction Committee (APLIC) Suggested Practices for Avian Protection on Power Lines (APLIC 1996, 2012). • Power providers would install anti-perching measures on all structures within 0.1 mile of either side of the proposed crossings of the Platte, Elkhorn, Niobrara, Cheyenne, Yellowstone, Milk and Missouri rivers. • For the power infrastructure that would serve PS-14, the power provider would install perch discouragers on the structures as requested by MTFWP to minimize raptor use of structures to prey on sage grouse. • To the extent practicable, construction would occur during daytime hours and comply with any local noise regulations. • Construction equipment would be properly equipped with mufflers to lessen noise impacts. • A 100-foot buffer from river crossings, free from hazardous materials, fuel storage, and vehicle fuel transfers would be marked and maintained. • Refueling and lubrication of construction equipment would occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup would conduct these activities. • All equipment maintenance and repairs would be performed in upland locations at least 100 feet from waterbodies and wetlands. • All equipment would be parked at least 100 feet from a watercourse or wetland overnight, where possible. • Equipment would not be washed in streams or wetlands. • Construction and restoration activities would be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials. • Each construction crew and cleanup crew would have sufficient tools and materials on hand to stop leaks, including supplies of absorbent and barrier materials that would allow for rapid containment and recovery of spilled materials. • If construction of power lines occurs during the interior least tern or piping plover nesting season, surveys of potentially suitable riverine and/or sand pit nesting habitat within 0.25 mile of new power lines would be conducted within 2 weeks of construction to determine presence of nesting pairs. If nesting interior least terns or piping plovers are present, construction would cease until chicks fledge from the site. • During spring (March–May) and fall (October–November) whooping crane migration periods, environmental monitors would complete a brief daily survey of any wetland or riverine habitat areas potentially used by whooping cranes in the morning and afternoon before starting equipment and following the Whooping Crane Survey Protocol previously developed by the USFWS and NGPC (USFWS 2017). If whooping cranes are sighted, the environmental monitor would immediately contact the USFWS and respective state agency in Nebraska, South Dakota, and/or Montana for further instruction and require that all human activity and equipment start-up be delayed. Work could proceed if whooping crane(s) leave the area. The compliance manager would record the sighting, bird departure time, and work start time on the survey form. The USFWS would notify the compliance manager of whooping crane migration locations during the spring and fall migrations through information gathered from the whooping crane tracking program.

Table S-7. Summary of Resource Protection Measures for the Proposed Electrical Power Infrastructure

Resource	Description
Protected and Special Status Species (continued)	• **Disturbed areas, as applicable, would be re-vegetated (particularly within riparian zones and in wetland habitats).** • **Use of helicopters within 0.5 mile of any whooping crane(s) would be prohibited.** • **Should power line routes be adjusted, they would be sited greater than 5 miles from Designated Critical Habitat and/or documented high-use areas for whooping cranes.** • **Power providers would mark new lines within 1 mile of potentially suitable habitat within the whooping crane 95 percent migration corridor.** • **Power providers would mark new lines near potentially suitable whooping crane habitat outside the 95-percent migration corridor at the discretion of the local USFWS Ecological Services Field Office, based on the biological needs of the whooping crane. Thus far, this would include the following: (1) The power line to PS-09 would be marked with BFDs within 0.25 mile of crossings of the Milk River. (2) The power line to PS-10 would be marked with BFDs within 0.25 mile of crossings of the Milk River and within 0.25 mile of two unnamed reservoirs crossed by the line. (3) The power line to PS-12 would be marked with BFDs within 0.25 mile of crossings of the Redwater River and Buffalo Springs Creek. (4) The power line to PS-14 would be marked with BFDs within 0.25 mile of crossings of Pennel Creek and an unnamed pond in the northwest corner of section 35, township 9 north, range 58 east, in Fallon County, Montana.** • **For the power infrastructure that would serve pump stations in Nebraska, the power provider(s) would complete a field review with the USFWS and NGPC to determine if any areas are present with a higher probability of whooping crane use (i.e., wetlands or large ponded areas (stock ponds), meadows, and obvious flight corridors to and from such areas to feeding habitats). The power provider(s) would install spiral BFDs, consistent with APLIC standards, in appropriate areas as identified during the field review.** • **For the power infrastructure that would serve pump stations in Nebraska, the power provider(s) would install spiral BFDs on the shield wire on the line span between the banks at the Platte River crossing and one span on each side of the crossing.** • **Should potentially suitable breeding or foraging habitat for piping plover be identified near the proposed infrastructure at a later time, power lines near breeding habitat (and within 0.25 mile of each side) and lines that would be built between rivers and sand and gravel mining areas would be marked with BFDs to reduce potential injury or mortality to piping plovers.** • **Keystone would develop a compliance monitoring plan that requires written confirmation that the power lines have been marked and that the markers are maintained in working condition.** • **Broadcast applications of pesticides or herbicides would be avoided within 0.25 miles of water bodies.** • **No tree removal would occur within 0.25 miles of a known occupied northern long-eared bat hibernaculum.** • **No tree removal would occur within 150 feet of a known occupied northern long-eared bat roost tree during the pup season (June 1-July 31)** • **Pre-construction presence/absence surveys would be completed if there is a need to remove trees during the northern long-eared bat pup season.** • **Should power line routes be adjusted, they would be routed to avoid construction within 0.50 mile of potentially suitable piping plover nesting habitat in alkali wetlands in Montana.**

Table S-7. Summary of Resource Protection Measures for the Proposed Electrical Power Infrastructure

Resource	Description
Protected and Special Status Species (continued)	• Along power lines necessary to serve the pump stations in Montana, the three sage-grouse mitigation plans approved by the Montana Sage-Grouse Oversight Team on December 18, 2018, would be implemented. • For proposed power lines in Montana that would serve PS-09, PS-10 and PS-13, local power providers would implement specific measures to avoid, minimize, and mitigate impacts to sagebrush habitat in coordination with the Montana Sage-Grouse Habitat Conservation Program. For one or more of these projects, such measures include considering alternate routes, burying distribution lines, observing seasonal stipulations for construction activities, installing power pole structures to minimize disturbance to sagebrush cluster locations, using non-nest supporting poles and conducting monthly inspections for avian impacts. • For proposed power lines in Montana that would serve PS-09 and PS-10, local power providers would compensate for residual impacts to habitat by completing habitat credit projects approved through the Montana Mitigation System, by obtaining credits from other entities, or by making in lieu fee payments to the State of Montana Greater Sage-Grouse Stewardship Fund. • Local power providers would implement measures developed in coordination with Keystone and the USFWS regarding ways to minimize or mitigate impacts on the greater sage-grouse and threatened and endangered species from the proposed infrastructure, per Keystone's mitigation plan for the greater sage-grouse. • For the power infrastructure that would serve PS-14, the power provider would work with Keystone to avoid any construction of the electric transmission line from March 1 to June 15. However, if construction is projected to occur during the period of March 1 to June 15 within three miles of active greater sage-grouse leks that are not screened by topography or that are within suitable nesting habitat regardless of screening, the power provider would avoid construction within 1 mile of leks from 8 pm until 2 hours after sunrise the following day on a daily basis and monitor active leks (displaying males) within three miles of the project during construction between March I and June 15. The power provider would contact the USFWS to obtain additional guidance if construction-related disturbance of lekking sage grouse is noted. • For the power infrastructure that would serve PS-14, the power provider would, where approved by landowners, control unauthorized off-road vehicle access to the construction ROW through the use of signs; fences with locking gates; slash and timber barriers, pipe barriers, or boulders lined across the construction ROW; or plant conifers of other appropriate trees or shrubs in accordance with landowner or manager request where such planting would not diminish the quality of adjacent Sprague's pipit habitat. • For the power infrastructure that would serve pump stations in Nebraska, the power provider(s) would complete field surveys for the western prairie fringed orchid and small white lady's slipper during the appropriate bloom periods only in areas along the final line routes that are considered "suitable" habitat. The power provider(s) would delineate and mark areas where either species is observed as "avoidance areas" where placement of structures and construction traffic would not occur. • Pre-construction presence/probable absence surveys would be conducted within potentially suitable western prairie fringed orchid habitat that was not previously surveyed, including the power line route to PS-21. Survey results would be submitted to the USFWS for review. Presence of this species would be assumed in potentially suitable habitat if surveys cannot be conducted during the flowering period. • Power Line alignments would be adjusted to avoid any identified populations of western prairie fringed orchid as practicable and/or approved by the landowner.

Table S-7. Summary of Resource Protection Measures for the Proposed Electrical Power Infrastructure

Resource	Description
Protected and Special Status Species (continued)	• To the greatest extent practicable, the width of the construction ROW would be reduced in areas where western prairie fringed orchid populations have been identified. • A noxious and invasive weed control program would be developed and implemented to reduce the potential for spread or invasion of weeds. • Herbicide application would occur by spot spraying only. • Use of herbicides within 100 feet of documented western prairie fringed orchid occurrence would be restricted. • Potentially suitable wet meadow habitats disturbed by construction, if any, would be restored using a USFWS- and NGPC-approved seed mix following construction. • Restoration of construction-related impacts on wet meadow habitats identified as potentially suitable for the western prairie fringed orchid, if any, would be monitored for a 5-year period, per USACE guidelines. • Pre-construction presence/probable absence surveys for western prairie fringed orchid would be conducted in potentially suitable habitat along the power line routes to PS-22 through PS-25, during the appropriate flowering period. The power provider(s) would delineate and mark areas where western prairie fringed orchid habitat is present as “avoidance areas” where placement of structures and construction traffic would not occur. • The NPPD and Rosebud Electric Cooperative would schedule power line and switching station construction activities during the American burying beetle dormant or inactive time (October 31 to March 31). The power providers would coordinate with USFWS and NGPC to determine appropriate measures to minimize potential effects if such scheduling cannot be accomplished due to unexpected circumstances, including weather delays. • WAPA would follow a set of standard construction and mitigation practices; these practices would be mandatory on portions of the power infrastructure involving WAPA. • WAPA and the power providers for PS-20, PS-21, and PS-22 would endeavor to reduce the likelihood of American burying beetles occurring in the potentially affected area by mowing vegetation to less than 8 inches in height, removing grass clippings, and inspecting the work area daily to remove all carcasses; these measures would be in force from March 15 through October 31 or until construction in the vicinity is completed, whichever is earlier.
Visual Resources	• Power providers would attempt to route power infrastructure along existing linear corridors such as existing power lines, roadways, fence lines, field lines, parcel boundaries, or section lines to reduce impacts to land use and visual resources. • Strategic structure placement and varying structure type (e.g., lattice, H-frame, or single-pole) and material (e.g., wood, steel, or weathered steel) would be considered to reduce potential impacts to visual resources. • Where feasible, power lines would be collocated on the same structures to consolidate infrastructure.
Socioeconomics and Environmental Justice	• A program that would include inspection of roadways and roadway structures, repair of damage that may occur to those facilities, establishment of an approved Traffic Management Plan, and coordination with state and local transportation agencies would be implemented. Before construction begins, contractors would develop detailed traffic plans that address all applicable laws, regulations, and ordinances.

Table S-7. Summary of Resource Protection Measures for the Proposed Electrical Power Infrastructure

Resource	Description
Cultural Resources	• **If impacts on NRHP-eligible properties could not be avoided, mitigation plans will be developed and implemented.** • **Whenever feasible, known cultural resources would be avoided, impacts would be minimized when avoidance is not possible, and impacts would be mitigated when minimization is not sufficient. In addition, Unanticipated Discovery Plans would be implemented to ensure minimization of impacts on unknown cultural resources that may be inadvertently encountered during construction or operation of the proposed infrastructure.** • **For the power infrastructure that would serve PS-14, PS-22, PS-23, PS-23B, PS-24, PS-25, and PS-26, power providers would provide an opportunity for SHPO(s) and consulting Indian tribes and other interested parties to review and comment on the proposed power infrastructure.** • **For the power infrastructure that would serve PS-14, field surveys of all remaining areas would be completed and consultation with Montana SHPO would occur before construction. Prior to construction, any known sites would be marked to avoid adverse impacts on sites.**

a. Protected and Special Status Species in relation to the electrical power and infrastructure include species protected under the ESA, the MBTA, and the Bald and Golden Eagle Protection Act, as well as BLM and state-specific regulations.

APLIC = Avian Power Line Interaction Committee; BA = Biological Assessment for the Keystone XL Project; BFD = Bird Flight Diverter; BLM = Bureau of Land Management; DR = Data Request to Keystone; ESA = Endangered Species Act; HDD = horizontal directional drill; MBTA = Migratory Bird Treaty Act; MDEQ = Montana Department of Environmental Quality; MTFWP = Montana Department of Fish, Wildlife and Parks; NGPC = Nebraska Game and Parks Commission; NHPA = National Historic Preservation Act; PS = Pump Station; SEIS = Supplemental Environmental Impact Statement; SHPO = State Historic Preservation Office; USFS = U.S. Forest Service; USFWS = U.S. Fish and Wildlife Service

S.7.2 Potential Effects of the Proposed Project from Accidental Releases

Impacts under normal operations would be negligible to moderate. However, there is potential for environmental impacts from the proposed Project if an accidental or otherwise unexpected release of crude oil from the Keystone XL pipeline or facilities occur. **The proposed Project would include processes, procedures and systems to prevent, detect and mitigate a release, should one occur.** These **include** (**1**) continuous monitoring systems and automatic shutoff valves to quickly identify a leak or rupture and halt pumping immediately upon detection of pressure fluctuations; and (**2**) prompt implementation of Keystone's response plan should mitigate effects. **Adherence to proper operating protocols and response activities conducted in accordance with Keystone's Emergency Response Plan, Geographic Response Plan, Facility Response Plan, Spill Prevention, Control and Countermeasure Plans, and Project-specific mitigation measures, including the PHMSA Special Conditions, would reduce the potential extent of impacts following an accidental release. As such, anticipated impacts would likely remain at less-than-significant levels.**

Keystone, in compliance with local, state and federal regulations, would implement prevention and mitigation measures in the design, construction, operation and maintenance of the pipeline and facilities, including:

- Keystone would incorporate the Project-specific Special Conditions recommended by PHMSA and detailed in Appendix Z of the 2014 Keystone XL Final SEIS.
- Keystone would monitor the pipeline and facilities using a supervisory control and data acquisition center (SCADA) system, which would continuously monitor the pipeline facility for leaks.

- Keystone would monitor and control the cathodic protection system 24 hours per day, 365 days per year, from a central control facility located in Edmonton, Alberta, Canada.
- Keystone would maintain required manuals, and file required integrity management plans, as required by PHMSA.
- Keystone would implement the following management plans: a Project-Specific Horizontal Directional Drilling Contingency Plan; a CMRP; a Reasonable and Prudent Practices for Stabilization guidance document; a Facility Response Plan for crude oil pipelines; Geographic Response Plans; and Keystone's Environmental, Health and Safety Policy.
- **Keystone would implement a Spill Prevention, Control, and Countermeasure (SPCC) Plan to establish procedures to prevent the discharge of hazardous or regulated materials during construction of the Project, particularly into or upon waters of the United States.**

The following summarizes potential effects that might occur in the unlikely event of a release.

Land Use, Recreation and Visual Resources: A potential accidental release could result in short- or long-term effects to land use, recreation and visual resources existing within the region of influence (ROI). Agriculture is the predominant land use along the Keystone XL Project, and a release could limit or prohibit agricultural production until cleanup is complete and contaminated soils are remediated. The Keystone XL Project crosses fisheries, and a release affecting areas along the banks and within the stream could temporarily restrict public access for fishing for the duration of cleanup. Physical contamination of open space could adversely affect vegetation, thereby restricting the use of the land for livestock grazing during remediation of any potential spills. In addition, toxicological impacts could include reduced vegetation for grazing. During remediation, contaminated vegetation and soils may require excavation and removal, and vehicles and equipment used to respond to and remediate a spill may increase the potential for soil disturbance (e.g., rutting, compaction and erosion). It is also possible that wind or water erosion could carry contaminated soils off the spill site and adversely affect vegetation used for grazing in areas beyond the spill location.

Geology and Soils: A potential release of crude oil could result in short- or long-term effects to soil resources existing within the ROI; due to the lack of seismic faults or oil, natural gas or coal mining operations along the Keystone XL Project, no adverse impacts to geology from an accidental release along the route would be anticipated. Large spills (releasing more than 1,000 barrels) that would have the potential to reach mineral resource extraction sites could contaminate those resources and disrupt commercial activity during spill response and remedial activities. The impacts would be short-term and adverse from an economic perspective rather than a natural resource perspective, but substantial contamination of the mineral resources could cause adverse impacts over a longer term. The disruption of commercial activity during response and remedial efforts could result in short-term adverse economic impacts on the owners and operators of mineral extraction sites near a release. These disruptions would likely last longer for a medium spill than if a small spill (releasing 50 barrels or less) were to occur. Small or medium (releasing more than 50 barrels and less than or equal to 1,000 barrels) spills would not likely cause long-term adverse impacts beyond the duration of remedial activities. Contamination of prime farmland soils could affect soil productivity adversely, and the beneficial use for farming or grazing would be restricted during remediation of the spill and potentially after remediation is complete. Remediation may require the excavation and removal of contaminated soils, which would potentially result in a permanent loss of prime farmland soils. Vehicles and equipment used to respond to and remediate a spill may increase the potential for soil disturbance (e.g., rutting, compaction and erosion). It is also possible that wind or water erosion could carry contaminated soils off a spill site and adversely affect prime farmland soils in areas beyond the spill location.

Air Quality: Direct and indirect impacts in the event of an accidental release from the pipeline would be short-term in nature, likely ranging from a few hours to several weeks. The primary impacts related to air quality would have the potential for adverse effects to human health. Human health impacts arise from inhalation of the hydrocarbons (organic molecules made of hydrogen and carbon atoms) that make up crude oil. Health effects from exposure depend on the concentration of the chemical in the air and the duration of exposure. In addition, degraded air quality and visual obstructions caused by smoke can disrupt professional and/or recreational activities in affected areas, negatively affecting the aesthetic and economic value of affected regions. In the event of a crude oil spill, the effects on air quality would depend on the size of the spill; the type of oil spilled; environmental conditions, including topography; and the weather. Oil spills spread over the ground or via waterways. The volatile and semi-volatile compounds then vaporize, emitting odors and airborne contaminants. Volatile and semi-volatile organic compounds (including polycyclic aromatic hydrocarbons) evaporate most rapidly and disperse according to the wind strength and direction and temperature. Conditions with no wind could result in the highest air concentrations, as wind serves to dissipate the contaminants. The extent of the impacts would depend on the volume of oil spilled, the size of the plume, the proximity of the incident to populated areas, the evaporative and dispersion characteristics of the weather and wind conditions, and the effectiveness of the spill response. While any release of crude oil may have an immediate and direct impact on the air quality near the spill, the potential for air quality impacts reduces with time as the material evaporates.

Noise and Vibration: A potential release of crude oil into the environment could result in short-term noise impacts, primarily during response, restoration and remediation activities. Potential impacts from noise would likely be associated with the equipment and vehicles used for site access, cleanup and restoration efforts. These impacts would be similar to those of a construction site, but the activities could occur at all hours of the day and night. Equipment would likely include vehicles and construction equipment, such as bulldozers, excavators and dump trucks, as well as various types of all-terrain vehicles. In addition, response and cleanup efforts could also include the use of watercraft and aircraft. Similar to human sensitive receptors, wildlife can experience impacts from exposure to noise and vibration resulting from human activities during response, restoration and remediation activities. These impacts to wildlife species could include stress, avoidance of feeding and decreased breeding success.

Water Resources:

Groundwater: The extent of impacts to groundwater would vary based on downward infiltration of a potential release, location and response time. Depth to groundwater varies along the Keystone XL Project. Impacts to groundwater resulting from a release would include water quality impacts potentially affecting sources of drinking water or irrigation. Prompt cleanup response would likely be capable of remediating the contaminated soils before the hazardous release reaches groundwater depth.

Surface Water: The extent of impacts to surface water would vary based on location, volume and response time. A crude oil spill in a stream, river or lake would have impacts resulting from the tendency of crude oil to float on the water surface (i.e., free product) and to mix with water. These impacts could include the degradation of water quality from dissolution and mixing of the oil in the water column, contamination of the water by chemical constituents (i.e., hydrocarbons) within crude oil and related degradation by-products and secondary effects such as lower levels of dissolved oxygen that occur from biodegradation of these compounds. The intensity and severity of water quality impacts would be dependent on a number of variables, including the volume of crude oil released into the waterbody and the characteristics of the waterbody (e.g., size, flow volume and rate at the time of the spill, etc.), which would influence propagation of the crude oil. Submerged crude oil could result in a persistent source of contamination (while the source releases crude oil to the environment) because of the slow rate of natural degradation of this material. Thus, submerged crude oil could result in the slow release of dissolved hydrocarbons, resulting in long-term chronic toxicological impacts to aquatic organisms.

Wetlands: The extent of impacts to wetlands would vary based on location, volume and response time. Direct impacts to wetlands would range from stress of vegetation and wildlife to species mortality and the degradation of wetland habitat and function. The severity of impacts on wetlands depends upon the volume and type of crude oil spilled and a variety of environmental factors (e.g., time of year, type of vegetation, amount of surface water present) and the cleanup response actions. Oil type is a major factor in determining the degree and type of impacts on wetland vegetation and wildlife. Lighter crude oils are more acutely toxic than heavier crude oils. Most crude oils affect wetlands through the smothering of leaves and soils.

Floodplains: A release to surface waters or floodplains during flood conditions could affect floodplains along and downstream of the Keystone XL Project. Remediation and cleanup efforts would have temporary and minor impacts on floodplains as a result of heavy equipment and remediation measures, such as contaminated soil removal. Appropriate steps would be taken to restore vegetation and reduce compaction.

Biological Resources: Although the potential for a major spill is limited due to Keystone's monitoring system and response plans to help mitigate any impacts, the potential release of petroleum products could result in direct and indirect physical and toxicological impacts on biological resources, including habitats, flora and fauna. A spill would have localized impacts on vegetation and generally would be limited to the physical bounds of the spill. However, the spill may have impacts on wildlife that could extend beyond the spill area. Physical impacts could arise from direct contact with released petroleum products. Toxicological impacts result from the chemical and biochemical actions of petroleum-based compounds on the biological processes of individual organisms and could include: direct and acute mortality; subacute interference with feeding or reproductive capacity; disorientation or confusion; reduced resistance to disease; tumors; reduction or loss of various sensory perceptions; interference with metabolic, biochemical and genetic processes: and many other acute or chronic effects.

Socioeconomics and Environmental Justice: Potential accidental release could result in short-term effects to socioeconomic resources, specifically emergency services. Local fire, police and ambulance departments would typically be the first to respond to an accidental release and may be responsible for evacuating residents, treating injuries as needed, restricting public access and containment of the release. First responders could face greater exposure to crude oil contact or fires and would be more susceptible to human health and safety impacts. Impacts from a leak would generally be localized, but regional impacts may occur if a large number of emergency personnel is needed to respond to a rupture or fire. Minority or low-income populations may experience adverse effects if a product is released in certain census block groups. Depending on the location and extent of a spill or incident, minority or low-income populations could be more vulnerable to health impacts associated with a product release because of reduced access to health care services. This factor could result in disproportionate adverse impacts to minority and low-income populations in the event of a large release.

A spill of crude oil could also affect transportation if it coats roadways or occurs in proximity to roadways or rail lines. Roadways and rail lines may need to be temporarily closed or have traffic restricted until remediation is complete. Road closures or traffic restrictions could result in changes to traffic patterns and limited access to nearby properties. Closure of rail lines or restrictions on trains could result in delays, as trains would have limited alternative routes. Impacts would be minor and range from localized to regional, depending on the location of the release and duration of remediation.

An accidental release could occur in treaty lands in southeastern Montana, western South Dakota and northwestern Nebraska where Indian tribes still claim rights to hunting, fishing and water use rights. Impacts to water resources from an accidental release could adversely affect important religious ceremonies, such as the **I**nipi in which water is a key component. Impacts to vegetation, wildlife and fisheries have the potential to impact subsistence activities including impacts to hunting and fishing rights. The loss of access to subsistence resources as a result of an accidental release would require individuals dependent on these resources to hunt, gather, harvest and fish elsewhere until the site of an accidental release is remediated**. Depending on the location of the accidental release, these effects could be disproportionately high and adverse to tribal communities affected by a spill.**

Two intakes associated with the Fort Peck Irrigation Project used to irrigate Tribal lands within the Fort Peck Reservation and are located 10 and 14 river-miles downstream of the proposed Keystone XL pipeline crossing of the Missouri River. A release to surface water located upstream, and in the vicinity of any of these intakes identified, could produce both short- and long-term effects on the suitability or usability of these intakes. The degree of impacts to surface water intakes from a release would depend on many factors, such as the size of the release, the time of year of the release and the response time to address the release. A spill that contaminates an intake may make it unusable for an extended period of time until spill response and recovery activities have been completed. Loss of these irrigation intakes during the growing season would result in economic losses to farmers, including Fort Peck's agricultural economy.

Cultural Resources: A potential accidental release could result in effects to existing **historic properties** within the ROI. Direct effects could include physical damage to features and/or artifacts due to the presence of oil, or if remediation activities result in ground disturbance. Indirect effects would consist of visual and auditory intrusions associated with the spill and the remediation activities. In the event of a crude oil release, remediation of the spill also could uncover buried artifacts, features or sites that were not previously known; in these instances, Keystone would **follow its procedures for remediation in coordination with the applicable federal and state agencies**.

Greenhouse Gases and Climate Change: Releases of crude oil into the environment would have negligible to minor greenhouse gas impacts. Activities resulting from a release of crude oil could contribute to greenhouse gases from fugitive emissions, from combustion of fuel in vehicles and equipment used for spill response and remediation actions, and from combustion of spilled crude oil in the event of a fire (either accidental or intentional). The amount of greenhouse gases emitted would vary depending on the volume of crude oil released and the extent and duration of spill response and cleanup activities. Greenhouse gas emissions from vehicles and equipment used for spill response and remediation would vary depending on the number and types of vehicles and equipment used and the duration of response actions. However, it is unlikely that these greenhouse gas emissions would significantly increase total greenhouse gas emissions under the proposed Project, because response activities would not occur on a frequent basis.

Reliability and Safety: Releases of crude oil can affect human health from exposure to the hydrocarbon constituents they contain. Although members of the public could experience long-term exposure after a spill, these effects would likely occur only for individuals who directly interact with the released product over many hours each day for an extended period of time (i.e., spill cleanup professionals). The implementation of health and safety practices and training regarding appropriate personal protective equipment for cleanup, exposure limits, work/rest schedules and other ways to minimize contact with spilled crude oil would mitigate the impacts of long-term exposure. Potential effects of a spill on populated areas could include interruptions to daily activities, such as access to safe drinking water, degraded air quality, restricted water-related activities or temporary relocation of affected individuals during spill response and remediation. State regulatory processes would prohibit the use of drinking water sources until they were confirmed safe for drinking, at which time the appropriate agencies would authorize resumption of use.

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FINAL
Supplemental Environmental Impact Statement
Keystone XL Project

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Acronyms

Acronym	Definition
°C	Degrees Celsius
°F	Degrees Fahrenheit
AIRFA	American Indian Religious Freedom Act
APE	area of potential effect
API	American Petroleum Institute
APLIC	Avian Power Line Interaction Committee
ARMP	Approved Resource Management Plan
AWBP	Aransas Wood Buffalo Population
BA	Biological Assessment
bbl	barrel
BFDs	bird flight diverters
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BiOp	Biological Opinion
Bpd	barrels per day
BTEX	benzene, toluene, ethylbenzene and xylenes
CAPP	Canadian Association of Petroleum Producers
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
CMRP	Construction Mitigation and Reclamation Plan
CNEB	Canada National Energy Board
CO_2	carbon dioxide
CO_2-eq	carbon dioxide equivalent
Con/Rec	Construction/Reclamation
dB	decibel
dBA	A-weighted decibel
Department	U.S. Department of State
dilbit	diluted bitumen
DNRC	Department of Natural Resources and Conservation
EA	Environmental Assessment
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EMF	electric and magnetic fields
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FR	*Federal Register*
GIS	geographic information system
GREET	Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation Model
HAP	hazardous air pollutant

Acronym	Definition
HDD	horizontal directional drill
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
kV	kilovolt
KXL	Keystone XL
LOS	Level of Service
MAR	Mainline Alternative Route
MBTA	Migratory Bird Treaty Act
MFWP	Montana Fish, Wildlife and Parks
MLV	mainline valve
mG	milligauss
MP	milepost
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NAGPRA	**Native American Graves Protection and Repatriation Act**
NDEQ	Nebraska Department of Environmental Quality
NDNR	Nebraska Department of Natural Resources
NEPA	National Environmental Policy Act
NGPC	Nebraska Game and Parks Commission
NHPA	National Historic Preservation Act
NHT	National Historic Trail
NID	National Interest Determination
NOAA	National Oceanic and Atmospheric Administration
NOA	Notice of Availability
NOI	Notice of Intent
NPPD	Nebraska Public Power District
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
PADD	U.S. Petroleum Administration for Defense District
PHMSA	Pipeline and Hazardous Materials Safety Administration
ppb	parts per billion
PPD	Public Power District
ppm	parts per million
PS	Pump Station
PSC	Public Service Commission
RAS	remedial action schemes
RCP	representative concentration pathways
ROI	region of influence
ROW	right-of-way

Acronym	Definition
RUS	Rural Utilities Service
SCADA	Supervisory Control and Data Acquisition
SEIS	Supplemental Environmental Impact Statement
SHPO	State Historic Preservation Office
SPCC	Spill Prevention Control and Countermeasure
SPP	Southwest Power Pool, Inc.
SVC	static var compensator
TWA	Temporary Workspace Area
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	*U.S. Code*
USDA	U.S. Department of Agriculture
USDOI	U.S. Department of Interior
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compound
WAPA	Western Area Power Administration
WAPA-UGP	WAPA’s Upper Great Plains Region
WCSB	Western Canadian Sedimentary Basin
WTI	West Texas Intermediate

1 INTRODUCTION

TransCanada Keystone Pipeline, L.P. (Keystone) proposes to construct, connect, operate**,** maintain **and eventually decommission** a pipeline system and ancillary facilities (e.g., access roads, pump stations and construction camps) that would transport Western Canadian Sedimentary Basin (WCSB) heavy crude oil from its existing facilities in Hardisty, Alberta, Canada, and Bakken crude oil from an on-ramp in Baker, Montana, to Steele City, Nebraska (referred to as the Keystone XL Project, or Project). The proposed pipeline would connect to the existing Keystone Cushing Extension pipeline, which extends from Steele City, Nebraska, to Cushing, Oklahoma. In total, the proposed Project would consist of approximately 1,209 miles of new, 36-inch-diameter pipeline, with approximately 327 miles of pipeline in Canada and approximately 882 miles in the United States. The proposed Project would cross the international border between Saskatchewan, Canada, and the United States near Morgan, Montana, and would include pipeline generally within a 110-foot-wide temporary construction right-of-way (ROW) and a 50-foot-wide permanent ROW in Montana, South Dakota and Nebraska. The construction and operation of the Project would require certain federal approvals, including the grant of a 44.4-mile ROW across federal lands in the State of Montana by the U.S. Bureau of Land Management (BLM) and permission to alter public works by the U.S. Army Corps of Engineers (USACE). In addition, the proposed Project would require construction of electrical power lines (both transmission and distribution) by multiple **public power entities** and cooperatives necessary for Keystone to operate proposed pipeline pump stations. Three federal agencies including the BLM, the U.S. Department of Energy's (DOE's) Western Area Power Administration (WAPA), and the U.S. Department of Agriculture's (USDA's) Rural Utilities Service (RUS) must make decisions related to providing a ROW across federal lands, expanding substations and interconnecting with the electrical grid and/or financing the construction and operation of the power lines.

The U.S. Department of State (the Department) has prepared this **Final** Supplemental Environmental Impact Statement (SEIS) for the 2014 Final Supplemental Environmental Impact Statement for the Keystone XL Project (2014 Keystone XL Final SEIS) consistent with the National Environmental Policy Act (NEPA) of 1969 (as implemented by the regulations of the Council on Environmental Quality [CEQ], found at 40 *Code of Federal Regulations* [CFR] 1500–1508).

Scope of the SEIS

On November 8, 2018, the U.S. District Court for the District of Montana identified four deficiencies in the 2014 Keystone XL Final SEIS: the effects of current oil prices, cumulative effects of greenhouse gas emissions, cultural resources and accidental release modeling.

This SEIS supplements the 2014 Keystone XL Final SEIS, considers the direct, indirect and cumulative impacts related to changes in the Project since 2014 and incorporates the following updated information and new studies:

- Update to the market analysis considering the effects of current market conditions and the viability of the proposed Keystone XL Project.
- Analysis of the Mainline Alternative Route (MAR), including existing resources, the potential for environmental impacts, and identification of any potential mitigation measures to address environmental impacts. The Nebraska Public Service Commission (Nebraska PSC) approved the MAR on November 20, 2017 and on August 23, 2019, the Nebraska Supreme Court upheld that decision.
- New information related to the Keystone XL Project, including studies conducted of the proposed Keystone XL pipeline's crossing of the Missouri River (a site-specific risk assessment conducted for the Missouri River crossing and the USACE Missouri River scour analysis), sensitive species surveys and agency data, and findings of cultural surveys completed since 2014.

- Revised methodology and analysis for greenhouse gas emissions using recently published lifecycle greenhouse gas emissions studies for WCSB and other crude oils as well as the Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model, and reevaluation of projected cumulative emissions using updated crude oil production and consumption estimates (e.g., U.S. Energy Information Administration (EIA), Canadian Association of Petroleum Producers [CAPP], and Canada National Energy Board [CNEB] projections). The analysis also considers recent climate change reports including the U.S. Global Change Research Program's Fourth National Climate Assessment and the Intergovernmental Panel on Climate Change (IPCC) Special Report on Global Warming of 1.5°C.

- Revised methodology for accidental releases, including updated modeling to account for industry- and Keystone-specific incident history since 2014, the latest findings and research related to oil spills, an updated analysis of potential for impacts from overland spills to sensitive resources along the entire alignment, and an updated analysis of potential for impacts to downstream receptors within 40 river-miles from the pipeline along connected hydraulic pathways.

- Additional supporting analysis of electrical power infrastructure required to support pipeline operations, including existing resources, the potential environmental effects, and identification of any potential mitigation measures to address the adverse environmental effects.

This SEIS analyzes the potential impacts of the proposed Project (see Section 2.4 for a description of the proposed Project) based on the Proposed Federal Decisions (see Section 1.3), including effects for potential construction, operations and maintenance of the proposed Project under the Proposed Action discussion and a No Action Alternative, where Keystone would not construct the proposed Project. Further, this SEIS incorporates by reference the 2011 Keystone XL Final EIS and the 2014 Keystone XL Final SEIS and previous analysis prepared by and incorporated into the Department's documentation relating to its compliance with NEPA.

SEIS Organization

This SEIS is organized into the following Chapters:

- Chapter 1, Introduction, provides a background on the Keystone XL Project; establishes the purpose and need; describes crude oil market conditions; and summarizes agency, tribal and public involvement activities.

- Chapter 2, Development of Alternatives, describes the alternatives carried forth for analysis within this SEIS, summarizes the alternatives dismissed from consideration and provides an overview of the Keystone XL Project and changes to project design since the 2014 Keystone XL Final SEIS.

- Chapter 3, Affected Environment, provides a description of the affected environment with a focus on the MAR, which was not analyzed in the 2014 Keystone XL Final SEIS. This chapter also incorporates information published since the 2014 Keystone XL Final SEIS regarding climate change.

- Chapter 4, Environmental Consequences from Construction and Normal Operations, provides an assessment of potential impacts to the resources discussed in Chapter 3 from construction, normal operations and maintenance activities with a focus on the MAR, which was not analyzed in the 2014 Keystone XL Final SEIS. This chapter also includes an updated analysis of greenhouse gas emissions using the GREET model.

- Chapter 5, Environmental Consequences from Accidental Releases, assesses the risk to resources along the entire length of the proposed Keystone XL pipeline using updated modelling and information generated since the 2014 Keystone XL Final SEIS, including studies conducted for the proposed Keystone XL pipeline's crossing of the Missouri River, sensitive species surveys and agency data, and findings of cultural surveys completed since 2014. These impacts are assessed separately from Chapter 4 as the potential for an accidental release and the effects on a potential resource are probability driven as opposed to having defined footprints for construction and normal operations analyzed in Chapter 4.
- Chapter 6, Electrical Power Infrastructure, provides a description of resources and an assessment of impacts from connected actions relating to electrical supply needs required for the proposed pipeline.
- Chapter 7, Cumulative Impacts, provides an assessment of the impacts from the proposed Keystone XL Project (including the electrical supply needs) in combination with other past, present and reasonably foreseeable future actions.
- Chapter 8, Summary of Consequences, outlines the level of potential environmental impacts discussed within this SEIS along with a summary of resource protection and conservation measures identified within this SEIS.
- Chapter 9, Irreversible and Irretrievable Commitment of Resources, describes commitments related to the use of nonrenewable resources and the effects that the use of these resources would have on future generations.

1.1 BACKGROUND

In 2008, Keystone filed an initial Presidential Permit application with the Secretary of State requesting authorization to construct, operate and maintain the Keystone XL crude oil pipeline and ancillary facilities at the United States-Canada border in Phillips County, Montana. This initial application was followed by Keystone XL route modifications, a new Presidential Permit application in 2012 and subsequent reviews by the Department. Table 1-1 presents the sequence of actions pertaining to the Keystone XL pipeline leading up to the issuance of a Presidential Permit for the Keystone XL pipeline in March 2019.

Table 1-1. Summary of Actions Related to the Keystone XL Pipeline

Date	Keystone and Department Actions
September 2008	Keystone filed an initial Presidential Permit application requesting authorization to build and operate the Keystone XL pipeline.
May 2009	**The Department holds the first of 10 meetings with agencies and tribes to discuss the Project and to draft a Section 106 Programmatic Agreement (May 2009 to December 2010).**
June 2011	**Programmatic Agreement signed.**
August 2011	Department evaluated the original pipeline alignment and published a Final EIS.
January 2012	President denied the Presidential Permit application for the Keystone XL pipeline.
April 2012	Keystone proposed a new alignment in Nebraska with the goal of avoiding the Sand Hills Region in Nebraska.
May 2012	Keystone filed a new application for a Presidential Permit for the Keystone XL pipeline that included a new alignment avoiding the Sand Hills Region of Nebraska.
October 2012	**The Department holds the first of four meetings and one teleconference with the agencies and tribes to discuss amending the 2011 Programmatic Agreement (October 2012 to July 2013).**

Table 1-1. Summary of Actions Related to the Keystone XL Pipeline

Date	Keystone and Department Actions
December 2013	**Programmatic Agreement amended and signed.**
January 2014	Department evaluated the route modifications in an SEIS and published the 2014 Keystone XL Final SEIS.
November 2015	Secretary of State denied the Presidential Permit application for the Keystone XL pipeline.
January 2017	Presidential Memorandum Regarding Construction of the Keystone XL Pipeline issued January 24, 2017. Keystone resubmitted the application for a Presidential Permit. The re-submitted application included minor route alterations due to agreements with local property owners for specific rights-of-way and easement access, but the proposed route, herein referred to as the Preferred Route, remained entirely within the areas previously analyzed by the Department in the 2014 Keystone XL Final SEIS.
March 2017	Under Secretary of State for Political Affairs issued the Presidential Permit to Keystone.
May 2018	The Department published a NOI in the FR to solicit public comments regarding scope and content of an EA of the MAR over a 30-day period.
July 2018	The Department published a NOA in the FR regarding availability of the Keystone XL MAR Draft EA and to solicit comments on the Draft EA over a 30-day public comment period.
August 2018	The United States District Court for the District of Montana ordered the 2014 Keystone XL Final SEIS be supplemented to consider the potential impacts of the MAR and related facilities.
September 2018	In response to the August 2018 Court Order, the Department published an NOI in the FR announcing its intent to prepare an SEIS on the MAR, which was followed by publication of an NOA in the FR announcing availability of the Keystone XL MAR Draft SEIS and a 45-day public comment period.
November 2018	The United States District Court for the District of Montana found that the 2014 Keystone XL Final SEIS largely complied with NEPA and specifically rejected challenges, among other things, its purpose and need, the range of alternatives, the no-action alternative, its discussion of the market demand for oil, impacts of the project in Canada, and the response to comments. It did find fault with narrow aspects of the 2014 Keystone XL Final SEIS and ordered that it be supplemented to account for new information that has become available since its publication, specifically including an updated market analysis, post-2014 cultural resource surveys and studies, revised greenhouse gas emissions modeling, and updates to the accidental release analysis based on post-2014 information.
December 2018	In response to the November 2018 Court Order, the Department published an NOI in the FR announcing their intent to prepare a new SEIS to the 2014 Keystone XL Final SEIS.
March 2019	The President issued a Presidential Permit on March 29, 2019, authorizing construction, connection, maintenance and operation of the Project at the United States-Canada border. This permit removed the Secretary of State (or his delegate) from any action with respect to the Project. In June 2019, the November 2018 Court judgments were vacated.
October 2019	The Department published an NOA in the FR regarding availability of the 2019 Keystone XL Draft SEIS, to solicit comments on the Draft SEIS over a 45-day public comment period.
December 2019	**The Department published an NOA in the FR regarding availability of the 2019 Keystone XL Final SEIS.**

BLM = U.S. Bureau of Land Management; Department = U.S. Department of State; EA = Environmental Assessment; EIS = Environmental Impact Statement; FR = *Federal Register*; NOA = Notice of Availability; NOI = Notice of Intent; SEIS = Supplemental Environmental Impact Statement

The only major alignment shift from the 2014 Keystone XL Final SEIS is related to the MAR in Nebraska. After resubmitting its Presidential Permit application for the Keystone XL pipeline in January 2017, Keystone filed an application for approval under Nebraska's Major Oil Pipeline Siting Act with the Nebraska PSC (Nebraska PSC 2017a). Nebraska's Major Oil Pipeline Siting Act, which became law in 2011, requires applicants to provide evidence of consideration of alternative routes and whether any other utility corridors exist that are feasible and could be beneficially used. Keystone's application to the Nebraska PSC therefore included three routes through Nebraska: the Keystone XL Preferred Route (analyzed in the 2014 Keystone XL Final SEIS) that had been proposed for approval by the Nebraska PSC, and two alternative routes called the "Keystone XL MAR" and the "Sandhills Alternative Route." On November 20, 2017, the Nebraska PSC approved the MAR basing their decision on the application review, hearings and reviews of the MAR by Nebraska state agencies (Nebraska PSC 2017b).

As shown in Figure 1-1, the MAR starts at a point 110 miles south of the Nebraska-South Dakota border (near milepost [MP] 711) located just north of the Elkhorn River in Antelope County. From this starting point, the MAR heads in a southeasterly direction across Madison and Stanton counties for approximately 43 miles. At MP 754, the MAR then intercepts the existing ROW for the Keystone Mainline and heads towards the south paralleling the existing Keystone Mainline for approximately 50 miles, crossing Shell Creek and the Platte River in Colfax County. The MAR then shifts away from its co-location with the existing Keystone Mainline at MP 804 for approximately 29 miles by routing west around the Seward County wellhead protection area. The MAR then rejoins the existing Keystone Mainline route at MP 833 and continues south for an additional 40 miles through Saline County, terminating in Jefferson County where it rejoins the 2014 Keystone XL Preferred Route at MP 873. The total length of the proposed Keystone XL pipeline through Nebraska would be approximately 281 miles, of which the MAR would be approximately 162 miles long.

The 2014 Keystone XL Preferred Route contained a total of five pump stations located in Nebraska. The MAR requires an additional pump station for a total of six pump stations in Nebraska. The MAR would be approximately 7 miles longer than the 2014 Keystone XL Preferred Route and co-located with the existing Keystone Mainline for approximately 88.7 miles and other utility and transportation ROW corridors for approximately 18.3 miles, which is 66 percent of its route; whereby the 2014 Keystone XL Preferred Route was co-located with existing linear facilities for only 2 miles. See Section 2.4.1 for further information on co-location of the MAR.

Table 1-2 summarizes key differences between the 2014 Keystone XL Preferred Route and the MAR in Nebraska. Figure 1-2 shows the entire Keystone XL Project with the MAR as discussed above.

Table 1-2. Summary of Key Changes of the Proposed Keystone XL Pipeline in Nebraska

Project Component	Previous Nebraska Totals 2014 Keystone XL Final SEIS	Current Nebraska Totals (considering the MAR)	Net Difference of MAR
Pipeline Length (miles)	274	281	+7
Co-location of ROW (miles)[a]	2	107	+105
Required Pump Stations	5	6	+1

[a] Co-location includes pipeline, utility and road ROW.

MAR = Mainline Alternative Route; ROW = right-of-way; SEIS = Supplemental Environmental Impact Statement

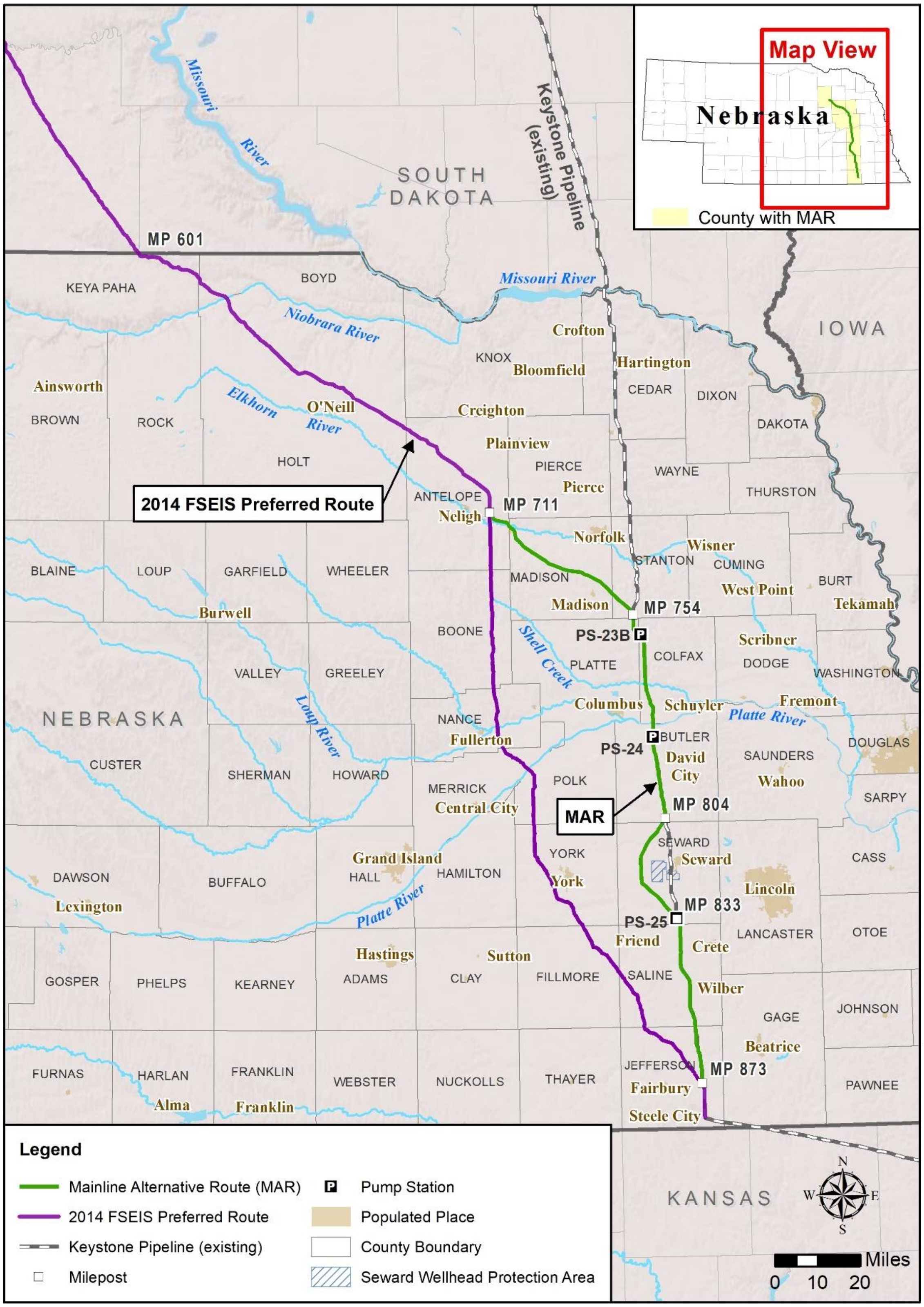


Figure 1-1. Proposed MAR in Comparison with the 2014 Keystone XL Final SEIS Preferred Route

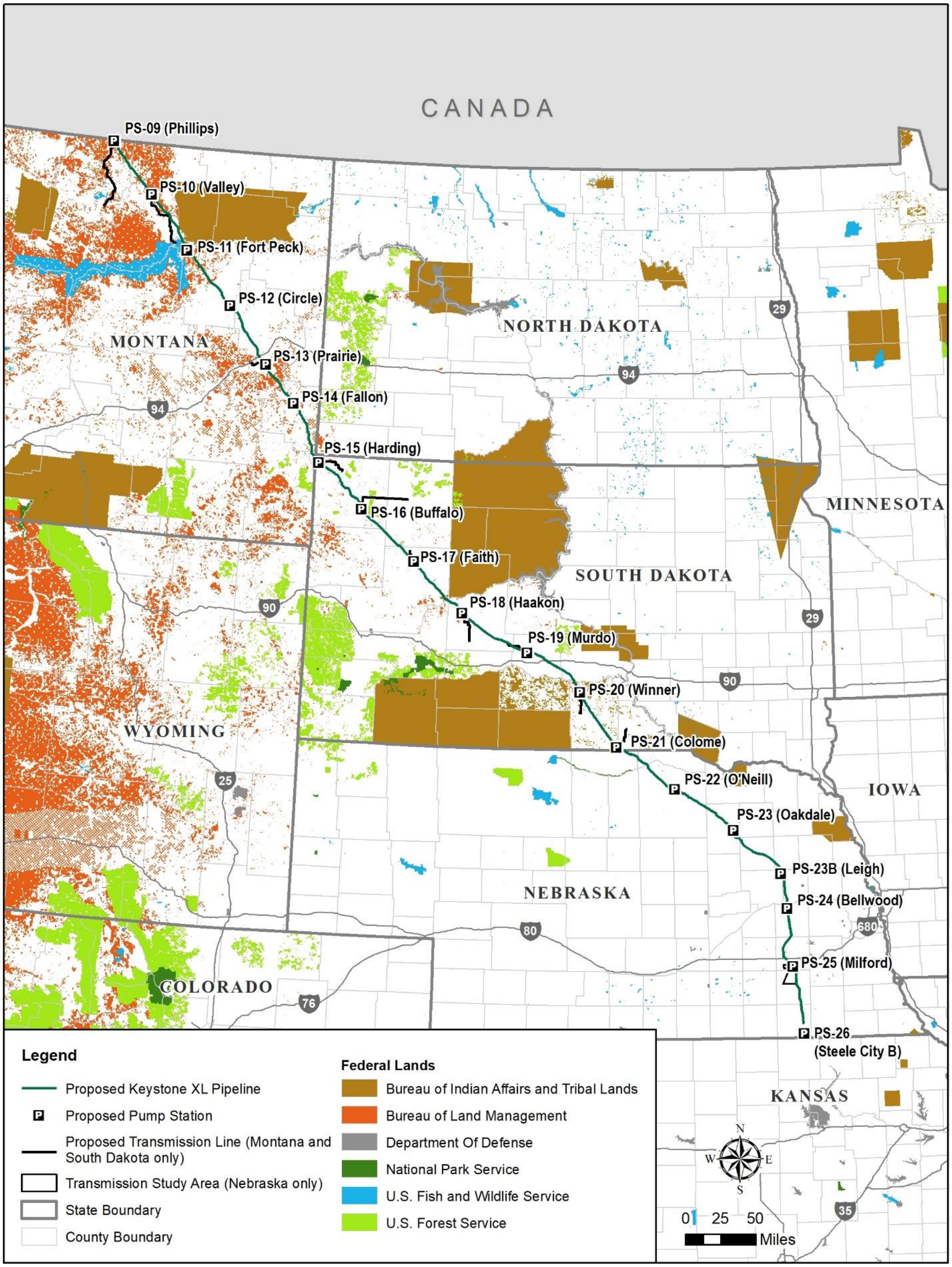


Figure 1-2. Proposed Keystone XL Project

1.2 PURPOSE AND NEED

This SEIS is being prepared to update the evaluation of the Keystone XL Project presented in the 2014 Keystone XL Final SEIS based on changes to the Project including the MAR and consideration of new information available since the 2014 Keystone XL Final SEIS. Those previous impact statements included statements of Purpose and Need applicable to the Department. Due to the fact that the President issued a Presidential Permit on March 29, 2019 authorizing construction, connection, maintenance and operation of the Project at the United States-Canada border, there is no longer any action for the Secretary of State or his delegate to take in respect to the Project. Nothing in this SEIS is to the contrary or may be construed to the contrary. The Department, in cooperation with other agencies, completed this SEIS because it began work on the SEIS before the Presidential Permit issued on March 29, 2019 and it was useful and efficient for the Department to complete its work as applied to the "Facilities" defined in the March 29, 2019 Presidential Permit. Finally, nothing in this SEIS should be construed as the Department exercising authority over the "Border Facilities" as defined in the March 29, 2019 Presidential Permit. The construction, connection, operation, and maintenance of the Keystone XL Project's "Border Facilities" are governed by the authority of the March 29, 2019 Presidential Permit.

1.2.1 Project Purpose and Need

The primary purpose of the proposed Keystone XL pipeline is to provide the infrastructure to transport up to 830,000 barrels per day (bpd) of crude oil from the WCSB in Canada and the Bakken Shale Formation in the United States to existing pipeline facilities near Steele City, Nebraska for onward delivery to Cushing, Oklahoma and the U.S. Gulf Coast area.

In order to consider the validity of the need for the proposed Keystone XL pipeline since the 2014 Keystone XL Final SEIS, the Department reviewed current market conditions, taking into consideration the state of the global crude oil market, western Canadian market and infrastructure to support western Canadian market demand (see Section 1.4). Overall, the updated market analysis, similar to the market analysis sections in the 2011 Keystone XL Final Environmental Impact Statement (2011 Keystone XL Final EIS) and 2014 Keystone XL Final SEIS, concludes that there is continued strong demand for transport of WCSB by pipeline, including by the proposed Project, under current and projected market conditions. This market analysis considers the most recent information from the EIA, the International Energy Agency (IEA) and CAPP.

1.2.2 Bureau of Land Management Purpose and Need

BLM has agreed to continue to be a cooperating agency for this SEIS **and will utilize the Department's NEPA documentation in issuing a decision on Keystone's proposed ROW to cross federal lands in Montana**. The proposed Keystone XL pipeline would cross **44.4 miles of** federal lands managed by the BLM and 1.88 **miles of lands managed by** USACE**, both** in Montana. The BLM's purpose and need is to respond to the Keystone application under Section 28 of the Mineral Leasing Act, as amended, for a ROW grant and Temporary Use Permit to construct, operate, maintain and decommission a crude oil pipeline and related facilities on federal lands in compliance with the Mineral Leasing Act, BLM ROW regulations and other applicable federal laws. The BLM must consider Keystone's ROW application in accordance with its multiple-use mandate and applicable land use plans. The ROW decision on the **Mineral Leasing Act** ROW application would also require USACE permission under Section 14 of the Rivers and Harbors Act of 1899, 33 USC § 408, to make alterations to federal property administered by the USACE, provided it is determined the proposed alteration will not be injurious to the public interest and will not impair the usefulness of a Civil Works project.

The BLM will decide whether to approve, approve with modification or deny issuance of a ROW grant and Temporary Use Permit to Keystone for the proposed Keystone XL pipeline, and if approved, under what terms and conditions. The BLM's **decision on Keystone's Mineral Leasing Act ROW application to cross federal land in Montana will rely on the environmental analysis** in this SEIS**,** the 2011 Keystone XL Final Environmental Impact Statement (2011 Keystone XL Final EIS) and the 2014 Keystone XL Final SEIS, as well as other information **considered or included with** those documents. **Keystone's Mineral Leasing Act ROW application to use federal lands in Montana is analyzed in the 2011 Keystone XL FEIS and the 2014 Keystone XL Final SEIS. There have been no re-alignments or modifications of the proposed Mineral Leasing Act ROW on federal land in Montana since the 2014 Keystone XL Final SEIS. This SEIS primarily analyzes the impacts associated with the MAR as a new alternative. It also supplements the 2014 Keystone XL Final SEIS by providing additional analysis regarding the effects of current oil prices, cumulative effects of greenhouse gas emissions, cultural resources and accidental release modeling, consistent with the direction in the U.S. District Court for the District of Montana's November 18, 2018, decision. This SEIS also documents and considers additional cultural resource surveys that have been completed on BLM lands in Montana since publication of the 2014 Keystone XL Final SEIS. Finally, the BLM conducted an in-depth review of the federal actions associated with the proposed Project and connected actions in this SEIS to evaluate anticipated effects of the Project on federally protected and candidate species and federally designated critical habitat. Pursuant to Section 7 of the Endangered Species Act, BLM prepared a Biological Assessment, which updates the December 2012 Final Biological Assessment for the Keystone XL Project** (**see Appendix H of the 2014 Keystone XL Final SEIS**). **Accordingly, BLM will consider and rely on the 2011 Keystone XL FEIS, the 2014 Keystone XL Final SEIS, and this SEIS in issuing a decision on Keystone's application for Mineral Leasing Act ROW on federal lands in Montana.**

1.2.3 Western Area Power Administration Purpose and Need

WAPA has agreed to continue to be a cooperating agency for this SEIS (similar to its role for the 2014 Keystone XL Final SEIS) and intends to use this document as a basis for issuing a Record of Decision.

WAPA's mission allows open access to the federal transmission system. Any entity requesting interconnection to the federal transmission system must submit an application for interconnection. Local power cooperatives have submitted requests to interconnect with the WAPA transmission system in order to serve the electrical needs of Pump Stations 9 through 13 and Pump Stations 17 through 19, as well as Pump Station 21. WAPA's purpose and need is to consider and respond to these interconnection requests from the local power cooperatives, and the related construction or upgrading of any WAPA-owned facilities as a result of the requests.

1.2.4 Rural Utilities Service Purpose and Need

RUS has agreed to continue to be a cooperating agency for this SEIS and intends to use this document in support of issuing a Record of Decision. RUS's purpose and need for taking action is to determine whether to provide federal financing to electric cooperatives through loans and loan guarantees for the construction, operation and improvement of electric transmission and generation facilities in rural areas. In regard to the proposed Keystone XL Project, this would include the Grand Electric Cooperative, West Central Electric Cooperative and Rosebud Electric Cooperative in South Dakota, which have applied for RUS financing for the construction of power lines to deliver power to Pump Stations 15 through 21.

1.2.5 U.S. Army Corps of Engineers Purpose and Need

The USACE has agreed to continue to be a cooperating agency for this SEIS and intends to use this document to support its determination whether to grant permission for Keystone to modify lands administered by the USACE at the Fort Peck project by concurring with the BLM's inclusion of USACE project land in the proposed ROW grant to Keystone for the Keystone XL Project. In addition to the permits, approvals and regulatory requirements listed in Section 1.9 of the 2014 Keystone XL Final SEIS, the USACE is considering issuance of Section 408 Permission (River and Harbors Appropriation Act of 1899 (33 USC 408)) required for alterations proposed within the lands and real property interests identified and acquired for a USACE project and to lands available for USACE projects under the navigation servitude. Under Section 408, the Secretary of the Army may, on recommendation of the Chief of Engineers, grant permission for the alteration of a public work so long as that alteration is not injurious to the public interest and will not impair the usefulness of the work.

USACE's purpose and need is to determine whether USACE may allow the BLM to include federal land administered by USACE for the Fort Peck Project in a ROW granted by BLM to Keystone for the installation of the proposed Keystone XL pipeline on Fort Peck Project land. USACE anticipates receiving and acting upon applications submitted by Keystone pursuant to Section 404 of the Clean Water Act of 1972 (33 USC 1344) (Section 404).

1.3 FEDERAL DECISIONS

1.3.1 Bureau of Land Management

BLM's Federal Decision includes whether to approve, approve with modification or deny issuance of a ROW grant and Temporary Use Permit to Keystone under Section 28 of the Mineral Leasing Act for the proposed Keystone XL pipeline, and if approved, under what terms and conditions. The ROW grant and Temporary Use Permit would cover the 44.4 miles of BLM land in Montana and **1.88 miles of lands administered by** USACE (described in Section 1.3.4.**)**. **Keystone's Mineral Leasing Act ROW application to use federal lands in Montana is analyzed in the 2011 Keystone XL FEIS and the 2014 Keystone XL Final SEIS. There have been no re-alignments or modifications of the proposed Mineral Leasing Act ROW on federal land in Montana since the 2014 Keystone XL Final SEIS. This SEIS primarily analyzes the impacts associated with the MAR as a new alternative. It also supplements the 2014 Keystone XL Final SEIS by providing additional analysis regarding the effects of current oil prices, cumulative effects of greenhouse gas emissions, cultural resources and accidental release modeling, consistent with the direction in the U.S. District Court for the District of Montana's November 18, 2018, decision. This SEIS also documents and considers additional cultural resource surveys that have been completed on BLM lands in Montana since publication of the 2014 Keystone XL Final SEIS. Finally, the BLM conducted an in-depth review of the federal actions associated with the proposed Project and connected actions in this SEIS to evaluate anticipated effects of the Project on federally protected and candidate species and federally designated critical habitat. Pursuant to Section 7 of the Endangered Species Act, BLM prepared a Biological Assessment, which updates the December 2012 Final Biological Assessment for the Keystone XL Project (see Appendix H of the 2014 Keystone XL Final SEIS**). **Accordingly, BLM will consider and rely on the 2011 Keystone XL FEIS, the 2014 Keystone XL Final SEIS, and this SEIS in issuing a decision on Keystone's application for Mineral Leasing Act ROW on federal lands in Montana.**

BLM also is considering other ROW applications under Title V of the Federal Land Policy and Management Act, 43 U.S.C. § 1761, which were filed by other applicants, for transmission and distribution lines for the proposed electrical power lines associated with Pump Station 9 and 10 of the proposed Keystone XL pipeline in Montana. Although BLM is evaluating these ROW applications in separate environmental assessments (EAs), the potential environmental effects of these ROWs are analyzed in Chapter 6, Electric**al Power Infrastructure** and Chapter 7, Cumulative Impacts of this document **as connected actions**.

1.3.2 Western Area Power Administration

WAPA's Federal Decision includes whether to approve or deny electric cooperative interconnection requests and to complete any necessary work to WAPA's infrastructure to accommodate the interconnections[1]. These interconnection requests are for Pump Station 9 through 13 in Montana and Pump Station 17 through 19 and 21 in South Dakota. The following provides a summary of WAPA's federal activities that are part of the Proposed Action:

- Pump Station 9—Construction and ownership of a new substation (the Bowdoin Substation) and interconnection;
- Pump Station 10—An expansion of the existing Fort Peck Substation and interconnection;
- Pump Station 11—Construction and ownership of a new substation and interconnection;
- Pump Station 12—Interconnection and minimal work within the existing Circle Substation footprint to accommodate the interconnection;
- Pump Station 13—An expansion of the existing O'Fallon Substation and interconnection;
- Pump Station 17—Interconnection and minimal work within the existing Maurine Substation footprint to accommodate the interconnection;
- Pump Station 18—Interconnection and minimal work within the existing Philip Substation footprint to accommodate the interconnection;
- Pump Station 19—Expansion of the existing Midland Substation and interconnection; and
- Pump Station 21—Rebuilding of the existing Gregory Substation and interconnection.

1.3.3 Rural Utilities Service

RUS's Federal Decision includes whether or not to provide federal financing **through loans and loan guarantees** to electric cooperatives for the construction, operation and improvement of electric transmission and generation facilities in rural areas. This includes electric cooperatives in South Dakota which have applied for RUS financing for the construction of power lines to deliver power to Pump Stations 15 through 21.

1.3.4 U.S. Army Corps of Engineers

USACE's Federal Decision is whether USACE may allow the BLM to include 1.88 miles of federal land administered by USACE for the Fort Peck Project in a ROW granted by BLM to Keystone for the installation of the proposed Keystone XL pipeline on Fort Peck Project land. USACE also anticipates receiving and acting upon applications submitted by Keystone pursuant to Section 404 of the Clean Water Act of 1972 (33 USC 1344).

[1] Southwest Power Pool, Inc. (SPP) and WAPA have concluded that the Big Bend to Witten 230-kilovolt (kV) Transmission Line Project contained in the 2014 Keystone XL Final SEIS is no longer required. Upon further study, installation of a static var compensator (SVC) at the existing Rosebud Electric Cooperative Witten 115-kV Substation in Tripp County South Dakota, along with remedial action schemes (RAS) and other minor modifications to existing facilities (capacitors or other devices), would maintain stability and reliability within the affected footprint (see Section 6.3 for further information).

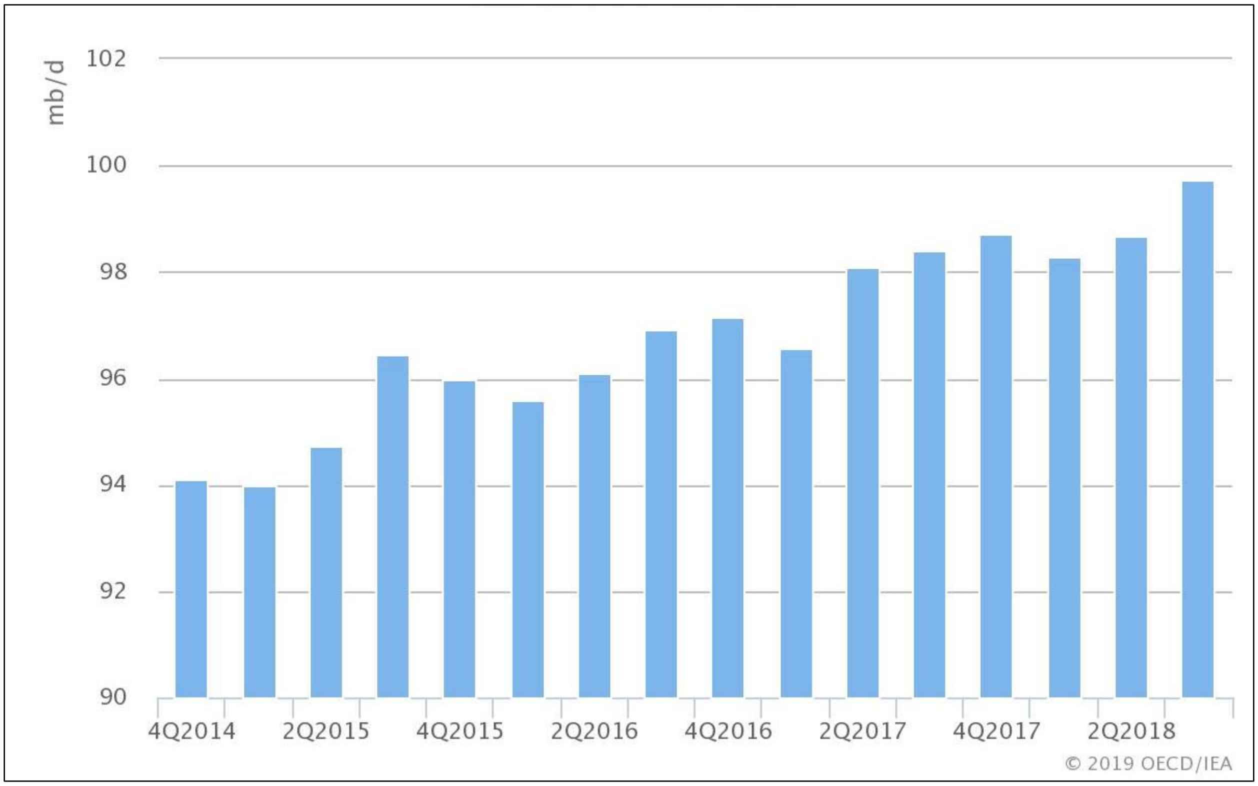
1.4 MARKET ANALYSIS

This section examines petroleum markets to assess demand for and potential impact of the proposed Project. It builds upon and updates the 2011 Keystone XL Final EIS and the 2014 Keystone XL Final SEIS. As noted within this section and the various forecast case scenarios, the rate of oil sands extraction is dependent on a variety of global market factors including supply, demand and the price of oil per barrel. Additionally, policies (laws, regulations, agreements) and the political environment (sanctions, restrictions to production) can affect rate of production. The following is a summary of key findings:

- There is an increasing global demand for crude oil under most forecasts with the exception of IEA's sustainable development scenario and regardless of high or low oil prices, oil demand increases through 2040.
- Since 2014 oil prices have varied over time, at times dropping below the price ranges addressed in the 2014 SEIS. Over the same period, however, WCSB crude oil production costs have dropped steadily and significantly, falling on average 40 percent over past four years.
- Over the medium and long terms, production of crude oil from the oil sands is expected to continue to grow.
- Lack of pipeline capacity has contributed to recent temporary cuts in production; continued uncertainty in pipeline infrastructure has been met with an increase in rail infrastructure and has caused western Canadian producers to begin to incorporate rail into their long-term business plans.

1.4.1 Demand

A variety of factors influence the predictions of forecasting future oil demand including policies, oil prices, the economic transition underway in major demand centers, the pace of fossil-fuel subsidy reform and the speed at which technology and business models emerge in the transport sector. Since the 2014 Keystone XL Final SEIS, the trend of global crude oil demand has shown a steady increase with daily oil demand up from 94 million bpd in 2014 to over 99 million bpd at the end of 2018 (see Figure 1-3). Over the past year, crude oil supply disruptions internationally have continued to impact oil markets and availability of crude oil for U.S. refineries. While total unplanned disruptions have fallen to their lowest levels since 2012, the trends in decline of production from traditional suppliers has accelerated since 2017 and are likely to continue in the short term. As of drafting of this supplement to the 2014 Keystone XL Final SEIS, oil production is sufficient for global demand, even with pressures on oil markets to replace Iranian exports, which the United States is committed to getting to zero. The United States remains in consultations with major oil producers, as well as major oil consuming organizations to ensure that global energy markets are stable and adequately supplied. However, with crude oil constraints from Mexico, increasing since December 2018, and Venezuela-related sanctions presenting major disruptions in the flow of needed crude oil to the United States, having reliable long-term sources of this vital commodity are more important than ever (The White House 2019).



Source: OECD/IEA 2019
mb/d = million barrels per day

Figure 1-3. Global Oil Demand

The Department reviewed recent publications by both the EIA and IEA for global oil demand forecasting and the Canadian Energy Research Institute (CERI) for projections related specifically to the Canadian oil sands market. As indicated in these publications, global energy demand is anticipated to increase through 2040, with global oil demand increasing under most forecasting scenarios. The majority of forecasting scenarios analyzed predict demand from 2018 to 2040 to increase between 11 to 21 percent (ranging from 106.3 million bpd to 120.0 million bpd. One scenario by IEA, the Sustainability Scenario, however, forecasts a long-term decline in global oil demand to 69.9 million bpd in 2040 (26 percent decrease). This scenario considers effective implementation of policies and achieved outcomes set forth by policies (described in Section 1.4.1.2). CERI forecasts an increase in Canadian oil sands production ranging between 4 million bpd to 7.5 million bpd by 2038.

1.4.1.1 EIA Projections

EIA has developed long-term projections (to 2040) for global oil demand. Their *International Energy Outlook 2017* provides a comprehensive global perspective regarding global oil demand. The following reference cases are analyzed, taking into account growing energy demand in developing economies as well as shifts towards other sources of energy in developed countries (EIA 2017):

- **Reference Case**: This case assumes current trends of known technology improvements and relies on the views of leading economic forecasters and demographers related to economic and demographic trends for 16 world regions based on Organization for Economic Co-operation and Development (OECD) membership status. This case also considers current policies—as reflected in current laws, regulations, and stated targets that are judged to reflect an actual policy commitment—for major countries with the goal of realistically capturing their effects on petroleum and other fuel liquids demand in the projections. Under the Reference Case, demand increases by 18 percent between 2015 and 2040 and world consumption of liquid fuels rises from 95 million bpd in 2015 to 113 million bpd in 2040. Non-OECD nations account for most of the increase, with demand rising by 1.3 percent per year compared with a slight decrease in the OECD nations. The Reference Case considers the price of North Sea Brent crude oil in 2016 dollars reaches $109 per barrel by 2040.

- **High Oil Price Case**: This case assumes faster economic growth among emerging, non-OECD nations, which contributes to higher energy demand. The high oil price is reflected in the assumption that the price of North Sea Brent crude oil in 2016 dollars reaches $226 per barrel by 2040, resulting in more production of crude oil and lease condensate from high-cost producers and less production from low-cost conventional resources. The approximate 110 million bpd global liquid fuels consumption projection in 2040 under this case is 2.9 million bpd lower than in the Reference Case as the High Oil Price Case assumes consumers switch to alternative fuels, act to conserve liquids and adopt more-efficient technologies.

- **Low Oil Price Case**: This case assumes slower non-OECD economic growth, which leads to lower energy demand, but the lower prices mean that consumers use more liquid fuels. The low oil price is reflected in the assumption that the price of North Sea Brent crude oil in 2016 dollars reaches $43 per barrel by 2040, resulting in more production of crude oil and lease condensate from low-cost conventional resources and less production from high-cost producers. In 2040, world liquids consumption is 4.5 million bpd higher than in the Reference Case at approximately 117.5 million bpd.

EIA's *International Agency Outlook 2017* forecast focuses on the Reference Case, which indicates the strong economic and population growth increase in non-OECD countries drive a 39 percent increase of liquid fuels consumption from 2015 to 2040. In contrast, overall OECD consumption of liquid fuels decreases by three percent. More than 80 percent of the total increase in liquid fuels consumption is in non-OECD Asia, as China and India experience rapid industrial growth and increased demand for transportation. For transportation alone, China's use of liquid fuels is projected to increase by 36 percent from 2015 to 2040 and India's use over that period increases by 142 percent. EIA also reports world liquid fuels production rises by 16.1 million bpd from 2015 to 2040 with non-OPEC crude oil production outside of the United States growing by 630,000 bpd from 2015 to 2040. Russia, Canada, Brazil and Kazakhstan increase production and sizeable decreases are projected for crude oil production from OECD Europe and China. Canada's forecasted 1.26 million bpd increase in production by 2040 mainly comes from oil sands production, with small additions from tight and non-tight resources (EIA 2017).

More recently, EIA released their *International Energy Outlook 2018*, which focuses on three heavily populated and high economic growth regions of the world (China, India and Africa) and how different drivers of macroeconomic growth may affect international energy markets in these regions. The 2018 forecast, however, only examines energy demand within these regions and does not break down energy demand by energy sector.

Crude oil prices have fluctuated dramatically in recent years, with many supply and demand fundamentals contributing to oil price movements. The EIA consistently updates both in their Annual and Short Term Energy Outlooks world oil price forecasts, including low and high price case scenarios. For instance, the 2012 Annual Energy Outlook estimated a reference case oil price of over $100 per barrel in 2019, reaching $145 per barrel in 2035 in 2010 dollars; the High Oil Price case scenario estimated $186 per barrel in 2017 (in 2010 dollars) reaching $200 per barrel in 2035. The low oil price case scenario estimated $58 per barrel in 2017, increasing to $62 per barrel in 2035. Instead, in determining the actual average annual spot price for Cushing, Oklahoma West Texas Intermediate (WTI) has decreased from

$94.05 per barrel in 2012, to $65.23 per barrel in 2018. While it is not feasible to accurately predict future oil prices, EIA annual projections represent the federal government's best estimate of future pricing at the time. It would be impractical to update environmental analysis based on these ever-changing estimates.

1.4.1.2 IEA Projections

IEA has forecasted long-term projections (to 2040) for global oil demand using the following three primary scenarios (OECD/IEA 2018a):

- **Current Policies Scenario**: This scenario provides a baseline for the analysis considering existing laws and regulations as of mid-2018 and excludes ambitions and targets declared by governments around the world. As shown in Table 1-3, under the Current Policies Scenario, global oil demand grows by 1.1 million bpd on average every year to 2040 (a similar pace to historical levels of growth) with no discernable slowdown. Global oil demand is led by an increase demand in the transportation sector (over 7 million bpd by 2025), without strengthened policies on fuel efficiency or the use of alternative fuels. China and India are responsible for nearly half of the total increase in demand to 2040. This scenario estimates 2040 global demand at 120.5 million bpd; a 21 percent increase from 2017 demand.
- **New Policies Scenario**: This scenario provides a measured assessment of where today's policy frameworks and ambitions announced as of August 2018, including the commitments made in the Nationally Determined Contributions under the Paris Agreement, together with the continued evolution of known technologies, might take the energy sector in the coming decades. Where commitments are aspirational, this scenario makes a judgement as to the likelihood of those commitments being met in full. Unlike the Sustainable Development Scenario, this scenario does not focus on achieving any particular outcome; rather it proves a forward-look on the basis of announced policy ambitions. Policy announcements considered in this scenario include the European Union's 2030 renewable energy and energy efficiency targets; the June 2018 announcement by China of a new 3-year action plan for cleaner air; the impact of the planned revision of the Corporate Average Fuel Economy standards in the United States; the announced U.S. Affordable Clean Energy rule that replaces the previous Clean Power Plan; Japan's revised basic energy plan; and Korea's 8^{th} National Electricity Plan. IEA has increased the projected global oil demand in 2040 under this scenario by more than 1 million bpd compared their 2017 outlook largely because of faster near-term growth and changes to fuel efficiency policies in the United States. This scenario estimates 2040 global demand at 106.3 million bpd; an 11 percent increase from 2017 demand.
- **Sustainable Development Scenario**: This scenario appeared for the first time in IEA's 2017 forecasting and considers selected key energy policy related outcomes and then considers ways these outcomes can be achieved. The energy policy related outcomes considered are the main energy-related components of the Sustainable Development Goals, agreed by 193 countries in 2015:
  - Delivering on the Paris Agreement with a goal of holding the increase in the global average temperature to "well below 2 °C".
  - Achieving universal access to modern energy by 2030.
  - Reducing dramatically the premature deaths due to energy-related air pollution.

The Sustainable Development Scenario sets out the major changes that would be required to deliver these goals simultaneously. Determined policy interventions within this scenario to address climate change lead to a peak in global oil demand around 2020 at 97 million bpd with demand peaking in nearly all countries before 2030. The main exceptions are India and countries in sub-Saharan Africa where demand grows to at least 2035. By 2040, cars that rely solely on gasoline and diesel are 40 percent more efficient than today; there are 930 million electric cars on the road (50 percent of the global car fleet); a quarter of buses are electric; and nearly 20 percent of fuels used by trucks are low or zero carbon. As a result, the demand in road transport in 2040 is more than 18 million bpd lower than present levels. Demand in aviation falls by 0.8 million bpd by 2040 as a result of enhanced efficiency measures and growth in biofuels. All these factors contribute to the 69.9 million bpd 2040 global demand estimate; a 26 percent decrease from 2017 demand.

Table 1-3. IEA's Projections for Global Oil Demand and Production by Scenario

			New Policies		Current Policies		Sustainable Development	
	2000	**2017**	**2025**	**2040**	**2025**	**2040**	**2025**	**2040**
Road transport	30.1	41.2	44.7	44.9	46.2	53.6	40.5	23.0
Aviation and navigation	8.3	11.5	13.2	16.3	13.8	18.5	11.2	9.3
Industry & petrochemicals	14.5	17.8	20.7	23.3	20.9	23.8	20.0	20.7
Buildings and power	14.3	12.5	11.2	9.2	11.8	10.9	10.2	6.5
Other	10.1	11.8	12.6	12.6	12.9	13.6	12.0	10.4
World oil demand	**77.3**	**94.8**	**102.4**	**106.3**	**105.5**	**120.5**	**93.9**	**69.9**
Share of Asia Pacific	25%	32%	35%	37%	35%	37%	36%	38%
Biofuels	0.2	1.8	2.8	4.7	2.5	3.5	4.4	7.3
World Liquids demand	**77.5**	**96.6**	**105.2**	**110.9**	**108.0**	**124.1**	**98.3**	**77.2**
Conventional crude oil	64.8	66.9	65.6	63.8	67.2	72.6	59.8	40.2
Tight oil	–	4.8	9.8	11.0	10.3	12.1	9.1	7.3
Natural gas liquids	8.9	16.7	19.0	21.1	19.8	22.9	17.5	15.6
Extra-heavy oil and bitumen	1.0	3.7	4.2	5.5	4.3	7.0	3.9	3.5
Other production	0.5	0.7	1.3	2.1	1.4	2.7	1.2	1.3
World oil production	**75.2**	**92.8**	**99.9**	**103.4**	**102.9**	**117.2**	**91.6**	**68.0**
Share of OPEC	*42%*	*43%*	*40%*	*45%*	*40%*	*45%*	*40%*	*44%*
Processing gains	1.8	2.3	2.5	2.9	2.6	3.3	2.3	1.9
World oil supply	**77.0**	**95.1**	**102.4**	**106.3**	**105.5**	**120.5**	**93.9**	**69.9**
Oil price ($2017/barrel)	**39**	**52**	**88**	**112**	**101**	**137**	**74**	**64**

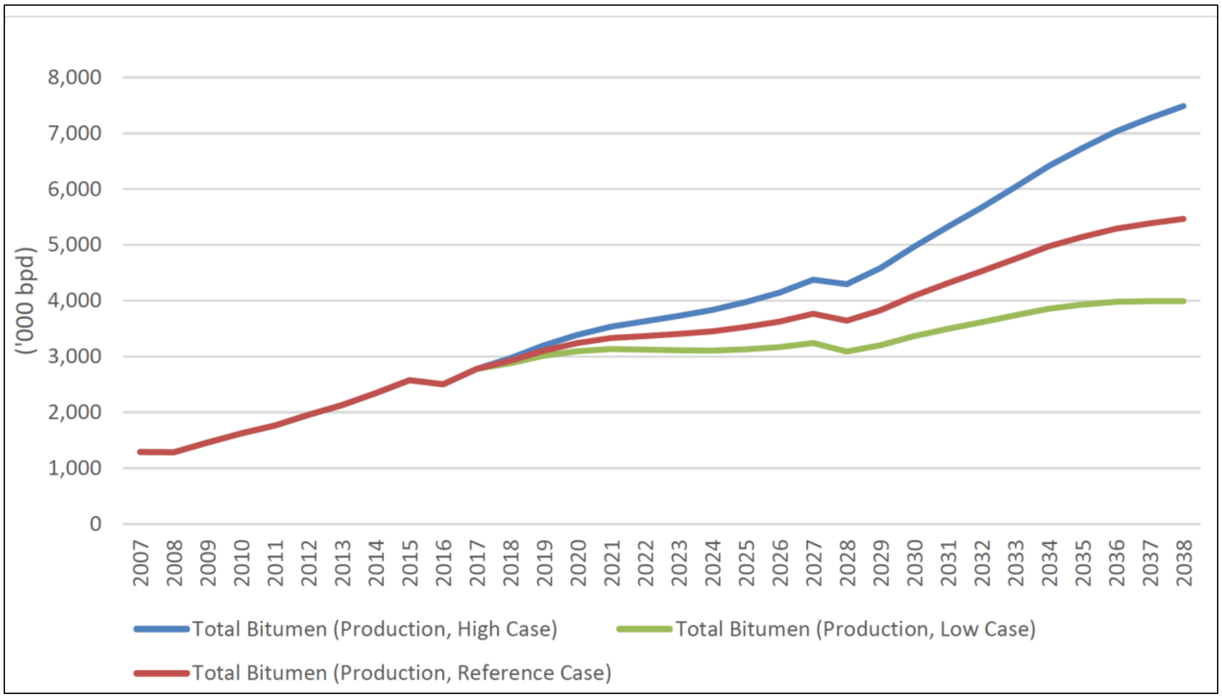
Source: OECD/ IEA 2018b
Note: Values presented are in million barrels per day

1.4.1.3 CERI Projections

CERI has forecasted long-term projections to 2038 for Canadian oil sands production and supply in consideration of oil sands supply costs in their Study 170, *Canadian Oil Sands Supply Costs and Development Projects (2018-2038)*. The study estimates production and capital investment forecasts for the oil sands industry will continue to increase into the future, albeit with some reduction on capital spending in the near term as a result of low crude oil prices and an overall global economic downturn (Millington 2018). CERI also notes the nature of new project development in the oil sands has changed with a transition from megaproject mines 10 years ago into smaller, more economic in situ projects using steam-assisted gravity drainage (Millington 2018).

Their forecast uses the following three primary scenarios (also refer to Figure 1-4):

- **Reference Case**: This case incorporates existing and future oil sands project developments subject to two constraints: project startup delays and capacity curtailments. The Reference Case Scenario provides a base case of the oil sands production and projects production volume increasing to 3.2 million bpd by 2020, 4.1 million bpd in 2030, and peaking at 5.5 million bpd by 2038.
- **High Case Scenario**: This case assumes higher bitumen production growth relative to the Reference Case with a growth rate approximately 1.5 times higher than the growth rate in the Reference Case. In the High Case Scenario, production from mining and in situ projects (thermal and cold bitumen) is set to grow to 3.4 million bpd in 2020, 5 million bpd in 2030, and peaking at an all-time high of 7.5 million bpd by 2038.
- **Low Case Scenario**: This case assumes lower bitumen production growth relative to the Reference Case (half of the average annual growth rate). In the Low Case Scenario production rises to 3.1 million bpd 2020, 3.4 million bpd by 2030, and flattens to 4.0 million bpd by 2038 period.



Source: Millington 2018

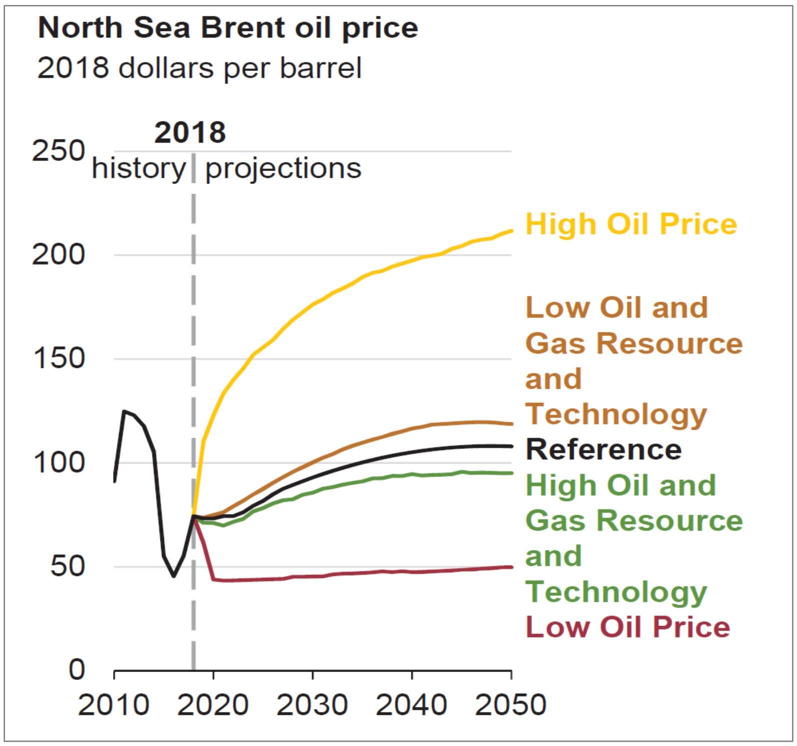
Figure 1-4. Bitumen Production Projections

The CERI study acknowledges an oil sands producer's project viability relies on many factors, such as but not limited to the demand-supply relationship between production, operating and transportation costs, and the market price. Oil prices, high construction costs, the probability of construction and regulatory delays, availability of suitable and accessible refinery capacity, and environmental performance metrics and other risk factors all factor into production.

1.4.2 Oil Prices

Since the 2014 Keystone XL Final SEIS, global crude oil prices declined more than 50 percent from peak prices to the lowest prices reached in 2016 (see Figure 1-5). Since 2016, prices have partially recovered to a current average price 25 percent lower than 2014 prices. Trends in price are anticipated to stabilize, in part due to the continued long-term growing crude oil global demand driven by China and India, and the uncertain outlook for historically large global heavy crude oil producers (i.e., Mexico and Venezuela) that have lost more than 30 percent of their production output since 2014.

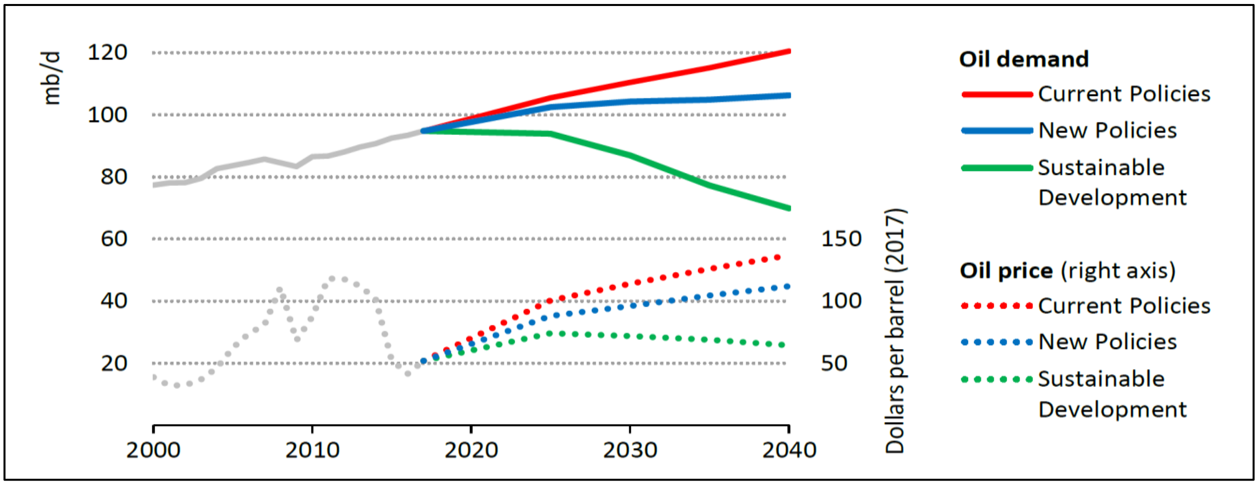
Figure 1-5 shows the EIA estimates for the price of North Sea Brent crude oil, in 2018 dollars, would reach $212 per barrel by 2050 under a High Oil Price Case, compared with $108 per barrel in the Reference Case and $50 per barrel in the Low Oil Price Case (EIA 2019). EIA acknowledges that crude oil prices are influenced more by international markets and global supply demand balances than by assumptions about domestic resources and technological advances.



Source: EIA 2019

Figure 1-5. North Sea Brent Crude Oil Price

Figure 1-6 illustrates IEA's *World Energy Outlook 2018* forecast of average crude oil price under the three scenarios previously discussed (see Section 1.4.1.2). The figure demonstrates that oil prices vary widely by scenario, which is driven by the different ways in which resources, costs and policies could affect the supply-demand balance.



Source: OECD/IEA 2018b

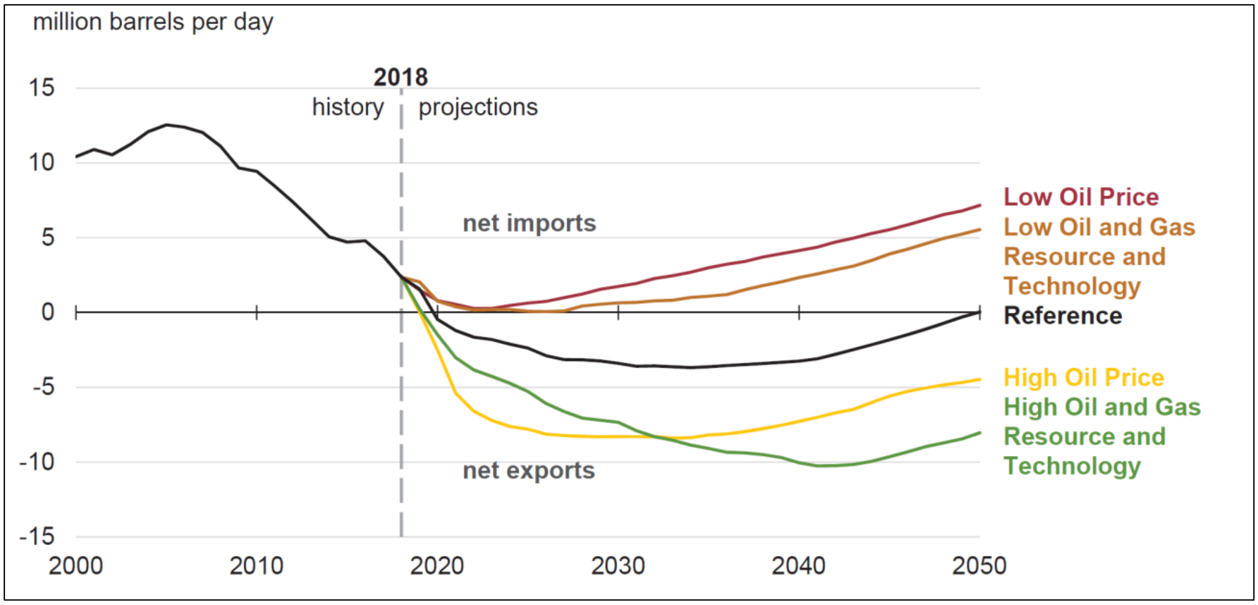
Figure 1-6. Global Oil Demand by Prices by Scenario

Both the Current Policies and New Policies scenarios have an upward drift in the oil price over the period to 2040. IEA characterizes a steady upward pressure on oil price under the New Policies Scenario, reaching $83 per barrel by 2025 and $111 per barrel in 2040. The Current Policies Scenario price increase is most pronounced as it considers high demand requiring new resource development. Both these scenarios reflect declining oil production at existing fields and the need to move to higher cost oil in more challenging and complex reservoirs due to demand. The Sustainable Development Scenario considers a lower demand for oil and the resilience of U.S. tight oil, which means that the upcycle visible in the other scenarios do not have time to play out before the Sustainable Development Scenario demand peaks around 2020. This limits the call on higher cost oil to balance the market and the price therefore stays "lower for longer" (IEA 2017).

1.4.3 U.S. Crude Oil Market

The EIA *Annual Energy Outlook 2019* forecasts the United States will become a net exporter of petroleum liquids after 2020 as U.S. crude oil production increases and domestic consumption of petroleum products decreases (see Figure 1-7). In the Reference Case, U.S. crude oil production continues to grow through 2030 and then plateaus at more than 14.0 million bpd until 2040 and net U.S. imports of crude oil and liquid fuels fall between 2018 and 2034 as strong production growth and decreasing domestic demand result in the United States becoming a net exporter. Following this period, net exports from the United States peak at more than 3.7 million bpd in 2034 before gradually reversing as domestic consumption rises.

Near the end of the projection period, the United States returns to being a net importer of petroleum and other liquids on a volume basis as a result of increasing domestic gasoline consumption and falling domestic crude oil production in those years. In the United States, the transportation sector is the largest consumer of petroleum and other liquids, particularly motor gasoline and distillate fuel oil. Current fuel economy standards stop requiring additional efficiency increases in 2025 for light-duty vehicles and in 2027 for heavy-duty vehicles, but travel continues to rise, and as a result, consumption of petroleum and other liquids increases later in the projection period (EIA 2019).



Source: EIA 2019

Note: The High Oil and Gas Resource and Technology Case represents a potential upper bound for petroleum and other liquids production, as additional resources and higher levels of technological advancement result in continued production growth. In the High Oil Price Case, high crude oil prices lead to more extraction in the near term, but cost increases and fewer easily accessible resources decrease production. The Low Oil and Gas Resource and Technology Case considers conditions with fewer resources, lower levels of technological advancement, and lower crude oil prices. The Low Oil and Gas Resource and Technology Case and the Low Oil Price Case represent potential lower bounds for domestic petroleum and other liquids production.

Figure 1-7. U.S. Net Import/Export of Petroleum and Other Liquids

As shown in Figure 1-7, the High Oil and Gas Resource and Technology Case which considers additional resources and higher levels of technological improvement, results in higher crude oil production and higher exports with exports reaching a high of 10.3 million bpd in 2041. Projected net exports reach a high of 8.4 million bpd in 2033 in the High Oil Price Case as a result of higher prices that support higher domestic production. Conversely, low oil prices in the Low Oil Price Case drive projected net imports up from 2.37 million bpd in 2018 to 7.17 million bpd in 2050.

As explained in detail in Section 1.4 of the 2014 Keystone XL Final SEIS, there is existing demand by Gulf Coast area refiners for secure sources of crude oil. Refiners in the Gulf Coast area are configured to efficiently process heavy crude oil into a wide range of qualities, from light sweet (low sulfur content) to heavy sour (higher sulfur content). Those refiners generally have access to a wide variety of crude oils through an extensive pipeline network for delivering domestic crude oils as well as waterborne imports from countries around the world. Currently, refiners in the Gulf Coast area obtain heavy crude oil primarily via waterborne foreign imports, but the reliability of those supplies is uncertain because of declining production and political uncertainty associated with the major traditional suppliers, including Venezuela, which suffers from instability, electricity outages and a lack of investment in its energy infrastructure that have combined to significantly reduce its oil production.

The shortfalls in crude oil from Venezuela, Mexico and other traditional suppliers, coupled with their inability to raise output in the short term, increase U.S. energy security concerns. Impacts from anticipated decreases in production and exports from other major oil exporters, including Iran, as well as unanticipated events such as the recent disruptions in Saudi Arabia also extend uncertainty and volatility. Thus, the lack of reliable supply of crude oil has increased insecurity.

1.4.4 Western Canadian Crude Oil Market

The WCSB is projected to have significant increases in production, with much of this increase to come from the oil sands. The EIA *Annual Energy Outlook 2018* shows total 2017 crude oil production in Canada at 3.8 million bpd and production increasing to 4.3 million bpd in 2020; an approximate increase of 500,000 bpd (EIA 2018a). CAPP forecasts a similar increase (approximately 550,000 bpd) with total oil production in Canada at 4.2 million bpd in 2017 and 4.75 million bpd in 2019. This projected growth compares to the recent increase of nearly 1 million bpd between 2014 and 2018. Of the total oil production estimates, WCSB oil sands crude oil would increase from 2.65 million bpd in 2017 to 3.1 million bpd in 2019 (CAPP 2018). This is consistent with CERI's projection that production of WCSB oil sands crude oil would reach 3 million bpd by the end of 2018 and continue to grow after that (Millington 2018).

The long-term additional crude oil production in the WCSB is projected to come to the market as heavy crude oil, in the form of diluted bitumen (dilbit). EIA forecasts growth in WCSB crude oil production at 4.37 million bpd in 2035, 5.06 million bpd in 2040, and up to 6.0 million bpd in 2050 (an annual growth rate between 2017 and 2050 of 1.4 percent) (EIA 2018a). This is consistent with projections under CERI's reference case, under which WCSB crude oil production would peak at 5.5 million bpd in 2038 (Millington 2018). The exact mix volume and final destination of crude oil types that would be transported by the Keystone XL pipeline would be determined by market forces (U.S. Department of State 2014). During consideration of the January 2017 re-submitted application for its Presidential Permit, **and during the 2019 Draft SEIS comment period,** Keystone affirmed that it maintains shipping contracts that will be substantially similar to those represented in its 2012 application for a Presidential Permit to transport approximately 555,000 bpd of WCSB crude oil to existing Gulf Coast area delivery points and 155,000 bpd of WCSB crude oil to Cushing, Oklahoma.

The recent global decline in oil prices from highs in 2014 is also reflective in WCSB crude oil; prices for both heavy and light Canadian crude oils declined 50 percent and 40 percent, respectively, between 2014 and the first half of 2018, with the lowest prices occurring in 2016 (Alberta Energy Regulator 2018). Since July 2018, however, Canadian crude oil prices have been on the decline as the WCSB supply glut grew due to transportation and storage issues, and November 2018 saw prices lower than 2016, with heavy Canadian crude oil dropping to under $20 per barrel ($17.71) (Tuttle and Tobin 2018; Statista 2018). Although the decline in price could translate into less investment of the resource, other economic factors come into play such as declining industry costs of construction since 2014 and more cost-efficient technologies. Whereas in 2014 the break-even point for oil sands producers, stated in terms of prices for WTI crude oil, was between $73 per barrel and $102 per barrel, in today's market the break-even point is estimated in a range between $47 per barrel and $66 per barrel, dropping 40 percent on average over the past 4 years (IHS Markit 2018a).

CERI examined oil sands supply, the constant dollar price needed to recover all capital expenditures, operating costs, royalties and taxes, and return on investment. The study determined that after adjusting for blending and transportation, the WTI equivalent supply costs at Cushing range between $60.17 per barrel and $51.59 per barrel for in situ projects using steam-assisted gravity drainage techniques (Millington 2018).

The 2014 Keystone XL Final SEIS estimated that prices at or above $75 per barrel (WTI-equivalent) would be likely to generate sufficient revenues to enable development of projected oil sands projects. Based on this estimate, the 2014 Keystone XL Final SEIS indicated that oil sands production would be expected to be most sensitive to increased transport costs in a range of prices around $65 to $75 per barrel (WTI-equivalent). Since the publication of the 2014 Keystone XL Final SEIS, however, WCSB crude oil production costs have dropped in tandem with the lower prices, falling on average 40 percent over the past 4 years. An IHS Markit study found that "half-cycle" costs associated with sustaining and operating costs of WCSB crude oil projects, excluding land acquisition and other costs associated with new projects, have steadily remained below the prevailing price of crude oil during this time; implying that WCSB crude oil was not at a risk of a production shut-in despite a depressed price environment since 2014 (IHS Markit 2018a). Moreover, as noted above, recent analysis by IHS Markit and CERI place the break-even prices in a range between $47 and $66 per barrel. The price range at which oil sands production could be sensitive to increased transport costs would therefore fall below, or at the lower end, of this range of break-even prices. Both the IEA and EIA predict that crude oil prices are likely to increase over the medium to long terms such that the recent lower price of crude oil globally (including WCSB crude oil) would not be a driving factor in the crude oil industry's decision regarding development of future WCSB production facilities.

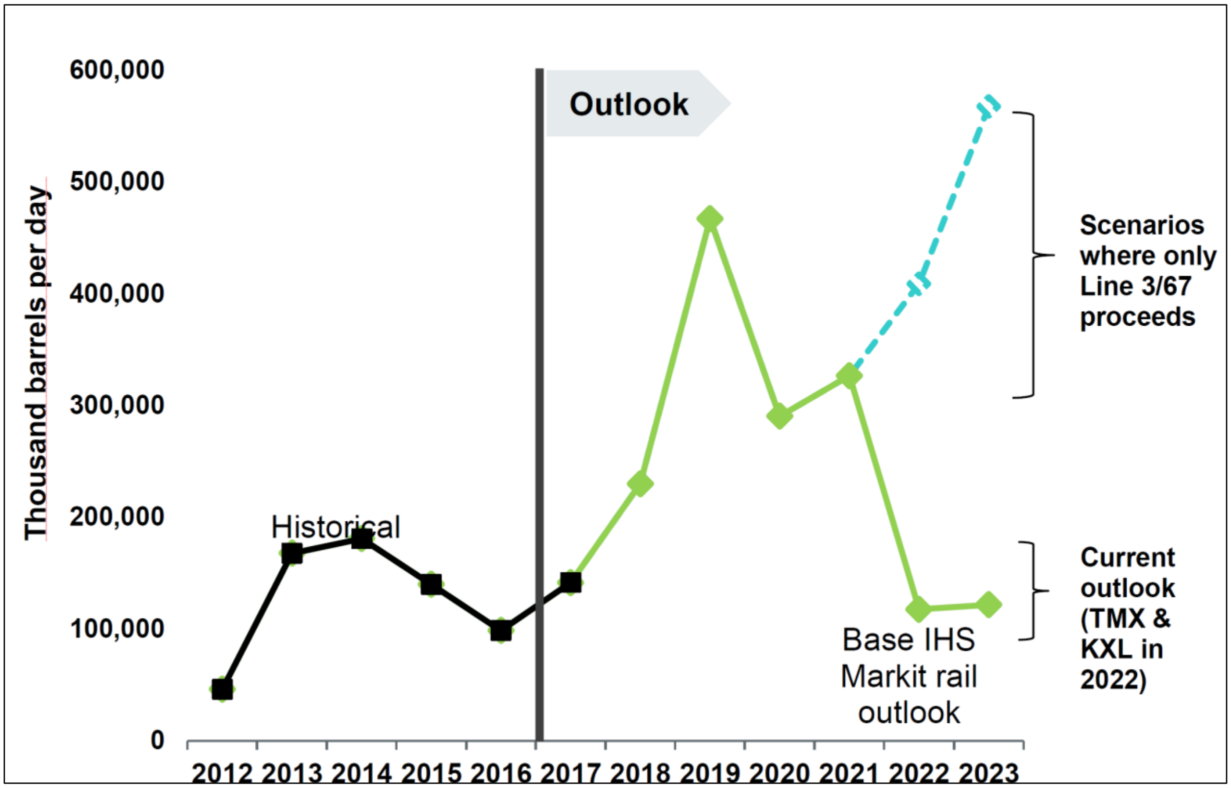
1.4.5 WCSB Infrastructure

CAPP's *2018 Crude Oil Forecast, Markets and Transportation* estimates the combined annual average crude oil capacity of pipelines from western Canada is approximately 4.02 million bpd. In 2017, about 0.66 million bpd of the total egress pipeline capacity was unavailable for transporting WCSB crude oil due to a combination of equipment being offline, constraints on downstream pipelines and capacity being allocated for transporting refined petroleum products or U.S. Bakken crude oil production (CAPP 2018). In 2017, CAPP reported most of WCSB crude oil supplies were transported to markets by pipeline but the volumes in excess of available pipeline capacity relied on rail. The CAPP report also evaluated future increases of pipeline capacity, stating the combined capacity from Enbridge's Line 3 Replacement project, Kinder Morgan's Trans Mountain Expansion, and TransCanada's Keystone XL would equal 1.79 million bpd; all of which would be needed to transport the two million bpd of anticipated supply growth from western Canada (CAPP 2018).

Since 2014, WCSB crude oil supply growth of nearly 1 million bpd has well exceeded that of total egress pipeline capacity exiting western Canada (IHS Markit 2018a). The lack of pipeline capacity has resulted in WCSB crude oil being transported by rail and processed oil placed in storage due to lack of transport capacity to bring the oil to market. CAPP states that, currently, rail service as a form of crude oil transport is struggling to meet the increased demands by western Canadian crude oil producers (CAPP 2018). CAPP also reports the current ability to move crude oil volumes by rail is being limited by insufficient access to locomotives, personnel and track space and that rail cannot accommodate sudden increases in demand caused by pipeline maintenance or extraordinary circumstances affecting pipelines (CAPP 2018). WCSB crude oil producers will be dependent on rail in moving supply over at least the next 3 years based on pipeline construction scenarios (see Figure 1-8).

CERI reports that although rail transportation costs have historically been higher than those of pipeline, continued market access and pipeline logistics constraints increased the use of 'crude-by-rail' among producers. In January 2018, Canadian producers shipped 145 million bpd by rail, a 20 percent increase from January 2017 (Millington 2018). Nevertheless, in response to lack of pipeline transportation capacity and a lack of storage, the Alberta government implemented a temporary cut in the production of raw crude oil and bitumen that started on January 1, 2019. The Alberta government, however, has reduced these production cuts as storage levels decreased in January and the value of WCSB crude oil increased (Government of Alberta 2019a).

With the uncertainty of new pipeline capacity as a means of transport, industry expectations are also changing; western Canadian producers are starting to incorporate rail into their long-term business plans. To address the bottleneck the Alberta Provincial government committed to increasing overall rail capacity to transport 120,000 bpd of crude oil (Government of Alberta 2019b). Figure 1-7 shows the expected response in terms of increased rail capacity in the event that Keystone XL and other projects are not constructed. Thus, even in the absence of the proposed Project, crude oil that would have been transported on Keystone XL is still being and will be produced and transported to market by rail.



Source: IHS Markit 2018a

Note: The Line 3/67 scenario relates to Enbridge's Line 3 replacement where IHS assumes an additional 390,000 bpd transport would be provided. IHS assumes the TransMountain Expansion (TMX) and Keystone XL (KXL) scenario would result in additional 1.42 million bpd capacity combined (590,000 and 830,000 bpd respectively).

Figure 1-8. Western Canadian Heavy Rail Crude Oil Transport Outlook

1.5 AGENCY, TRIBAL AND PUBLIC INVOLVEMENT

The Department published a Notice of Intent (NOI) in the *Federal Register* (FR) on December 3, 2018 to announce the intent for preparation of a new SEIS for the Keystone XL Project (83 FR 62398). Despite the fact that the President has since issued a Presidential Permit for the Project, thereby relieving the Secretary of State or his delegate of any further permitting action with regard to the Project, the Department nevertheless will continue its involvement in the assessment of environmental impacts of the Project.

Past scoping activities regarding the Keystone XL Project included publication of an NOI in the FR on May 25, 2018 to solicit comments on the MAR (83 FR 24383). That public scoping period extended from May 25 to June 25, 2018, during which the Department received comments from stakeholders, including Indian tribes, non-governmental organizations and members of the public. The Department received 56 comment submissions, of which 10 were campaigns that provided a total of 212,604 signatures. The public scoping comments addressed a broad range of concerns, including the scope of this environmental review, the role of the Department in the NEPA process, the need for the Project based on market conditions, potential cumulative and connected actions, pipeline safety and the potential for spills, spill incident records and corporate history, and the adequacy of regulatory oversight for pipelines and pipeline safety. Commenters also raised concerns about potential impacts on environmental and human resources, specifically including soil erosion, soil productivity, water resources (e.g., the Ogallala aquifer), biological resources (e.g., whooping cranes), Indian treaties, cultural and tribal resources, socioeconomic conditions, environmental justice, damage to property and landowner access.

Commenters additionally expressed concerns about the potential for cumulative impacts associated with the Project that may adversely affect U.S. energy use and dependence on nonrenewable resources, and the contribution to greenhouse gases and global climate change. Many comments also requested a full SEIS be performed because the Project could cause significant impacts and stated that this environmental review should encompass the whole Keystone XL pipeline. Finally, numerous stakeholders submitted comments simply expressing opposition for the Project. The Department considered these scoping comments in the preparation of this SEIS.

Prior to this SEIS, the Department prepared a Draft Environment Assessment (EA) and Draft SEIS regarding the MAR and published Notice of Availability (NOA) announcing the availability of the draft documents in the FR (83 FR 36659 and 83 FR 48358, respectively). The public comment period extended from July 30 to August 29, 2018 on the Draft EA and from September 21 to November 8, 2018 for the Draft SEIS. The Department considered comments received during both the Draft EA and the Draft SEIS public comment periods in this new Draft SEIS document.

The Department published an NOA in the *Federal Register* (84 FR 53215) on October 4, 2019 to announce availability of the Draft SEIS and to solicit public comments over a 45-day period and to announce a public meeting in Billings, Montana which was held on October 29, 2019. The Department **also** distributed the Draft SEIS to other federal, state and local government agencies that may have expertise relevant to this environmental review (see Appendix A, Indian Tribe, Agency and Elected Officials Coordination). The Department also published the Draft SEIS on its website, announced publication of this document in the FR and local newspapers, and invited public comments by mail or through http://www.regulations.gov. **Appendix D, Comment Response Document, provides a summary of comments and Department responses for substantive comments received over the 45-day comment period. Appendix E contains the full submissions from federal agencies, Indian tribes, elected officials and non-governmental organizations.**

The Department invited the following agencies who agreed to be cooperating agencies on the 2018 Keystone XL MAR Draft SEIS to remain as cooperating agencies for preparation of this SEIS:

FEDERAL AGENCIES

- U.S. National Park Service (NPS)
- Pipeline and Hazardous Materials Safety Administration (PHMSA)
- U.S. Army Corps of Engineers (USACE)
- U.S. Bureau of Land Management (BLM)
- U.S. Department of Agriculture (USDA), Rural Utilities Service (RUS)
- U.S. Fish and Wildlife Service (USFWS)
- Western Area Power Administration (WAPA)

STATE AGENCIES

- Nebraska Department of Environmental Quality (NDEQ)

The U.S. Environmental Protection Agency (USEPA) agreed to participate in this SEIS as a coordinating agency. The Department coordinated with the USEPA telephonically and through email for this SEIS.

In addition, the Department invited the following Indian tribes involved in the Keystone XL Pipeline Programmatic Agreement to participate in the NEPA process for this SEIS (refer to Appendix A, Indian Tribe, Agency and Elected Officials Coordination for a sample letter):

INDIAN TRIBES

- Absentee-Shawnee Tribe of Indians of Oklahoma
- Alabama-Coushatta Tribe of Texas
- Apache Tribe of Oklahoma
- Assiniboine & Sioux Tribes of the Fort Peck Indian Reservation
- Blackfeet Tribe of the Blackfeet Indian Reservation of Montana
- Cherokee Nation
- Cheyenne and Arapaho Tribes
- Cheyenne River Sioux Tribe of the Cheyenne River Reservation
- Chippewa Cree Indians of the Rocky Boy's Reservation
- Confederated Tribes of the Goshute Reservation
- Crow Creek Sioux Tribe of the Crow Creek Reservation
- Crow Tribe of Montana
- Delaware Tribe of Indians
- Duckwater Shoshone Tribe of the Duckwater Reservation
- Eastern Band of Cherokee Indians
- Shoshone Tribe of the Wind River Reservation
- Ely Shoshone Tribe of Nevada
- Forest County Potawatomi Community
- Fort Belknap Indian Community
- Hannahville Indian Community
- Ho-Chunk Nation of Wisconsin
- Iowa Tribe of Kansas and Nebraska
- Kaw Nation, Oklahoma
- Kialegee Tribal Town
- Kickapoo Traditional Tribe of Texas
- Kickapoo Tribe in Kansas
- Kiowa Tribe
- **Little Shell Tribe of Chippewa Indians of Montana**
- Lower Brule Sioux Tribe of the Lower Brule Reservation
- Lower Sioux Indian Community in the State of Minnesota
- Match-e-be-nash-she-wish Band of Pottawatomi Indians of Michigan
- Nez Perce Tribe
- Northern Arapaho Tribe of the Wind River Reservation
- Northern Cheyenne Tribe
- Nottawaseppi Huron Band of the Potawatomi
- Oglala Sioux Tribe of the Pine Ridge Reservation
- Omaha Tribe of Nebraska
- Otoe-Missouria Tribe of Indians
- Pawnee Nation of Oklahoma
- Poarch Band of Creeks
- Pokagon Band of Potawatomi Indians
- Ponca Tribe of Indians of Oklahoma
- Ponca Tribe of Nebraska
- Prairie Band of Potawatomi Nation
- Red Lake Band of Chippewa Indians
- Rosebud Sioux Tribe of the Rosebud Indian Reservation
- Sac and Fox Nation of Missouri in Kansas and Nebraska
- Sac and Fox Nation
- Sac and Fox Tribe of the Mississippi in Iowa
- Santee Sioux Nation
- Shakopee Mdewakanton Sioux Community of Minnesota
- Shoshone-Bannock Tribes of the Fort Hall Reservation
- Sisseton-Wahpeton Oyate of the Lake Traverse Reservation
- Skull Valley Band of Goshute Indians of Utah
- Southern Ute Indian Tribe

- Spirit Lake Tribe
- Standing Rock Sioux Tribe of North & South Dakota
- The Modoc Tribe of Oklahoma
- The Osage Nation
- Thlopthlocco Tribal Town
- Three Affiliated Tribes of the Fort Berthold Reservation
- Tonkawa Tribe of Indians of Oklahoma
- Turtle Mountain Band of Chippewa Indians of North Dakota
- Upper Sioux Community
- Ute Indian Tribe of the Uintah & Ouray Reservation
- Ute Mountain Ute Tribe
- Wichita and Affiliated Tribes
- Yankton Sioux Tribe of South Dakota
- Ysleta del Sur Pueblo

2 DEVELOPMENT OF ALTERNATIVES

The Department considered and evaluated the direct, indirect and cumulative effects of three route alternatives in the 2014 Keystone XL Final SEIS, including the Preferred Route. An overview of the proposed Project and alternatives for the entire Keystone XL route outside of the MAR can be found in Chapter 2 of the 2014 Keystone XL Final SEIS.

The 2014 Keystone XL Final SEIS, however, does not address the MAR because the MAR was developed subsequently as part of the planning process and in support of Keystone's application to the Nebraska PSC for approval of a pipeline route. This section, therefore, provides greater detail regarding the MAR and incorporates Chapter 2 of the 2014 Keystone XL Final SEIS with regard to the remainder of the Keystone XL route.

Keystone employed a multidisciplinary approach to identify potential pipeline corridor routes through Nebraska. This process produced the Preferred Route that was previously analyzed by the Department in the 2014 Keystone XL Final SEIS and two alternatives, including the MAR. In developing the range of reasonable alternatives for this SEIS, the Department considered the Nebraska PSC's review and approval of the MAR, and the following criteria that were used in its development:

- Site new pipeline and supporting facilities to minimize impacts to environmentally sensitive areas (e.g., surface waters, wetlands, protected species and their habitat, and heritage resources).
- Site new pipeline to maximize the use of existing ROW, access roadways and pipeline infrastructure to the greatest extent possible to minimize impacts to landowners and land uses.
- Minimize the route length and the construction of permanent aboveground facilities.
- Avoid wellhead protection areas.
- Cross the Niobrara River at a location not designated as scenic or recreational under the National Wild and Scenic River Act of 1968.

Based on the siting criteria and the approval of the MAR by the Nebraska PSC, this SEIS considers two alternatives for detailed analysis: the Proposed Action (Section 2.1) and the No Action Alternative (Section 2.2). Section 2.3, Alternatives Dismissed from Further Consideration, describes the alternatives considered but eliminated from detailed analysis during the screening process and explains the basis for elimination.

2.1 PROPOSED ACTION

The Department has carried forward a new Preferred Route defining the proposed Project analyzed within this SEIS and as a basis for the Federal Decisions described in Section 1.3. The new Preferred Route considered in this SEIS consists of the 2014 Keystone XL Final SEIS Preferred Route Alternative revised to follow the MAR through Nebraska (see Figure 1-2). Under the Proposed Action, Keystone would construct and operate the Keystone XL Project. This would include approximately 162 miles of construction, connection, operation and maintenance along the MAR of the proposed new 36-inch diameter pipeline and related ancillary facilities within Nebraska that were not analyzed within the 2014 Keystone XL Final SEIS. See Figure 1-1 and Section 2.4 for a detailed description of the MAR and Figure 1-2 for an overview of the proposed Keystone XL Project.

2.2 NO ACTION ALTERNATIVE

Consistent with CEQ regulations for implementing NEPA, the Department is including the No Action Alternative for consideration. This SEIS analyzes the status quo baseline No Action Alternative to compare effects of the Proposed Action if the Keystone XL Project was not constructed or operated.

The 2014 Keystone XL Final SEIS considered a range of potential scenarios that could occur under the No Action Alternative, including rail/pipeline, rail/tanker and rail direct to the Gulf Coast as alternate means of crude oil transport if the Keystone XL Project was not constructed or operated. In developing alternative transport scenarios, efforts were made to focus on reasonably likely scenarios by the oil and transportation industry in response to the crude oil transport constraints that would occur if the permit were denied. Among other factors, likelihood was determined by analyzing what would be practical (e.g., economically competitive), take advantage of existing infrastructure to the extent possible, use proven technologies, and are similar to transport options currently being utilized.

At present, Canada remains committed to developing the oil sands. Moreover, this SEIS updates the market analysis from the 2014 Keystone XL Final SEIS and finds that there is continued global crude oil market demand under most scenarios and that WCSB production is likely to continue to increase. The updated market analysis also shows despite the recent lower price of global crude oil (including WCSB crude oil) since 2014, the industry break-even point of WCSB crude oil has also dropped in tandem with production costs, indicating production of WCSB crude oil will continue. Additionally, transport capacity issues remain, and rail is becoming a growing alternative to pipelines for transport of WCSB crude oil. These other No Action Alternative scenarios considered in the 2014 Keystone XL Final SEIS, therefore, remain viable. Impacts under these scenarios are anticipated to be consistent with the findings of the 2014 Keystone XL Final SEIS contained in Chapter 5, Alternatives, and are incorporated by reference.

2.3 ALTERNATIVES DISMISSED FROM FURTHER CONSIDERATION

The Department conducted a robust analysis of alternatives in both the 2014 Keystone XL Final SEIS and in the earlier 2011 Keystone XL Final EIS. This included consideration of transportation of crude oil by rail, trucking or use of existing pipelines, as well as use of alternative energy sources and energy conservation. Ultimately the Department dismissed each of these alternatives from detailed analysis as they failed to meet the purpose and need.

The environmental review process also involved shifting a portion of the proposed pipeline route in Nebraska (the proposed Steele City Segment analyzed in the 2011 Keystone XL Final EIS) further to the east to avoid the sensitive Sand Hills Region in Nebraska. This revised route is presented and analyzed as the Preferred Route in the 2014 Keystone XL Final SEIS and is incorporated by reference herein. The Department dismissed the Steele City Segment Alternative (presented as the Sandhills Alternative Route in the Nebraska Public Service Commission application) as this alternative does not minimize impacts to environmentally sensitive areas (e.g., Sand Hills Region).

2.4 OVERVIEW OF KEYSTONE'S PROPOSED PROJECT

Section 2.1 of the 2014 Keystone XL Final SEIS contains a detailed description of Keystone's proposed Project for areas outside of the MAR. This section describes the changes to the proposed Project with an emphasis on the MAR and changes to the proposed Project which have occurred since the 2014 Keystone XL Final SEIS (see Figure 1-2 for the current proposed Project under consideration). Chapter 6, Electrical Power Infrastructure, provides updated descriptions for connected actions by electrical cooperatives associated with the proposed electrical power lines.

The MAR, as analyzed as part of this SEIS, is the portion of the pipeline route in Nebraska that deviates from the Preferred Route that was analyzed in the 2014 Keystone XL Final SEIS (see Figure 1-1). The MAR consists of approximately 162 miles of new 36-inch diameter pipeline that traverses Antelope, Madison, Stanton, Platte, Colfax, Butler, Seward, Saline and Jefferson counties in Nebraska. As shown in Figure 2-1, the MAR starts near MP 711 in Antelope County and heads in a southeasterly direction across Madison and Stanton counties for approximately 43 miles. At proposed MP 754, the MAR then intercepts the existing ROW for the Keystone Mainline and heads towards the south paralleling the existing Keystone Mainline for approximately 50 miles, crossing Shell Creek and the Platte River in Colfax County.

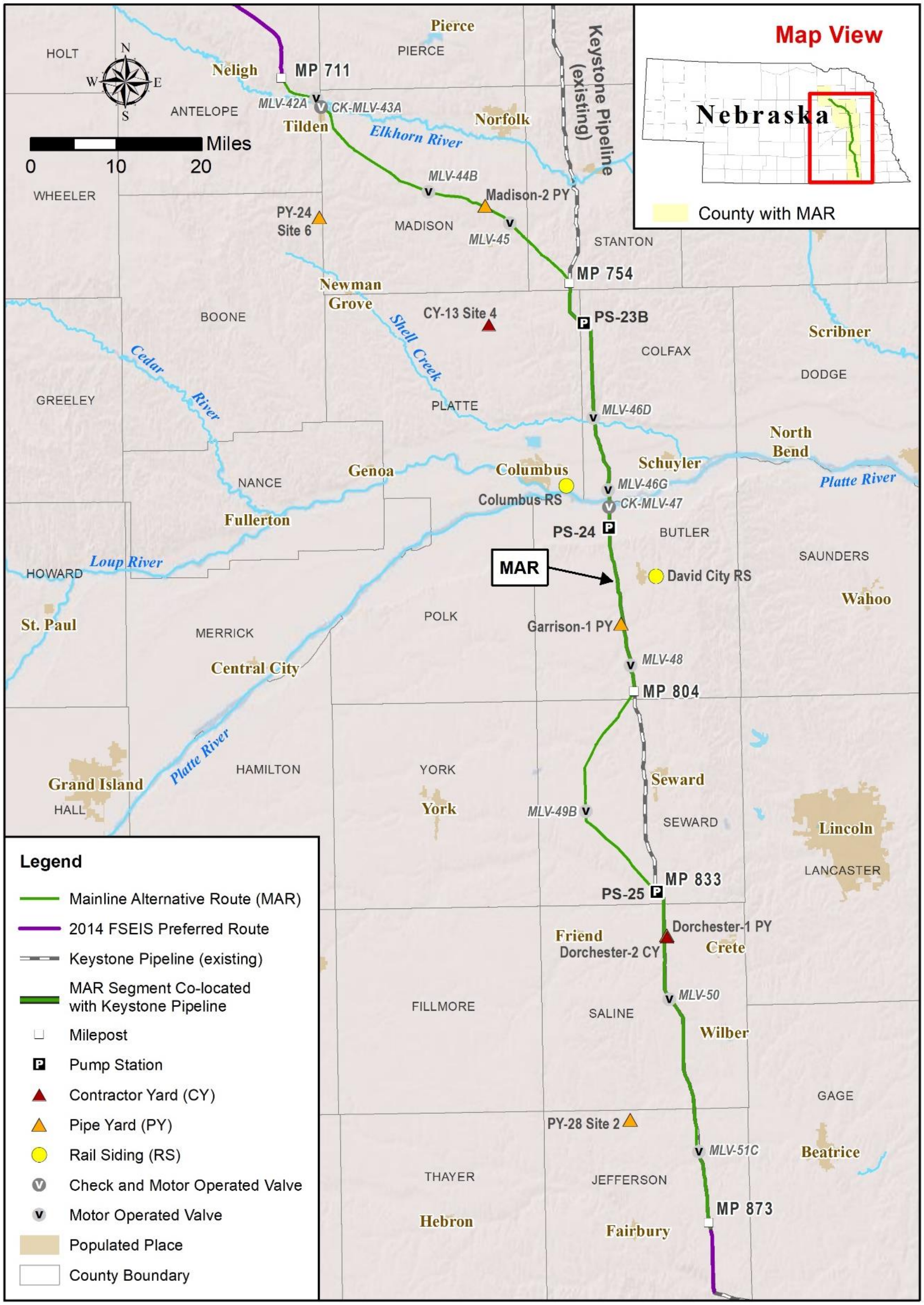


Figure 2-1. Proposed MAR Alignment

The MAR then shifts away from its co-location with the existing Keystone Mainline at proposed MP 804 for approximately 29 miles by routing west around the Seward County wellhead protection area. The MAR then rejoins the existing Keystone Mainline route at proposed MP 833 and continues south for an additional 40 miles through Saline County, terminating in Jefferson County where it rejoins the 2014 Keystone XL Preferred Route at MP 873. The MAR is not located on any federal lands.

The MAR would involve the construction of facilities ancillary to the pipeline including pump stations, mainline valves (MLVs), access roads, pipe storage yards, contractor yards and rail siding facilities. In total, the MAR would be approximately 162 miles with a total of three pump stations.

2.4.1 Land Requirements

Table 2-1 presents surface disturbances associated with the construction and operation of the MAR. Pipeline construction of the MAR would disturb approximately 2,842 acres of land with approximately 1,032 acres retained as permanent ROW and for permanent ancillary facilities. Keystone would restore all disturbed acreage after construction according to landowner agreements and Construction/Reclamation (Con/Rec) units which prescribe land reclamation conditions based on Con/Rec type. The approximately 1,032 acres of permanent ROW would not be restored to original uses but would serve to provide adequate space for designated pipeline ROW maintenance and aboveground facilities including pump stations and valves. The expected life of the proposed pipeline is approximately 50 years.

Table 2-1. Summary of Lands Affected by the MAR

Facility	MAR Lands Affected (acres)	
	Construction	Operations
Pipeline ROW[b]	2,156.9	986.6
Additional Temporary Workspace Areas	273.6	0.0
Access Road Easement	24.3	2.5
Pipe Yard	170.6	0.0
Contractor Yard	71.6	0.0
Rail Siding	102.9	0.0
Pump Stations[a, b]	42.5	**36**
Total	**2,842.4**	**1,025.1**

a. All MLVs and meters would be located within the areas associated with a pump station or permanent ROW. Consequently, the acres of disturbance for these aboveground facilities are captured within the Pipeline ROW and Pump Station categories within the table.

b. Pump station **parcel** acreages range from approximately 12.5 acres to 16.6 acres**; however, the operational footprint for each station would only require 12 acres**.

HDD = horizontal directional drill; MAR = Mainline Alternative Route; MLV = mainline valve; ROW = right-of-way

The MAR is co-located with the existing Keystone Mainline ROW and other linear facilities for a total of 107 miles, which is approximately 66 percent of the MAR. In approving the MAR, the Nebraska PSC recognized many benefits to maximizing the co-location of the proposed MAR pipeline route with the existing Keystone Mainline, primarily that co-location would minimize land disturbance during construction and land use changes during operations (Nebraska PSC 2017b). Table 2-2 summarizes the types and lengths of co-location opportunities found with the MAR.

Table 2-2. Co-location of the MAR

MAR Co-location Feature	Length of Co-location (miles)
ROW (Keystone Mainline)	88.7
Utility Corridors	7.1
Roads	9.6
Railroads	1.6

MAR = Mainline Alternative Route; ROW = right-of-way

2.4.2 Pipeline Right-of-Way

Installation of the new 36-inch diameter pipeline would occur within a 110-foot-wide construction ROW, consisting of a 60-foot temporary construction ROW and a 50-foot permanent ROW (i.e., permanent easement). Though the typical width of the construction ROW would be 110 feet, this width may be adjusted based on best management practices to address natural resources or engineering and safety concerns. Keystone would reduce the construction ROW to 85 feet to avoid or minimize impacts on wetlands and certain other sensitive environmental features.

2.4.3 Temporary Workspace Areas

In addition to the typical construction ROW, pipeline construction requiring special techniques (e.g., river, wetland and road/rail crossings; horizontal directional drill [HDD] entry and exit points; steep slopes and rocky soils) and construction staging areas would involve temporary workspace areas (TWAs) for short durations.

Keystone would adjust the location of TWAs as the MAR continues to be designed and site-specific engineering, landowner requests and environmental studies are completed. This would involve the adjustment of TWAs as necessary related to delineated wetland and waterbody locations, side-hill cuts and rough terrain. For example, Keystone would adjust TWAs at the prescribed setback distance from wetland and waterbody features unless impractical and as determined on a site-specific basis. Table 2-3 lists the dimensions and acreages of typical TWAs.

Table 2-3. Dimensions and Acreage of Typical Temporary Workspace Areas

Crossing Type	Dimensions of Workspace (length by width in feet at each side of feature crossed)	Acreage of Workspace[a]
Waterbody crossing using HDD	250 x 150, as well as the length of the drill plus 150 x 150 on exit side	1.4
Waterbody crossing $\geq$ 50 feet wide	300 x 100[b]	0.7
Water crossing < 50 feet wide	150 x 25 on working and spoil sides or 150 x 50 on working side only	0.2
Bored highways and railroads	175 x 25 on working and spoil sides or 175 x 50 on working side only	0.2
Open-cut or bored county or private roads	125 x 25 on working and spoil sides or 125 x 50 on working side only	0.1
Foreign pipeline/utility/other buried feature crossings[c]	125 x 50	0.1
Push-pull wetland crossings	50 feet x length of wetland	Varies
Construction spread mobilization and demobilization	470 x 470	5.1
Stringing truck turnaround areas	200 x 80	0.4

a. Total for each feature.
b. At each end of crossing.
c. Pipeline/utility/other buried features owned/operated by entities other than Keystone.
$\geq$ = greater than or equal to; < = less than; HDD = horizontal directional drill

2.4.4 Pipe Yards, Contractor Yards and Railroad Sidings

Pipeline construction requires temporary pipe storage sites (i.e., pipe yards), contractor yards and railroad sidings to store materials and equipment. To the extent practical, Keystone uses existing commercial/industrial sites or sites that previously were used for construction. Keystone would also maximize the use of existing public or private roads to access each yard. Keystone would use pipe yards and contractor yards on a temporary basis and would restore, as appropriate, upon completion of construction per landowner requirements. Pipeline construction would require pipe yards at 30- to 80-mile intervals and would require contractor yards at approximately 60-mile intervals. Table 2-4 provides a summary of the pipe yards, contractor yards and railroad sidings, as currently known, for the MAR by county, location and acreage.

Table 2-4. Temporary Pipe Yards, Contractor Yards and Railroad Sidings along the MAR

Facility Type	Facility Name	County	Milepost	Construction (Acres)	Operations (Acres)
Pipe Yard	PY-24 Site 6	Madison	724.5	53.0	0.0
	Madison-2 PY	Madison	740.5	29.4	0
	Garrison-1 PY	Butler	795.8	32.5	0.0
	Dorchester-1 PY	Saline	838.2	34.4	0.0
	PY-28 Site 2	Jefferson	860.0	21.3	0.0
Contractor Yard	CY-13 Site 4	Platte	759.6	40.0	0
	Dorchester-2 CY	Saline	838.4	31.6	0.0
Rail Siding	Columbus RS	Platte	779.3	91.0	0
	David City RS	Butler	790.6	11.9	0.0

2.4.5 Construction Camps

No construction camps are proposed along the MAR in Nebraska. Table 2-5 summarizes the status of construction camps since the 2014 Keystone XL Final SEIS. Changes in locations (i.e., Hinsdale, Opal and O'Neill construction camps) were a result of landowner acceptance and negotiations following the 2014 Keystone XL Final SEIS. **Additionally, the proposed Whitewater Camp in Montana has been removed.**

The 2014 Keystone XL Final SEIS analysis considered a total of 8 construction camps; 4 in Montana, 3 in South Dakota, and 1 in Nebraska. As indicated in Table 2-5, a total of 1**1** camps are currently being considered; **6** in Montana, 4 in South Dakota and 1 in Nebraska. Keystone added the construction camp near Pump Station 9 in Phillips County, Montana, to alleviate the excessive drive times to/from the pump station and existing commercial lodging establishments, which can also impact construction safety. The addition of the other three construction camp locations is due to anticipated use of existing commercial lodging in the area by other major pipeline projects at the same time as the proposed construction period for Keystone XL Project.

Section 4.10 of the 2014 Keystone XL Final SEIS discusses socioeconomic impacts related to construction camps. The analysis estimated that the construction camps would generate the equivalent of 1 full year of property tax revenue for the counties they would be located, which is a total of about $4 million and short-term revenues from sources such as sales and use taxes would total approximately $66 million combined in the states that levy such a tax. This benefit would be extended to Phillips and Dawson counties in Montana and Haakon County in South Dakota as these are additional sites not considered in the 2014 Keystone XL Final SEIS analysis.

Table 2-5. Updated List of Proposed Keystone XL Pipeline Construction Camp Locations

Camp	State	County	Nearest Milepost	Notes
PS-09	MT	Phillips	1	New proposed mini-camp[a]. Site is a cultivated hay field within a landscape matrix dominated by agriculture. Surveys completed for wetlands, waterbodies, noxious weeds and cultural resources identified: • Two marginal wetland features (a farmed wetland and a small, isolated, depressional wetland). • Canada thistle (invasive plant which is included in the Noxious Weed Plan). Raptor and grouse lek surveys are planned to be completed in 2019.
Hinsdale	MT	Valley	47	New proposed construction camp location. Site is a cultivated hay field within a landscape matrix dominated by agriculture. Surveys completed for wetlands, waterbodies, raptor nests (including bald and golden eagle), noxious weeds and cultural resources identified: • No wetlands at the site. • No raptor nests within the 1.0-mile survey buffer; no sharp-tailed grouse leks or sage-grouse leks within their survey buffers (0.25-mile and 4.0-mile, respectively). • Field bindweed and Canada thistle (invasive plants which are included the Noxious Weed Plan). • One non-eligible historic homestead (site 24VL2063).
Fort Peck	MT	Valley	86	Same site as analyzed in the 2014 Keystone XL Final SEIS.
Circle	MT	McCone	146	Same site as analyzed in the 2014 Keystone XL Final SEIS.
Glendive	MT	Dawson	195	New proposed construction camp. Site is a mix of native and non-native grassland and occurs within a landscape matrix dominated by agriculture, immediately adjacent to Interstate 94. Surveys completed for wetlands, waterbodies, raptor nests (including bald and golden eagle), noxious weeds and cultural resources identified: • One ephemeral waterbody without a wetland component (camp design to avoid feature). • One red-tailed hawk nest approximately 0.8 mile north of the site (outside the Montana Department of Environmental Quality required 1,000-meter seasonal construction constraint buffer); no sharp-tailed grouse leks or sage-grouse leks in their survey buffers (0.25-mile and 4.0-mile, respectively). • Leafy spurge, Canada thistle and field bindweed (invasive plants which are included in the Noxious Weed Plan). • No cultural sites.
Baker	MT	Fallon	249	Same site as analyzed in the 2014 Keystone XL Final SEIS.
Buffalo	SD	Harding	313	Same site as analyzed in the 2014 Keystone XL Final SEIS.
Opal	SD	Meade	381	New proposed construction camp location. Site is a cultivated hay field within a landscape matrix of agriculture and native grassland. Surveys completed for wetlands, waterbodies, raptor nests (including bald and golden eagle), sharp-tailed grouse leks, noxious weeds and cultural resources did not identify any of these resources.

Table 2-5. Updated List of Proposed Keystone XL Pipeline Construction Camp Locations

Camp	State	County	Nearest Milepost	Notes
Philip	SD	Haakon	463	New proposed construction camp. Site is a cultivated field within a landscape matrix of agriculture and native and non-native grassland. Surveys completed for raptor nests (including bald and golden eagle), sharp-tailed grouse leks, noxious weeds and cultural resources did not identify any of these resources. The wetland and waterbodies survey identified two ephemeral pothole wetlands, both of which were significantly disturbed by past agricultural activity and do not appear to hold water in all years.
Colome	SD	Tripp	580	Same site as analyzed in the 2014 Keystone XL Final SEIS.
O'Neill	NE	Holt	654	New proposed construction camp location. Site is currently in crop rotation and use. Surveys completed for wetlands, waterbodies, raptor nests (including bald and golden eagle), and noxious weeds did not identify any of these resources. The cultural resources survey identified two non-eligible isolated finds (C601HT003FS [prehistoric] and C601HT002FS [historic]).

[a] The proposed "mini-camp" accommodates fewer camp residents (96-150) than a full-size camp (646-1,000) and occupy an overall smaller footprint (containing fewer housing, and a smaller kitchen, dining hall, and recreational center).

MT = Montana; NE = Nebraska; PS = pump station; SD = South Dakota

Note: The 2014 Keystone XL Final SEIS considered a construction camp in Howes (Meade County), SD but it has been removed.

Section 4.10 of the 2014 Keystone XL Final SEIS also discusses measures to establish a camp Code of Conduct to control and manage behavior in all proposed Project camps which would apply to the additional three camps proposed. The Code of Conduct addresses camp access control procedures, bringing weapons into the camp, disruptive or abusive behavior, alcohol use and criminal/illegal activities. All camp residents must agree to abide by the conditions of the Code of Conduct**. Workers who violate the camp Code of Conduct would be dismissed.** In addition, as stated in the 2014 Keystone XL Final SEIS, each camp site would be fully fenced and have a guard house at a single entrance. A contract security officer manning the guard house would be provided on a 24/7 basis and at all times there would be at least one additional roving security officer supplemented with off-duty law enforcement personnel, as needed.

2.4.6 Temporary and Permanent Access Roads

Keystone would use existing public and private roads to gain access to most of the construction ROW. Keystone would build temporary access roads where existing roads are lacking or unavailable for use, and construct permanent access roads from public roads to pump stations and MLVs. The typical access road would be 30 feet wide. Temporary access roads would be reclaimed to landowner requirements following construction. Keystone would be responsible for maintenance of the new permanent access roads.

2.4.7 Aboveground Facilities

The MAR would require approximately 37 acres of land, other than permanent ROW, along the proposed route for aboveground facilities, including pump stations with MLVs, and intermediate MLVs that are not associated with a pump station (see Table 2-1).

2.4.7.1 Pump Stations

The MAR would require three pump stations, resulting in a total of six pump stations located in Nebraska. Although Keystone has not yet determined the exact locations of the pump stations, Figure 2-1 shows the approximate locations proposed for the three pump stations associated with the MAR. **The** pump stations **have been sited to avoid** sensitive resources (e.g., wildlife, vegetation, waterbodies, etc.). In addition, Keystone would locate the pump stations to minimize interference with agricultural operations on adjacent land and facilitate access by Keystone maintenance crews, as needed.

Previous versions of the proposed Project discussed in the 2014 Keystone XL Final SEIS also included requirements for two additional pump stations in Kansas (Pump Stations 27 and 28) along the existing Keystone Pipeline system; however, Keystone has recently determined that these two stations have independent commercial utility and will be constructed regardless of whether the proposed Project is approved. Therefore, they are no longer part of the proposed Project.

2.4.7.2 Power Lines and Substations

Each of the pump stations along the proposed MAR would operate using electrical power supplied by the regional provider, Nebraska Public Power District (NPPD). Each pump station would occupy approximately 12.5 acres to 16.6 acres of land, which would include the associated substation required for operation of the facility. A power line to each pump station facility would be constructed, operated and maintained by local power providers to provide electrical service to pumping stations (see Table 2-6 for the linear feet of power lines to the pump stations along the MAR). The **public power entities** providing the distribution lines are responsible for obtaining the necessary permits, approvals or authorizations from federal, state or local governments.

Table 2-6. Summary of Power Lines to Pump Stations along the MAR

Pump Station	Linear Feet of New Power Line[a]
PS-23B	5,280
PS-24	5,280
PS-25	33,264
Total	**43,824**

[a.] Value represents a maximum potential distance based on the existing utility grid and proximity to the pump station.
PS = pump station

Further analysis of transmission and electrical distribution lines is contained in Chapter 6, Electrical Power Infrastructure. Overall, the requirement for the power lines have remained unchanged since the 2014 Keystone XL Final SEIS, except for the Big Bend to Witten 230-kV Transmission Line that has been removed from consideration.

2.4.7.3 Mainline Valves

Keystone would install MLVs at pump stations, major river crossings and other locations, as required to comply with PHMSA regulations at 49 CFR 195.260 and in the 2014 Keystone XL Final SEIS Appendix Z Condition 32. Each MLV not associated with a pump station (referred to as an "intermediate MLV") would occupy a fenced site within the pipeline ROW, approximately 40 by 50 feet in size, located within the 50-foot-wide permanent ROW. Table 2-7 presents the location of MLVs for the proposed MAR. The number and location of valves may be further refined when the final MAR design is complete.

Table 2-7. Mainline Valve Locations along the MAR

MLV Identification	Type	County	Milepost
MLV-42A	Motor Operated	Antelope	716.5
CK-MLV-43A	Check and Motor Operated	Madison	716.9
MLV-44B	Motor Operated	Madison	733.4
MLV-45	Motor Operated	Madison	743.9
MLV-46D	Motor Operated	Colfax	770.9
MLV-46G	Motor Operated	Colfax	779.9
CK-MLV-47	Check and Motor Operated	Colfax	781.9
MLV-48	Motor Operated	Butler	800.9
MLV-49B	Check and Motor Operated	Seward	819.9
MLV-50	Motor Operated	Seward	845.8
MLV-51D	Motor Operated	Saline	864.5

CK = check; MAR = Mainline Alternative Route; MLV = mainline valve

2.4.8 Construction Procedures

Keystone would design, construct, test and operate the MAR facilities in accordance with all applicable requirements included in the U.S. Department of Transportation's (USDOT) regulations at 49 CFR 195, *Transportation of Hazardous Liquids by Pipeline*, other applicable regulations, as well as special conditions set forth in Appendix Z of the 2014 Keystone XL Final SEIS (Link to Appendix Z). The 2014 Keystone XL Final SEIS contains detailed descriptions of procedures Keystone would use for pipeline construction. The following sections incorporate by reference and summarize construction procedures for the proposed MAR described in Chapter 2 of the 2014 Keystone XL Final SEIS (Link to Chapter 2) and the Keystone XL Construction Mitigation and Reclamation Plan (CMRP) located in Appendix G of the 2014 Keystone XL Final SEIS by reference (Link to Appendix G).

2.4.8.1 General Pipeline Construction Procedures

Keystone has proposed the installation of 36-inch diameter pipeline for the entire length of the MAR in Nebraska. Pipeline construction would generally proceed in a linear fashion on each spread (e.g., pre-determined construction segments), with each operation usually separated by a designated number of miles.

Pipeline construction would generally proceed as a moving assembly line, comprising:

- Surveying and staking the construction ROW;
- Clearing and grading;
- Stringing and bending;
- Welding and coating;
- Trenching;
- Lowering-in and backfilling;
- Hydrostatic testing; and
- Cleanup and restoration.

2.4.8.2 Restoration

The CMRP contains procedures that would be used throughout the Keystone XL Project, including the area of the MAR, to avoid or minimize impacts. Subsections of the CMRP address specific environmental conditions, including:

- General conditions;
- Spill prevention and containment;
- Uplands;
- Drain tile systems;
- Wetland crossings;
- Waterbodies and riparian areas; and
- Hydrostatic testing.

2.4.8.3 Aboveground Facility Construction Procedures

Construction activities at each of the new pump stations would follow a standard sequence of activities: clearing and grading, installing foundations for the electrical building and support buildings, and erecting the structures to support the pumps and/or associated facilities. Keystone would confine construction activities and the storage of building materials to the pump station construction sites.

2.4.8.4 Special Pipeline Construction Techniques

Pipeline construction would entail special construction techniques for crossing roads, highways and railroads; pipeline, utility and other buried feature crossings; steep terrain; unstable soils; perennial waterbodies; wetlands; areas that require ripping; and residential and commercial areas. Discussion of impacts and mitigation measures for sensitive areas contained within the CMRP is summarized below.

Waterbody Crossings

The MAR would cross 17 perennial waterbodies. Pipeline construction for perennial waterbody crossing would use one of four techniques: the open-cut wet method, dry flume method, dry dam-and-pump method or HDD.

The crossing method employed at a perennial stream would be distinguished in USACE permit conditions. Intermittent waterbodies that are dry or have nonmoving water at the time of construction would be crossed using conventional upland construction methods. As currently planned, pipeline construction would use HDD for crossing three major rivers (Elkhorn, Platte and Big Blue) as well as perennial Union Creek. Other waterbodies would be crossed by either wet or dry open-cut methods.

Throughout the MAR, the pipeline would have a minimum of 5 feet of cover at waterbodies, ditches and drainages except in areas of consolidated bedrock where the minimum cover would be 3 feet. Where the HDD method is used, the pipeline would be at least 25 feet beneath the bottom of the waterbody. The pipeline would be weighted to counteract buoyancy for non-HDD installations as needed. TWAs would be needed on both sides of waterbodies to stage construction, fabricate the pipeline and store materials.

Keystone would install erosion and sediment control measures across portions of the construction ROW in accordance with the CMRP to reduce sediment transport into the waterbody.

Since publication of the 2014 Keystone XL Final SEIS, the following stream locations have been added for HDD of the proposed pipeline outside of the MAR:

- Westfork Hungry Creek – MP 99, McCone County, Montana
- Cabin Creek Headcuts – MP 220, Prairie County, Montana
- Ash Creek Bluff – MP 431, Meade & Pennington counties, South Dakota

Wetland Crossings

Keystone used data from preliminary windshield surveys conducted in December of 2017 along the MAR, aerial photography, field surveys where permission was granted, and National Wetland Inventory maps to identify wetlands crossed by the MAR.

Construction methods and reclamation procedures for wetland crossings are detailed in Section 6.0 of the CMRP. The wetland crossing method used would depend largely on the stability of the soils at the time of construction. The typical construction ROW in wetland areas would be 85 feet wide, but may be as wide as 110 feet if conditions require. Over most of the construction ROW, clearing of vegetation would be limited to flush-cutting trees and shrubs and their subsequent removal. Keystone would limit stump removal, grading, topsoil segregation and excavation to the area immediately over the trench line. **Additional areas of stump removal, grading, topsoil segregation and excavation within the full construction ROW, however, would be required for the crossing of linear features (e.g., existing utility, road, stream or railroad) where extra workspace is needed to complete the crossing of that feature.**

Floodplain Considerations

As part of pre-construction design, Keystone examined the historical flows at all stream crossings where the U.S. Geological Survey (USGS) has collected flow data to determine the proper pipeline burial depth in the floodplain for protection from flooding and erosive events that may occur along rivers. Keystone also utilized flood data from the National Oceanic and Atmospheric Administration (NOAA) and the Federal Emergency Management Agency (FEMA) to estimate the lateral migration potential of the stream and river beds and to determine the extent and depth a stream/river course could migrate in a floodplain over the course of the 50-year life of the Project. The construction drawings incorporate this information at each crossing and include a set of drawings developed to address potential lateral migration at waterbody crossings as well as site-specific drawings to address potential vertical scour.

Based on the vertical and lateral migration estimates for minor and intermediate-sized streams, Keystone determined the appropriate pipeline burial depth is five feet or greater below the minimum elevation within the defined stream channel. Outside of the stream channel, the five feet or greater burial depth extends a minimum of 15 feet from the top of the defined stream channel **for streams where migration was determined to be a risk over the 50-year life of the Project**. For major rivers where Keystone would use the HDD method of construction, site-specific drawings specify a minimum depth of 25 feet below the stream channel. This depth has been shown to protect the pipe for a worst-case scenario, far beyond a 100-year design. During the lateral migration analysis, Keystone confirmed HDD entry and exit locations are placed outside the potential lateral migration zone for the stream. For the Missouri River crossing, where the most severe floods have been recorded due to water releases from the upstream dam, Keystone was required to model the erosive effects of a worst-case 40,000-year flood event (no record of such an event has been observed) to determine if the burial depth of the HDD crossing would result in sufficient cover to protect the pipe. The modeling confirmed that the current design would not be exposed in such an event unlikely to occur on the river. Chapter 5, Environmental Consequences from Accidental Releases, presents additional information for potential release in floodplain and riverine areas.

Keystone has also examined the flood information for the recent (March 2019) floods in Nebraska and South Dakota. The data indicates that this flooding event is well within the design parameters utilized both in the design of HDD crossings of the larger rivers and in the lateral migration studies and burial design for minor and intermediate streams.

2.4.9 Operation and Maintenance

Keystone would use the same general pipeline operation procedures for the MAR as for the rest of the Keystone XL pipeline (as described in the 2014 Keystone XL Final SEIS [Section 2.1]). Adoption of the MAR has no impact on operating procedures. Keystone would operate, maintain, monitor and inspect the proposed pipeline in accordance with PHMSA regulations, Special Conditions in the 2014 Keystone XL Final SEIS Appendix Z (Link to Appendix Z) and applicable permit requirements.

Keystone would maintain a 50-foot-wide permanent ROW along the proposed route during operation of the pipeline. This includes periodic clearing of woody vegetation along the permanent ROW to maintain accessibility for pipeline integrity surveys. Keystone would conduct mechanical mowing or cutting along the permanent ROW, as needed, for normal vegetation maintenance. If permanent ROW maintenance requires herbicides for noxious weed control, Keystone would apply herbicides through spot spraying.

Prior to application, Keystone would survey the area for populations of plant species of concern (i.e., western prairie fringed orchid) and would avoid herbicide use at those locations. Most agricultural crops could be grown within this permanent ROW, but structures and deep-rooted vegetation such as trees would not be allowed. In areas where the pipeline would be installed using HDD, the pipeline would be deeper and trees could remain in the ROW. During pipeline operations, Keystone would institute direct observation methods, including aerial patrols, ground patrols and public and landowner awareness programs, to monitor pipeline integrity and safety.

2.4.10 Decommissioning

PHMSA has requirements that apply to the decommissioning of crude oil pipelines in 49 CFR 195.402(c)(10) and in 49 CFR 195.59 and 195.402. These regulations require that for hazardous liquid pipelines, the procedural manuals for operations, maintenance and emergencies must include procedures for abandonment, including safe disconnection from an operating pipeline system, purging of combustibles and sealing abandoned facilities left in place to minimize safety and environmental hazards (49 CFR 195.402). Further, these regulations require that for each abandoned onshore pipeline facility that crosses over, under or through a commercially navigable waterway, the last operator of that facility must file a report upon abandonment of that facility. The report must contain all reasonably available information related to the facility, including information in the possession of a third party. The report must contain the location, size, date, method of abandonment and a certification that the facility has been abandoned in accordance with all applicable laws.

Keystone would adopt operating procedures to address these requirements for the Keystone XL Project. Keystone typically does not abandon large-diameter pipelines but generally decommissions the pipe as market conditions dictate. During this process, the pipeline is purged of its contents, filled with an inert gas and left in place with warning signage intact. The pipeline is then considered to be a purged but active pipeline. A purged but active pipeline does not require formal abandonment because there is an expectation to continue using the pipeline at a later time. This allows a dormant pipeline to be used again or converted to another purpose in the future, subject to landowner permission and applicable regulatory approvals. PHMSA allows for the deferral of certain activities for purged but active pipelines that may be impractical, such as in-line inspections. However, cathodic protection would likely be left functional as would other integrity measures such as periodic inspections under the integrity management plan.

Decommissioning activities would be conducted consistent with all applicable regulatory requirements that are in place at the time of decommissioning. Since regulations at the federal, state and local level change over time, it would be highly speculative to estimate what regulatory framework would apply to the Keystone XL pipeline (including the MAR) decommissioning at the end of its useful life of more than 50 years in the future.

The proposed ROW grant and Temporary Use Permit to cover the 44.4 miles crossing of BLM land in Montana and roughly 1.88 mile crossing of lands administered by USACE described in Section 1.3.4 pursuant to the Mineral Leasing Act of 1920 for the proposed Keystone XL pipeline would have a maximum term not-to-exceed 30 years. For the Keystone XL pipeline to extend beyond 30 years, the approved ROW grant would require a renewal authorization-certification decision by the BLM. While there are no state regulations applicable to pipeline decommissioning in Montana, South Dakota or Nebraska, environmental specifications developed by Montana Department of Environmental Quality would address reclamation of areas disturbed during abandonment. Rights-of-way on federal lands will be subject to rules and regulations regarding decommissioning and reclamation of Mineral Leasing Act rights-of-way.

Prior to decommissioning, Keystone would identify the decommissioning procedures it would use along each portion of the route, identify the regulations with which it would be required to comply and submit applications for the appropriate environmental permits. At that point, Keystone and the issuing agencies would address the environmental impacts of implementation of the decommissioning procedures and identify the mitigation measures required to avoid or minimize impacts.

3 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter presents the affected environment for resources expected to experience environmental impacts from construction, maintenance and normal operations of the Keystone XL Project. Consistent with NEPA and CEQ regulations, the description of the affected environment focuses on those resources and conditions potentially subject to effects from implementing the proposed Project. The 2014 Keystone XL Final SEIS contains detailed description of the affected environment along the entire Keystone XL Project. As stated in Section 1.1, the scope of this SEIS is focused on changes in the Project since 2014. Specific to the affected environment, this includes a description of resources within the MAR and new information regarding baseline conditions from surveys or studies conducted after the issuance of the 2014 Keystone XL Final SEIS. Specific updates to resources with new information outside of the MAR along the Preferred Route analyzed in the 2014 Keystone XL Final SEIS include an update to paleontological resources based on surveys conducted in 2018 (Section 3.3.1.1), an update to cultural resources based on surveys conducted in 2018 (Section 3.9.1.6) and an update to greenhouse gases and climate change based on publications post-2014 (Section 3.10). Chapter 6, Electrical Power Infrastructure, provides new information for resources located along proposed electrical power lines.

Table 3.1-1 identifies the resources analyzed within this SEIS and provides justification for the level of analysis.

Table 3.1-1. Analysis of Resources

Resource	Level of SEIS Analysis and Justification
Land Use, Recreation and Visual Resources	Construction of the pipeline and associated facilities would require both ROW and land transfer to Keystone. The 2014 Keystone XL Final SEIS contains detailed analysis of land use, recreation and visual resources for construction and operations of the entire Keystone XL Project. This SEIS contains an assessment of existing land use, recreation and visual resources along the MAR (Section 3.2) and an analysis of impacts to these resources from construction, normal operations and maintenance activities (Section 4.2).
Geology and Soils	Construction of the pipeline would require ground disturbance from trenching activities, siting of TWAs and siting of permanent facilities (e.g., pump stations). Construction equipment could leak or spill fuels, lubricants or coolants resulting in soil contamination. The 2014 Keystone XL Final SEIS contains detailed analysis of geology and soils for construction and operations of the entire Keystone XL Project. This SEIS contains an assessment of existing geology and soil resources along the MAR (Section 3.3) and an analysis of impacts to geology and soils from construction, normal operations and maintenance activities (Section 4.3).
Air Quality	Construction and operations of the pipeline would introduce air emissions. The 2014 Keystone XL Final SEIS contains detailed analysis of air quality for construction and operations of the entire Keystone XL Project. This SEIS contains an assessment of existing air quality conditions within the MAR (Section 3.4) and an analysis of air quality impacts resulting from construction and operational (pump station) emissions (Section 4.4) for Project components not analyzed in the 2014 Keystone XL Final SEIS.
Noise and Vibration	Construction of the pipeline would temporarily generate noise. Pipeline facilities along the MAR (e.g., pump stations) would generate long-term noise. The 2014 Keystone XL Final SEIS contains detailed analysis of noise and vibration for construction and operations of the entire Keystone XL Project. This SEIS contains an assessment of the existing noise environment along the MAR (Section 3.5) and an analysis of impacts to sensitive receptors due to noise and vibration from construction, normal operations and maintenance activities (Section 4.5).

Table 3.1-1. Analysis of Resources

Resource	Level of SEIS Analysis and Justification
Water Resources	Construction of the pipeline would involve new crossings of water resources, floodplains and wetlands. The 2014 Keystone XL Final SEIS contains detailed analysis of water resources for construction and operations of the entire Keystone XL Project. This SEIS identifies locations and characteristics of these resources along the MAR (Section 3.6) and provides an analysis of impacts to these resources from construction, normal operations and maintenance activities (Section 4.6).
Biological Resources	Construction of the pipeline would require land clearing and stream crossings, which have the potential to adversely affect terrestrial and aquatic habitat and species that occupy these habitats. This SEIS identifies biological resources within the MAR (Section 3.7) and provides an analysis of impacts to these resources from construction, normal operations and maintenance activities (Section 4.7). This SEIS also provides updates to federally-protected species since the 2014 Keystone XL Final SEIS analysis, includes species information from surveys conducted since the 2014 analysis , and incorporates proposed conservation measures and mitigation as part of USFWS consultation.
Socioeconomics and Environmental Justice	The 2014 Keystone XL Final SEIS contains detailed analysis of socioeconomics and environmental justice for construction and operations of the entire Keystone XL Project. This SEIS evaluates socioeconomic conditions of the counties located within the MAR and identifies minority and low-income populations within these areas (Section 3.8). This SEIS also provides an analysis of impacts to these resources from construction, normal operations and maintenance activities (Section 4.8).
Cultural Resources	Construction of the pipeline would require ground disturbance and construction of facilities (e.g., pump stations), which have the potential to adversely affect cultural resources. The 2013 Amended Programmatic Agreement (Appendix E of the 2014 Keystone XL Final SEIS) contains mitigation measures agreed to by Keystone, which would be adhered to for construction, normal operations and maintenance activities. This SEIS identifies cultural resources within the MAR (Section 3.9) and provides an analysis of impacts to these resources from construction, normal operations and maintenance activities (Section 4.9). This SEIS also provides updates to surveys and findings conducted since the 2014 Keystone XL Final SEIS.
Greenhouse Gases and Climate Change	Construction and operations of the pipeline would introduce greenhouse gas emissions. This SEIS contains an assessment of greenhouse gases and climate change (Section 3.10), an analysis of greenhouse gas emissions from construction and operations of the Project (Section 4.10) and the potential for cumulative greenhouse gas and climate change impacts (Chapter 7). This includes revised methodology and analysis using recently published lifecycle greenhouse gas emissions studies for WCSB crude oils and other crude oils as well as use of the GREET Model.
Reliability and Safety	The transport of crude oil along the proposed pipeline would introduce risk of potential release. This SEIS discusses the risk and potential effects on resources along the pipeline and considers revised methodology for accidental releases, including updated modeling to account for industry and TransCanada-specific incident history since 2014, the latest findings and research related to oil spills, an updated analysis of potential for impacts from overland spills to sensitive resources along the entire alignment (including the Missouri River crossing), and an updated analysis of potential for impacts to downstream receptors 40 river-miles from the pipeline and along the connected hydraulic pathways. The 2014 Keystone XL Final SEIS contains detailed discussions on worker safety (construction and long-term maintenance), construction-related public safety and health effects from new pipeline construction, and safe storage of materials and the handling, treatment and disposal of hazardous wastes. Keystone would adhere to these measures during construction, operations and maintenance of the MAR.
Electrical Power Infrastructure	Construction of the Project also requires construction of electrical power infrastructure to support pipeline operations. This SEIS re-evaluates existing resources along these corridors, analyzes the potential for adverse impacts and identifies any potential mitigation measures to minimize adverse effects (Chapter 6).

GREET = Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation; MAR = Mainline Alternative Route; ROW = right-of-way; SEIS = Supplemental Environmental Impact Statement; TWA = temporary workspace area; USFWS = U.S. Fish and Wildlife Service; WCSB = Western Canadian Sedimentary Basin

3.2 LAND USE, RECREATION AND VISUAL RESOURCES

The 2014 Keystone XL Final SEIS discusses land use, recreation and visual resources along the Preferred Route. This section supplements the 2014 analysis to include discussion of the land use, recreation and visual resources within the MAR. Chapter 5, Environmental Consequences from Accidental Releases, assesses the risk to land use, recreation and visual resources in the event of an accidental release. Chapter 6, Electrical Power Infrastructure, provides a description of land use, recreation and visual resources and an assessment of impacts from connected actions relating to electrical supply needs required for the proposed pipeline. Chapter 7, Cumulative Impacts, provides an assessment of the impacts to land use, recreation and visual resources from the proposed Keystone XL Project (including the electrical supply needs) in combination with other past, present and reasonably foreseeable future actions.

The region of influence (ROI) includes the land uses and recreational resources within and adjacent to the 110-foot-wide ROW, which includes the 50-foot-wide operational ROW.

This SEIS considers the following data sources for characterizing land use, recreational resources and visual resources:

- Geographic Information System (GIS) land cover data generated by USDA, USFWS, USGS and Nebraska Game and Parks Commission (NGPC)
- Current and historic satellite imagery to review changes in land cover and determine proximity to residences
- Government websites relating to state and national protected land, and recreational and scenic areas, and other conservation programs (e.g., NPS, USFWS, Nebraska Department of Transportation, NDEQ, NGPC)
- May 2018 site visit

3.2.1 Land Use, Recreation and Visual Resources Overview

The MAR extends approximately 162 miles across Antelope, Madison, Stanton, Platte, Colfax, Butler, Seward, Saline and Jefferson counties in Nebraska. The MAR pipeline ROW would be co-located with the existing Keystone Mainline and other ROWs for approximately 107 miles, while approximately 55 miles of the MAR pipeline would be located in a new ROW. Table 2-2, Co-location of the MAR, lists the total distances where the MAR ROW would be co-located with another existing ROW. Pipeline installation would occur within a 110-foot wide construction ROW, while ongoing pipeline operations and maintenance would require establishing a 50-foot wide permanent operational ROW within the 110-foot wide ROW. The MAR also would involve the construction of permanent and temporary aboveground facilities ancillary to the pipeline including three pump stations, ten MLVs, access roads, pipe storage yards, contractor yards and rail siding facilities.

3.2.1.1 Land Use

Land Ownership

More than 99 percent of the MAR includes privately owned land, and only a small portion of the MAR (approximately 0.25 percent) passes through land under state ownership. The MAR would not cross any federal or locally owned land. Table 3.2-1 shows the total distance by land ownership type that the MAR crosses.

Table 3.2-1. Land Ownership

Land Ownership	Length Crossed (miles)
Federal	0.0
State	0.4
Local	0.0
Private	160.4
Water	0.0
Road Crossings	1.2
Total	**162.0**

Land Uses

The MAR and associated facilities primarily pass through agricultural land and rural grassland used for livestock grazing. Some forested land, wetlands, developed land and open water occur as well. Table 3.2-2 lists the land uses along the MAR broken down by the permanent operational and temporary construction ROW.

Table 3.2-2. Land Use

Primary Land Use Category	Land Use Sub-Category	Area Within ROW (acres)	
		Construction	Operations[a]
Agriculture	Cultivated crops	2,307.8	**838**.3
	Pasture/hay	10.2	3.0
Grassland/rangeland	N/A	349.4	127.8
Developed	N/A	126.8	36.2
Forest	N/A	33.4	12.6
Water and wetlands	Emergent herbaceous wetlands	0.8	0.2
	Woody wetlands	8.2	4.3
	Open water	5.6	2.7
Total		**2,842.2**	**1,025.1**

[a.] Includes land associated with permanent facilities such as pump stations.
N/A = not applicable; ROW = right-of-way

The MAR construction ROW includes approximately 127 acres of developed land. This acreage includes all land currently identified as developed based on the National Land Cover Database, as well as recent aerial photography. The majority of this land consists of open space, defined as space consisting of less than 20 percent constructed surfaces; most land categorized as open space consists of vegetative cover such as lawn-type grasses. Developed land may include structures such as residences, barns, silos, cattle yards and parking and storage areas. No actual structures are located within the MAR ROW. Based on Keystone field survey data, aerial photography and land use records, the nearest structure to the pipeline is located approximately 140 feet from the construction ROW (NDEQWQ 2018a). There are 157 structures located within 500 feet of the ROW. There are no structures located within 500 feet of the proposed pump station locations. The nearest structure to a pump station is located approximately 800 feet away, and 16 structures are located within 0.5 mile of the proposed pump station locations.

Special Management Areas and Conservation Easements

The MAR crosses approximately 238 acres of the Rainwater Basin region, a region spanning 21 counties in southeastern Nebraska. The Rainwater Basin includes numerous wetlands formed in shallow basins that provide resting and feeding areas for tens of millions of birds during annual spring and fall migrations (NGPC 2018a, USFWS 2018a). There are 84 publicly owned wetlands in this region that are managed by the USFWS and the NGPC. The USFWS manages 61 individual waterfowl production areas scattered through 21 counties, as part of the National Wildlife Refuge System. While the pipeline passes through the Rainwater Basin, a review of land ownership records indicates that the construction and operational ROWs would not cross any land managed by the USFWS or by the state of Nebraska for wildlife habitat (USFWS 2017a; NGPC 2018b). Temporary and permanent aboveground facilities associated with the MAR would also not be located within 0.5 mile of any special management area.

The USDA and the USFWS both support various types of conservation easements with private landowners in the Rainwater Basin region to help enhance wetlands, improve water quality and conserve soils (Rainwater Basin Joint Venture 2016). USDA easement programs include the Wetlands Reserve Enhancement Program, Conservation Reserve Program, Conservation Reserve Enhancement Program and State Acres for Wildlife Enhancement Program. USFWS conservation easement programs enroll private lands into the National Wildlife Refuge System and place restrictions on certain land uses including farming and development; livestock grazing, however, is typically permitted. A review of land easement records indicates the MAR ROW would not include any lands currently enrolled in USDA or USFWS easements (USDA 2018a, USFWS 2017a).

3.2.1.2 Recreation

The MAR does not pass through or near any national parks or national forests. However, the MAR does cross two National Historic Trails (NHTs) (NPS 2009). The NPS manages but does not own these NHTs, which “recognize original trails or routes of travel of national historic significance including past routes of exploration, migration, and military action” (NPS 2018). Section 3.9 provides more information on NHT crossings.

Some aboveground facilities associated with the MAR would be located within 0.5 mile of the NHTs. A proposed temporary rail siding at David City would be approximately 0.2 mile east of the California NHT (Oxbow Trail segment) in Butler County. Pump Station 24 would be located approximately 0.4 mile from the California NHT (Oxbow Trail Alternative Route segment) in Butler County.

The MAR would not cross any designated National Recreational Rivers or Wild and Scenic Rivers (USDA 2018b). However, the MAR crosses several perennial waterbodies that the NDEQ has designated as recreational, as shown in Table 3.2-3. Existing water-based recreational use may also take place on or near other waterbodies crossed by the MAR that do not have a formal “recreational use” designation.

The MAR crosses the Cowboy Recreational Trail, operated and managed by the NGPC (NGPC 2019). The trail is 321 miles long of which 192 miles are improved with a crushed limestone surface, including in the vicinity of the MAR crossing. The MAR does not pass through any other state parks or recreational areas (NGPC 2018b). The nearest state recreational area is Blue River State Recreation Area, which is located approximately 0.9 mile west of the pipeline near MAR MP 833. The recreational area is located on the west fork of Big Blue River at the crossing of the Big Blue River (west fork) and U.S. Route 6. None of the pump stations would be located close to any recreational areas. Pump Station 24, the nearest to a state park or recreational area, is located approximately 2 miles northwest of the Blue River State Recreational Area.

Table 3.2-3. Waterbodies Designated for Recreational Use

County	Waterbody	Type	Nearest MAR Milepost	Impairments[a]
Antelope	Elkhorn River	Perennial River	716	No
Stanton	Union Creek	Perennial River	747	Yes
Colfax	Shell Creek	Perennial River	771	Yes
Butler	Platte River	Perennial River	781	Yes
Saline	West Fork Big Blue River	Perennial River	835	Yes

Source: NDEQ 2016

[a.] Impaired waterbodies are those not meeting the applicable state water quality standards and designated uses, as stipulated by Section 303(d) of the federal Clean Water Act.

MAR = Mainline Alternative Route

3.2.1.3 Visual Resources

Visual resources are the visible physical features of a landscape that have an aesthetic value to viewers. Examples of visual resources include rivers and other waterbodies, national and state parks, other recreation areas and scenic roads. While most land has inherent visual values that warrant different levels of management, the aesthetic value of landscape views is a subjective characteristic. Federal and state agencies may regulate development in and around designated scenic areas to preserve their visual characteristics.

The MAR crosses a variety of landscapes, including agricultural land, rangeland, wetlands, waterways, floodplains and forest, with the most common landscapes being agricultural land and rangelands. The MAR would not cross any federal lands that are managed for their scenic value. NHTs are managed in coordination with NPS but are not considered federal lands except where they cross federally owned property. Visual resources for these trails are managed in accordance with the regulations of the agency or entity that owns the land that the trail traverses. Because the trails are found on private property there is no visual resources management requirement, with the exception of the scenic byways.

The MAR would cross one designated Nebraska Scenic Byway, U.S. Route 30, near Richland, Nebraska. Scenic byways are designated based on “the number and quality of the proposed byway’s unusual, exceptional or distinctive scenic, historic, recreational, cultural or archeological features within a 40-mile radius of the proposed byway” along with other criteria (Nebraska Department of Transportation 2014). However, designation as a scenic byway does not place any restrictions on future development along or near the byway. No pump stations would be located close to U.S. Route 30.

The state of Nebraska does not have formal guidelines for managing visual resources for private or state-owned lands.

3.3 GEOLOGY AND SOILS

The 2014 Keystone XL Final SEIS discusses geology and soils along the Preferred Route. This section supplements the 2014 analysis to include discussion of geology and soils within the MAR and an update to paleontological resources along the Preferred Route based on surveys conducted in 2018. Chapter 5, Environmental Consequences from Accidental Releases, assesses the risk to geology and soils in the event of an accidental release. Chapter 6, Electrical Power Infrastructure, provides a description of geology and soils and an assessment of impacts from connected actions relating to electrical supply needs required for the proposed pipeline. Chapter 7, Cumulative Impacts, provides an assessment of the impacts to geology and soils from the proposed Keystone XL Project (including the electrical supply needs) in combination with other past, present and reasonably foreseeable future actions.

The ROI includes the geology and soils within and adjacent to the 110-foot-wide construction ROW (i.e., 60-foot-wide temporary ROW and the 50-foot-wide permanent operational ROW).

This SEIS considers the following data sources for characterizing geology and soils:

- USEPA Ecoregions
- USGS
- Nebraska Geological Survey
- USDA, Natural Resources Conservation Service (NRCS)
- 2014 Keystone XL Final SEIS

3.3.1 Geology Overview

Much of the description of the geologic conditions described for the Nebraska portion of the Preferred Route in the 2014 Keystone XL Final SEIS (Section 3.1) is also applicable to the MAR, such as the description of the surface and bedrock geology, fossil fuel and mineral resources, paleontological resources and geologic hazards. The proposed route extends through relatively flat and stable areas, and the potential for seismic hazards (earthquakes), landslides or subsidence (sink holes) is low. **Keystone reviewed national karst maps to determine areas of potential karst terrain along the MAR prone to subsidence and did not identify any areas that would present a significant concern.**

There are no known active oil, natural gas or coal mining operations along the MAR. The main mineral resource along the MAR is aggregate (sand and gravel) used for road and building construction. There are 12 mineral operations within 1 mile of the MAR centerline, mostly sand and gravel, but all operations are abandoned or inactive; 6 are located in Antelope County, 4 in Saline County and 2 in Seward County (University of Nebraska-Lincoln 2018). The pipeline would not cross any known active faults. Eastern Nebraska has experienced earthquakes in the past, however, and is within approximately 500 miles from the New Madrid fault zone which is the most active seismic area in the United States east of the Rocky Mountains.

The MAR lies within two different Level II Ecoregions of the Great Plains Physiographic Province: the northern portion of the MAR lies within the Western Corn Belt Plains, and the southern portion of the proposed route lies within the Central Great Plains. A brief overview of the physiographic characteristics of these two ecoregions is provided below (Chapman et al. 2001; Burchett 1986).

- Western Corn Belt Plains (MP 710.61 to 770.90). This region crosses through transitional sandy plain and northeastern Nebraska loess hills and is a mixture of level to rolling plains and glaciated, rolling low hills and perennial streams. The elevation ranges between 1,100 and

2,000 feet above mean sea level, and the local relief ranges between 5 and 300 feet, with significant local relief found near the Elkhorn River. The surficial geology includes alluvial sand, gravel and lacustrine silt and sediments, limestone and shale; and the underlying bedrock consists of shale, limestone and sandstone of the Niobrara Formation and Ogallala Group sandstone.

- Central Great Plains (MP 770.90 to 835.42). This region primarily crosses the Platte River Valley and Rainwater Basin Plains. It is a mixture of flat wide alluvial valley, shallow streams on a sandy bed and flat to rolling dissected plains with a deep layer of loess. It also contains intermittent and perennial streams (historically extensive rainwater basins and wetlands). The elevation ranges between 1,300 and 2,900 feet above mean sea level, and the local relief ranges between 2 and 100 feet. The surficial geology includes calcareous loess, alluvial sand, gravel and lacustrine sand and silt, shale, limestone, sandstone and Greenhorn limestone. The underlying bedrock consists of shale, limestone and sandstone of the Carlile Shale, Greenhorn Formation and Graneros Shale. Dakota Formation sandstone and shale underlie the proposed MAR from Butler County to the Kansas border.

3.3.1.1 Paleontological Overview

Approximately 4,133 acres were subject to a detailed pedestrian or visual paleontological survey based on bedrock formations. Within the MAR, two new non-significant fossil localities were documented during this effort and were found in loose limestone boulders lying on the surface (Exp and Paleo Solutions Inc. 2018). These fossils consist of Inoceramid (bivalve) shell fragments, coral impressions and unidentifiable bivalve shell fragments, and are likely from the Greenhorn Limestone. No in situ bedrock was observed during the field survey. While a records search conducted during the survey found no previously recorded fossil localities within the MAR, two such sites are located within 5 miles. These localities produced mammals, including a short-faced bear and an American Mastodon, in Pleistocene age deposits (Exp and Paleo Solutions Inc. 2018).

Keystone conducted the following additional surveys in 2018 for portions of the proposed pipeline route in Montana, South Dakota and Nebraska:

- Montana (between MP 1.17 and 274.83). The survey area included federally, state- and privately owned lands located in Fallon, Prairie, McCone and Valley counties. The survey documented one non-significant fossil occurrence (petrified wood fragments) and no significant fossil localities on federal lands; two non-significant fossil occurrences (petrified wood fragments) and no significant fossil localities on state lands; and four non-significant fossil occurrences (petrified wood fragments; one site with undetermined vertebrae fragments) on private lands (Exp and Paleo Solutions Inc. 2019a).
- South Dakota (between MP 288.28 and 599.74). The survey area included state- and privately owned lands located in Harding, Meade, Haakon, Pennington, Jones, Lyman and Tripp counties. The survey documented one non-significant fossil occurrence (petrified wood fragments) and no significant fossil localities on state lands, and four non-significant fossil occurrences (two sites petrified wood fragments; one site with pieces of baculites; and one site with phragmocone fragment) on private lands (Exp and Paleo Solutions Inc. 2019b).
- Nebraska (between MP 606.29 and 848.15). The survey area included privately owned lands located in Colfax, Madison, Holt, Antelope, Seward, Boyd, Saline, Stanton and Keya Paha counties. The survey did not document any significant or non-significant sites (Exp and Paleo Solutions Inc. 2019c).

3.3.2 Soils Overview

The soil conditions along the MAR are very similar to those discussed for Nebraska in Section 3.2 of the 2014 Keystone XL Final SEIS. Specifically, the MAR footprint lies within the following two land resource regions, located within the south-central part of the Great Plain Province of the Interior Plains Physiographic Region (NRCS 2004; 1998):

- Central Feed Grains and Livestock Region which encompasses Antelope, Madison, Stanton, Platte, Colfax Butler, Saline and Jefferson counties in Nebraska. The region extends for 71.72 miles (44 percent of the route), from MP 710 to 781.72. This is further classified as the Loess Uplands Resource Area.
- Central Great Plains Winter Wheat and Range Region which encompasses Butler, Seward and Saline counties in Nebraska. It extends a distance of 92.25 miles (56 percent of the route) from MP 781.73 to 873.98. The major resource areas crossed include the Central Nebraska Loess Hills, Loess Uplands, Central Loess Plains and Nebraska and Kansas Loess-Drift Hills.

The dominant landforms in the northern portion crossed by the MAR are stagnation moraines, end moraines, glacial outwash plains, terraces and floodplains. Progressing south, the MAR crosses uplands covered primarily by loess and underlain by glacial drift. The soils of these two land resource regions are very dark colored, base-rich, mineral soils known as Mollisols. Such soils generally have a frigid soil temperature regime, are very deep, have a loamy texture and range from well-drained to very poorly drained. Table 3.3-1 includes a summary of the physical and interpretative characteristics of the soil series within the MAR. Key definitions of soil characteristics identified in the table are provided below.

- Drought-prone soils include coarse-textured soils (sandy loams and coarser) that are moderately well to excessively drained.
- Hydric soils are saturated for a sufficient period of time during the growing season that the upper soil level is without oxygen. The NRCS defines hydric soils as soils under normal conditions that are saturated for a sufficient period of time during the growing season to support the growth of hydrophytic vegetation (NRCS 2018a); soils found in wetlands are called hydric soils.
- Prime farmland is defined by the NRCS as "having the best combination of chemical and physical characteristics for producing food, feed, forage, fiber and oilseed crops and is also available for these uses" (NRCS 2000). Undeveloped land with high crop production potential may be classified as "prime farmland."
- Soil loss tolerance (T-factor) is defined as the maximum rate of annual soil erosion that will permit crop productivity to be sustained economically and indefinitely. The T-factors are integer values from 1 through 5 tons per acre per year. The factor of 1 ton per acre per year is for shallow or otherwise fragile soils and 5 tons per acre per year is for deep soils that are least subject to damage by erosion. The classes of T-factors are 1, 2, 3, 4 and 5 (NRCS 2018b).

Table 3.3-1. Soil Characteristics within Proposed MAR

Soil Characteristics	Centerline Crossing (Miles)[a]	Acres Disturbed in ROW and Construction Areas [a, b]	Percentage of Route[a]
Drought Prone	7.0	104.6	4
Hydric	42.6	822.1	26
Prime Farmland	112.6	1,986.1	69
T-Factor Soil Loss Tolerance			
3 tons per year	34.1	622.3	21
5 tons per year	129.0	2,209.7	79

Source: NRCS 2018b, 2018c, 2018d

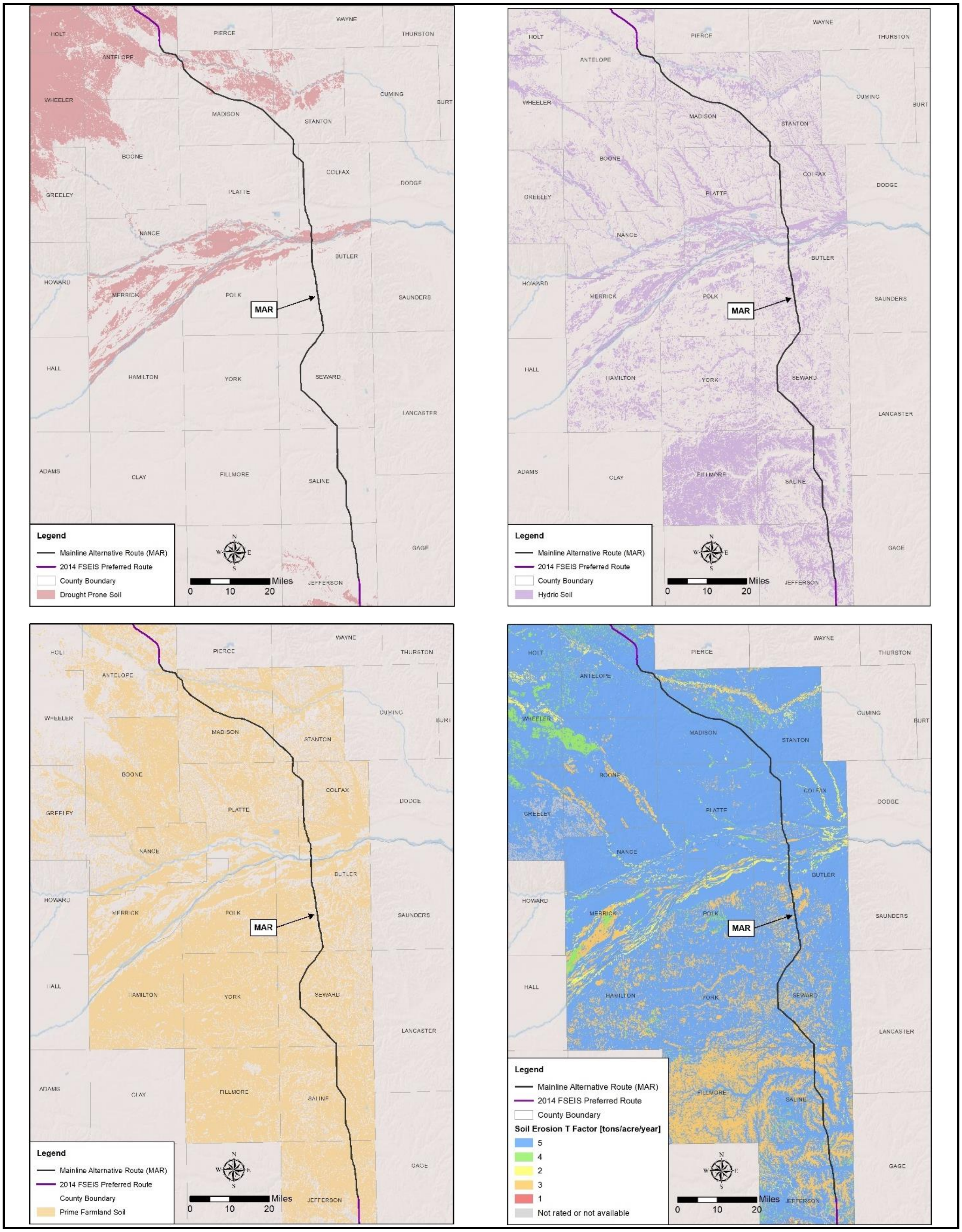
a. Percentages do not add up to 100 percent as soil types often contain more than one characteristic (e.g., soils in a given area can be classified as both hydric and prime farmland).

b. Acreage for the construction ROW include the pipeline ROW, additional temporary workspace areas, access road easement, pipe yard, contractor yard, rail siding and pump stations.

NRCS = Natural Resources Conservation Service; ROW = right-of-way

As seen in the table, soils along the MAR are dominated by prime farmland (69 percent) and soils with a high loss tolerance of 5 tons per year (73 percent). The higher T-factor soils indicate the MAR contains deep soils that are least subject to damage by erosion. Twenty-six percent of soils within the MAR are classified as hydric, and a small percentage (4 percent) are drought prone. Soils within the MAR are also prone to compaction (surface clay loam or soils of finer texture with poor to very poor drainage classes) and are dominant throughout the MAR, comprising 86 percent of the total area (Exp 2018). The most compaction prone soils are found along the southern portion of the route, below the Platte River.

Figure 3.3-1 shows the distribution of drought-prone, hydric and prime farmland soils along the MAR along with T-factor classifications. As seen in the figure, the drought prone soils are limited to the northern portion of the route on each side of the Antelope Madison county line, another portion of Madison County and just north of the Platte River in Colfax County. Hydric soils are scattered throughout the route but more concentrated next to waterbodies found along the MAR. Prime farmland is also scattered throughout the MAR but slightly more concentrated in the southern portion of the route. As discussed above, the MAR crosses through soils with soil erosion T-factors split primarily between 3 and 5 tons per year, including a fairly even split within the southern portion of the route and the 5 tons per year class dominating in the northern portion of the route.



Source: NRCS 2018b, 2018c, 2018d

Figure 3.3-1. MAR Soil Characteristics

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3.4 AIR QUALITY

The 2014 Keystone XL Final SEIS discusses air quality along the Preferred Route. This section supplements the 2014 analysis to include discussion of air quality within the potentially affected environment of the MAR. Chapter 5, Environmental Consequences from Accidental Releases, assesses the impacts to air quality in the event of an accidental release. Chapter 6, Electrical Power Infrastructure, provides a description of air quality and an assessment of impacts from connected actions relating to electrical supply needs required for the proposed pipeline. Chapter 7, Cumulative Impacts, provides an assessment of the impacts to air quality from the proposed Keystone XL Project (including the electrical supply needs) in combination with other past, present and reasonably foreseeable future actions.

Air pollution is the presence of one or more contaminants (e.g., dust, fumes, gas, mist, odor, smoke, vapor) in the outdoor atmosphere in quantities and of characteristics and duration such as to be injurious to human, plant or animal life. Air quality, as a resource, incorporates components that describe air pollution within a region, sources of air emissions and regulations governing those emissions. Regional climate, local terrain features and meteorological conditions also influence ambient air quality. See Section 3.10 for discussion of greenhouse gases and climate change.

The ROI for air quality extends beyond land-based construction and operational ROW boundaries of the MAR to include the greater Antelope, Madison, Stanton, Platte, Colfax, Butler, Seward, Saline and Jefferson counties, since air pollution dissipates throughout the atmosphere. This SEIS considers the following data types for characterizing air quality:

- Ambient air monitoring station data for Antelope, Madison, Stanton, Platte, Colfax, Butler, Seward, Saline and Jefferson counties,
- National Ambient Air Quality Standards (NAAQS), and
- Designations of attainment or nonattainment (i.e., meeting or not meeting the NAAQS).

3.4.1 Air Quality Overview

3.4.1.1 National Ambient Air Quality Standards

The MAR and associated facilities have the potential to affect local and regional ambient air quality. The USEPA sets NAAQS and develops regulations to help ensure good air quality. In the state of Nebraska, the NDEQ is responsible for monitoring compliance with ambient air quality standards and regulating air pollutant emissions. NDEQ samples countywide areas and compares the data with NAAQS. States may develop and enforce state-specific ambient air quality standards that are more stringent than federal regulations but cannot enforce rules that are less stringent.

NAAQS represent the maximum levels of background pollution that are considered safe, with an adequate margin of safety, to protect the public health and welfare (Table 3.4-1). Areas that do not meet these NAAQS are called nonattainment areas; areas that meet both primary and secondary standards are known as attainment areas. All counties crossed by the MAR in Nebraska (Antelope, Madison, Stanton, Platte, Colfax, Butler, Seward, Saline and Jefferson counties) are currently classified as either in “attainment” or “unclassified/attainment” (USEPA 2018a).

Table 3.4-1. National and State Ambient Air Quality Standards

Pollutant	Primary / Secondary	Averaging Time	National	Nebraska[a]
CO	Primary	8-hour[b]	9 ppm (10,000 µg/m^3)	9 ppm (10,000 µg/m^3)
	Primary	1-hour[b]	35 ppm (40,000 µg/m^3)	35 ppm (40,000 µg/m^3)
NO_2	Primary	1-hour[c]	100 ppb (188 µg/m^3)	100 ppb (188 µg/m^3)
	Primary and Secondary	Annual mean	53 ppb (100 µg/m^3)	53 ppb (100 µg/m^3)
O_3	Primary and Secondary	8-hour[d]	0.07 ppm	0.075 ppm
Pb	Primary and Secondary	Rolling 3-month average[e]	0.15 µg/m^3	0.15 µg/m^3
$PM_{2.5}$	Primary	Annual mean[f]	12.0 µg/m^3	12.0 µg/m^3
	Secondary	Annual mean[f]	15.0 µg/m^3	15.0 µg/m^3
	Primary and Secondary	24-hour[g]	35 µg/m^3	35 µg/m^3
PM_{10}	Primary and Secondary	24-hour[h]	150 µg/m^3	150 µg/m^3
SO_2	Primary	1-hour[i]	75 ppb (196 µg/m^3)	75 ppb (196 µg/m^3)
	Secondary	3-hour[b]	0.5 ppm	0.5 ppm
Total Reduced Sulfur	Primary	Maximum 1-minute average	N/A	10.0 ppm[j]
	Primary	Maximum 30-minute rolling average	N/A	0.10 ppm[j]

Source: USEPA 2018b; NDEQ 2018a

a. State ambient air quality standards only supersede NAAQS if more stringent.

b. Not to be exceeded more than once per year.

c. To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb.

d. The 3-year average of the fourth-highest daily maximum 8-hour average O_3 concentrations measured at each monitor within an area over each year must not exceed the standard.

e. NAAQS for lead not to be exceeded.

f. To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed the standard.

g. The 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m^3.

h. Not to be exceeded more than once per year on average over 3 years.

i. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.075 ppm.

j. These standards apply only where human exposure occurs. Ambient concentrations of total reduced sulfur emissions occurring as a result of natural activities that have no associated economic benefits, such as seasonal stratification or turnover of lakes and lagoons, and the release of water uncontaminated by process or industrial activity from lakes, reservoirs, lagoons and water impoundment systems shall not constitute violation of these standards. Specifics on these standards can be found under Nebraska Administrative Code Title 129, Chapter 4, Section 007 (NDEQ 2018a).

CO = carbon monoxide; N/A = not applicable; NAAQS = National Ambient Air Quality Standards; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter of diameter 2.5 microns or less; PM_{10} = particulate matter of diameter 10 microns or less; ppb = parts per billion; ppm = parts per million; SO_2 = sulfur dioxide; µg/m^3 = microgram per cubic meter

3.4.1.2 Air Quality Monitoring Network

Nebraska has a network of strategically placed outdoor air quality monitoring stations throughout the state. The air monitoring stations are composed of instrumentation owned and operated both by state agencies and by cooperating local agencies. The monitoring stations measure concentrations of the specific air pollutants relevant to that regional area and local meteorological conditions, such as wind speed and temperature. The monitoring stations measure characteristics of ambient air quality levels to determine the effects of emissions from all sources of criteria pollutants, track concentrations of air pollution over time and determine compliance with NAAQS and the state ambient air quality standards, thus assisting in the designation of nonattainment areas. However, the Nebraska air quality monitoring system does not include monitoring equipment in any of the counties crossed by the MAR (NDEQ 2018b).

3.4.1.3 Climate

Regional climate and meteorological conditions can influence the transport and dispersion of air pollutants that affect air quality. The climate along the MAR in Nebraska is warm during the summer when temperatures tend to be in the 70s degrees Fahrenheit (°F) and very cold during the winter when temperatures tend to be in the 20s°F. The warmest month of the year is July with an average maximum temperature of approximately 86°F near the northern point of the MAR (Tilden, Nebraska) and approximately 90°F near the southern point (Plymouth, Nebraska), while the coldest month of the year is January with an average minimum temperature of approximately 8°F to 12°F along the route. Temperature variations between night and day tend to be moderate during summer with a difference that can reach 25°F, and moderate during winter with an average difference of 23°F. The annual average precipitation ranges from approximately 27 inches to 31 inches along the route. Rainfall is fairly evenly distributed throughout the year. The wettest month of the year is June near the northern point of the MAR, and May near the southern point, with an average rainfall of approximately 4 to 5 inches along the route (Idcide 2018).

3.4.1.4 Nebraska Air Quality Rules

The MAR and associated facilities would not be subject to NDEQ or federal air permitting requirements because no stationary emissions sources would be installed. The pump stations are not considered stationary sources of air emissions because they would be operated using electrical power supplied by offsite sources.

According to 40 CFR 93.153(b), federal actions require a Conformity Determination for each pollutant where the total of direct and indirect emissions in a nonattainment or maintenance area caused by a federal action would equal or exceed any of the rates in paragraphs 40 CFR 93.153(b)(1) or (2). However, because the USEPA have classified all counties in Nebraska as in attainment for all NAAQS (USEPA 2018a), no Conformity Determination is required.

Nebraska has general air quality rules relating to air quality considerations that are applicable to construction of the MAR, including prevention of construction dust and prevention of visible emissions from diesel-powered motor vehicles. Table 3.4-2 summarizes general air quality rules applicable to the construction of the MAR, facilities and access roads.

Table 3.4-2. Nebraska Air Quality Regulations Pertaining to Construction of the MAR

Title	Details	Applicability to the Proposed Project
NDEQ, Title 129, Chapter 32, Sections 001, 002 Duty to Prevent Escape of Dust	No person may cause or permit the handling, transporting or storage of any material in a manner which may allow particulate matter to become airborne in such quantities and concentrations that it remains visible in the ambient air beyond the premises where it originates. No person may cause or permit a building or its appurtenances or a road, or a driveway or an open area to be constructed, used, repaired or demolished without applying all such reasonable measures to prevent particulate matter from becoming airborne so that it remains visible beyond the premises where it originates. The Director may require such reasonable measures as may be necessary to prevent particulate matter from becoming airborne, including but not limited to paving or frequent cleaning of roads, driveways and parking lots; application of dust-free surfaces; application of water; and the planting and maintenance of vegetative ground cover.	Construction of the MAR pipeline, pump stations and access roads would require excavation, temporary storage, moving and grading of soil, which can result in airborne particulate matter.
NDEQ, Title 129, Chapter 39, Section 001 Visible Emissions from Diesel-Powered Motor Vehicles	No person shall operate a diesel-powered motor vehicle on any public street or highway in such a manner that smoke discharged from the exhaust is of a shade or density equal to or darker than that designated as No. 1 on the Ringelmann Chart or an equivalent opacity of 20% for 10 consecutive seconds or longer.	Construction of the MAR and associated facilities and access roads would require use of diesel-powered motor vehicles of which some would travel on highways and public streets.

Source: NDEQ 2018c

% = percent; MAR = Mainline Alternative Route; NDEQ = Nebraska Department of Environmental Quality

3.4.1.5 Class 1 Areas

Under the Clean Air Act, the Class I area designations were given to 156 areas that met certain criteria (e.g., national parks greater than 6,000 acres, national wilderness areas and national memorial parks greater than 5,000 acres, and one international park) (40 CFR 81.400). The purpose of the Class I areas is to provide a protection program for specific air quality concerns at each Class I area. Section 162(a) of the Clean Air Act granted these areas special air quality protections. Generally, air quality impacts at Class I areas are evaluated when a proposed emissions source is a major source and is within 100 kilometers (62 miles) of a Class I area. There are no Class I National Park and Wilderness Areas in Nebraska; the nearest sites are in Colorado and South Dakota. NDEQ provides fine particulate and particulate speciation monitors at the Nebraska National Forest in Halsey, Thomas County, intended to provide information for studying regional haze that may impact Class I National Park and Wilderness Areas, as part of the Interagency Monitoring of Protected Visual Environments program (NDEQ 2018b).

3.5 NOISE AND VIBRATION

The 2014 Keystone XL Final SEIS discusses noise conditions along the Preferred Route. This section supplements the 2014 analysis to include discussion of the noise conditions within the MAR. Chapter 5, Environmental Consequences from Accidental Releases, assesses the impacts to noise conditions along the pipeline in the event of an accidental release. Chapter 6, Electrical Power Infrastructure, provides a description of noise conditions and an assessment of impacts from connected actions relating to electrical supply needs required for the proposed pipeline. Chapter 7, Cumulative Impacts, provides an assessment of the impacts to noise and vibration from the proposed Keystone XL Project (including the electrical supply needs) in combination with other past, present and reasonably foreseeable future actions.

The ROI for noise extends 0.5 mile from the 110-foot construction ROW edge of the MAR, which is the area that could be susceptible to noise impacts.

This SEIS considers the following data sources for characterizing the noise environment and vibration:

- Aerial photography to identify potential noise-sensitive receptors near the pipeline including the USDA Farm Service Agency National Imagery Program county mosaics for counties within the Project area.
- The 2012 USDOT High-Speed Ground Transportation Noise and Vibration Impact Assessment methodology to estimate ambient, construction and operational noise levels, and to evaluate general noise and vibration concepts.
- USEPA methodology for noise concepts and limits.
- TransCanada Keystone XL Pipeline Nebraska Environmental Report, April 2018.

3.5.1 Noise and Vibration Overview

Sound is a physical phenomenon consisting of vibrations that travel through a medium, such as air, and are sensed by the human ear. Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing or is otherwise intrusive. Human response to noise varies depending on the type and characteristics of the noise, distance between noise source and receptor, receptor sensitivity and time of day. Noise is often generated by activities essential to a community's quality of life, such as construction or vehicular traffic.

> **Sound** is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and sensed by the human ear.
>
> **Noise** is defined as any unwanted sound. The human ear experiences sound as a result of pressure variations in the air.

Sound varies by both intensity and frequency. The physical intensity or loudness level of noise is expressed quantitatively as the sound pressure level. Sound pressure levels are defined in terms of decibels (dB), which are measured on a logarithmic scale. Sound can be quantified in terms of its amplitude (loudness) and frequency (pitch). Frequency is measured in hertz, which is the number of cycles per second. The typical human ear can hear frequencies ranging from approximately 20 hertz to 20,000 hertz. Typically, the human ear is most sensitive to sounds in the middle frequencies where speech is found and is less sensitive to sounds in the low and high frequencies.

Since the human ear cannot perceive all pitches or frequencies equally, measured noise levels in dB will not reflect the actual human perception of the loudness of the noise. Thus, the sound measures can be adjusted or weighted to correspond to a scale appropriate for human hearing. The common sound descriptors used to evaluate the way the human ear interprets dB from various sources are as follows:

- **Decibel (dB)**: Sound pressure level measurement of intensity. The decibel is a logarithmic unit that expresses the ratio of a sound pressure level to a standard reference level.
- **A-Weighted Decibel Scale (dBA):** Often used to describe the sound pressure levels that account for how the human ear responds to different frequencies and perceives sound.
- **Hertz**: Measurement of frequency or pitch.
- **Equivalent Sound Level (L_{eq}):** The L_{eq} represents the average sound energy over a given period, presented in decibels.
- **Day-Night Average Sound Level (L_{dn}):** The L_{dn} is the 24-hour L_{eq}, but with a 10-dB penalty added to nighttime noise levels (10 p.m. to 7 a.m.) to reflect the greater intrusiveness of noise experienced during this time.
- **Sensitive Receptors**: Locations or land uses associated with indoor or outdoor areas inhabited by humans that may be subject to significant interference from noise (i.e., nearby residences, schools, hospitals, nursing home facilities and recreational areas).

The adjusted scales are useful for gauging and comparing the subjective loudness of sounds to humans. The threshold of perception of the human ear is approximately 3 dB. A 5-dB change is considered to be clearly noticeable to the ear, and a 10-dB change is perceived as an approximate doubling (or halving) of the noise level (MPCA 1999). Table 3.5-1 presents a list of sounds encountered in daily life and their approximate levels in dBA. Table 3.5-2 presents the typical sound levels associated with residential communities.

Table 3.5-1. Examples of Common Sound Levels

Noise Level (dBA)	Description	Typical Sources
140	Threshold of pain	–
125	Uncomfortably loud	Automobile assembly line
120	Uncomfortably loud	Jet aircraft
100	Very loud	Diesel truck
80	Moderately loud	Motor bus
60	Moderate	Low conversation
40	Quiet	Quiet room
20	Very quiet	Leaves rustling

Source: Liu and Lipták 1997
dBA = A-weighted sound level in decibels

Table 3.5-2. Typical L_{90} Sound Levels in Residential Communities

Description	Typical Range (dBA)	Average (dBA)
Very Quiet Rural or Remote Area	26 to 30	28
Very Quiet Suburban or Rural Area	31 to 35	33
Quiet Suburban Residential	36 to 40	38
Normal Suburban Residential	41 to 45	43
Urban Residential	46 to 50	48
Noisy Urban Residential	51 to 55	53
Very Noisy Urban Residential	56 to 60	58

Source: USEPA 1974
dBA = A-weighted decibel
Note: L_{90} is the level exceeded for 90 percent of the time. For 90 percent of the time, the noise level is above this level. It is generally considered to be representing the background or ambient level of a noise environment.

Ambient or background noise is a combination of various sources heard simultaneously. Calculating noise levels for combinations of sounds does not involve simple addition, but instead uses a logarithmic scale (HUD 1985). As a result, the addition of two noises, such as a garbage truck (100 dBA) and a lawn mower (95 dBA) would result in a cumulative sound level of 101.2 dBA, not 195 dBA.

Noise levels decrease (attenuate) with distance from the source. The decrease in sound level from any single noise source normally follows the “inverse square law.” That is, the sound level change is inversely proportional to the square of the distance from the sound source. A generally accepted rule is that the sound level from a stationary source would drop approximately 6 dB each time the distance from the sound source is doubled. Sound level from a moving “line” source (e.g., a train or vehicle) would drop 3 dB each time the distance from the source is doubled (USDOT 2012).

Barriers, both manmade (e.g., sound walls) and natural (e.g., forested areas, hills, etc.) may reduce noise levels, as may other natural factors, such as temperature and climate. Standard buildings typically provide approximately 15 dB of noise reduction between exterior and interior noise levels (USEPA 1978). Noise generated by stationary and mobile sources has the potential to impact sensitive noise receptors, such as residences, hospitals, schools and churches. Persistent and escalating sources of sound are often considered annoyances and can interfere with normal activities, such as sleeping or conversation, such that these sounds could disrupt or diminish quality of life.

Vibration refers to the oscillations or rapid linear motion of parts of a fluid or elastic solid whose equilibrium has been disturbed. Vibration is often expressed in terms of the peak particle velocity, as inches per second or millimeters per second, when used to evaluate human annoyance and building damage impacts. Common sources of ground-borne vibration are trains, heavy farm or construction machinery and ground-breaking construction activities such as blasting, drilling and operating heavy earth-moving equipment. Although it is unusual for vibration from sources such as buses and trucks to be perceptible, ground-borne vibration can be a serious concern for sensitive receptors near construction activities, a transit system route or maintenance facility. The impacts of ground-borne vibration include perceptible movement of the building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. In severe cases, the vibration can cause damage to buildings (USDOT 2012).

While there are no federal standards for vibration, various researchers and organizations have published guidelines. The human response to vibration involves barely perceptible vibration levels (in peak particle velocity) of 0.01 inch per second, distinctly perceptible levels of 0.04 inch per second and strongly perceptible of 0.10 inch per second (Jones and Stokes 2004). The vibration levels represent continuous, frequent or intermittent sources that are typical of construction activities such as directional drilling operations. Additionally, 0.2 inch per second is the threshold at which there is a risk of architectural damage to normal structures, such as dwellings (Jones and Stokes 2004).

3.5.1.1 Existing Noise Environment

The MAR would be constructed in primarily rural agricultural areas. The existing noise level in a particular area is generally based on its proximity to nearby major roadways or railroads or on population density (USDOT 2006). The majority of the MAR corridor is not close to major roadways or railways. Therefore, ambient noise levels were estimated based on the population density of each affected county using the methodology described in USDOT's Transit Noise and Vibration Impact Assessment (USDOT 2006).

According to the U.S. Census Bureau, the population density of the affected counties is between approximately 8 and 61 people per square mile (U.S. Census Bureau 2010a). As a result, the existing L_{dn} in the vicinity of the MAR is estimated with be 35 dBA, and the existing ambient equivalent continuous sound levels (in L_{eq}) during daytime and nighttime are estimated to be approximately 35 and 25 dBA, respectively (USDOT 2006). Ambient (background) noise levels occur from infrequent roadway traffic, farm machinery on a seasonal basis, pets and various other household noises. However, depending on the distance from the pumping units, residences near pump stations can experience increased ambient noise levels because of operation of the pumps for the pipeline.

The closest noise-sensitive receptor is located approximately 140 feet from the pipeline construction ROW. Additionally, there are approximately 157 noise-sensitive receptors located within 500 feet and approximately 1,090 within 0.5 mile of the construction ROW. Table 3.5-3 presents the closest nearby noise-sensitive receptors within 0.5 mile of each pump station.

Table 3.5-3. Nearest Noise-Sensitive Receptors to the Pump Stations

Pump Station Location	County	Nearest Milepost	Distance from Source to Noise-Sensitive Receptor (feet)	Direction from Nearest Receptor to Source	Number of Residences within 0.5 Mile of Source
Pump Station 23B	Platte	758	798	Southwest	9
Pump Station 24	Butler	785	1,520	East	4
Pump Station 25	Seward	830	2,031	Northwest	3

Source: Google Earth 2018b
dBA = A-weighted decibel
Note: Aerial imagery was used to identify potential nearby sensitive receptors (Google Earth 2018b).

The closest federal and state parks to the MAR are the Blue River State Recreational Area in Seward County, Nebraska and the De Soto National Wildlife Refuge in Harrison County, Iowa, which are approximately 0.9 mile west and 78 miles east of the construction ROW, respectively.

3.5.1.2 Noise Regulations

The Noise Control Act of 1972 (42 USC 4901) directs federal agencies to comply with applicable federal, state, interstate and local noise control regulations. The primary responsibility of addressing noise pollution has shifted to state and local governments. In 1974, the USEPA published its document entitled *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin on Safety,* which evaluated the effects of environmental noise with respect to health and safety (USEPA 1974). The document provides information for state and local agencies to use in developing their ambient noise standards. As set forth in the publication, the USEPA provided information suggesting that an $L_{eq(24)}$ of 70 dBA is the level above which environmental noise could cause hearing loss if heard consistently over several years. An L_{dn} of 55 dBA outdoors and 45 dBA indoors is the threshold above which noise could cause interference or annoyance (USEPA 1974).

No standardized criteria have been developed for assessing construction noise impact (i.e., short-term or temporary activities; usually less than 1 year). Nebraska does not have regulatory noise limits for construction, although some local governments have ordinances governing noise from construction or industrial activities. In the absence of standardized criteria for a detailed assessment of construction noise, the Federal Transit Administration recommends the following for residential areas: construction noise levels at the sensitive receptor should not exceed an 8-hour L_{eq} of 80 dBA during daytime (7 a.m. to 10 p.m.), an 8-hour L_{eq} of 70 dBA during nighttime (10 p.m. to 7 a.m.) and a 30-day average L_{dn} of 75 dBA. In urban areas with very high ambient noise levels (L_{dn} greater than 65 dBA), L_{dn} from construction operations should not exceed existing ambient plus 10 dBA (USDOT 2006).

Aside from the USEPA noise standards described above, Keystone has agreed to a 55 dBA L_{dn} measured at the nearest noise-sensitive receptor in Nebraska during operations at pump stations (Exp 2018). Additionally, noise levels of the proposed Project plus baseline noise levels would not exceed a 10-dBA increase from the baseline noise levels at pump stations (U.S. Department of State 2014).

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3.6 WATER RESOURCES

The 2014 Keystone XL Final SEIS discusses water resources along the Preferred Route. This section supplements the 2014 analysis to include discussion of water resources along the MAR. Chapter 5, Environmental Consequences from Accidental Releases, assesses the risk to water resources in the event of an accidental release; this includes new information related to the proposed Keystone XL pipeline's crossing of the Missouri River in Montana, and an updated evaluation of surface water intakes extending 40 river-miles downstream of proposed pipeline crossings. Chapter 6, Electrical Power Infrastructure, provides a description of water resources and an assessment of impacts from connected actions relating to electrical supply needs required for the proposed pipeline. Chapter 7, Cumulative Impacts, provides an assessment of the impacts to water resources from the proposed Keystone XL Project (including the electrical supply needs) in combination with other past, present and reasonably foreseeable future actions.

This section discusses water resources along the MAR, to include groundwater, surface water, wetlands, floodplains and wild and scenic rivers. The ROI includes water resources within and adjacent to the 110-foot-wide construction ROW, which includes the 50-foot-wide operational ROW.

This SEIS considers the following data sources for characterizing water resources:

- USEPA
- NDEQ
- State of Nebraska geographic databases
- USGS
- Surface Water Quality Standards
- Waterbody and wetland surveys conducted for the MAR
- FEMA

3.6.1 Water Resources Overview

3.6.1.1 Groundwater

Groundwater resources are a primary source of irrigation and potable water in Nebraska. While the MAR includes slight changes from descriptions in Section 3.3.2 of the 2014 Keystone XL Final SEIS for Nebraska, the underlying groundwater and aquifer descriptions within the MAR are similar. Principal groundwater aquifers underlying the MAR include alluvial aquifers and the Northern High Plains Aquifer, a nationally important water resource that underlies much of the state; and the Lower Cretaceous Aquifer. A principal aquifer is defined as a regionally extensive aquifer or aquifer system that has the potential to be used as a source of potable water (USGS 2003, 2002).

Alluvial aquifers are found within the uppermost (shallow) groundwater-bearing zones and are unconsolidated sediment (sand and gravel) aquifers representing a variety of settings, including river and stream valleys (alluvial aquifers) and glacial drainages (glacial drift aquifers) (Divine and Sibray 2017). Alluvial aquifers that underlie the MAR typically consist of sediments deposited in stream valleys. Where these stream valley aquifers cross the Northern High Plains Aquifer, the stream valleys are hydraulically connected to, and considered to be part of, the underlying Northern High Plains Aquifer. Groundwater in the alluvial aquifers is typically shallow (less than 50 feet below ground surface) and unconfined (USGS 1997).

The Northern High Plains Aquifer consists of hydraulically connected geologic units from the late Tertiary through Quaternary geologic time. The principal geologic unit in the Northern High Plains Aquifer in Nebraska is the Ogallala Group. This unit covers the largest area in Nebraska and is the most plentiful source of groundwater in the aquifer. The Ogallala Group mostly consists of unconsolidated sand and gravel, although its occurrence along the MAR is limited to the northern most portion of the route (Antelope and Madison counties) where the formation is primarily underlain by the Pierre Shale, as described further below. Depth to groundwater in the Ogallala Group ranges from near the surface to 200 feet below ground surface, and the median depth to groundwater in this unit is 110 feet below ground surface (U.S. Department of State 2014). Where the Ogallala Group is not present, the Northern High Plains Aquifer is typically described to include groundwater bearing Quaternary and recent aeolian, fluvial and glacial alluvium overlying and adjacent to the Ogallala Group; as such, conditions overlap somewhat with the shallow alluvial aquifers described previously.

Other units in the Northern High Plains Aquifer include younger deposits which provide sources of water. These groundwater regions that underlie the MAR include Quaternary/recent alluvium of the Eastern Nebraska Unit (including the Northeast and Southeast Nebraska Glacial Drift and South Central Plains) and the Platte River Valley Unit. The Eastern Nebraska Unit refers to the late Tertiary and Quaternary in the eastern part of the Northern High Plains where the Ogallala is thin or absent (USGS 2007). This unit consists of sand and gravel and overlies Cretaceous-age bedrock. The median depth to groundwater in this unit is 79 feet below ground surface level (U.S. Department of State 2014).

The Platte River Valley Unit includes alluvial sediments within the Platte River Valley of the Northern High Plains Aquifer. This unit consists of stream deposited sand, gravel and clay of Quaternary to Holocene age and also overlies Cretaceous-age bedrock. Depth to groundwater is generally less near the Platte River because it is hydraulically connected to the aquifer through the stream valley aquifers that parallel the rivers (USGS 1997). The median depth to groundwater in this unit is approximately 5 feet below ground surface level (U.S. Department of State 2014).

When present, the Ogallala Group and associated alluvial aquifers are a primary source of groundwater for agricultural, domestic, commercial, industrial and potable use. Available studies and reports indicate that, in general, water within the Northern High Plains Aquifer and alluvial aquifers in the state exhibit low concentrations of total dissolved solids, making the water in the shallow aquifers generally suitable for irrigation, potable and industrial uses (USGS 2007). Along the MAR, the primary use is for irrigation; other uses include potable use, livestock watering and industrial use. However, while the water quality of the Northern High Plains Aquifer is suitable for drinking, impacts from farming operations are present in areas of shallow groundwater. Table 3.6-1 summarizes compounds found in more than 50 groundwater samples drawn from wells monitored in Nebraska.

Table 3.6-1. Compounds Found in Wells Monitored in Nebraska

Compound	Total Samples Collected	Number of Samples that Exceed the Reporting Limit	Percent of Samples that Exceed the Reporting Limit (percent)
Nitrate-N	117,049	103,515	88.4
Alachlor ethane sulfonic acid	136	7	52.2
Deethylatrazine	5,678	1,572	27.7
Atrazine	10,590	2,283	21.6
Metolachlor	9,660	1,066	11.0
Deisopropylatrazine	4,989	380	7.6
Cyanazine	10,122	422	4.2
Alachlor	10,160	305	3.0
Propazine	5,571	120	2.2
Simazine	6,131	125	2.0
Prometon	5,925	55	0.9
Metribuzin	10,016	60	0.6

Source: NDEQ 2017

Note: Nitrate is a form of nitrogen common in human and animal waste, plant residue and commercial fertilizers. All other compounds in this table are herbicides, or degradation products or metabolites of herbicides.

Figure 3.6-1 shows the distribution of these aquifers within the ROI. The MAR would extend 148.5 linear miles through areas underlain by the Northern High Plains Aquifer. A further breakout of the specific groundwater regions crossed include the following: 31.3 miles through the East Central Dissected Plains/Ogallala Group, 35 miles through the Northeast Nebraska Glacial Drift, 9.1 miles through the Platte River Valley, 29.3 miles through the South Central Plains, and 58.7 miles through the Southeast Nebraska Glacial Drift, for a total of 163.4 miles. The majority of the MAR overlies aquifers of alluvial and glacial origin (113.8 miles) (Figure 3.6-1) (USGS 2003, 2002).

As shown in Figure 3.6-1, the principal aquifer unit underlying the northern portion of the MAR includes unconsolidated sediments of Quaternary age (including the Northeast Nebraska Glacial Drift Aquifer) and the Ogallala Group, where present in Antelope and Madison counties. The principal aquifer unit underlying the portion of the MAR that crosses the Platte River (southern Colfax and northern Butler counties) is the Platte River Valley Unit of the Northern High Plains Aquifer. The southern portion of the MAR overlies the Southeast Nebraska Glacial Drift and South Central Plains units.

In addition, because primary aquifers are thin or absent in parts of eastern Nebraska, the population in eastern Nebraska relies on secondary aquifers for water use. Secondary aquifers are bedrock aquifers of Cretaceous age (Lower Cretaceous Principal Aquifer) that lie below the principal aquifers. There are four secondary aquifers in eastern Nebraska. The extent to which they are used varies, but the aquifer with the largest number of active registered wells (more than 3,000 statewide) is the Dakota Aquifer that underlies a small portion (approximately 13 miles) of the MAR in Butler and Jefferson counties.

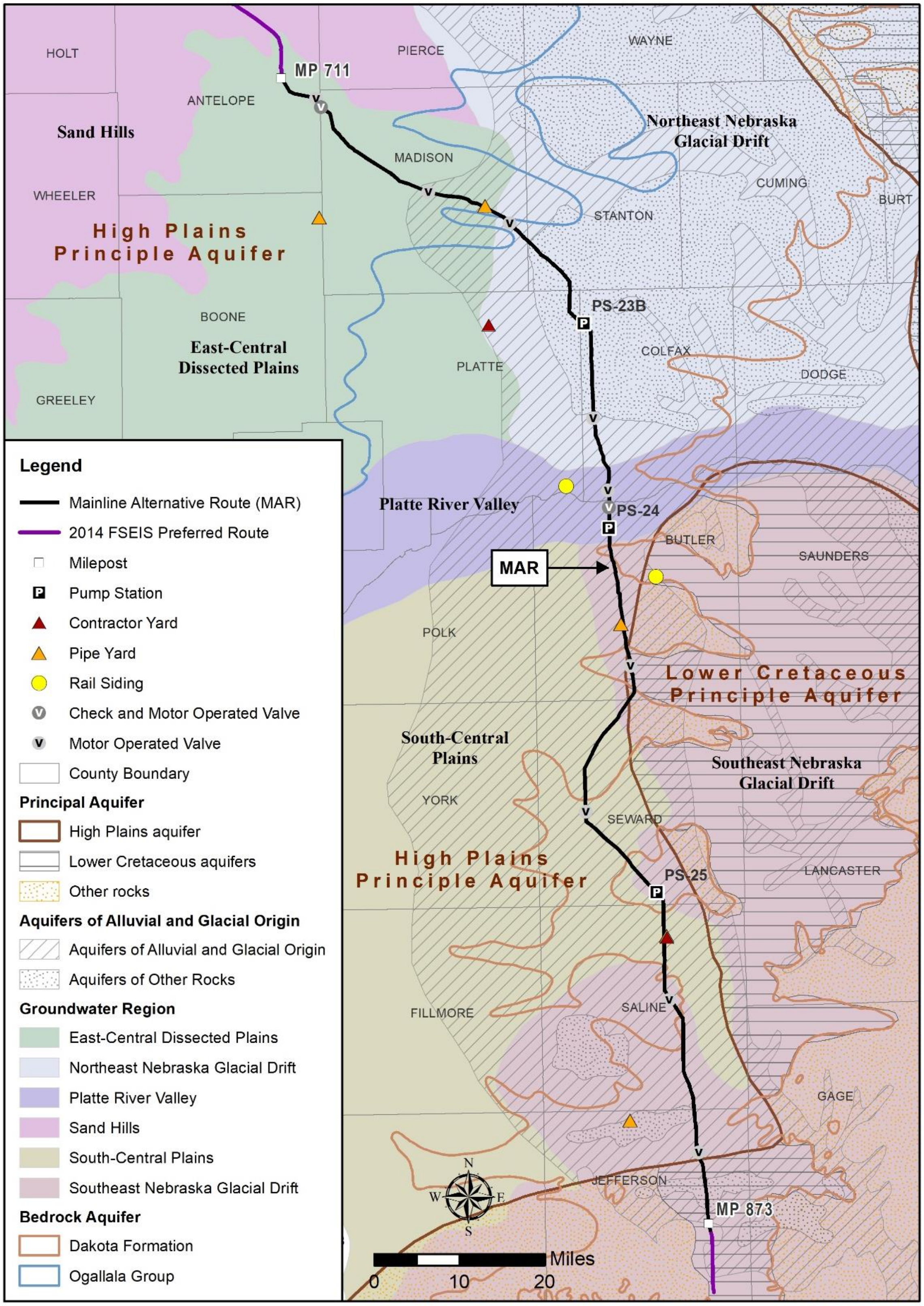
Most of the wells are private domestic wells (over 70 percent). The concentration of registered private wells is especially high in southern Jefferson County. Private wells more commonly draw from primary aquifers than from secondary aquifers. Secondary aquifers generally have lower yield than primary aquifers and, because they are hosted by bedrock units, they are more consolidated and harder to drill through to establish a well (Divine and Sibray 2017).

A total of 12 private water wells are located within 100 feet of the MAR, although 3 are abandoned. Of the nine active wells, two wells are classified as domestic and seven wells are classified as irrigation. The active wells are located in Madison, Butler, Seward, Saline and Jefferson counties. Their approximate milepost locations and distance from the centerline are identified in Table 3.6-2.

Table 3.6-2. Private Wells within 100 Feet of the MAR

County	Well Use	Approximate Milepost	Distance from Centerline (feet)
Madison	Irrigation	727.13	2.54
Madison	Irrigation	736.89	8.10
Butler	Irrigation	802.06	10.28
Seward	Irrigation	821.56	32.73
Saline	Irrigation	835.56	54.01
Saline	Domestic	836.53	25.97
Saline	Domestic	846.89	67.81
Jefferson	Irrigation	860.67	94.50
Jefferson	Irrigation	870.92	10.39

Source: NDNR 2018
MAR = Mainline Alternative Route



Source: USGS 2003, 2002

Figure 3.6-1. Aquifers Crossed by the MAR

The MAR also lies within 1 mile of seven wellhead protection areas, which are areas regulated to prevent contamination of a well or well field supplying a public water supply system. Their locations are listed by county in Table 3.6-3.

Table 3.6-3. Wellhead Protection Areas within 1 Mile of the MAR

County	Approximate Milepost	Distance and Direction from Centerline (miles)
Antelope (City of Tilden)	717.60	0.28 SW
Madison (City of Battle Creek)	732.14	0.23 NNE
Seward (Village of Goehner)	822.62	0.25 NE
Seward (City of Milford)	829.33	0.83 NE
Saline (Village of Dorchester)	837.56	0.50 W
Jefferson (Village of Plymouth)	863.41	0.14 E
Jefferson (Village of Harbine)	869.84	0.49 E

Source: NDEQ 2018d
E = east; MAR = Mainline Alternative Route; N = north; NE = northeast; SW = southwest; W = west

3.6.1.2 Surface Water

Nebraska's rivers of the central High Plains typically flow through broad, flat valleys and deposit and rework sediments. These sediments form dynamic and unstable braided channel and transient depositional bars within relatively flat and broad valleys (Wiken et al. 2011). The proposed MAR would cross three major river basins in Nebraska: Elkhorn, Lower Platte and Big Blue. Streams are typically overloaded with fine-grain sediment, mostly silt and sand with smaller quantities of gravel. The MAR crosses a total of 105 waterbodies, including 31 perennial rivers and streams, 60 intermittent/ephemeral streams and 14 other waterbodies (e.g., levee and water control structures such as man-made ditch, etc.) (Exp and Westech 2018a). A perennial river or stream is one that flows continuously. An intermittent stream is one that flows only at certain times of the year when it receives water from springs or from some surface source such as melting snow in mountainous areas. An ephemeral stream is one that flows only in response to direct precipitation and whose channel is always above the water table. Table 3.6-4 provides a listing of the perennial streams crossed by the proposed MAR, as well as Title 117, *Nebraska Surface Water Quality Standards,* water quality designation and proposed crossing method. Table 3.7-2 in Section 3.7 provides state classifications with respect to aquatic life.

The total waterbody crossing distance within the MAR would be 0.7 mile, 0.36 mile of which would be crossed using the HDD method. Figure 3.6-2 illustrates the major watersheds in Nebraska and the significant river and stream waterbodies within those watersheds that would be crossed by the MAR.

Table 3.6-4. MAR Perennial Stream Crossings

County	Milepost	Waterbody	Title 117 Segment Number	Crossing Length[a] (feet)	State Water Quality Classification	Crossing Method
Antelope	712.5	Trueblood Creek	11200	16	Agricultural Water Supply – Class A; Aesthetics	Open-Cut
Antelope	716.3	Elkhorn River	10000	209.16	Primary contact recreation; Agricultural Water Supply – Class A; Aesthetics	HDD
Antelope	716.4	Giles Creek	11000	51.33	Agricultural Water Supply – Class A; Aesthetics	Open Cut
Madison	723.7	Buffalo Creek	10700	12.36	Agricultural Water Supply – Class A; Aesthetics	Open Cut
Madison	731.7	Battle Creek	10500	6.68	Agricultural Water Supply – Class A; Aesthetics	Open Cut
Madison	737.5	Tributary to Taylor Creek	Not listed in NDEQ 2014. Field survey captured this as perennial.	4.5	N/A	Open Cut
Madison	742.6	Tributary to Union Creek	Not listed in NDEQ 2014. Field survey captured this as perennial.	6.3	N/A	Open Cut
Stanton	747.1	Union Creek	21900	29.64	Primary contact recreation; Agricultural Water Supply – Class A; Aesthetics	HDD
Stanton	748.4	Tributary to Meridian Creek	Not listed in Title 117. Field survey captured this as perennial.	8.83	N/A	Open Cut
Colfax	771.4	Shell Creek	20600	69.23	Primary contact recreation; Agricultural Water Supply – Class A; Aesthetics	Open Cut
Colfax	778.7	Lost Creek	21100	29.75	Agricultural Water Supply – Class A; Aesthetics	Open Cut

Table 3.6-4. MAR Perennial Stream Crossings

County	Milepost	Waterbody	Title 117 Segment Number	Crossing Length[a] (feet)	State Water Quality Classification	Crossing Method
Butler	781.1	Platte River	20000	1429.74	Primary contact recreation; Public Drinking Water Use; Agricultural Water Supply – Class A; Aesthetics	HDD
Butler	781.5	Tributary to Platte River	Not listed in Title 117. Field survey captured this as perennial.	10.18	Agricultural Water Supply – Class A; Aesthetics	Open Cut
Butler	783.5	Deer Creek	21600	18.01	Agricultural Water Supply – Class A; Aesthetics	Open Cut
Butler	786.3	Tributary to Deer Creek	Not listed in Title 117. Field survey captured this as perennial.	4.84	N/A	Open Cut
Butler	788.1	Tributary to Deer Creek	Not listed in Title 117. Field survey captured this as perennial.	2.10	N/A	Open Cut
Butler	790.0	Tributary to Little Blue River	Not listed in Title 117. Field survey captured this as perennial.	17.37	N/A	Open Cut
Butler	793.7	Tributary to Little Blue River	Not listed in Title 117. Field survey captured this as perennial.	21.67	N/A	Open Cut
Butler	798.7	Tributary to Little Blue River	Not listed in Title 117. Field survey captured this as perennial.	13.61	N/A	Open Cut
Butler	800.2	Tributary to Little Blue River	Not listed in Title 117. Field survey captured this as perennial.	6.24	N/A	Open Cut
Seward	807.7	Big Blue River	30000	41.42	Agricultural Water Supply – Class A; Aesthetics	HDD
Seward	812.0	Lincoln Creek	20800	30.9	Agricultural Water Supply – Class A; Aesthetics	Open Cut

Table 3.6-4. MAR Perennial Stream Crossings

County	Milepost	Waterbody	Title 117 Segment Number	Crossing Length[a] (feet)	State Water Quality Classification	Crossing Method
Saline	834.7	West Fork, Big Blue River	10000	71.86	Primary contact recreation; Agricultural Water Supply – Class A; Aesthetics	Open Cut
Saline	841.0	Turkey Creek	30000	38.11	Agricultural Water Supply – Class A; Aesthetics	Open Cut
Saline	842.5	Spring Creek	20100	39.29	Agricultural Water Supply – Class A; Aesthetics	Open Cut
Saline	849.3	Dry Creek	Not listed in Title 117. Field survey captured this as perennial.	2.95	Agricultural Water Supply – Class A; Aesthetics	Open Cut
Saline	849.4	Dry Creek	Not listed in Title 117. Field survey captured this as perennial.	8.13	Agricultural Water Supply – Class A; Aesthetics	Open Cut
Saline	856.6	Swan Creek	10100	41.43	Agricultural Water Supply – Class A; Aesthetics	Open Cut
Jefferson	867.0	Cub Creek	11900	29.22	Agricultural Water Supply – Class A; Aesthetics	Open Cut
Jefferson	867.8	Tributary to Cub Creek	Not listed in Title 117. Field survey captured this as perennial.	7.69	N/A	Open Cut
Jefferson	867.8	Tributary to Cub Creek	Not listed in Title 117. Field survey captured this as perennial.	74.23	N/A	Open Cut
Jefferson	872.8	Big Indian Creek	10800	15.78	N/A	Open Cut

Source: NDEQ 2014

[a.] Crossing length is the linear distance the waterbody is intersected by the pipeline, as measured in feet.

HDD = horizontal directional drill; MAR = Mainline Alternative Route; N/A = not applicable (unnamed tributary does not have a use classification)

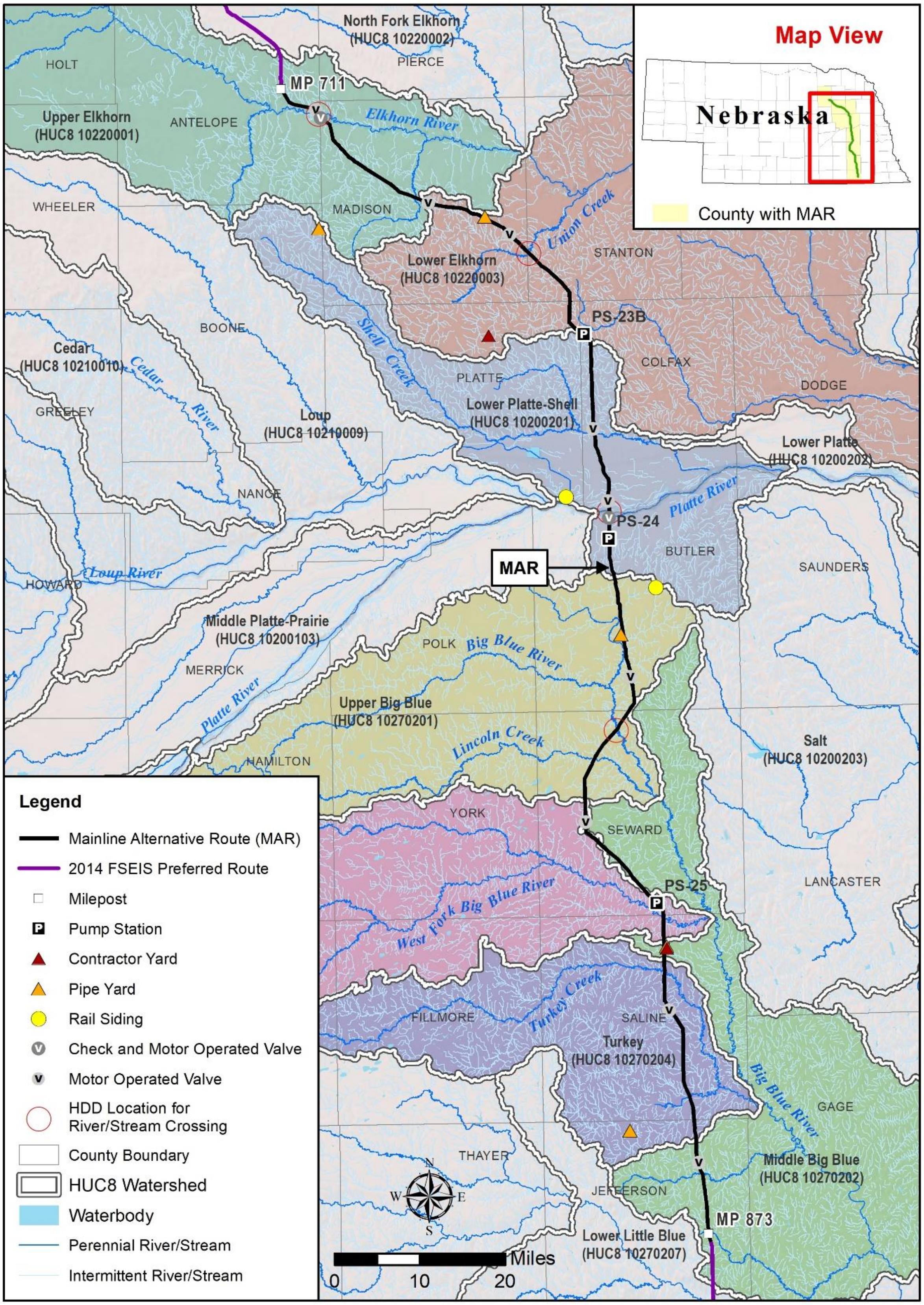


Figure 3.6-2. Watersheds and Major Rivers Crossed by the MAR

3.6.1.3 Water Quality

Table 3.6-4 identifies the rivers and streams crossed by the MAR with state water use designations based on their surface water classification or by waterbody type. With respect to water use, all are Class A waters used for general agricultural purposes (irrigation and livestock watering) without treatment and are aesthetically acceptable (NDEQ 2014). Five are also suitable for contact recreation (swimming), and one (Platte River) is suitable for drinking water use, as indicated in Table 3.6-4. Section 3.7 (Table 3.7-2) presents stream classifications with respect to aquatic life in perennial rivers and streams.

The Clean Water Act requires that states report on water quality of their waters. Through ambient water quality monitoring, states determine if a waterbody satisfies the water quality criteria associated with each state's designated uses. Section 401 of the Clean Water Act requires applicants of a federal license or permit provide a certification that any discharges from the facility would comply with the act, including state-established water quality standard requirements. When a state-defined designated use is not met or supported by the waterbody, it is deemed impaired. Designated uses are defined on a state-by-state basis and documented according to the reporting requirements of Clean Water Act Sections 303 and 305.

The 2018 Water Quality Integrated Report documents contamination or impairment of waters (NDEQ 2018) for four impaired waterbodies crossed by the MAR. Contamination in these waterbodies include bacteria (E. coli) and pesticides (Atrazine). Table 3.6-5 provides the names of the waterbodies, host county and the impairment or contaminant identified.

Table 3.6-5. Impaired Waterbodies along the Proposed MAR

Waterbody Name	Waterbody ID	County	Use	Impairment (Cause)
Elkhorn River	EL3-10000	Antelope	Recreation	Bacteria (E. coli)
Union Creek	EL1-21900	Stanton	Recreation	Bacteria (E. coli)
Shell Creek	LP1-20600	Colfax	Recreation	Bacteria (E. coli)
Big Blue River	BB3-10000	Seward	Recreation / Aquatic Life	Bacteria (E. coli) / Atrazine (May to June)

Source: NDEQ 2018e

3.6.1.4 Wetlands

Wetlands are areas where water covers the soil or is present either at or near the surface of the soil all year or for varying periods of time during the year. Water saturation largely determines how the soil develops and the types of plant and animal communities supported by the wetland. Wetlands provide food and habitat for a diverse array of plants and animals, act as buffers to flooding and erosion and serve as key links in the global water cycle. Wetlands are primarily regulated at the federal level by the USACE and at the state level by the NDEQ per Sections 401 and 404 of the Clean Water Act. Section 401 has been discussed previously. Section 404 requires permitting of certain activities (i.e., the placement of structures and/or fill material) occurring within the boundaries of wetlands meeting certain criteria. The permits are often authorized by a Nationwide Permit or could be authorized by an individual permit.

Wetlands are classified according to shared environmental factors, such as vegetation, soils and hydrology (Cowardin et al. 1979). This analysis considers wetland and waterbody surveys completed on the MAR between April 25, 2018 and June 4, 2018 where access was allowed (approximately 75 percent of the MAR). It also uses USFWS National Wetland Inventory data in locations where surveys were unable to be completed. Wetland systems along the proposed MAR are classified as palustrine or riverine/open water, based on vegetation and/or surface water cover. These types of wetlands are characterized by a dominance of trees, shrubs or persistent emergent herbaceous vegetation. Subsystems of the palustrine wetland types within the MAR include palustrine emergent, palustrine scrub-shrub and palustrine forested.

Many of the wetlands along the MAR have been extensively altered by historical and current agricultural practices. Table 3.6-6 includes a summary of the wetlands and acreages crossed by the MAR. As shown in the table, the primary wetland type crossed by the MAR is emergent herbaceous wetlands. These are associated both with rivers and streams (riparian wetlands) as well as agricultural lands; all forested wetlands appear to be riparian in nature (USFWS 2018b).

Table 3.6-6. Wetland Types Crossed by the MAR

Land Cover Type	Temporary ROW[a] and Construction Areas (acres)	Permanent Pipeline ROW (acres)	Permanent Facilities (acres)
Emergent Herbaceous Wetlands	5.7	2.2[b]	0
Scrub-Shrub Wetlands	0	0	0
Forested Wetlands	0.0	0.0[b]	0

Source: Exp and Westech 2018a

[a] The temporary ROW values do not include acreages for vegetation communities that would be avoided through use of HDD.

[b] The use of HDD at larger stream crossings would avoid 0.5 acre of forested wetlands and 0.2 acre of emergent wetlands in the permanent ROW. The remaining forested wetlands would be converted to palustrine emergent wetlands through the life of operations. All other areas would be restored per USACE permit conditions for a no net loss of palustrine emergent wetlands.

HDD = horizontal directional drill; MAR = Mainline Alternative Route; ROW = right-of-way; USACE = U.S. Army Corps of Engineers

Based on the 2018 field surveys (Exp and Westech 2018a), hydrophytic vegetation was typically dominated by the non-native, and somewhat invasive, reed canarygrass (*Phalaris arundinaceae*). Other common grasses included various species of foxtail such as shortawn foxtail (*Alopecurus aequalis*), creeping meadow foxtail (*Alopecurus arundinaceus*) and meadow foxtail (*Alopecurus pratensis*); Kentucky bluegrass (*Poa pratensis*); and occasionally broadleaf cattail (*Typha latifolia*) or narrowleaf cattail (*Typha angustifolia*). Incidental or less common native species were frequently Emory's sedge (*Carex emoryi*) and clustered field sedge (*Carex praegracilis*). Forested wetlands were primarily found along streams and the Platte River. Dominant trees included green ash (*Fraxinus pennsylvanica*), peachleaf willow (*Salix amygdaloides*) and plains cottonwood (*Populus deltoides*). Understory vegetation was often dominated by reed canarygrass (Exp and Westech 2018a).

Wetlands of special concern that may be crossed by the MAR include wetlands within the Rainwater Basin Region (small portion of southern Butler and western Seward counties). The Rainwater Basin Region in south-central Nebraska was named for the abundant natural wetlands that formed where clay-bottomed playa depressions occur. These depressions flood quickly during heavy rainstorms and snow melt. The MAR wetland crossings in the Rainwater Basin Region are outside of the Rainwater Basin Wetland Management District, which contains approximately 60 wetland easements in south-central Nebraska and is managed by the USFWS and Nebraska's Game and Parks Commission. Wetland areas crossed by the MAR within the Basin have mostly been cultivated for agriculture (i.e., converted to rotated cropland) as indicated by National Wetland Inventory Mapping (USFWS 2018b) and confirmed during the 2018 field surveys. No features were found to currently meet the definition of a traditional historic rainwater basin wetland (Exp and Westech 2018a).

3.6.1.5 Floodplains

Floodplains are areas of land adjacent to rivers and streams that convey overflows during flood events. Floodplains form where overbank floodwaters spread out laterally and deposit fine grain sediments. Floodplains typically support a complex array of wetland, riparian and woodland habitats. While flooding in Nebraska typically occurs in the spring, events occurring throughout the year may cause water levels to rise. The 2014 Keystone XL Final SEIS describes how ice jams, rapid snowmelt and intense rainfall have all contributed to recent major flooding events. Blockage of channels by ice jams in some of the larger braided rivers such as the Elkhorn and Platte have the potential to cause significant channel migration (Mason and Joeckel 2007).

FEMA defines a floodplain as being any land area susceptible to being inundated by water from any source (FEMA 2017). FEMA prepares Flood Insurance Rate Maps (FIRMs) that delineate flood hazard areas, such as floodplains, for communities. These maps are used to administer floodplain regulations and to reduce flood damage. Typically, these maps indicate the locations of 100-year floodplains, which are areas with a 1 percent chance of flooding occurring in any single year. Executive Order 11988, Floodplain Management, states that actions by federal agencies are to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplain development wherever there is a practicable alternative. Each agency is to provide leadership and shall take action to reduce the risk of flood loss; to minimize the impact of floods on human safety, health and welfare; and to restore and preserve the natural and beneficial values served by floodplains.

Seward County is the only county crossed by the MAR that does not have FEMA or state emergency management mapping of floodplains (29.4 miles), although floodplains are expected to be present with the majority of rivers and streams crossed by the MAR. In general, seasonal flooding occurs in areas where the MAR crosses active stream and river channels. In addition, the portions of the MAR located along channels or intermittent drainages could be subject to flash flooding. A review of the mapped portions of the MAR route indicate it would cross approximately 10.8 miles of mapped floodplains in Nebraska, all of which lie within the Special Flood Hazard Area shown on FEMA FIRMs defined as the area within the 100-year flood zone (FEMA 2018). Figure 3.1.2-4 in the 2014 Keystone XL Final SEIS shows the flood hazard areas in Nebraska. Areas showing the highest flood hazard appear to be located along the major rivers along the MAR (i.e., the Elkhorn River in Antelope and Madison counties, Platte River in Colfax and Butler counties, Big Blue River in the eastern portions of Seward and Saline counties and Little Blue River in Jefferson County).

3.6.1.6 Wild and Scenic Rivers

Nebraska has approximately 79,056 miles of rivers, of which 197 miles are designated as wild and scenic, within two separate rivers: Missouri River and the Niobrara River. Neither of these rivers would be crossed by the MAR. Keystone's crossing of the Niobrara River has been previously evaluated in the 2014 Keystone XL Final SEIS (USFWS 2018c).

3.7 BIOLOGICAL RESOURCES

The 2014 Keystone XL Final SEIS discusses biological resources along the Preferred Route. This section supplements the 2014 analysis to include biological resources within the potentially affected environment of the proposed MAR and updates to federally-protected species since the 2014 analysis. This section also includes information on big game priority areas in Montana along the Preferred Route established by the February 9, 2018 Department of Interior Secretarial Order 3362, Improving Habitat Quality in Western Big-Game Winter Range and Migration Corridors. Chapter 5, Environmental Consequences from Accidental Releases, assesses the risk to biological resources along the entire length of the proposed Keystone XL pipeline. Chapter 6, Electrical Power Infrastructure, provides a description of biological resources**, including natural history information on protected species,** and an assessment of impacts from connected actions relating to electrical supply needs required for the proposed pipeline. Chapter 7, Cumulative Impacts, provides an assessment of the impacts to biological resources from the proposed Keystone XL Project (including the electrical supply needs) in combination with other past, present and reasonably foreseeable future actions.

The ROI includes the biological resources within and adjacent to the 110-foot-wide construction ROW, which includes the 50-foot-wide operational ROW.

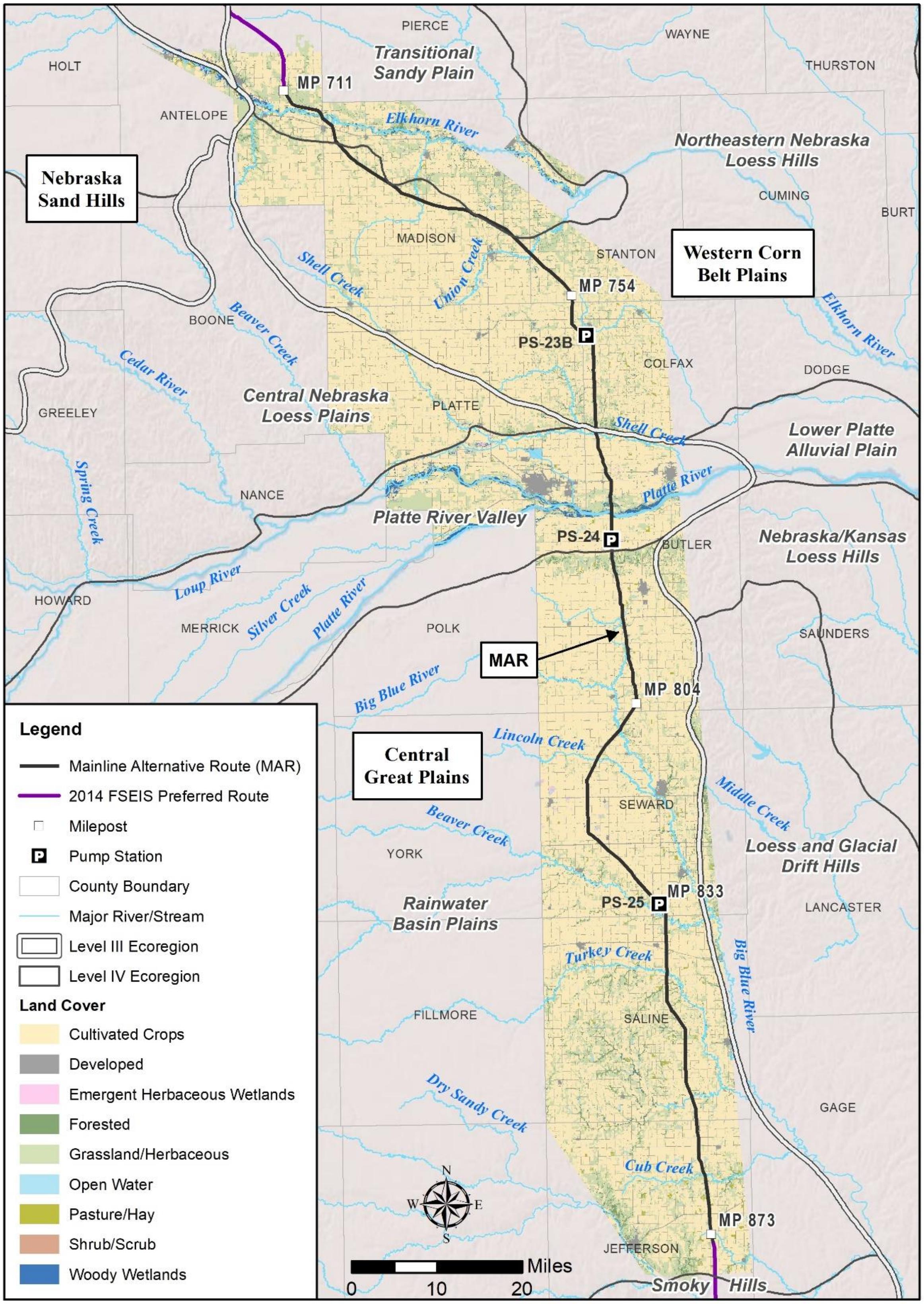
This SEIS considers the following data sources for characterizing biological resources:

- USFWS databases
- USEPA Ecoregion mapping
- USGS National Land Cover Data
- Nebraska Surface Water Quality Standards
- Coordination with federal and state agencies
- Biological field surveys conducted for the MAR

3.7.1 Biological Resources Overview

3.7.1.1 Vegetation Communities

This SEIS uses both ecoregions and land cover types to identify vegetation communities along the MAR. Figure 3.7-1 depicts both Level IV ecoregions and land cover types. As shown in Figure 3.7-1, the MAR crosses five Level IV ecoregions; the Transitional Sandy Plain and Northeastern Nebraska Loess Hills which are subsets of the Level III Western Corn Belt Plains ecoregion, and the Central Nebraska Loess Plains, Platte River Valley and Rainwater Basin Plains which are subsets of the Level III Central Great Plains ecoregion. Figure 3.7-1 also shows that cultivated crops are the dominant land cover/vegetation type within the MAR and greater region. Table 3.7-1 further describes vegetation communities within these ecoregions. Section 3.7.1.2 contains a discussion of "Biologically Unique Landscapes and Vegetation Communities of Conservation Concern."



Source: USGS 2011a

Figure 3.7-1. Ecoregions and Land Cover Types

Table 3.7-1. Descriptions of USEPA Ecoregions Crossed by the MAR

Level III Ecoregion	Level IV Ecoregion	Potential Natural Vegetation Communities and Use
Western Corn Belt Plains	Transitional Sandy Plain	Natural vegetation is a combination of Sand Hills prairie, tallgrass prairie and some wet meadow communities. Use includes both dryland and irrigated cropland. Corn and alfalfa are the principal crops, with a smaller acreage of winter wheat, oats and grain sorghum.
	Northeastern Nebraska Loess Hills	Natural vegetation is predominately tallgrass prairie communities. Wet meadows and cottonwood woodland are often located in floodplains. Use as cropland, especially corn, is common.
Central Great Plains	Central Nebraska Loess Plains	Natural vegetation is mixed-grass prairie communities. Predominant uses include rangeland with large areas of cropland planted in winter wheat, corn and forage crops. Irrigation agriculture continues to expand in this area.
	Platte River Valley	Natural vegetation communities include lowland tallgrass prairie with areas of wet meadow and marsh. With flood management and reduced river flow, floodplain forests have increased along the Platte River. Extensive cropland of corn, grain sorghum, soybeans and alfalfa exists, much of which is irrigated. Some native rangeland and hay lands exist. Channelized streams and flood control structures also exist.
	Rainwater Basin Plains	Natural vegetation includes transitional tallgrass prairie communities with areas of wet meadow and marsh. Extensive cropland exists with sorghum and winter wheat as the principal dryland crops. Corn and alfalfa are the principal irrigated crops. Historically, the region contained extensive rainwater basins and wetlands that provide important habitat for migrating bird species. Most of the basins have been drained for cultivation, and only a few remnants still exist.

Source: Chapman et al. 2001
MAR = Mainline Alternative Route; USEPA = U.S. Environmental Protection Agency

As shown in Figure 3.7-1, the MAR crosses the following general land cover types (USGS 2011a):

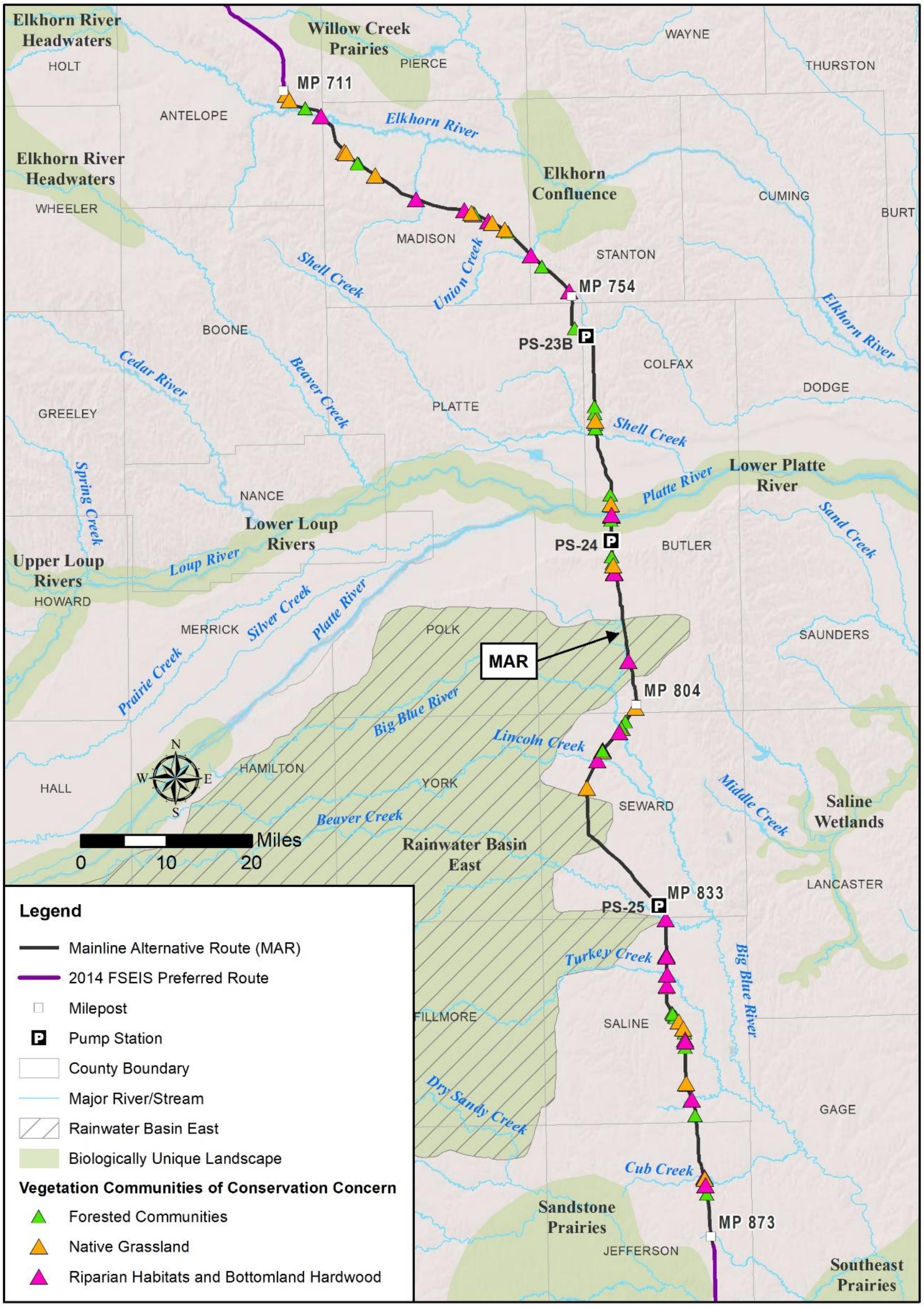
- **Cultivated cropland**: Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco and cotton, and also perennial woody crops such as orchards and vineyards.
- **Pasture/hay**: Areas of grasses, legumes or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle.
- **Grassland herbaceous**: Areas dominated by gramanoid or herbaceous vegetation such that these species generally represent more than 80 percent of total vegetation. These areas are not subject to intensive management such as tilling but can be utilized for grazing.
- **Deciduous forest:** Areas in which trees greater than 5 meters tall represent more than 20 percent of total vegetation cover. More than 75 percent of the tree species shed foliage simultaneously in response to seasonal change.
- **Emergent herbaceous wetland:** Areas where perennial herbaceous vegetation accounts for greater than 80 percent of vegetative cover and water periodically saturates or covers the soil or substrate.
- **Woody wetlands:** Woody and herbaceous communities associated with larger rivers and streams that are subject to at least seasonal inundation.
- **Open water:** Open water, sometimes associated with wetland habitat.
- **Developed:** Areas with a mixture of constructed materials which can contain impervious surface and vegetation.

3.7.1.2 Biologically Unique Landscapes and Vegetation Communities of Conservation Concern

Section 3.5.4 of the 2014 Keystone XL Final SEIS includes a discussion of biologically unique landscapes and vegetation communities of conservation concern. The 2014 Keystone XL Final SEIS defines these communities of concern because of declining abundance, sensitivity to disturbance and/or reliance of listed or sensitive species on the habitats that they create (U.S. Department of State 2014). Similar to the Preferred Route in Nebraska, the MAR crosses the following landscapes and communities of conservation concern:

- **Rainwater Basin Landscape:** A complex of wetlands and grasslands on the flat to rolling loess-covered plains of the Rainwater Basin Plains, which encompasses a 17-county area in central Nebraska. This region supports millions of migratory ducks, geese and shorebirds. Natural vegetation communities include mixed grass, tallgrass and saline prairie communities.
- **Lower Platte River Landscape:** This landscape encompasses the Platte River channel and its floodplain from where it meets the Loup River in Platte County east to where it begins in Sarpy County. The unique features of this landscape include sandbars that support colonies of federally protected piping plovers and interior least terns. The Lower Platte River also supports many rare large river fish, including the lake sturgeon, blue sucker, sturgeon chub and pallid sturgeon. Forest communities occur along much of the river bank, while the floodplain now supports mostly cropland.
- **Native Grassland:** This community is among the most threatened native vegetation communities in the United States and includes tallgrass prairies, mixed-grass prairies and shortgrass prairies. Suppression of fires, agriculture, urbanization and mineral exploration have all altered native grassland and reduced the occurrence of this community.
- **Riparian Habitats and Bottomland Hardwood:** Riparian and bottomland hardwood areas are important as wildlife habitat within the western United States as these areas provide wildlife with habitat for food, dens and nests.
- **Forest Communities:** Native wooded communities were once an integral component of the prairie landscape providing foraging, breeding and refuge habitats for many wildlife species. Many of these communities have been lost due to land conversion to agricultural uses, levee construction and urban development.

Figure 3.7-2 shows the occurrence of these communities along the MAR.



Source: NNHP 2011; Westech 2018

Figure 3.7-2. Biologically Unique Landscapes and Vegetation Communities of Conservation Concern

3.7.1.3 Big Game Priority Areas

Secretarial Order 3362 was signed by the U.S. Secretary of the Interior on February 9, 2018 to improve habitat quality and western range and migration corridors on federal lands for antelope, elk and mule deer. This order directs appropriate bureaus within the Department of the Interior to work in close collaboration with states and private landowners to develop guidelines that ensure big game populations continue to exist in priority states, such as Montana. Through scientific endeavors and land management actions initiated as a result of this order, wildlife such as Rocky Mountain Elk (elk), Mule Deer (deer), Pronghorn Antelope (pronghorn) and many other species will benefit. Specifically, the order directs the BLM to "appropriately apply site-specific management activities, as identified in State land use plans, site-specific plans, or the Action Plan that conserve or restore habitat to sustain local and regional big-game populations…"

Montana Fish, Wildlife and Parks (MFWP) has identified **five** areas as priority big-game winter range and migration corridors. The State of Montana has developed the *"Montana Action Plan for Implementation of Department of the Interior Secretarial Order 3362: Improving Habitat Quality in Western Big-Game Winter Range and Migration Corridors".* This plan identifies four areas as priority big-game winter range and migration corridors, referred to as Priority Areas A through **E**. The Project crosses approximately 68 miles (43,520 acres) of Priority Area D from the Canadian Border to the Fort Peck Reservoir (see Figure 3.7-3).

Habitat types found within Priority Area D for the elk, deer and pronghorn species in this region range from sagebrush grasslands to deciduous wetland/riparian areas. Habitat fragmentation from development and spread of noxious weeds is the primary threat to habitat quality and migration corridors within the region.

The following land conservation and habitat improvement efforts are ongoing to reduce threats to habitat and improve habitat quality:

- MFWP continues to work with transportation (highway department and railroad) to facilitate wildlife passage, as needed, for highway and railroad transportation projects. This includes working to minimize the effects of barriers such as fences, roads, highways, and railroads on migrating ungulates in this area.
- The USFWS Charles M. Russel National Wildlife Refuge is using best available science and restoration techniques to enhance and restore pronghorn migration corridors north of the refuge.
- The BLM field offices work with the MFWP, BLM permittees and private landowners to maintain wildlife-friendly fencing and keep fence gates open during the winter, where possible, within wildlife migration corridors. These fences reduce obstructions to big game daily and/or seasonally, direct mortality, and interruptions to habitat use in areas crucial for antelope, mule and white-tailed deer, and elk populations.
- The USFWS has developed a Candidate Conservation Agreement with Assurances for working with private landowners in this landscape. While the primary focus of the Candidate Conservation Agreement with Assurances is threat reductions for grassland birds and sage grouse, it will support habitat conservation for pronghorn antelope and other big game species. Key partners are The Nature Conservancy, BLM and many private landowners.

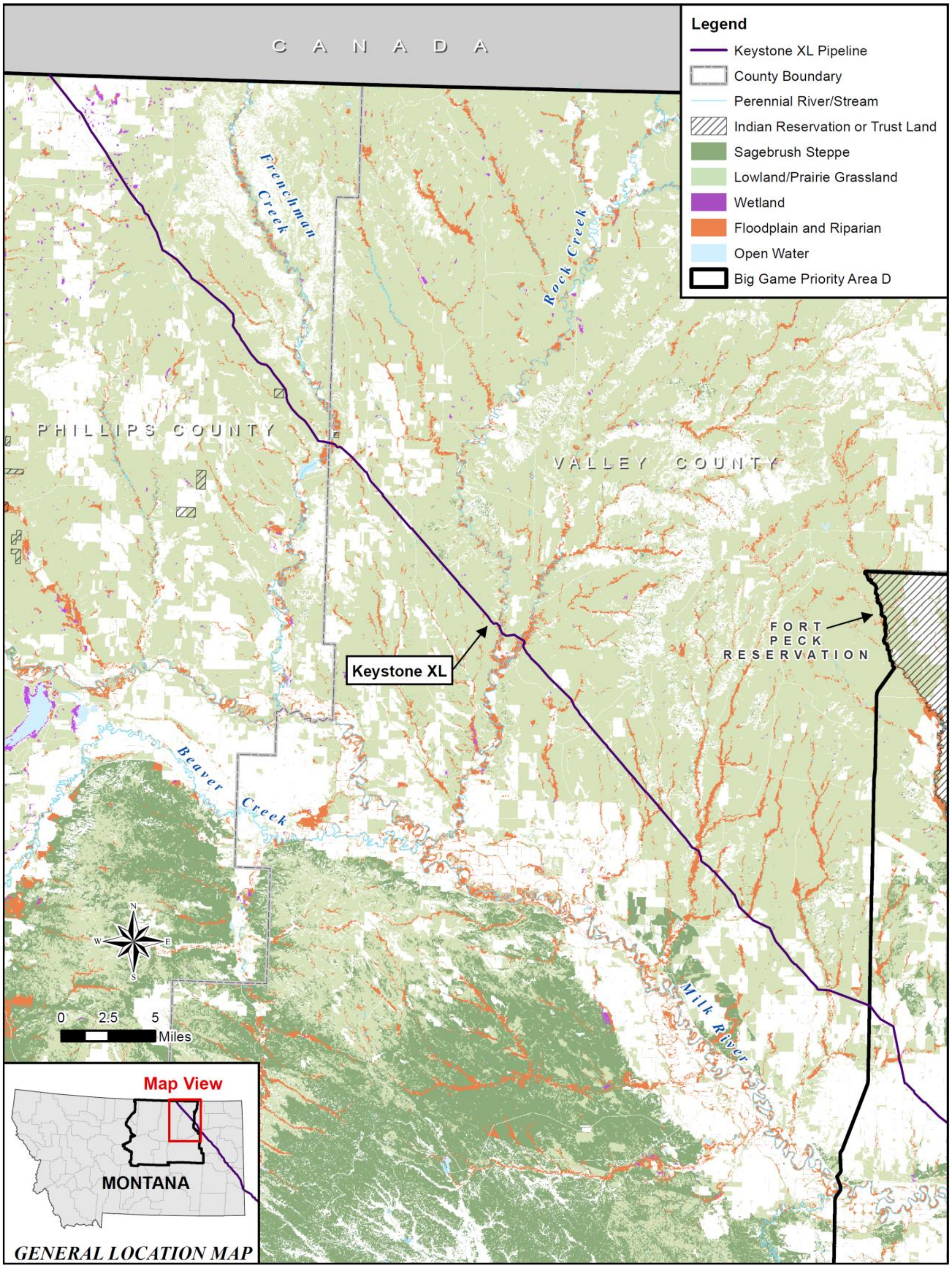


Figure 3.7-3. Proposed Keystone XL Pipeline Crossing Through Big Game Priority Area D

In addition, the USFWS is collaborating with numerous partners including MFWP and the National Wildlife Federation on studies to better understand connectivity and corridors for antelope, greater sage grouse and mule deer in this Northern Great Plains Landscape. The ongoing studies by the USFWS and MFWP will provide a better understanding of the seasonal ranges and migration corridors of elk, mule deer and pronghorn antelope. The studies will focus on building the internal capacity for seasonal and migration habitat delineation to develop a methodology to meet the needs of existing wildlife movement data and then delivering maps of this data to landowners and managers for decision making.

3.7.1.4 Wildlife and Fisheries

Sections 3.6 and 3.7 of the 2014 Keystone XL Final SEIS include detailed discussions of wildlife and fishery communities located in Nebraska. Similar species identified in the 2014 Keystone XL Final SEIS occurring in Nebraska would have the potential to occur along the MAR. This includes 5 species of big game animals (see Table 3.6-2 of the 2014 Keystone XL Final SEIS), 25 species of small and medium game animals (see Table 3.6-3 of the 2014 Keystone XL Final SEIS), 328 species of waterfowl and game birds, 27 species of non-game mammals, 27 bird species of conservation concern, 47 species of reptiles, 15 species of amphibians and tens of thousands of invertebrate species.

The MAR would cross new aquatic resources (streams). Table 3.7-2 includes information on new perennial stream crossings that may support aquatic life. The NDEQ classifies all 18 crossings as warmwater. Class A waters provide habitat for year-round maintenance of one or more identified key species, and Class B waters provide habitat where the variety of warmwater biota is limited by water volume or flow, water quality, substrate composition or other habitat conditions (NDEQ 2014). Section 3.6 includes details on all stream crossings associated with the MAR.

Table 3.7-2. MAR Perennial Stream Crossings

County	Milepost	Waterbody Name	State Classification	Key Species[a]	Construction Method
Antelope	712.5	Trueblood Creek	Class B Warmwater	–	Open Cut
Antelope	716.3	Elkhorn River	Class A Warmwater	northern pike, channel catfish, flathead catfish, largemouth bass	HDD
Antelope	716.4	Giles Creek	Class B Warmwater	–	Open Cut
Madison	723.7	Buffalo Creek	Class A Warmwater	Johnny darter	Open Cut
Madison	731.7	Battle Creek	Class A Warmwater	grass pickerel	Open Cut
Madison	737.5	Tributary to Taylor Creek	N/A	–	Open Cut
Madison	742.6	Tributary to Union Creek	N/A	–	Open Cut
Stanton	747.1	Union Creek	Class A Warmwater	channel catfish	HDD
Stanton	748.4	Tributary to Meridian Creek	N/A	–	Open Cut
Colfax	771.4	Shell Creek	Class A Warmwater	channel catfish	Open Cut
Colfax	778.7	Lost Creek	Class B Warmwater	–	Open Cut
Butler	781.1	Platte River	Class A Warmwater	channel catfish, flathead catfish	HDD

Table 3.7-2. MAR Perennial Stream Crossings

County	Milepost	Waterbody Name	State Classification	Key Species[a]	Construction Method
Butler	781.5	Tributary to Platte River	Class B Warmwater	–	Open Cut
Butler	783.5	Deer Creek	Class B Warmwater	–	Open Cut
Butler	786.3	Tributary to Deer Creek	N/A	–	Open Cut
Butler	788.1	Tributary to Deer Creek	N/A	–	Open Cut
Butler	790.0	Tributary to Little Blue River	N/A	–	Open Cut
Butler	793.7	Tributary to Little Blue River	N/A	–	Open Cut
Butler	798.7	Tributary to Little Blue River	N/A	–	Open Cut
Butler	800.2	Tributary to Little Blue River	N/A	–	Open Cut
Seward	807.7	Big Blue River	Class B Warmwater	channel catfish, flathead catfish	HDD
Seward	812.0	Lincoln Creek	Class B Warmwater	–	Open Cut
Saline	834.7	West Fork Big Blue River	Class A Warmwater	channel catfish	Open Cut
Saline	841.0	Turkey Creek	Class B Warmwater	–	Open Cut
Saline	842.5	Spring Creek	Class B Warmwater	–	Open Cut
Saline	849.3	Dry Creek	Class B Warmwater	–	Open Cut
Saline	849.4	Dry Creek	Class B Warmwater	–	Open Cut
Saline	856.6	Swan Creek	Class A Warmwater	channel catfish	Open Cut
Jefferson	866.0	Cub Creek	Class A Warmwater	channel catfish	Open Cut
Jefferson	867.8	Tributary to Cub Creek	N/A	–	Open Cut
Jefferson	867.8	Tributary to Cub Creek	N/A	–	Open Cut
Jefferson	872.8	Tributary to Big Indian Creek	N/A	–	Open Cut

Source: NDEQ 2014

[a] NDEQ defines Key Species as those identified as endangered, threatened, sensitive or recreationally important aquatic species associated with a particular water body and its aquatic life use class.

HDD = horizontal directional drill; MAR = Mainline Alternative Route; N/A = not applicable (unnamed tributary does not have an aquatic life classification); NDEQ = Nebraska Department of Environmental Quality.

3.7.1.5 Migratory Birds

The MAR falls entirely within the Prairie Avifaunal Biome, the same biome discussed in Section 3.6 of the 2014 Keystone XL Final SEIS. Migratory birds use habitats crossed by the MAR for nesting, migration and overwintering. Review of the USFWS Information for Planning and Conservation database identified 18 species of migratory birds of conservation concern that have the potential to occur along the MAR (USFWS 2018d). The Migratory Bird Treaty Act (MBTA) (16 USC 703-712) prohibits the take (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct) of any migratory bird without authorization from the USFWS. All migratory birds (identified in 50 CFR 10.13) are protected under the MBTA. The U.S. Department of the Interior's Office of the Solicitor issued Memorandum M-37050 on December 22, 2017, which adopts the position that the MBTA prohibition on the "taking" or "killing" of migratory birds applies only to deliberate acts intended to take a migratory bird (U.S. Department of Interior 2017). The legal opinion reverses the position of prior administrations that the MBTA prohibits not only the intentional take of migratory birds but also the take of migratory birds that is incidental to otherwise lawful activity (i.e., unintentional). Unintentional take includes disturbance to species and nests during ground-clearing activities, such as ROW clearing, where unobserved nests of migratory birds could be located.

3.7.1.6 Threatened and Endangered Species

Table 3.7-3 contains the federal- and state-listed species potentially occurring along the MAR and summarizes each species' preferred habitats. Figure 3.7-4 shows available species ranges and critical habitat for these species in relation to the MAR.

Table 3.7-3. Summary of Federal- and State-Listed Species with the Potential to Occur in the MAR

Common Name	Scientific Name	Status	Habitat and Potential for Occurrence
Birds			
Interior least tern	*Sterna antillarum*	FE, SE	Nesting areas of interior least terns include sparsely vegetated sand and gravel bars within a wide, unobstructed river channel or salt flats along lake shorelines. In Nebraska, the terns predominately breed along the Platte, Niobrara and Missouri rivers. Isolated breeding colonies can also be found throughout the Elkhorn and Loup river systems. As shown in Figure 3.7-4, the MAR crosses the interior least tern's estimated current breeding range at the Platte River near the border between Colfax and Butler counties where sandbars and sand/gravel pits associated with this segment of the river could support least tern breeding and foraging populations. The MAR crossing of the Elkhorn River is west of the estimated current breeding range. Interior least terns would only potentially occur in the area during the breeding and nesting season.
Piping plover	*Charadrius melodus*	FT, ST	Nesting areas of piping plover include beaches and dry barren sandbars in wide, open channel beds. The MAR would cross the piping plover's estimated current breeding range at the Platte River. The MAR would cross the Platte River at the border between Colfax and Butler counties, which contain sandbars and sand/gravel pits that could support piping plover breeding and foraging populations. The MAR's crossing of the Elkhorn River is west of the estimated current breeding range (see Figure 3.7-4). Piping plovers would only potentially occur in the area of the MAR during the breeding and nesting season.

Table 3.7-3. Summary of Federal- and State-Listed Species with the Potential to Occur in the MAR

Common Name	Scientific Name	Status	Habitat and Potential for Occurrence
Rufa red knot	*Calidris canutus rufa*	FT	The rufa red knot is generally restricted to ocean coasts during winter and occurs primarily along the coast during migration. However, small numbers of rufa red knots are reported annually across the interior United States during spring and fall migrations. There is no evidence that this species uses any non-coastal sites as traditional stopover locations, with the possible exception of a few lakes, primarily saline, in the northern-most portion of the Great Plains. In addition, although the rufa red knot occurs as a sporadic and somewhat uncommon migrant throughout the area of the MAR, it does not have a defined range in Nebraska. Lake McConaughy is the site in Nebraska where the species has been observed the most times. There is a total of 28 documented sightings for the period of record, which goes back more than a century.
Whooping crane	*Grus americana*	FE, SE	Each spring and fall, whooping cranes migrate through Nebraska along the Central Flyway. The whooping crane prefers shallow braided riverine habitat and wetlands for roosting and use agricultural fields, wet meadows, marsh habitats and shallow rivers for feeding. Overnight roosting requires shallow water over submerged sandbars, with the whooping crane preferring unobstructed channels isolated from human disturbance. While migrating through Nebraska, whooping cranes use the central Platte, Loup and Niobrara rivers and a variety of wetland habitats as stopover and resting spots. Whooping cranes typically select sites with wide, open views and areas isolated from human disturbance. Critical habitat has been designated in Nebraska for the whooping crane and includes a segment of the Platte River from Lexington to Denman, Nebraska, to the west of the MAR. The estimated current range of the whooping crane overlaps with the MAR in Antelope, Madison, Butler and Seward counties. One of the major river systems used by the whooping crane is the Platte River, which would be crossed by the MAR. However, the MAR would cross the Platte River at the border between Colfax and Butler counties, east of NGPC's estimated whooping crane migration use area. Figure 3.7-4 shows the primary occurrence area in relation to the MAR, which is located along the eastern boundary. USFWS fly-way sighting data (USFWS 2018e) and USGS telemetry data (USGS 2018a) were also reviewed for recorded ground sightings of whooping cranes near the MAR. The sets of data confirm the species range depicted on Figure 3.7-4, as a majority of sightings and telemetry data indicate ground activity west of the MAR. It is important to recognize both sets of data have limitations as the USFWS sighting data is dependent on human observation. Telemetry data was collected from 2009 through 2017 and represents the best available scientific information because it is not dependent on human observation and is a large data set representative of the entire population. A single marked bird, however, is likely accompanied by multiple unmarked birds as whooping cranes migrate in small flocks. The telemetry data provide information on suitable habitat locations, not population numbers. Of the 9 years of telemetry data, six recordings were detected within 5 miles of the MAR and only one fly-way sighting occurred within 5 miles of the MAR. This data would indicate that although the whooping crane can be found within areas of the MAR, their occurrence within the area is highly intermittent.

Table 3.7-3. Summary of Federal- and State-Listed Species with the Potential to Occur in the MAR

Common Name	Scientific Name	Status	Habitat and Potential for Occurrence
Fish			
Pallid sturgeon	*Scaphirhynchus albus*	FE, SE	Pallid sturgeons are adapted for living close to the bottom of large, shallow, silty rivers with sand and gravel bars and tend to select main channel areas with islands or sand bars. Pallid sturgeon has been captured in downstream reaches of several major tributaries of the Missouri River, including the Platte River. Pallid sturgeon have been documented in the Platte River during the spring, summer and fall periods, with limited data indicating that the lower Platte River is likely used for spawning. Thus, the lower Platte River appears to provide suitable habitat for multiple life stages of this species. The MAR crosses the pallid sturgeon's estimated current range in the lower Platte River. The crossing location would be at the border between Colfax and Butler counties where it would cross the main channel of the river (see Figure 3.7-4).
Topeka shiner	*Notropis topeka*	FE, SE	The Topeka shiner is normally found in slow-flowing, cool, clear, prairie creeks or spring-fed pools in larger streams. This species prefers pool-like areas that are outside the main channel courses, in contact with groundwater and that contain vegetation and areas of exposed gravel. Typical substrates utilized by the Topeka shiner include gravel, rubble, sand or bedrock with some silt. USFWS has designated critical habitat for Topeka shiner in five different watersheds, including the Elkhorn River watershed in Madison County, Nebraska. Areas designated as critical habitat for the Topeka shiner are either occupied by the species or provide critical links between occupied habitats. Within the Elkhorn River watershed, only one stream segment, a segment of Taylor Creek, was designated as critical habitat for Topeka shiner. In eastern Nebraska near the MAR, the estimated current range of the Topeka shiner is very localized, limited to portions of Madison and Stanton counties. The MAR would pass through the Union Creek system in this area (see Figure 3.7-4). Surveys for the Topeka shiner were conducted on June 19, 2018 and August 2, 2018 to determine the fish species present within the portion of Union Creek crossed by the MAR. The Topeka shiner was not observed during the surveys. The surveys noted the Union Creek within this location is a degraded stream system that experiences rapid changes in flow and turbidity as a result of a surrounding landscape dedicated to intensive row cropping. A review of fish community data over the decades indicates the community has become homogenized over time, and the possibility of species such as the Topeka Shiner residing in the stream at the pipeline crossing is highly remote.
Lake sturgeon	*Acipenser fulvescens*	SE	The lake sturgeon is listed as state endangered. This fish species is found in main channel habitats in the Mississippi River and main channel areas with islands or sand bars in the upper Missouri River system, including the Platte River. Lake sturgeon prefer areas with a diversity of water depth and velocities formed by braided channels, sand bars, islands, sand flats and gravel bars. The only crossing of the Platte River along the MAR occurs in Butler County. This crossing occurs upstream of known lake sturgeon collection points.

Table 3.7-3. Summary of Federal- and State-Listed Species with the Potential to Occur in the MAR

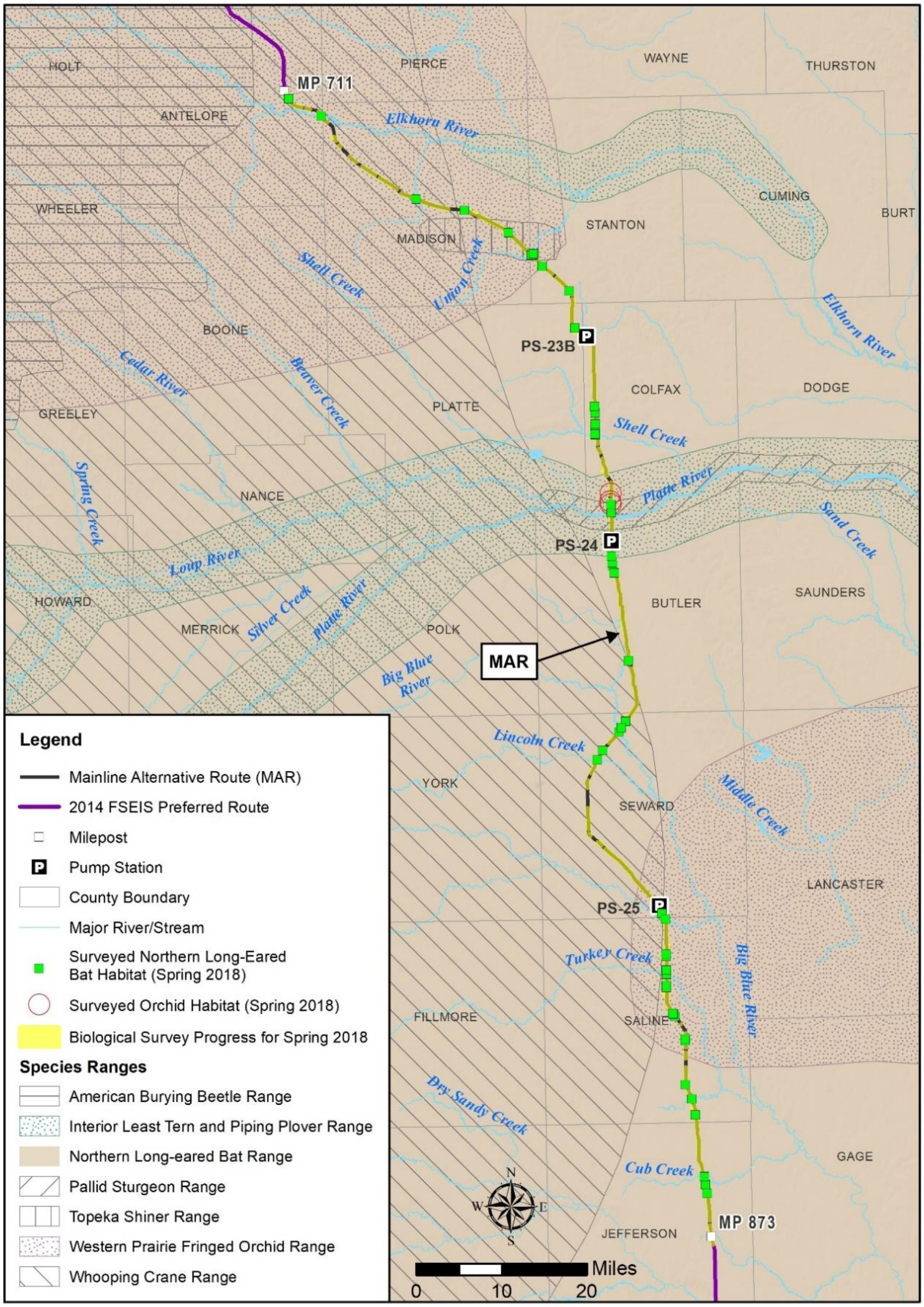
Common Name	Scientific Name	Status	Habitat and Potential for Occurrence
Sturgeon chub	*Macrhybopsis gelida*	SE	The sturgeon chub is listed as state endangered. This species inhabits main channel habitats of turbid rivers with sand or gravel bars and feeds upon aquatic insects. The known range of sturgeon chub includes the Platte River to the western border of Butler County. The MAR would cross the Platte River in Butler County.
Invertebrates			
American burying beetle	*Nicrophorus americanus*	FE, SE	The American burying beetle is listed as endangered in Nebraska, and its estimated current range includes portions of Antelope County, Nebraska. Although the proposed MAR initiates in Antelope County, the route would be located east of the estimated current range of this species (see Figure 3.7-4). In addition, tilling associated agricultural activities have diminished suitable habitat for the beetle throughout the MAR. All other counties along the MAR are located entirely outside the current range of the American burying beetle. Surveys conducted along the MAR did not detect any populations of the beetle.
Mammals			
Northern long-eared bat	*Myotis septentrionalis*	FT, ST	The northern long-eared bat hibernation period begins as early as August and continues through the winter months in high-humidity caves and mines. During the summer, forested areas, including riparian corridors, provide habitat (e.g., decaying trees, loose bark, tree snags and stumps) for roosting, feeding and maternity colonies. Roosting occurs primarily under the bark of trees or snags at least 3 inches diameter at breast height. The northern long-eared bat's range spans eastern Nebraska, including the area which would be crossed by the MAR. In addition, the area along the MAR is located within the White-Nose Syndrome Zone. Keystone surveyed the MAR for suitable northern long-eared bat habitat. The Spring 2018 surveys were performed in locations of approved access and covered approximately 75 percent of the MAR. Where access was not allowed, habitat was identified via photo-interpretation and, in some cases, from adjacent parcels where access was allowed. The surveys conservatively identified approximately 258.3 acres of potential northern long-eared bat habitat along the MAR. The estimate was conservative as most sites were relatively isolated, small fragments of wooded habitat along drainages or small wood lots and almost all sites were surrounded by large areas of cultivation or pasture that is less utilized by the species. The largest areas of more developed habitat with relatively extensive wooded acreage and larger trees with deeply fissured bark, snags, loose bark and/or cavities occurred at the larger river and stream crossings, particularly the Platte River (see Figure 3.7-4).
River otter	*Lontra Canadensis*	ST	River otters may be found along any major river system in Nebraska. They inhabit large ranges along streams and rivers that flow through prairies, and in surface waters in the Sand Hills region. River otters den in hollow logs, among roots, under overhangs, or in other animal dens or burrows. The river otter disappeared from Nebraska between approximately 1904 and 1977; populations have rebounded since that time. While Nebraska does not have a trapping season, such activities are permitted in other states.

Table 3.7-3. Summary of Federal- and State-Listed Species with the Potential to Occur in the MAR

Common Name	Scientific Name	Status	Habitat and Potential for Occurrence
Reptiles			
Western massasauga	*Sistrurus tergeminus*	ST	The western massasauga inhabits grassland habitats, such as tallgrass prairie and grassy fields, and moist areas, such as marshland, wet prairies and floodplains. Winter is spent hibernating in crayfish burrows. The current known range of the western massasauga within the ROI includes only a small portion of eastern Colfax County. As the proposed MAR would be located in western Colfax County, this species is not expected to overlap the MAR.
Plants			
Western prairie fringed orchid	*Platanthera praeclara*	FT, ST	The western prairie fringed orchid grows in wet to somewhat drier prairies in the eastern portion of Nebraska, and its estimated current range overlaps with the MAR in Antelope, Madison, Stanton, Seward and Saline counties as shown in Figure 3.7-4. In central and northeast Nebraska, it occurs in wet prairies and meadows. It is most often found in unplowed, calcareous prairies and sedge meadows and may occur along ditches and roadsides. However, the majority of the lands crossed by the MAR are disturbed agricultural lands and are not likely to support this species. Keystone surveyed the MAR for potential habitat of the western prairie fringed orchid. The Spring 2018 surveys were performed in locations of approved access and covered approximately 75 percent of the MAR. The surveys identified very little suitable habitat along the MAR as the vast majority of the route (95 percent of the surveyed area) was either cultivated (plowed and extensively drained) or invaded by non-native species, primarily smooth brome (*Bromus inermis*) in uplands and reed canarygrass (*Phalaris arundinacea*) in wetlands. Surveys determined two fair and one good mosaic of wetland, riparian and wet prairie as suitable habitat along the MAR just north of the Platte River crossing (see Figure 3.7-4). An additional survey was completed in July 2018. The survey identified five areas of potentially suitable habitat along the MAR north of the Platte River. The areas were categorized as the following habitat quality ratings: two fair, two good and one excellent.
Small white lady's slipper	*Cypripedium candidum*	ST	The small white lady's slipper is a perennial species found in bogs, fends or grasslands. In the ROI, this species occurs along the Elkhorn River in Antelope and Madison counties.

Source: 50 CFR 17; 43 FR 20938; 70 FR 15239; EcoCentrics and Westech 2018; Exp and Hoback Consulting Inc. 2018; Exp and Westech 2018b, 2018c; Jorgensen 2015; NGPC 2018c, 2018d, 2018e, 2017a, 2017b, 2015, 2014, 2013a, 2013b, 2013c, 2013d, 2013e, 2013f, 2012, 2011a, 2011b, 2011c; NNHP 2013; Rahel and Thel 2004; Steffensen et al. 2014; U.S. Department of State 2014; USFWS 2018f, 2018g, 2014a, 2014b, 1996

FE = federally endangered; FT = federally threatened; MAR = Mainline Alternative Route; NGPC = Nebraska Game and Parks Commission; SE = state endangered; ST = state threatened; U.S. = United States; USFWS = U.S. Fish and Wildlife Service



Source: Exp and Westech 2018b, 2018c; NGPC 2018d, 2017a, 2017b, 2015, 2014, 2011a, 2011b, 2011c; USFWS 2019d

Note: The Topeka shiner habitat is associated with the Union Creek System (not displayed on figure) within Madison and Stanton counties

Figure 3.7-4. Federally Listed Species Ranges with the Potential to Occur in the MAR

The 2014 Keystone XL Final SEIS concluded the American burying beetle was the only species that may be affected, and is likely to be adversely affected, by the proposed Keystone XL Project. Since the 2014 Keystone XL Final SEIS was published, the USFWS listed two additional species, the northern long-eared bat and the rufa red knot, as federally threatened. Table 3.7-4 summarizes changes to species listings and Department actions since the 2014 Keystone XL Final SEIS, with regard to the ESA. Table 3.7-4 also includes current consultation BLM has initiated with USFWS and Keystone activities.

Table 3.7-4. ESA Updates since the 2014 Keystone XL Final SEIS

Date	Activity
January 12, 2015	USFWS Final Rule listing the rufa red knot as federally threatened becomes effective.
July 9, 2015	The Department reinitiated consultation with USFWS regarding the rufa red knot determining the Keystone XL Project "may affect, but is not likely to adversely affect" the species (see Appendix A).
August 27, 2015	USFWS concurred in the "may affect, but is not likely to adversely affect" determination for the rufa red knot.
May 4, 2015	USFWS Final Rule listing the northern long-eared bat becomes effective.
March 15, 2017	The Department reinitiated consultation with USFWS regarding the northern long-eared bat determining the Keystone XL Project "may affect, but is not likely to adversely affect" the species (see Appendix A). The letter also re-evaluated the conclusions drawn during the 2014 Keystone XL Final SEIS consultation process.
March 16, 2017	USFWS concurred in the "may affect, but is not likely to adversely affect" determination for the northern long-eared bat providing conservation measures listed in the March 15, 2017 letter are implemented (see Appendix A). The USFWS also agreed with the Department that the conclusions for the species in the 2013 Biological Opinion (BiOp) remain valid predicated on the completion of required pre-construction population surveys for the federally endangered American burying beetle to confirm the amount of take authorized in the Incidental Take Statement will not be exceeded for the species.
January 31, 2018	The Department reinitiated consultation with USFWS regarding the Keystone XL Project and analysis of the MAR, requesting any new information on potentially affected species along the MAR.
March 29, 2019	The President of the United States issues a Presidential Permit for construction, connection, operation and maintenance of pipeline facilities at the international border of the United States and Canada for the Keystone XL Project. This permit supersedes the March 23, 2017 Presidential Permit.
May 6, 2019	The USFWS withdraws their May 15, 2013 BiOp prepared as part of the 2014 Keystone XL Final SEIS at the request of the Department subsequent to issuance of the March 29, 2019 Presidential Permit.
September 30, 2019	**A BA was submitted to the USFWS under Section 7 of the ESA which included an analysis of the potential adverse impacts to federally-protected species from construction and operations of the proposed Keystone XL pipeline and from potential oil spills associated with the Keystone XL pipeline in light of the updated data and analysis included in Chapter 5, Environmental Consequences from Accidental Releases, and other data/species updates as appropriate.**
November 27, 2019	**An amended BA was submitted to the USFWS as part of the Section 7 consultation process.**
Present	The **USFWS has prepared a BiOp; findings of the BiOp, have been updated in the Final SEIS document including the** conservation and mitigation measures **summarized within Chapter 8, Summary of Consequences**.

BA = Biological Assessment; BiOp = Biological Opinion; Department = U.S. Department of State; ESA = Endangered Species Act; **MAR = Mainline Alternative Route;** SEIS = Supplemental Environmental Impact Statement; USFWS = U.S. Fish and Wildlife Service

As indicated in Table 3.7-4, both the previous BA and BiOp were withdrawn in **May** 2019 subsequent to issuance of the March 29, 2019 Presidential Permit. **The agencies submitted an amended BA (BLM 2019) to the USFWS on November 27, 2019, consistent with Section 7 of the ESA.**

Table 3.7-5 summarizes the potential occurrence of 13 federally-protected species along the remainder of the proposed Keystone XL pipeline outside of the MAR. As indicated in Table 3.7-5, 10 of these 13 species have the potential for occurrence and are considered in the BA; the other three species are either extinct or their ranges outside of the area of the proposed Project. Figures 3.7-5 through 3.7-7 shows available species ranges and critical habitat for these species by state.

Table 3.7-5. Summary of Federally-Listed Species with the Potential to Occur along the Proposed Keystone XL Pipeline

Common Name	Scientific Name	Status	Habitat and Potential for Occurrence
Birds			
Eskimo Curlew	*Numenius borealis*	FE	The Eskimo curlew historically migrated through the proposed Project area in Nebraska, reliant on wet meadow and grassland habitats in the Great Plains as it migrated between its breeding and overwintering habitats in Alaska and South America. Habitat loss, widespread overhunting, and loss of food resources led to the decline and eventual loss of this species. The species has not been confirmed in Nebraska since 1926 and in South Dakota since 1963 and does not occur in Montana. It is now thought to be extinct, and therefore, would not occur in the Project area.
Interior least tern	*Sterna antillarum*	FE	Interior least terns spend four to five months at their breeding sites. They arrive at breeding areas from late April to early June. Interior least terns are considered colonial nesters; colonies generally consist of up to 20 nests. Nesting areas of interior least terns include sparsely vegetated sand and gravel bars within a wide, unobstructed river channel or salt flats along lake shorelines. **Montana**: Breeding and foraging habitat includes sandbars and sand/gravel pits along the Missouri and Yellowstone rivers in Montana. **South Dakota**: Breeding and foraging habitat includes sandbars and sand/gravel pits along Cheyenne River in South Dakota. **Nebraska**: In Nebraska, the terns predominately breed along the Platte, Niobrara and Missouri rivers. Isolated breeding colonies can also be found throughout the Elkhorn and Loup river systems.
Piping plover	*Charadrius melodus*	FT	Nesting season for the piping plover is from April 15 through September 1. Nesting areas of piping plover include beaches and dry barren sandbars in wide, open channel beds. Nesting habitat of inland populations consists of sparsely vegetated shorelines around small alkali lakes, large reservoir beaches, river islands and adjacent sandpits, and shorelines associated with industrial ponds. **Montana**: Potential nesting habitat for the piping plover is restricted to alkali wetlands and the Fort Peck Reservoir in Montana. Surveys and consultation with USFWS did not identify suitable wetlands for nesting piping plovers along the pipeline route, however individual transient piping plovers may be observed along some portions of the Yellowstone River. **South Dakota:** The piping plover is not known to occur in South Dakota. Breeding and foraging habitat would include sandbars and sand/gravel pits along the Cheyenne River in South Dakota.

Table 3.7-5. Summary of Federally-Listed Species with the Potential to Occur along the Proposed Keystone XL Pipeline

Common Name	Scientific Name	Status	Habitat and Potential for Occurrence
Piping plover (continued)	*Charadrius melodus*	FT	**Nebraska:** Potential nesting habitat for the piping plover is restricted to sandy beaches and sandbars along the Platte, Loup, and Niobrara rivers in Nebraska. Surveys identified one foraging plover at the Niobrara River crossing in 2008. No nesting piping plovers were identified within line-of-sight of the ROW crossing of the Missouri, Platte or Loup rivers.
Rufa red knot	*Calidris canutus rufa*	FT	The rufa red knot is generally restricted to ocean coasts during winter and occurs primarily along the coast during migration. However, small numbers of rufa red knots are reported annually across the interior United States during spring and fall migrations. There is no evidence that this species uses any non-coastal sites as traditional stopover locations, with the possible exception of a few lakes, primarily saline, in the northern-most portion of the Great Plains. The rufa red knot occurs as a sporadic and somewhat uncommon migrant throughout the area of the proposed Project. Preferred stopover habitat includes ponds and wetlands with adequate mollusk foraging opportunity, which is highly limited in the Project area due to agricultural practices. **Montana**: The rufa red knot is not known to occur in Montana. **South Dakota**: The rufa red knot is not known to occur in South Dakota. **Nebraska**: The rufa red knot does not have a defined range in Nebraska. As stated in Table 3.7-3, the rufa red knot occurs as a sporadic and somewhat uncommon migrant throughout the area of the MAR.
Whooping crane	*Grus americana*	FE	Each spring and fall, whooping cranes migrate along the Central Flyway. The whooping crane occurs as a migrant throughout the proposed Project area. Possible areas used by whooping cranes during migration include major river systems and their associated wetlands, as well as palustrine wetlands and shallow areas of reservoirs, stock ponds and other lacustrine wetlands for roosting with agricultural croplands for foraging in the vicinity. All of the proposed Project route in Montana and a portion of the Project route in South Dakota are located west of the 95 percent flyway migration corridor. The whooping crane prefers shallow braided riverine habitat and wetlands for roosting and uses agricultural fields, wet meadows, marsh habitats and shallow rivers for feeding. Overnight roosting requires shallow water over submerged sandbars, with the whooping crane preferring unobstructed channels isolated from human disturbance. Whooping cranes typically select sites with wide, open views and areas isolated from human disturbance. **Montana:** The Yellowstone River is a potential stop-over site for whooping cranes. **South Dakota:** The Missouri River system is used by whooping cranes along with wetlands during severe weather and wetlands close to agricultural lands for feeding. The White and Cheyenne rivers contain suitable stop-over habitat although it is very unlikely the whooping cranes would be present at these crossings.

Table 3.7-5. Summary of Federally-Listed Species with the Potential to Occur along the Proposed Keystone XL Pipeline

Common Name	Scientific Name	Status	Habitat and Potential for Occurrence
Whooping crane (continued)	*Grus americana*	FE	**Nebraska:** The major river systems used by whooping cranes in Nebraska include the Platte, Loup, Republican, Cedar and Niobrara rivers. The Platte, Loup and Niobrara rivers would be crossed by the proposed Project. The USFWS has designated critical habitat for the whooping crane along a stretch of the Platte River from Lexington to Denman, to the west of the proposed Project area.
Fish			
Pallid sturgeon	*Scaphirhynchus albus*	FE	Pallid sturgeons are adapted for living close to the bottom of large, shallow, silty rivers with sand and gravel bars and tend to select main channel areas with islands or sand bars. The pallid sturgeon is found in big river systems including the Missouri River and its major tributaries including the Yellowstone, Niobrara, and Platte rivers. Floodplains, backwaters, chutes, sloughs, islands, sandbars, and main channel waters form the large-river ecosystem that provides macrohabitat requirements for the pallid sturgeon, a species that is associated with diverse aquatic habitats. These habitats were historically dynamic and in a constant state of change due to influences from the natural hydrography as well as sediment and runoff inputs from an enormous watershed spanning portions of 10 states. **Montana:** Potential for species to occur at crossings of the Milk River above the Fort Peck Reservoir, at the crossing of the Missouri River below Fort Peck Dam, and at the crossing of the Yellowstone River downstream of Fallon, Montana. **South Dakota:** Potential for species in the headwaters of Lake Sharpe in South Dakota. **Nebraska:** Potential for species to occur in the Missouri River near the mouth of the Platte River near Plattsmouth, Nebraska.
Topeka shiner	*Notropis topeka*	FE	The Topeka shiner is normally found in slow-flowing, cool, clear, prairie creeks or spring-fed pools in larger streams. This species prefers pool-like areas that are outside the main channel courses, in contact with groundwater and that contain vegetation and areas of exposed gravel. Typical substrates utilized by the Topeka shiner include gravel, rubble, sand or bedrock with some silt. USFWS has designated critical habitat for Topeka shiner in five different watersheds, including the Elkhorn River watershed in Madison County, Nebraska. Areas designated as critical habitat for the Topeka shiner are either occupied by the species or provide critical links between occupied habitats. Within the Elkhorn River watershed, only one stream segment, a segment of Taylor Creek, was designated as critical habitat for the Topeka shiner. **Montana**: The Topeka shiner does not occur in Montana. **South Dakota**: The Topeka shiner does not occur in South Dakota. **Nebraska**: The estimated current range of the Topeka shiner is very localized, limited to a portion of Madison and Stanton counties in Nebraska.

Table 3.7-5. Summary of Federally-Listed Species with the Potential to Occur along the Proposed Keystone XL Pipeline

Common Name	Scientific Name	Status	Habitat and Potential for Occurrence
Invertebrates			
American burying beetle	*Nicrophorus americanus*	FE	Typical habitat includes mesic areas such as wet meadows, streams and wetlands in association with relatively undisturbed semi-arid, sandhill and loam grasslands. Reconnaissance surveys of habitat suitability along the pipeline ROW for South Dakota and Nebraska were conducted from 2008 to 2012, and additional surveys were conducted along the MAR in 2018. Habitat was rated based on the Nebraska habitat rating system that reflects the potential for American burying beetle occurrence based on general habitat characteristics (prime, good, fair, marginal, poor). Surveys in South Dakota and Nebraska identified American burying beetle habitat that is either classified as prime, good, fair, marginal or poor. **Montana**: The American burying beetle does not occur in Montana. **South Dakota**: The American burying beetle is found in Tripp, Todd, and Gregory counties in South Dakota. **Nebraska**: In Nebraska, American burying beetle populations are known to occur in Antelope, Blaine, Boone, Brown, Cherry, Custer, Dawson, Frontier, Gasper, Holt, Keya Paha, Lincoln, Loup, Rock, Thomas, Valley, and Wheeler counties and may occur elsewhere in Nebraska. Surveys conducted along the MAR did not detect any populations of the beetle.
Mammals			
Black-footed ferret	*Mustela nigripes*	FE	Black-footed ferrets are not known to exist outside reintroduced populations in the western United States. Eleven reintroductions of black-footed ferrets have occurred in Montana, South Dakota and Kansas; these were outside the Keystone XL pipeline ROW. Ferrets are most commonly observed in late summer or early fall. Natural Heritage Program data for Montana and South Dakota contains no historical records of black-footed ferrets within 5 miles of the proposed ROW. Historically, the range of black-footed ferret coincided closely with prairie dogs which make up more than 90 percent of the black-footed ferret's diet. According to the USFWS Pierre Ecological Services Field Office, black-tailed prairie dog towns in all of South Dakota and Nebraska are block-cleared, meaning the towns no longer contain any wild free-ranging black-footed ferrets and activities within these areas that result in the removal of the black-tailed prairie dogs and/or their habitat would no longer be required to meet the USFWS survey guidelines for black-footed ferrets. In Montana, surveys are still required and mitigation measures would be adopted and implemented by Keystone to prevent potential direct or indirect impacts on the black-footed ferret population in that state from construction activities, should they occur close enough to the proposed Project to be potentially impacted. **Montana**: The proposed Project crosses the historical range of the black-footed ferret in Montana, however, is outside of the current species range.

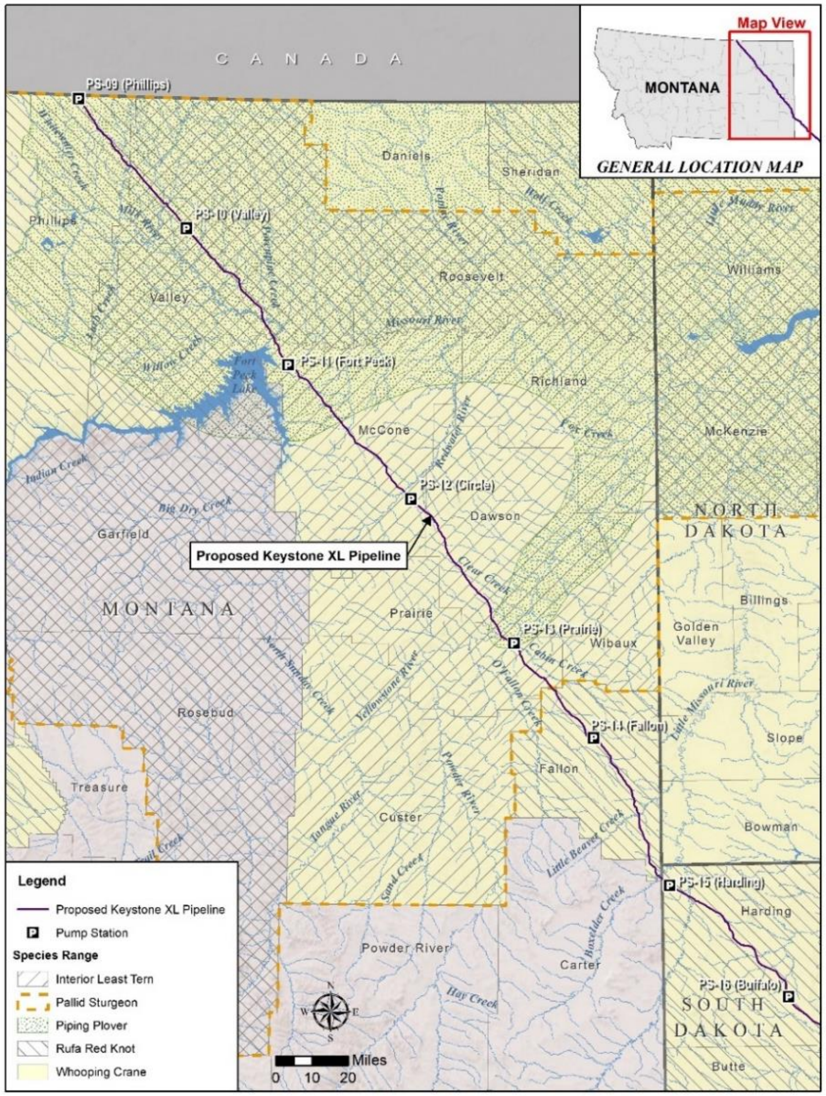
Table 3.7-5. Summary of Federally-Listed Species with the Potential to Occur along the Proposed Keystone XL Pipeline

Common Name	Scientific Name	Status	Habitat and Potential for Occurrence
Black-footed ferret (continued)	*Mustela nigripes*	FE	**South Dakota:** The proposed Project crosses the historical range of the black-footed ferret in South Dakota, however, is outside of the current species range. **Nebraska**: The proposed Project crosses the historical range of the black-footed ferret in Nebraska, however, is outside of the current species range.
Gray wolf	*Canis lupus*	FE	Gray wolves once ranged across the entire North American continent, however, bounty programs to eliminate wolf populations and their predation on livestock reduced populations by the early 1900s from historic ranges to Alaska, Canada and northeastern Minnesota. The gray wolf is currently listed as federally endangered in Nebraska and the western half of North Dakota and South Dakota, and was delisted in Montana in May 2011 due to recovery success. **Montana:** The proposed project is east of the gray wolf's range which occurs in the western part of the state. The species is not protected under the ESA in Montana. **South Dakota:** There are no known populations of the wolf in South Dakota. **Nebraska:** There are no known populations of the wolf in Nebraska.
Northern long-eared bat	*Myotis septentrionalis*	FT	The northern long-eared bat hibernation period begins as early as August and continues through the winter months in high-humidity caves and mines. During the summer, forested areas, including riparian corridors, provide habitat (e.g., decaying trees, loose bark, tree snags and stumps) for roosting, feeding and maternity colonies. Roosting occurs primarily under the bark of trees or snags at least 3 inches diameter at breast height. **Montana**: The northern long-eared bat's range includes Dawson, Prairie and Fallon counties in Montana**, however, recent surveys in 2019 have expanded the known range of this species in Valley and McCone counties and have documented northern long-eared bat presence near the Fort Peck spillway.** **South Dakota**: The northern long-eared bat's range includes all of South Dakota **although suitable habitat within the Project area is unlikely**. **Nebraska**: The northern long-eared bat's range includes all of Nebraska **although suitable habitat within the Project area is unlikely**.

Table 3.7-5. Summary of Federally-Listed Species with the Potential to Occur along the Proposed Keystone XL Pipeline

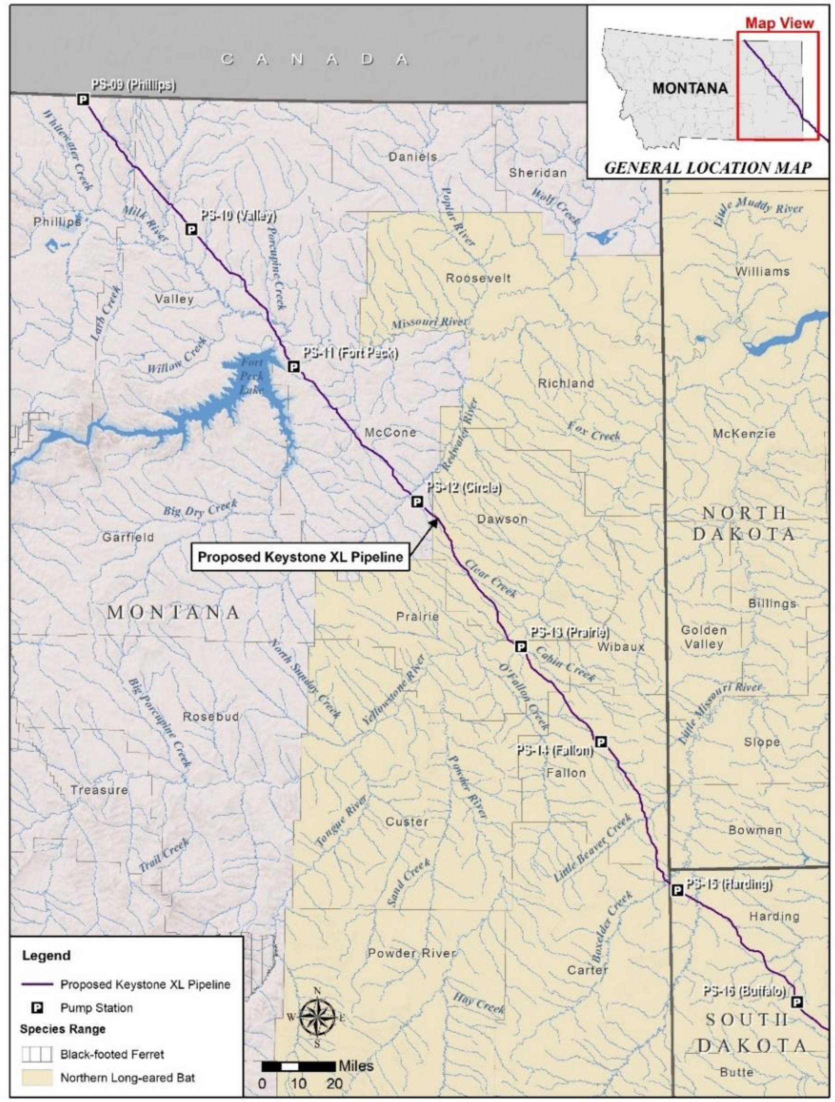
Common Name	Scientific Name	Status	Habitat and Potential for Occurrence
Plants			
Blowout penstemon	*Penstemon haydenii*	FE	The proposed Project is located east of the blowout penstemon's habitat. The plant occurs in sand blowout areas in Nebraska and Wyoming sandhill habitat. The blowout penstemon is associated with early successional blowout habitat where it has little competition for scarce water and nutrients from other plants. As blowout habitats mature and become stabilized, other plants become established, and the blowout penstemon disappears.
Western prairie fringed orchid	*Platanthera praeclara*	FT	The western prairie fringed orchid is most commonly found in moist, undisturbed mesic to wet calcareous prairies, sedge meadows and mesic swales. Populations of western prairie fringed orchids vary dramatically between wet and dry years, with increases in wet years, and decreases in dry years. Soil moisture appears to be the most significant factor in the survival of individual orchids and the number of orchids flowering in a given year. **Montana**: The western prairie fringed orchid does not occur in Montana. **South Dakota**: Populations of the western prairie fringed orchid in South Dakota are possibly extirpated but is likely to occur given the availability of suitable habitat in South Dakota. **Nebraska**: The western prairie fringed orchid is known to occur in the counties of Holt, Antelope, and Boone in Nebraska. Surveys identified one occurrence at a wetland in 2009 but none were located during a survey in 2012.

Source: U.S. Department of State 2014; USFWS 2019a through 2019j**, 2012a**



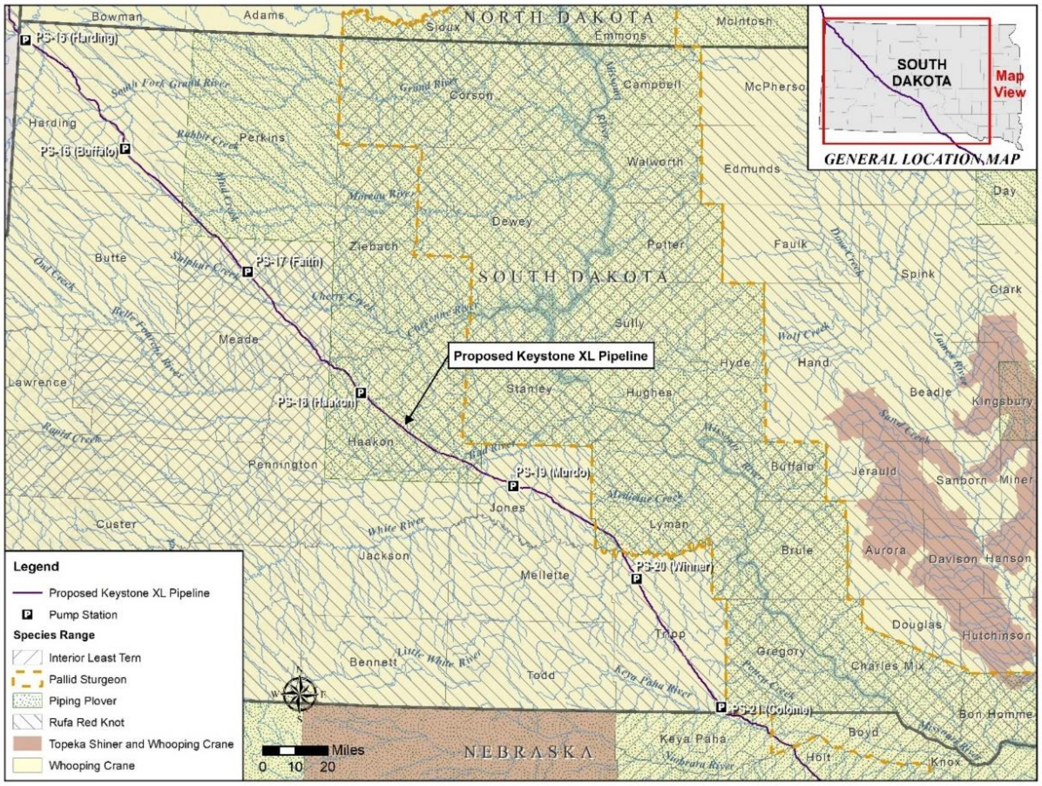
Source: USFWS 2019c, 2019e, 2019f, 2019g, 2019j

Figure 3.7-5a. Federally Listed Bird and Fish Species Ranges in Montana



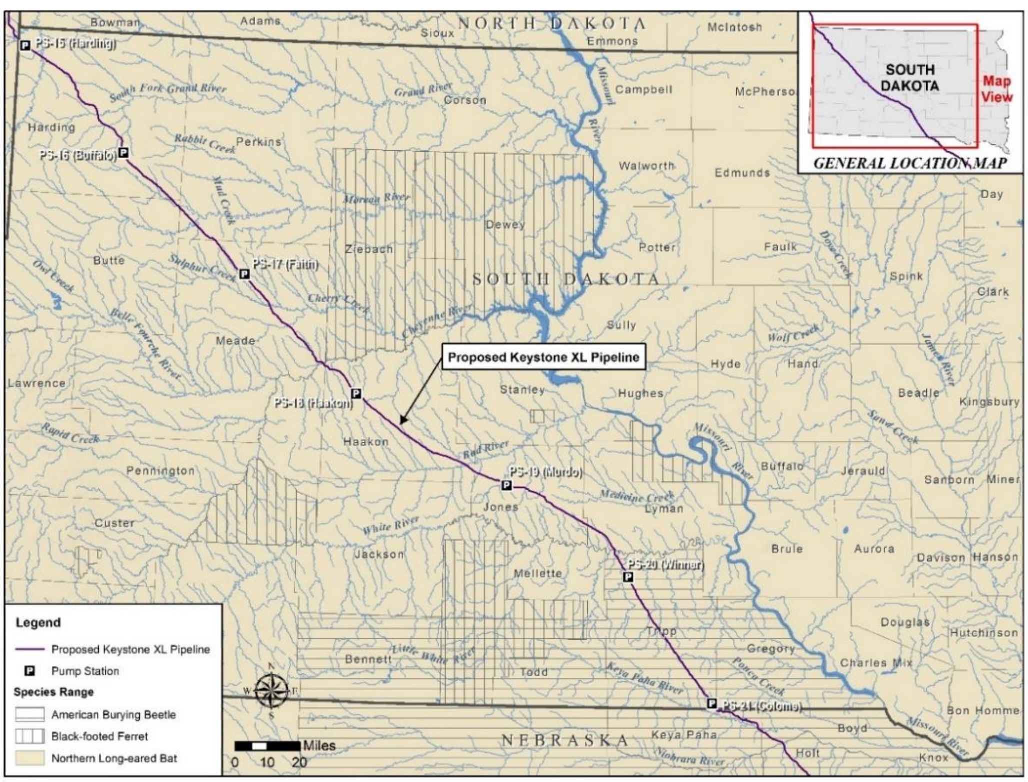
Source: USFWS 2019b, 2019d

Figure 3.7-5b. Federally Listed Mammal and Insect Species Ranges in Montana



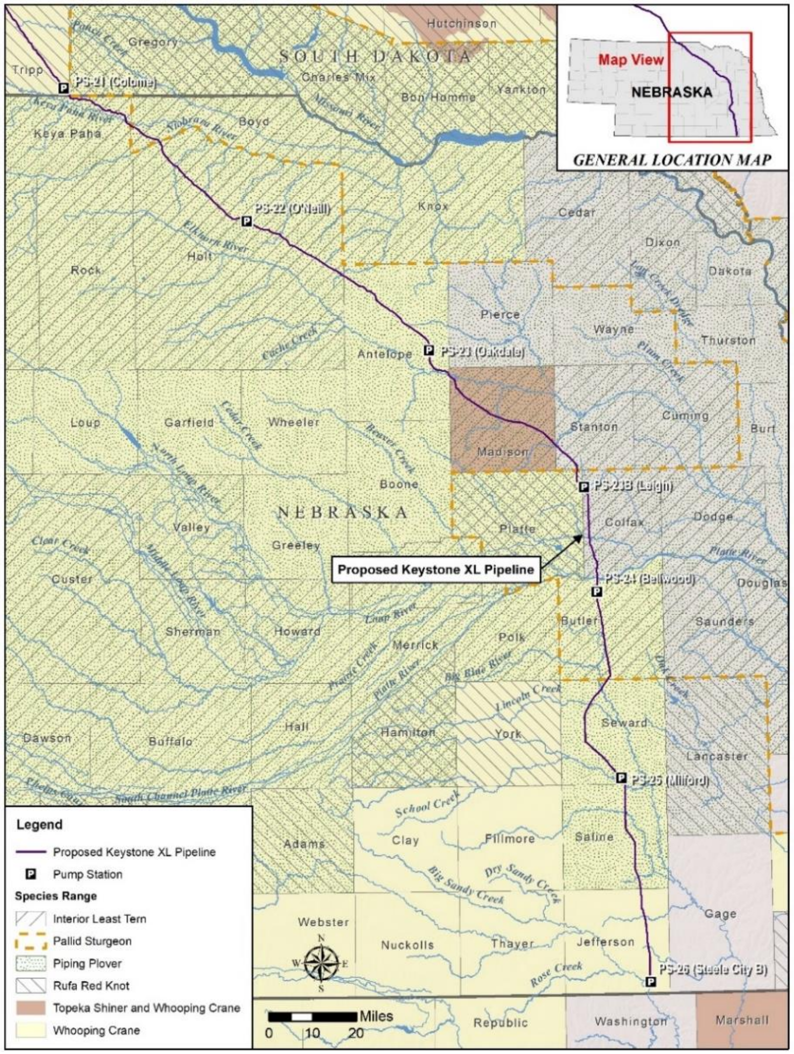
Source: USFWS 2019c, 2019e, 2019f, 2019g, 2019h, 2019j

Figure 3.7-6a. Federally Listed Bird and Fish Species Ranges in South Dakota



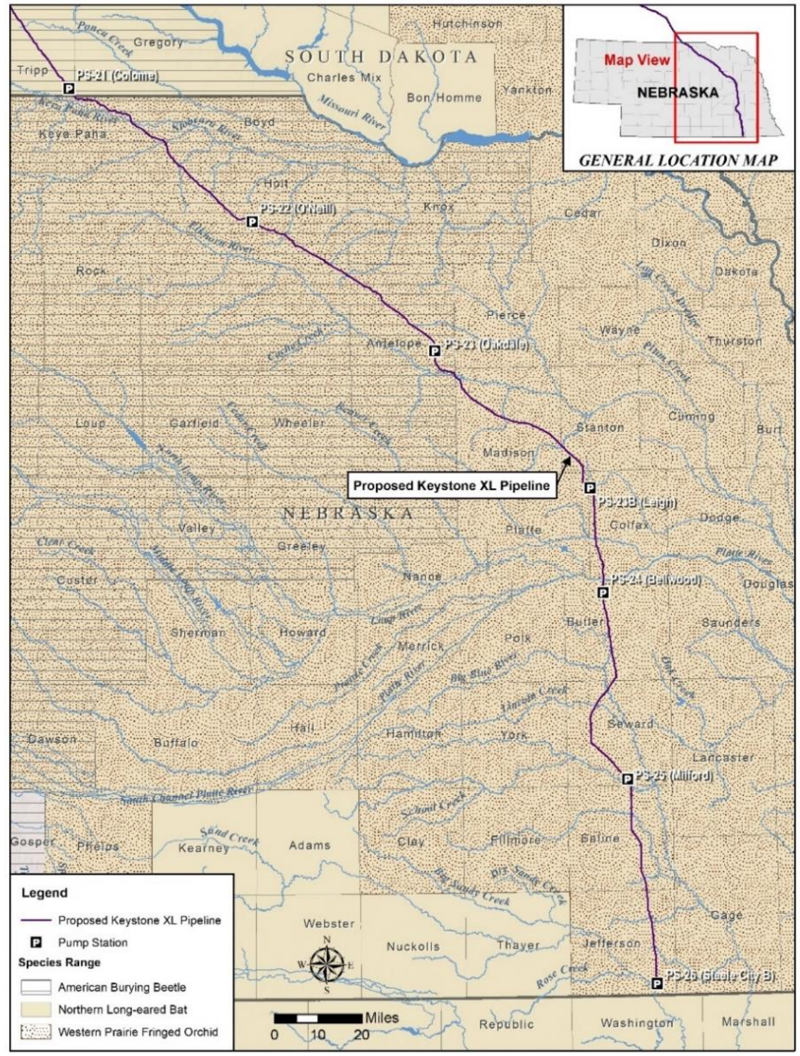
Source: USFWS 2019a, 2019b, 2019d

Figure 3.7-6b. Federally Listed Mammal and Insect Species Ranges in South Dakota



Source: USFWS 2019c, 2019e, 2019f, 2019g, 2019h, 2019j

Figure 3.7-7a. Federally Listed Bird and Fish Species Ranges in Nebraska



Source: USFWS 2019a, 2019d, 2019i

Figure 3.7-7b. Federally Listed Mammal and Insect Species Ranges in Nebraska

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3.8 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

The 2014 Keystone XL Final SEIS discusses socioeconomic conditions and the minority and low-income populations along the Preferred Route. This section supplements the 2014 analysis to include a discussion of socioeconomic conditions and the minority and low-income populations within the MAR. This section also supplements the 2014 analysis to include a discussion of treaty lands and water rights. Chapter 5, Environmental Consequences from Accidental Releases, assesses the risk to socioeconomic conditions and the minority and low-income populations in the event of an accidental release. Chapter 6, Electrical Power Infrastructure, provides a description of socioeconomic conditions and the minority and low-income populations and an assessment of impacts from connected actions relating to electrical supply needs required for the proposed pipeline. Chapter 7, Cumulative Impacts, provides an assessment of the impacts to socioeconomic conditions and minority and low-income populations from the proposed Keystone XL Project (including the electrical supply needs) in combination with other past, present and reasonably foreseeable future actions.

Socioeconomic conditions relate to the population, housing, economy, public services and traffic and transportation within a region, which are important aspects describing the human environment. The socioeconomic conditions of the region determine its ability to support a project and provide a baseline for assessing how a project may affect the human environment. Minority and low-income populations are the populations at risk of disproportionately high and adverse impacts from a project because they often lack the political and social resources to avoid, endure or mitigate potential effects.

The ROI includes Antelope, Madison, Stanton, Platte, Colfax, Butler, Seward, Saline and Jefferson counties. The environmental justice analysis considers census tracts and block groups within a 2-mile radius of the pipeline, which includes the ROI and a small portion of Pierce County, Nebraska.

This SEIS considers the following data sources for characterizing socioeconomic conditions and environmental justice populations:

- U.S. Census data from the 2012 to 2016 American Community Service and the 2010 decennial Census
- USACops data relating to police departments
- Community Network data relating to fire departments
- Nebraska Department of Revenue data relating to tax revenue
- U.S. Department of Health and Human Services Data Warehouse relating to Medically Underserved Areas/Populations and Health Professional Shortage Areas
- Current satellite imagery to identify characteristics of roadways (e.g., number of lanes, geometry)
- Government websites relating to transportation infrastructure (e.g., USDOT, Nebraska Department of Transportation)
- Department site visit, May 9, 2018
- IMPLAN Model data

3.8.1 Socioeconomic Overview

The MAR crosses nine counties in Nebraska, beginning in Antelope County and continuing approximately 162 miles south and southeast through Jefferson County. The nine counties in Nebraska along the pipeline route would likely experience the most direct socioeconomic impacts of constructing and operating the proposed pipeline within the MAR.

3.8.1.1 Population

Table 3.8-1 shows population data for the counties crossed by the MAR in 2010 and 2016. The counties along the MAR are predominantly rural and sparsely populated areas, with an estimated total population of 137,646 reported in 2016.

Table 3.8-1. Population Change in Project Area

County	Population 2010	Population 2016	Percent Change (2010-2016)
Antelope	6,685	6,421	-3.9
Madison	34,876	35,125	0.7
Stanton	6,129	6,022	-1.7
Platte	32,237	32,703	1.4
Colfax	10,515	10,499	0.2
Butler	8,395	8,053	-4.1
Seward	16,750	17,113	2.2
Saline	14,200	14,356	1.1
Jefferson	7,547	7,354	-2.6
Total	**137,334**	**137,646**	**0.2**

Source: U.S. Census Bureau 2017a

3.8.1.2 Housing

Table 3.8-2 provides a detailed summary of housing in the area of the MAR. Housing needs would be mostly during construction; therefore, the housing analysis focuses on temporary housing. Vacancy rates for rental units along the MAR range from a low of 1.1 percent in Butler County to a high of 7.9 percent in Jefferson County. The distribution of vacant housing units in each county through which the MAR traverses is highly variable, ranging from 303 vacant units in Stanton County to 1,045 vacant units in Madison County (U.S. Census Bureau 2017b). Similar to vacant rental units, the distribution of campgrounds and hotels in each county through which the MAR traverses is highly variable. Tourism is at its peak between the months of May to September, and the availability of short-term housing could be restricted during these times.

Table 3.8-2. Temporary Housing Stock in Project Area

County	Total Housing Units	Vacant Housing Units	Rental Vacancy Rate (Percent)	Hotels/Motels	Campgrounds
Antelope	3,284	537	6.5	–[a]	253
Madison	15,101	1,045	5.8	645	–[a]
Stanton	2,645	303	5.5	–[a]	–[a]
Platte	13,606	869	3.4	598	–
Colfax	4,121	462	1.4	68	85
Butler	4,059	580	1.1	–[a]	–[a]
Seward	6,993	645	4.9	105	–[a]
Saline	5,790	671	2.5	77	483
Jefferson	3,903	600	7.9	79	–[a]
Total	**59,502**	**5,712**	**4.3**	**1,572**	**821**

Source: Colfax County 2014; Exp 2018; U.S. Census Bureau 2017b

[a.] No facilities reported in county.

3.8.1.3 Economic Base

Employment and income patterns provide insight into local economic conditions, including the strength of the local economy and the well-being of the residents. Table 3.8-3 shows summary statistics covering these economic parameters. Median household income and per capita income vary from county to county. The per capita income ranges from a low of $21,880 in Saline County to a high of $29,282 in Stanton County. The median household income throughout the ROI ranges from a low of $44,616 in Jefferson County to a high of $61,563 in Seward County (U.S. Census Bureau 2017b).

Unemployment rates in 2016 ranged between 3 and 5 percent for most counties, with a low of 1.8 percent in Antelope County and a high of 5.4 percent in Colfax County.

Table 3.8-3. Existing Income and Employment Conditions in Project Area

County	Per Capita Income (2016)	Median Household Income (2016)	Labor Force (2016) (Persons)	Unemployment Rate (2016) (Percent)
Antelope	$27,048	$46,381	3,245	1.8
Madison	$24,458	$48,673	19,022	3.1
Stanton	$29,282	$58,553	3,253	3.3
Platte	$27,052	$58,473	18,314	4.6
Colfax	$23,619	$52,712	5,610	5.4
Butler	$28,045	$51,166	4,398	4.5
Seward	$28,491	$61,563	8,954	3.5
Saline	$21,880	$49,332	7,256	3.4
Jefferson	$26,305	$44,616	3,824	3.2

Source: U.S. Census Bureau 2017c

3.8.1.4 Tax Revenues

Table 3.8-4 shows property tax revenue in each county the MAR crosses. Annual property tax revenues are a function of property value assessed by local government units and effective property tax rates. Annual property tax rates are subject to fluctuations.

Property tax revenues vary widely across the counties located along the MAR from approximately $22 million in Stanton County to nearly $69 million in Platte County. The effective tax rate among the counties crossed by the MAR is generally similar, ranging from 1.0 percent in Antelope County to 1.6 percent in Madison County (Nebraska Department of Revenue 2018a).

Table 3.8-4. Property Tax Revenues for Affected Counties in Project Area

County	Total Property Tax Revenue (2017)
Antelope	$26,159,146
Madison	$63,019,193
Stanton	$21,950,914
Platte	$68,863,997
Colfax	$28,231,996
Butler	$30,055,100
Seward	$41,739,172
Saline	$34,329,635
Jefferson	$26,951,526

Source: Nebraska Department of Revenue 2018a

3.8.1.5 Public Services

Public services that the proposed Project could affect include police, fire protection and medical facilities. Table 3.8-5 shows the number of police/sheriff departments and fire stations within the counties along the MAR, as well as the nearest critical access medical facility in each county. Critical Access Medical Facilities are designed to provide 24/7 emergency care, but have 25 or fewer acute care inpatient beds.

The Emergency Planning and Community Right-to-Know Act and the Superfund Amendments and Reauthorization Act of 1986 designate Local Emergency Planning Committees for a state's established planning area. Local Emergency Planning Committees plan for contingencies that may occur from hazardous or toxic materials contained within or transported across their borders. In the state of Nebraska, Local Emergency Planning Committees function at the county level.

Table 3.8-5. Public Service Facilities in Project Area

County	Police/Sheriff Departments	Fire Departments	Nearest Critical Access Medical Facility to the MAR
Antelope	4	5	Antelope Memorial Hospital
Madison	8	6	–[a]
Stanton	1	2	–[a]
Platte	3	6	–[a]
Colfax	5	3	CHI Health Schuyler
Butler	2	8	Butler County Health Care Center
Seward	3	5	Memorial Hospital
Saline	4	6	Crete Area Medical Center
Jefferson	3	5	Jefferson Community Health Center

Source: Community Network 2018; USACops 2018

[a.] No Critical Access Medical Facility in county.

MAR = Mainline Alternative Route

3.8.1.6 Traffic and Transportation

The ROI for the proposed Project includes the roadways within the 110-foot-wide construction ROW, which includes the 50-foot-wide operational ROW.

The MAR is located east of Lincoln, Nebraska, crossing primarily rural areas, with some low-density residential areas. The transportation network within the Project area is serviced by the major roadways indicated in Table 3.8-6. These roadways intersect with the proposed pipeline route a total of 14 times. Major roadways for this analysis are defined as Category III roads, primary U.S. and state highways and Category IV roads, Primary Limited Access roads or interstates. The MAR also intersects secondary and local roadways a total of 197 times.

Table 3.8-6. Major Roads in Project Area

Road	Counties	Intersections within Proposed MAR
State Highway 92	Butler	1
State Highway 64	Butler	1
U.S. Highway 30	Colfax	1[a]
U.S. Highway 136	Jefferson	1
U.S. Highway 81	Madison	1[a]
State Highway 275	Madison	1
State Highway 121	Madison	1
State Highway 32	Madison	1
State Highway 91	Platte, Saline	2
State Highway 33	Platte	1
Interstate 80	Seward	1[a]
U.S. Highway 34	Seward	1
State Highway 15	Seward	1
	Total Intersections	14

[a.] Denotes pipeline crosses east-bound and west-bound lanes of divided highway.
MAR = Mainline Alternative Route

3.8.2 Environmental Justice Overview

Based on CEQ guidance (CEQ 1997a), a minority or low-income population may exist where either:

- The minority or low-income population in the affected area exceeds 50 percent; or
- The minority or low-income population of the affected area is "meaningfully greater" than the minority or low-income composition of the general population. "Meaningfully greater" is defined as greater than 120 percent of the minority or low-income populations of the county in which the respective census unit of analysis is located.

3.8.2.1 Minority Populations

There are 34 census block groups encompassed by or intersecting a 2-mile radius of the proposed MAR across the nine counties. The Department calculated the percentage of each block group's population represented by each minority classification (each racial group, aggregate race minority population and Hispanic/Latino ethnic origin).

Of the 34 block groups, none of the block groups had individual racial group minority populations and aggregate minority populations that met the 50 percent criterion, and a total of five block groups met the meaningfully greater criterion for one or more racial groups. The following is a breakdown of these block groups:

- **Butler County** – There are two block groups within Butler County with total minority populations that exceed the meaningfully greater criterion for environmental justice populations. These two block groups include a total minority population of 172 persons.
- **Madison County** – There are two block groups within Madison County with total minority populations that exceed the meaningfully greater criterion for environmental justice populations. These two block groups include a total minority population of 1,267 persons.
- **Platte County** – There is one block group within Platte County with a total minority population that exceeds the meaningfully greater criterion for environmental justice populations. The block group includes a total minority population of 700 persons.

See Figure 3.8-1 for locations of these block groups meeting the meaningfully greater criterion for environmental justice minority populations.

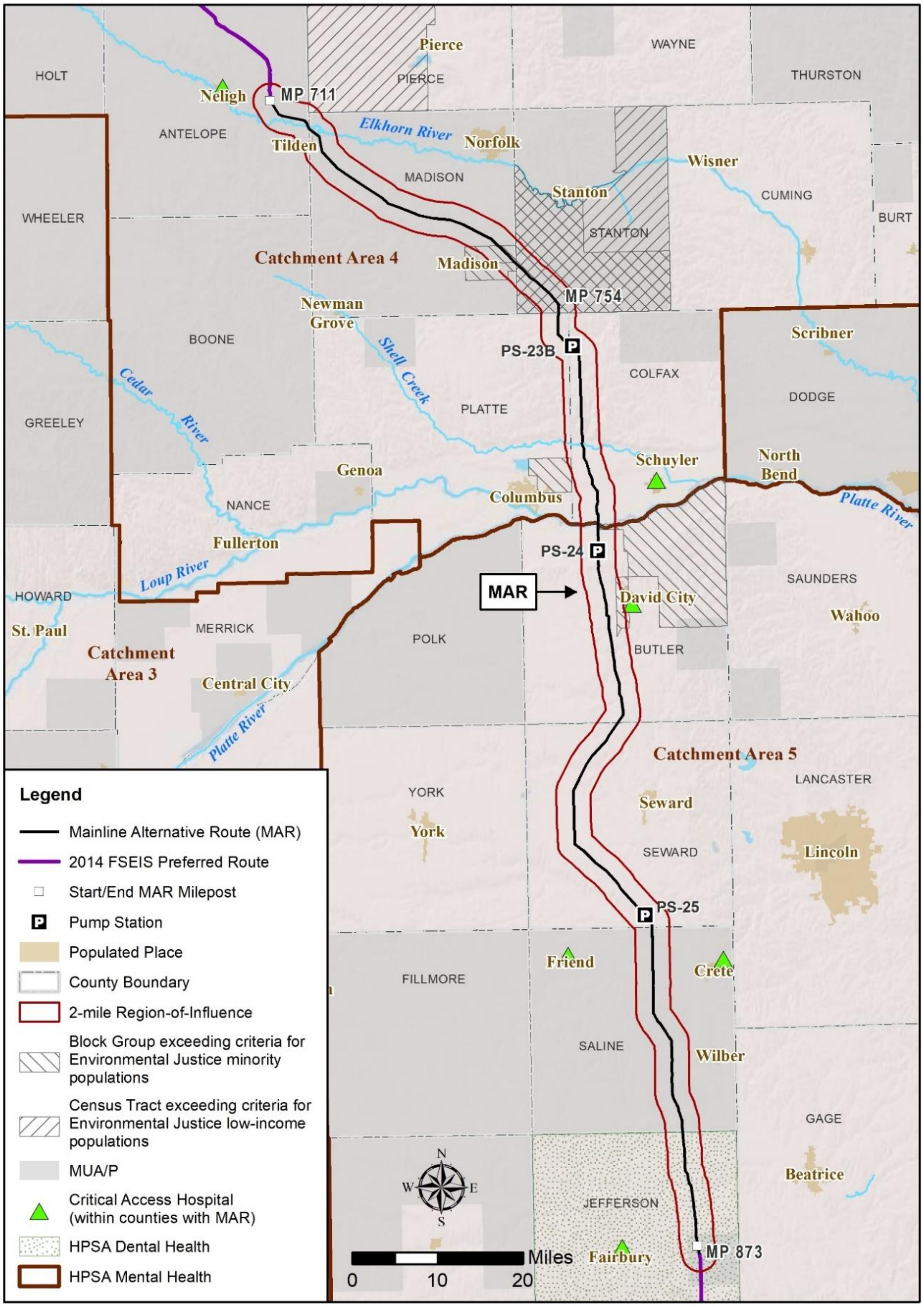
3.8.2.2 Low-Income Populations

There are 20 census tracts encompassed by or intersecting with a 2-mile radius of the proposed MAR across the nine counties. As with the minority populations, low-income populations were evaluated using the absolute 50 percent and the relative 120 percent or greater criteria for potentially affected census tracts within the counties. If a census tract's percentage of low-income individuals was more than 120 percent of the low-income percentage of the corresponding county, then the area was identified as having a low-income population.

Of the 20 census tracts, none of the census tracts had low-income populations that exceeded the 50 percent criterion, and a total of two census tracts met the 120 percent criterion for low-income individuals. The following is a breakdown of these census tracts:

- **Pierce County** – There is one census tract within Pierce County with a low-income population that exceeds the meaningfully greater criterion for environmental justice populations. The census tract includes a total low-income population of 3,084 persons.
- **Stanton County** – There is one census tract within Stanton County with a low-income population that exceeds the meaningfully greater criterion for environmental justice populations. The census tract includes a total low-income population of 1,601 persons.

See Figure 3.8-1 for locations of census tracts meeting the meaningfully greater criteria for environmental justice low-income populations.



Source: U.S. Census Bureau 2017b, 2012; U.S. Department of Health and Human Services 2018; Flex Monitoring Team 2018

Figure 3.8-1. Environmental Justice Populations and Health Care Facilities

3.8.2.3 Medically Underserved Populations

The U.S. Department of Health and Human Services, Health Resources and Services Administration, designates Health Professional Shortage Areas and Medically Underserved Areas/Populations in an effort to identify areas that have shortages of medical services. The agency categorizes Health Professional Shortage Areas by shortages of primary medical care, dental care or mental health providers. Medically Underserved Areas/Populations are areas or populations designated as meeting one or more of the following criteria: too few primary care providers, high infant mortality, high poverty and/or high elderly populations. Medically Underserved Populations may include groups of persons who face economic, cultural or linguistic barriers to health care. The area within which the majority of the medical facilities' patients reside is referred to as the "catchment area." Table 3.8-7 summarizes the Medically Underserved Areas/Populations within the ROI, and Figure 3.8-1 displays the locations of the Medically Underserved Areas/Populations and Health Professional Shortage Areas.

Table 3.8-7. Medically Underserved Areas/Populations in Project Area

County	Census Block Groups with Minority Populations	Census Tracts with Low-Income Populations	Health Professional Shortage Areas		Medically Underserved Areas/ Populations
			Designation Name/ Facility Location	Geographic Area or Facility Type	Designation Name
Antelope	0	0	Catchment Area 4 Antelope	Geographic Population(M) Single County (M)	Antelope Service Area
Madison	2	0	Midtown Health Center, Inc. Ponca Hills Health and Wellness Center/Ponca Tribe Madison County	Comprehensive Health Center (P, D, M) Native American Tribal Population (P, D, M) Single County (M)	Hispanic Population – Madison County
Stanton	0	1	Catchment Area 4 Stanton	Geographic Population (M) Single County (M)	Stanton Service Area
Platte	1	0	East Central District Health Department Platte County	Comprehensive Health Center (P, D, M) Single County (M)	St. Bernard Service Area
Colfax	0	0	Howells Family Practice CHI Health Schuyler Clinic CHI Health Clarkson Clinic Catchment Area 4 Colfax	Rural Health Clinic (P, D, M) Rural Health Clinic (P, D, M) Rural Health Clinic (P, D, M) Geographic Population (M) Single County (M)	Adams Prec Service Area Schuyler City – County
Butler	2	0	Catchment Area 5 Butler	Geographic Population (M) Single County (M)	David City Service Area
Seward	0	0	Catchment Area 5 Seward	Geographic Population (M) Single County (M)	No Medically Underserved Areas in this County
Saline	0	0	Catchment Area 5 Saline	Geographic Population (M) Single County (M)	Saline Service Area
Jefferson	0	0	Catchment Area 5 Jefferson	Geographic Population (M) Single County (M, D)	Fairbury City – County Pleasant Prec – County
Pierce	0	1	CHI Health Plainview Clinic Catchment Area 4 Pierce	Rural Health Clinic (P, D, M) Geographic Population (M) Single County (M)	No Medically Underserved Areas in this County

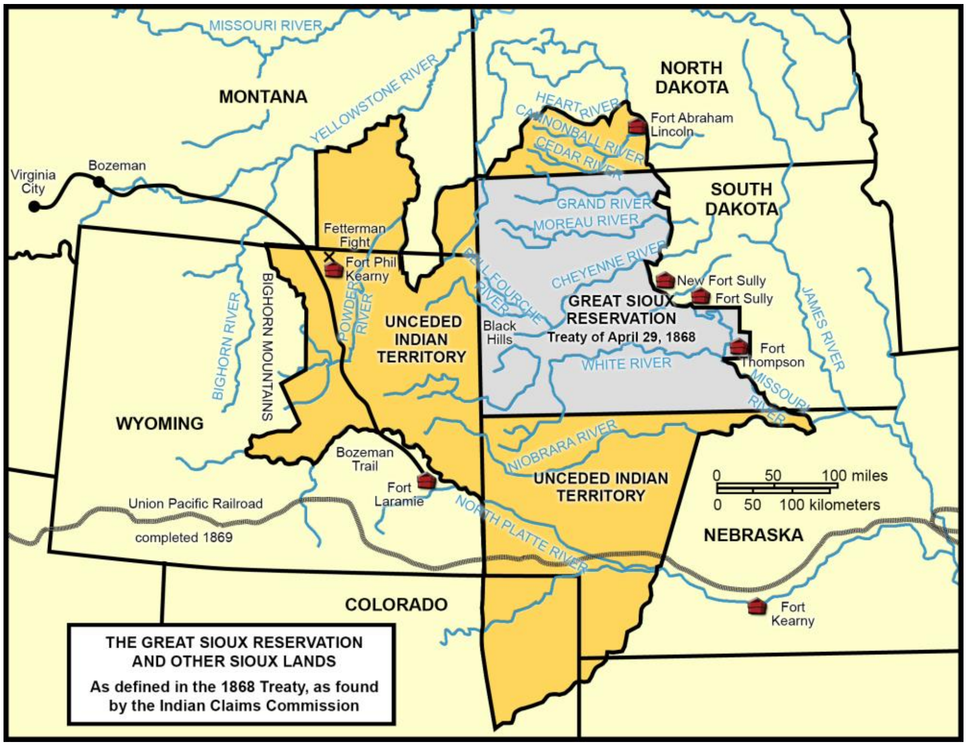
Source: U.S. Department of Health & Human Services 2018

D = dental; M = mental health; P = primary medical care

3.8.2.4 Treaty Lands and Water Rights

The Keystone XL Project crosses treaty lands in southeastern Montana, western South Dakota and northwestern Nebraska. Different tribes dependent on their respective treaties, executive orders or congressional acts may assert different claims related to a multitude of issues pertaining to off reservation hunting, fishing, water and other resource rights. The Fort Laramie Treaty of 1851 was the first effort to define the territory of the Great Sioux Nation of Lakotas, Dakotas and Nakotas. The Treaty of 1851 did not establish a reservation, but began the process of defining a territory in which the Sioux could live and hunt. Under the terms of the treaty, all Indian tribes in attendance pledged a lasting peace with each other, and they consented to share their hunting ranges, especially those districts where bison were still plentiful. The treaty also contained articles pledging a peace between the Indian tribes and the United States, giving the U.S. government permission to construct roads and military posts within tribal territories and to permit the safe passage of emigrants through these areas in return for the payment of annual annuities. This treaty was followed by the Fort Laramie Treaty of 1868 which created the Great Sioux Reservation and unceded lands reserved for hunting (see Figure 3.8-2). A portion of the unceded lands in northern Dakota Territory became part of the Great Sioux Reservation (later Standing Rock Reservation) following an agreement between the federal government and the Sioux leaders in September 1876 (State Historical Society of North Dakota 2019; Albers et al. 2003). The treaty would permit the construction of roads and posts to accommodate overland travel. Other past regional treaties include the 1855 Blackfeet Treaty which established the Blackfeet Indian Reservation, historically encompassing most of the northern half of Montana to the west of the project. In 1888, Congress ratified an agreement to reduce the territory of the Gros Ventre, Piegan, Blood, Blackfeet and River Crow Indian Tribes. In return, Congress created the original Fort Belknap Indian Reservation, also located to the west of the project. The MAR portion of the proposed Keystone XL pipeline does not cross the 1868 Treaty lands. As shown in Figure 3.8-2, the Treaty lands are north of the Niobrara River; the start of the MAR is approximately 60 miles south of the Niobrara River's confluence with the Missouri River where the eastern point of the treaty lands terminate.

Regarding water rights, in 1908, a Supreme Court ruling established the Winters Doctrine which clarifies water rights of American Indian reservations by establishing that when the federal government created Indian reservations, water rights were reserved in sufficient quantity to meet the purposes for which the reservation was established. The specific case involved the Fort Belknap Reservation in Montana and their right to use the water of the Milk River which was being diverted upstream by farmers. The upstream diversion provided insufficient water supply to support irrigation for agriculture on the reservation. The Supreme Court ruled in favor of the United States and the Native American Indians, arguing that the establishment of the Fort Belknap Reservation entitled the Native American Indians to perpetual use of the water that it contained; their rights were "reserved" at the date of establishment (1888), and, contrary to the doctrine of prior appropriation, those rights could not be lost through nonuse. Courts have held that Indian tribes have "reserved" rights in all waters that arise on, border, traverse, or underlie their reservations.



Source: State Historical Society of North Dakota 2019

Figure 3.8-2. Lands Defined by the 1868 Fort Laramie Treaty

More recently, in 2000, Congress enacted the Fort Peck Reservation Rural Water System Act to (1) ensure a safe and adequate municipal, rural and industrial water supply for the residents of the Fort Peck Indian Reservation in the state of Montana; and (2) assist the citizens of Roosevelt, Sheridan, Daniels and Valley counties in the state, outside the Fort Peck Indian Reservation, in developing safe and adequate municipal, rural and industrial water supplies (Public Law 106-382). The resulting project, known as the Assiniboine and Sioux Rural Water Supply System, is comprised of the Fort Peck Reservation and Dry Prairie Rural Water Authority, which are located in northeastern Montana. **While portions of the Assiniboine and Sioux Rural Water Supply System are still in development, much of the work has been completed and title for operational facilities has been transferred to the Bureau of Indian Affairs to be held in trust for the Indian tribes. The Assiniboine and Sioux Rural Water Supply System uses water from the Fort Peck-Montana Compact, which was ratified in 1985 by the state of Montana and the Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation. The Compact was approved by the Secretary of the Interior and the U.S. Attorney General and establishes water rights of the Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation in the State of Montana to water on, under, adjacent to, or otherwise appurtenant to the Reservation, including waters of the Missouri River, its tributaries, and ground water. The Assiniboine and Sioux Rural Water Supply System provides clean, safe drinking water to schools, churches and other faith communities, hospitals, and businesses on the Reservation.** The Fort Peck Reservation has a total population of approximately 10,700 people, of which approximately 5,800 are members of the Assiniboine and Sioux Tribes. The water system serves Reservation populations in or around the towns of Wolf Point, Poplar, Brockton, Fort Kipp, Oswego and Frazer. Towns not on the Reservation, including Glasgow, Scobey, Plentywood and Culbertson, are served by the Dry Prairie Rural Water Association (Assiniboine & Sioux Rural Water Supply System 2010). **The ultimate design population serviced by the water supply system is 31,200 people.**

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3.9 CULTURAL RESOURCES

The 2014 Keystone XL Final SEIS discusses cultural resources along the Preferred Route. This section supplements the 2014 analysis to include a discussion of the cultural resources within the MAR along with a discussion of updates to cultural resources within Montana, South Dakota and areas of Nebraska along the Preferred Route which have been surveyed since 2014. Chapter 5, Environmental Consequences from Accidental Releases, assesses the risk to cultural resources in the event of an accidental release. Chapter 6, Electrical Power Infrastructure, provides a description of cultural resources and an assessment of impacts from connected actions relating to electrical supply needs required for the proposed pipeline. Chapter 7, Cumulative Impacts, provides an assessment of the cultural resources impacts from the proposed Keystone XL Project (including the electrical supply needs) in combination with other past, present and reasonably foreseeable future actions.

Cultural resources were **identified** within the potentially affected environment (i.e., area of potential effect [APE]) of the proposed Keystone XL pipeline. The APE generally includes a 300-foot-wide study area, centering 150 feet from the proposed pipeline centerline. **This SEIS uses the following terms:**

- **Historic properties, as defined under the National Historic Preservation Act (NHPA), are properties included in or eligible for inclusion in the National Register of Historic Places (NRHP) (36 CFR §800.16(l)). Traditional Cultural Properties, which are recognized for maintaining traditional ways of life among Indian tribes and other traditional communities, may be historic properties.**
- **Cultural resources include the remains and sites associated with human activities, such as prehistoric and ethno-historic Indian archaeological sites, historic archaeological sites, historic buildings and structures, and elements or areas of the natural landscape. Cultural resources determined to be National Register eligible are historic properties.**

As a basis for the analysis of **historic properties**, this SEIS considers federal and state regulations, standards and guidance. The Department invited 6**9** Indian tribes having geographic and/or ancestral ties to participate in the NEPA process (Section 1.5, Agency, Tribal and Public Involvement, provides a list), as well as **state and federal agencies that are consulting parties to the Project Programmatic Agreement** (see Appendix A, Indian Tribe and Agency Coordination).

In addition, consistent with Section 106 of the NHPA, the Department has conducted government-to-government consultation with Indian tribes. Table 3.9-1 provides a brief timeline of coordination efforts with Indian tribes regarding the **Keystone XL project since publication of the 2014 Keystone XL Final SEIS**.

Table 3.9-1. Department Coordination Efforts with Indian Tribes Regarding the Keystone XL Project Since 2014

Date	Activity
December 23, 2013	The Department executed a Programmatic Agreement to take into account the effects of the Keystone XL Project on historic properties listed in or eligible for listing in the NRHP resulting from construction, operations and maintenance of the Keystone XL Project (see Appendix E of the 2014 Keystone XL Final SEIS (Link to Appendix E)).
April 10, 2018	The Department sent a letter to the 67 Indian tribes who expressed interest in the h**istoric properties** potentially affected by the Keystone XL Project. The letter stated the Department is continuing government-to-government consultation with the tribes and in accordance with the Programmatic Agreement (see Appendix A, Indian Tribe and Agency Coordination).
May 1, 2018	In accordance with stipulation V.B.2 of the Programmatic Agreement, the Department sent letters to Indian tribe leaders and THPOs. In order to make a reasonable and good faith effort to complete the identification of historic properties before construction begins, the Department requested assistance in identifying Traditional Cultural Properties/properties of religious and cultural significance of the tribe that may be eligible for listing in the NRHP and could be affected by construction of the MAR (see Appendix A, Indian Tribe and Agency Coordination). **Four tribes submitted Scopes of Work to conduct TCP studies. All were approved by the Department.**
May 24, 2018	The Department sent a letter to the 67 Indian tribes who expressed interest in the **historic properties** potentially affected by the Keystone XL Project announcing the decision to prepare an EA on the MAR and to establish a direct point of contact for each tribe interested in participation on the Draft EA.
July, 2018	**Three tribes conducted approved TCP studies within the MAR (Omaha Tribe of Nebraska, the Santee Sioux Nation and the Fort Belknap Indian Community). The tribes reported multiple locations that may contain burials. Two magnetometer surveys were conducted to investigate these locations.**
July 26, 2018	The Department sent a letter to tribes notifying them of the availability of the 2018 Keystone XL MAR Draft EA and start of a 30-day comment period.
August 16, 2018	**The Department met with the Chairman and Tribal Council for the Assiniboine & Sioux Tribes of the Fort Peck Indian Reservation, in Poplar, Montana to provide the tribal leadership with an update on the cultural resources investigations conducted for the Keystone XL Project and to discuss any concerns the tribe might have regarding the effect of the Project on those resources. Representing the Department was the Director, Office of Environmental Quality and Transboundary Issues, Bureau of Oceans and International and Scientific Affairs the Department's Trade and Environment Negotiator; and, the Department's legal counsel. The Department was scheduled to meet with the Fort Belknap Indian Community in Harlem, Montana on August 15, 2018 for the same purpose; however, at the last moment the tribe cancelled the meeting with no explanation and shortly thereafter ceased communicating with the Department**
August 29, 2018	**The Department sent a letter to all tribes notifying them of the availability of the cultural resources survey report on the MAR and requested their comments on National Register eligibility and effect.**
September 17, 2018	The Department sent a letter to tribes notifying them of the availability of the 2018 Keystone XL MAR Draft SEIS and start of a 45-day comment period.
October 5, 2018	**The Department sent the Omaha Tribe of Nebraska, the Santee Sioux Nation and the Fort Belknap Indian Community the results of two magnetometer studies investigating potential burial locations along the MAR and requested comments. No burial features were identified.**
December 12, 2018	**The Department, responding to a request from the Omaha Tribe, agreed to include the potential burial locations to the list of places that will be monitored by tribal members during construction.**
December 14, 2018	The Department sent a letter to tribes announcing the decision to prepare a new SEIS in response to the Federal District Court for the District of Montana's November 8, 2018 Order for the Department to supplement the analysis in the 2014 Keystone XL Final SEIS relating to greenhouse gas emissions, oil spills, cultural resources and market analysis.

Table 3.9-1. Department Coordination Efforts with Indian Tribes Regarding the Keystone XL Project Since 2014

Date	Activity
June 26, 2019	**The Department met with the Tribal Chairman, the Tribal Historic Preservation Officer, and a member of the Tribal Council tribal leadership for the Little Shell Tribe of Chippewa Indians of Montana at the tribal headquarters in Great Falls, Montana. The purpose of the meeting was to discuss concerns the tribe had expressed about the potential effects of the Project to cultural resources and the need for supplementary cultural resources inventory of the Project ROW in Montana. The Department's cultural resources contractor attended the meeting and reported the meeting results to the Department for decision making.**
July 2, 2019	**The Department sent an invitation via email to all tribal consulting parties inviting their participation in the field work. Representatives from four tribes chose to participate. The Department will consult with all tribal consulting parties on the result of the re-inspection once the inventory report is complete.**
July 30 – August 29, 2019	**The Department, in conjunction with Keystone, arranged to re-inspect 77 miles of the Project ROW in Montana to supplement the existing cultural resources inventory record.**
October 4, 2019	**The Department sent a letter to tribes notifying them of the availability of the 2019 Keystone XL Draft SEIS and start of a 45-day comment period.**

Department = U.S. Department of State; EA = Environmental Assessment; MAR = Mainline Alternative Route; NRHP = National Register of Historic Places; SEIS = Supplemental Environmental Impact Statement; **TCP = Traditional Cultural Property;** THPO = Tribal Historic Preservation Officer

This discussion supplements the 2014 Keystone XL Final SEIS and considers information obtained from the cultural resource survey work conducted along the MAR as well as surveys conducted along the Preferred Route since the 2014 Keystone XL Final SEIS.

The Department re-engaged the consulting parties to the Programmatic Agreement following issuance of a Presidential permit for the Keystone XL Project in March 2017. The Department notified all 17 state and federal agencies that are signatories to the agreement and all tribal consulting parties about the Project start-up and requested point of contact information (two tribes have since joined as tribal consulting parties). Since April 2018 the Department has provided all consulting parties with letters, reports, maps and other documents generated in compliance with the Programmatic Agreement for review and comment. Initially, these documents were sent through the U.S. mail; however, in August 2018, the Department launched an online cultural resources portal for downloading documents for review. When review documents become available, an email notice is sent to all parties requesting their comments, typically within a 30-day review period. The parties are free to choose which documents they wish to review and provide their comments to the Department either in writing or via email. In March 2019, a GIS feature was added to the portal enabling users to see the location of all recorded cultural resources in relation to the Project pipeline ROW, access roads, substations, etc. This enables all consulting parties access to the same cultural resources information enhancing the consultation process.

3.9.1 Cultural Resources Overview

Federal regulations, including the NHPA, the Native American Graves Protection and Repatriation Act and the Archaeological Resources Protection Act, address the impact of federal agency actions with the potential to affect cultural resources.

3.9.1.1 Section 106 of the National Historic Preservation Act

The Department is the Lead Federal Agency for Section 106 of the NHPA and consultation with Indian tribes for this project as specified in the Programmatic Agreement (see Appendix E of the 2014 Keystone XL Final SEIS). Consistent with Section 106 of the NHPA, as amended (54 USC 306108), this SEIS considers potential effects on historic properties present within the APE. The Department has coordinated with the Advisory Council on Historic Preservation, SHPO(s), BLM, WAPA, federally recognized Indian tribes as well as non-federally recognized tribes (e.g., Little Shell Tribe of Chippewa Indians of Montana) regarding the Project and its potential effects on historic properties.

The NHPA uses the term "historic properties" to define significant resources. Under the NHPA, "historic properties" means "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places [NRHP] maintained by the Secretary of the Interior. This term includes artifacts, records and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet National Register criteria" (36 CFR 800.16.(*l*)(1)). To be listed within the NRHP, a historic property must meet at least one of the following criteria (36 CFR 60.4):

A. That are associated with events that have made a significant contribution to the broad patterns of our history; or

B. That are associated with the lives of significant persons in our past; or

C. That embody the distinctive characteristics of a type, period or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. That have yielded or may be likely to yield, information important in history or prehistory.

3.9.1.2 Traditional Cultural Properties

Under the NHPA, Traditional Cultural Properties also may be considered. According to the National Park Service's National Register Bulletin 38, "traditional" in the context of Traditional Cultural Properties "refers to those beliefs, customs, and practices of a living community of people that have been passed down through the generations, usually orally or through practice. The traditional cultural significance of a historic property, then, is significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices" (NPS 1998).

Traditional Cultural Properties may include the following:

- A location associated with traditional beliefs of an Indian tribe
- A rural community whose organization, buildings and structures, or patterns of land use represent cultural traditions valued by long-term residents
- An urban neighborhood that is the traditional home of a particular cultural group
- A location where Indian tribe religious practitioners have historically gone or are known or thought to go today to perform ceremonial activities
- A location where a community has traditionally carried out economic, artistic or other cultural practices

3.9.1.3 Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act (25 USC 3001-3013; Public Law 110-161) describes the rights of American Indian lineal descendants and tribes (including Native Hawaiian organizations) with respect to the treatment, repatriation and disposition of human remains, funerary objects, sacred objects and objects of cultural patrimony. These are referred to collectively in the statute as cultural items and are those for which Indian tribes can show a relationship of lineal descent or cultural affiliation.

The two primary purposes of the Native American Graves Protection and Repatriation Act (NAGPRA) are:

- Provide protection for Native American burial sites and careful control over the removal of Native American human remains, funerary objects, sacred objects and items of cultural patrimony on federal and Tribal lands; this includes coordination with Indian tribes whenever archaeological investigations encounter, or are expected to encounter, Native American cultural items, or when projects unexpectedly discover such items on federal or Tribal lands; and
- Require federal agencies and museums receiving federal funds to inventory holdings of Native American human remains and funerary objects and to provide written summaries of other cultural items.

In addition, **the states of Montana, South Dakota and Nebraska have laws that** govern the inadvertent discovery and/or excavation of unmarked burials and human remains as well as associated artifacts on private lands. The**se laws** provide legal protection to all unmarked burials and human remains regardless of age, ethnic origin or religious affiliation by preventing unnecessary disturbance, and outlines the steps for protecting and final deposition of unmarked burials and human remains, including notification of local law enforcement, involvement of interested parties and the penalties for their disturbance.

On federal lands, NAGPRA would be followed in the event of a discovery of potential remains. On private and state lands, the appropriate state laws and the Unanticipated Discovery Plan would be followed/implemented pursuant to the Programmatic Agreement.

3.9.1.4 American Indian Religious Freedom Act

The American Indian Religious Freedom Act of 1978 (AIRFA) (42 USC 1996) affirms the right of Native Americans to have access to their sacred places. If a place of religious importance to Native Americans may be affected by an undertaking, AIRFA promotes consultation with Native American religious practitioners, which may be coordinated with Section 106 consistent consultation. Amendments to Section 101 of the NHPA in 1992 strengthened the interface between AIRFA and NHPA by clarifying that:

- Properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization may be determined to be eligible for inclusion on the National Register.
- In carrying out its responsibilities under or consistent with Section 106, a federal agency shall consult with any Indian tribe or Native Hawaiian organization that attaches religious and cultural significance to such properties.
- The Department continues to **consult** with Indian tribes concerning properties of religious or cultural significance in accordance with the Programmatic Agreement.

3.9.1.5 Archaeological Resources Protection Act

The Archaeological Resources Protection Act (16 USC 470aa-470mm; Public Law 96-95, as amended) was enacted to protect archaeological resources and sites that are on public lands and Tribal lands, and to foster increased cooperation and exchange of information between governmental authorities, professional archaeologists and private individuals.

The Archaeological Resources Protection Act describes the requirements that must be met before federal authorities can issue a permit to excavate or remove any archaeological resource on federal or Tribal lands and to coordinate the curation requirements of artifacts, other materials excavated or removed, and the records related to the artifacts and materials. Although the primary purpose of the Archaeological Resources Protection Act is to provide more effective law enforcement to protect archaeological sites on public lands, this statute also governs the removal and curation requirements of artifacts, including those resources protected under Native American Graves Protection and Repatriation Act.

3.9.1.6 Cultural Resources Investigations since the 2014 Keystone XL Final SEIS

The cultural resource inventory **is** ongoing for the Keystone XL Project to comply with the stipulation in the Programmatic Agreement that requires **the Department to make a reasonable and good faith effort to identify and evaluate historic properties within the Project APE**. Table 3.9-2 presents a summary of the cultural resource surveys conducted since the 2014 Keystone XL Final SEIS for the Project.

In 2018 and 2019, surveys were conducted in all three states for all parcels with landowner permission. In Montana, where BLM is considering whether to issue a ROW in accordance with the Mineral Leasing Act of 1920, all BLM/USACE acres have been surveyed**. Findings of the 2019 survey efforts are included in Section 3.9.2 and are considered in Section 4.9 regarding the potential for adverse effects on historic properties.**

Table 3.9-2. Surveys Conducted since the 2014 Keystone XL Final SEIS

Survey Reference	Location	Project Component Surveyed	Land Ownership
Phase I Cultural Resources Survey Report Nebraska Mainline Alternative Route. Addendum No. 15. July 24, 2018.	NE	• Pipeline Survey Corridor: 130 miles / 3,637 acres • Auxiliary Sites/Pump Stations: 163 acres • Access Roads: 43 acres	Private
Class III Cultural Resource Inventory for Proposed Construction Camp in Haakon County, South Dakota. Memorandum KXL1399-EXP-EN-MM-0007, September 14, 2018.	SD	• Construction Camp: 98.5 acres	Private
Level III Cultural Resources Inventory of the Grand Electric Cooperative, Inc. Transmission Line 15 Harding County, South Dakota, September 28, 2018.	SD	• Transmission Line: 239.4 acres	Private
Level III Cultural Resources Report South Dakota. Addendum No. 10: Additional Fieldwork Results. December 13, 2018.	SD	• 238.3 acres[a]	• Private: 223.5 acres • State: 14.8 acres
Phase I Cultural Resources Survey Report Nebraska Mainline Alternative Route. Addendum No. 16. December 13, 2018.	NE	• Pipeline Survey Corridor: 30 miles • Auxiliary Sites/Pump Stations: 140 acres • Access Roads: 3.5 miles	Private
Cultural Resource Inventory Conducted for the Coal Hill Substation and Pump Station 11 Keystone XL Pipeline Project, McCone County, Montana, December 17, 2018.	MT	• Pump Station: 45 acres	Private
An Ethnographic Narrative and Site Revisit of Seven Potential TCP Sites along the Keystone XL Pipeline Project (Project) in Phillips and Valley Counties, Montana, January 2019	MT	• Pipeline ROW (acreage not specified)	Private, State and BLM
Level III Cultural Resources Inventory of the Grand Electric Cooperative, Inc. Transmission Line 809 Harding County, South Dakota, January 10, 2019.	SD	• Transmission Line: 17.1 acres	State
Class III Cultural Resources Survey Report Montana. Addendum No. 9: Additional Fieldwork Results. January 14, 2019.	MT	• 1,021.6 acres[b]	• Private: 962.5 acres • Federal, BLM: 48 acres • State: 11.1 acres
Level III Cultural Resources Inventory of the Grand Electric Cooperative, Inc. Single Phase Distribution Line 217 Harding County, South Dakota, January 14, 2019.	SD	• Transmission Line: 11.6 acres	• Private: 8.6 acres • State: 3.0 acres
Level III Cultural Resources Report South Dakota. Addendum No. 11: Additional Fieldwork Results. February 18, 2019.	SD	• Auxiliary Site: 24.2 acres	Private

Source: Ethnoscience 2018; Exp (Exp Energy Services Inc) and American Resources Group, Ltd. 2018a, 2018b; Exp and Ethnoscience 2019a, 2019b, 2018b; Fort Peck Assiniboine & Sioux Tribes 2019; Quality Services, Inc. 2019a, 2019b, 2018; Western Area Power Administration 2018.

a. Acreage surveyed consists of a combination of previously unsurveyed centerline, centerline route variances, construction camps, access routes and additional temporary workspace.

b. Acreage surveyed consists of a combination of previously unsurveyed centerline, centerline route variances, pump stations, construction camps, access routes and site visits to previously recorded sites.

MT = Montana; NE = Nebraska; SD = South Dakota; TCP = Traditional Cultural Property

Sections 3.9.2 and 3.9.2.1 contain further information from the survey reports findings for the MAR and previously unsurveyed portions of the 2014 Keystone XL Preferred Route, respectively.

Table 3.9-3 summarizes the remaining lands requiring cultural resource investigations, approximately **526 acres**. All of these lands are in Nebraska. While these areas have yet to be surveyed by Keystone primarily due to lack of landowner permissions, cultural investigations based on previous surveys and a literature review have been completed. Additionally, the Programmatic Agreement establishes an agreed-upon process for addressing as yet unsurveyed areas going forward. The Nebraska SHPO has recently confirmed that the process outlined in the Programmatic Agreement contains appropriate measures for handling unsurveyed locations (see Appendix A, Indian Tribe, Agency and Elected Officials Coordination). As outlined in the Programmatic Agreement, if surveys are incomplete **for any reason (including** landowner access**)** prior to the commencement of construction, a coordination plan would be prepared and submitted to the Department for review and approval pursuant to Stipulation V.B.2.b of the Programmatic Agreement. The coordination plan would outline the areas that still need to be inventoried and the schedule to complete the identification and evaluation of **historic properties** in those areas prior to construction. These measures would identify **historic properties** prior to disturbance and allow for management of recorded sites per the Programmatic Agreement to avoid or mitigate adverse effects. Section 4.9 provides additional detail on the Programmatic Agreement conditions regarding unsurveyed locations.

Table 3.9-3. Keystone XL Project Cultural Resources Inventory Status by State

State	Total Centerline ROW Acres	Cultural Surveyed Centerline ROW Acres	Remaining Centerline ROW Acres Needing Cultural Survey	Percentage Cultural Survey Complete
Montana	4,464.3	4,464.3	0.0	100
South Dakota	4,745.9	4,745.9	0.0	100
Nebraska (total)	4,099.4	3,573.1	526.3	87
Nebraska (MAR)	2,427.9	2,256.6	171.3	93
Nebraska (Preferred)	1,671.5	1,316,5	355.0	79

Note: The unsurveyed areas are due to lack of landowner permissions and landlocked areas with no access.
MAR = Mainline Alternative Route; SEIS = Supplemental Environmental Impact Statement

3.9.2 Cultural Resources Investigations within the MAR

On November 28, 2017, Keystone performed a site file search and literature review within 1 mile on either side of the MAR centerline at the Nebraska State Historical Society in Lincoln, Nebraska. The records search and literature review provided the nature and extent of archaeological investigations conducted to date in the portions of east-central Nebraska that the MAR traverses and identified the number and nature of previously recorded sites located within the 2-mile-wide corridor. Keystone also examined county histories, General Land Office plats and historic maps and atlases to identify potential historic sites within or adjacent (up to 2 miles) to the MAR APE. The records search indicated the following (Exp 2018):

- Along the length of the MAR, 42 archaeological surveys have been previously conducted within 1 mile on either side of the proposed centerline. The overwhelming majority of the surveys (71 percent) are small highway projects, most of which resulted in negative findings.
- Sixty-two archaeological sites have been previously identified and recorded. Of these, 21 are prehistoric sites, 35 are historic sites and 5 contain both prehistoric and historic components. It is not known whether one site contains prehistoric and/or historic components.
- A minimum of 36 potential historic sites are within or adjacent to the current MAR 2-mile-wide corridor, the majority of which are farmsteads/rural households.
- A total of 274 properties, including three NRHP-listed structures, have been previously surveyed and documented within the 2-mile-wide study corridor. Only 12 of the 274 properties are located within or adjacent to the MAR APE. Ten of the properties have either "unknown" or "more info needed" with respect to NRHP status, while the other two have been formally evaluated against NRHP criteria and are not eligible for NRHP listing in Nebraska Historic Buildings Survey reports.

Table 3.9-4 lists all sites identified by literature review that are located within the 300-foot MAR APE.

Keystone also performed archaeological field investigations and architectural surveys along the MAR in **2018 and 2019**. **Table 3.9-5 provides information on sites identified during these surveys.** All sites identified within the MAR are located on private land. No known villages or reported activity areas have been located within the 2-mile-wide study corridor. A review of recorded Ponca archaeological sites within 25 miles of the MAR indicate only two sites that have clear Ponca associations – one is the grave of Standing Bear and the other is the Ponca Agency; both are located along the Niobrara River (north of the Elkhorn River) in Knox County (Exp 2018).

Table 3.9-4. Cultural Resources Identified within the MAR APE by Literature Review

Site Number	Description	Notes
25AP0060	Historic Farm/Ranch	Historic site situated on the bluffs lining the northern wall of the Elkhorn River valley in southeastern Antelope County, approximately 1.2 miles north of the current channel of the river. As previously mapped, the site straddles the Project survey corridor at approximately MP 712.5–712.63. The Nebraska SHPO site-file database lists the NRHP eligibility status of the site as unknown.
25BU0003	Precontact Unknown	Prehistoric site situated on the bluffs lining the southern wall of the Platte River valley in north-central Butler County, approximately 5.25 miles south of the current channel of the river. As previously mapped (from a 1936 site form), the site is located somewhere within a 160-acre parcel that extends into the Project survey corridor at approximately MP 787.75–787.8.
25BU0059	Historic Farmstead	Near MP 786. No additional information.
25BU0060	Historic Farmstead	Near MP 796. No additional information.
25BU0067	Historic Farmstead	Near MP 783. No additional information.
25JF0037	Precontact Lithic Scatter	Between MP 875 and 876. No additional information.
25JF0038	Precontact Lithic Scatter	Near MP 873. No additional information.
25JF0039	Precontact Lithic Scatter	Near MP 871. No additional information.
25JF0040	Historic Farmstead	Between MP 868 and 869. No additional information.
25PT0114	Precontact Lithic Scatter	Between MP 758 and 759. No additional information.
25SA0078	Historic Farmstead	Near MP 852. No additional information.
25SA0081	Historic Farmstead	Between MP 843 and 844. No additional information.
25SA0082	Historic Farmstead	Near MP 858. No additional information.
25SA0083	Historic Farmstead	Near MP 857. No additional information.
25SA0084	Historic Farmstead	Near MP 845. No additional information.
25SA0085	Historic Dump Site	Near MP 853. No additional information.
25ST0020	Precontact Village	A multicomponent village site containing components representing "Upper Republican, Woodland, and possibly an earlier occupation". Near MP 748. The NSHS database currently lists the NRHP eligibility status of site as unknown.
25ST0041	Historic Farmstead	Near MP 755. No additional information.
C801HT002FS	Historic Artifact Shelter	4- by 4-meter displaced concrete and brick scatter to fill marshy area. Previously determined "not eligible". Near MP 676.
C801HT004FS	Historic Tractor Part	Ferrous metal tractor part. Previously determined "not eligible". Near MP 672.
C801HT005FS	Precontact Isolate	Petrified wood angular fragment. Previously determined "not eligible". Between MP 658 and 659.
CX00-033	Historic Farmstead	Habitation, Central Plains Tradition. Previously determined "potentially eligible". Near MP 772.
CX00-051	Historic Road (Lincoln Highway)	Lincoln Highway. Near MP 778.
MD00-103	Historic Farmstead	2S frame clapboard cube hip roof front porch with double porch columns. Large barn garage two smaller outbuildings. Near MP 719.
ST00-093	Historic Farmstead	Non Cont House; New House Frame; Original House. Near MP 749.

Source: Exp 2018

APE = area of potential effect; MAR = Mainline Alternative Route; MP = milepost; NRHP = National Register of Historic Places; NSHS = Nebraska State Historical Society; SHPO = State Historic Preservation Office

Table 3.9-5. Cultural Resources Evaluated within the MAR APE by Field Survey

Site Number	Description	Notes	Evaluation
25AP60	Prehistoric Limited Activity; Historic Farmstead/ Rural Household	Historic site situated on the bluffs lining the northern wall of the Elkhorn River valley in southeastern Antelope County, approximately 1.2 miles north of the current channel of the river. Same as site 25AP0060 in Table 3.9-4. As previously mapped, the site straddles the Project survey corridor at approximately MP 713 and is within the construction and permanent ROW.	**Not Eligible, No Effect, No Further Work**
25CX73	Historic Farmstead/ Rural Household	Near MP 772 within temporary work space and access road. No additional information.	**Not Eligible, No Effect, No Further Work**
25AP99	**Prehistoric Lithic Scatter**	**Near MP 713 within the construction and permanent ROW. No additional information.**	**Unevaluated, Avoid or Test for NRHP Eligibility**
25AP100	**Prehistoric Lithic Scatter**	**Near MP 716 within the construction and permanent ROW. No additional information.**	**Unevaluated, Avoid or Test for NRHP Eligibility**
25AP101	Prehistoric Lithic Scatter	Near MP 716 outside of limits of disturbance. No additional information.	**Not Eligible, No Effect, No Further Work**
25AP102	Historic Farmstead/ Rural Household	Near MP 717 within the construction and permanent ROW. No additional information.	**Not Eligible, No Effect, No Further Work**
25MD31	Historic Artifact Scatter	Near MP 726 outside of limits of disturbance. No additional information.	**Not Eligible, No Effect, No Further Work**
25MD32	**Prehistoric Lithic Scatter**	**Near MP 732 within the construction and permanent ROW. No additional information.**	**Unevaluated, Avoid or Test for NRHP Eligibility**
25MD33	Historic Artifact Scatter	Near MP 740 outside of limits of disturbance. No additional information.	**Not Eligible, No Effect, No Further Work**
25MD34	Historic Artifact Scatter	Near MP 742 within the construction and permanent ROW. No additional information.	**Not Eligible, No Effect, No Further Work**
25ST20	**Prehistoric Lithic Scatter**	**Near MP 747 within the construction ROW, access road footprint and temporary work space. Same as Site 25ST0020 in Table 3.9-4.**	**Unevaluated, Avoid or Test for NRHP Eligibility**
25ST52	Historic Artifact Scatter	Near MP 748 outside of limits of disturbance. No additional information.	**Not Eligible, No Effect, No Further Work**
25ST53	Historic Farmstead/ Rural Household	Near MP 754 within temporary work space. No additional information.	**Not Eligible, No Effect, No Further Work**
25ST54	Historic Artifact Scatter	Near MP 754 outside of limits of disturbance. No additional information.	**Not Eligible, No Effect, No Further Work**
25PT118	Historic Farmstead/ Rural Household	Near MP 758 within the construction and permanent ROW. No additional information.	**Not Eligible, No Effect, No Further Work**
PT00285	Historic Farmstead/ Rural Household/ Architectural Property	Near MP 759 within the access road footprint. No additional information.	**Not Eligible, No Effect, No Further Work**
25PT119	Prehistoric Isolate	Near MP 759 outside of limits of disturbance. No additional information.	**Not Eligible, No Effect, No Further Work**

Table 3.9-5. Cultural Resources Evaluated within the MAR APE by Field Survey

Site Number	Description	Notes	Evaluation
CX00-205	Historic Farmstead/ Architectural Property	Near MP 769 outside of limits of disturbance. No additional information.	**Not Eligible, No Effect, No Further Work**
25CX72	Historic Farmstead/ Rural Household	Near MP 770 outside of limits of disturbance. No additional information.	**Not Eligible, No Effect, No Further Work**
CX00204	Historic Farmstead/ Architectural Property	Near MP 776 within the construction ROW and access road footprint. No additional information.	**Not Eligible, No Effect, No Further Work**
25BU77	Prehistoric Limited Activity	Near MP 782 outside of limits of disturbance. No additional information.	**Not Eligible, No Effect, No Further Work**
25BU78	Historic Road Cut	Near MP 786 within the construction ROW. No additional information.	**Not Eligible, No Effect, No Further Work**
BU00325	Historic Farmstead/ Architectural Property	Near MP 788 outside of limits of disturbance. No additional information.	**Not Eligible, No Effect, No Further Work**
25BU79	Historic Farmstead/ Rural Household	Near MP 798 within the access road footprint. No additional information.	**Not Eligible, No Effect, No Further Work**
25SW71	Historic Farmstead/ Rural Household	Near MP 812 within the construction and permanent ROW, access road footprint and temporary work space. No additional information.	**Not Eligible, No Effect, No Further Work**
25SW72	Historic Farmstead/ Rural Household	Near MP 821 within the construction and permanent ROW and temporary work space. No additional information.	**Not Eligible, No Effect, No Further Work**
25SW73	20th Century Artifact Scatter	Near MP 823 within access road footprint. No additional information.	**Not Eligible, No Effect, No Further Work**
25SW75	Historic Farmstead/ Rural Household	Near MP 824 within the construction and permanent ROW and temporary work space. No additional information.	**Not Eligible, No Effect, No Further Work**
25SW74	Historic Farmstead/ Rural Household	Near MP 824 outside of limits of disturbance. No additional information.	**Not Eligible, No Effect, No Further Work**
25SW76	Historic Farmstead/ Rural Household	Near MP 831 within the construction ROW and pump station 12-acre parcel. No additional information.	**Not Eligible, No Effect, No Further Work**
25SA81	**Historic Farmstead/ Rural Household**	**Near MP 843 within the construction and permanent ROW. No additional information.**	**Unevaluated, Avoid or Test for NRHP Eligibility**
25SA97	Historic Artifact Scatter	Near MP 843 outside of limits of disturbance. No additional information.	**Not Eligible, No Effect, No Further Work**
25SA78	Historic Farmstead/ Rural Household w/Prehistoric Component	Near MP 851 outside of limits of disturbance. No additional information.	**Not Eligible, No Effect, No Further Work**

Table 3.9-5. Cultural Resources Evaluated within the MAR APE by Field Survey

Site Number	Description	Notes	Evaluation
SA00347	Historic Farmstead/ Rural Household/ Architectural Property	Near MP 854 within the construction and permanent ROW and temporary work space. No additional information.	**Not Eligible, No Effect, No Further Work**
C901SA001	**Historic Dump**	**Pending SHPO concurrence**	**Not Eligible, No Further Work**
C901SE002	**Historic Farmstead/ Rural Household**	**Pending SHPO concurrence**	**Not Eligible, No Further Work**

Source: Exp and American Resources Group, Ltd. 2018a
Note: Bolded sites indicate NRHP eligibility of the site has not been evaluated.
APE = area of potential effect; MAR = Mainline Alternative Route; MP = milepost; NRHP = National Register of Historic Places; NSHS = Nebraska State Historical Society; ROW = right-of-way; SHPO = State Historic Preservation Office

The survey also reported two locations where NPS NHTs (Mormon Pioneer Trail and California Trail) cross the MAR in Colfax and Butler counties, along the north and south sides of the Platte River, respectively. A review of the NPS National Trails System Map also confirmed the MAR crosses these two trails (NPS 2017a, 2017b, 2006). These trails served as primary overland routes spurring the earliest settlement in the areas where they crossed. One crossing of both the California and Mormon NHTs occurs in Colfax County near proposed MP 780 where the existing Keystone Pipeline crosses the trails. Three other crossings of the California NHT occurs near proposed MP 785 and 784 in Butler County. The trail at the MAR crossing locations in Butler County generally runs parallel to Road 40 then follows KL Road.

These areas that potentially could contain historic trail segments were surveyed, but no visible surface evidence of the trails was identified. These former routes of the historic trails were likely superseded by the construction of the road, railroad grade and tracks, or destroyed through plowing and cultivation. An east-west road cut was identified in the vicinity of the southern historic trail segment, but it was interpreted to not represent a segment of the California Trail (Exp and American Resources Group, Ltd. 2018a).

Some aboveground facilities associated with the MAR would be located within 0.5 mile of the NHTs. A proposed temporary rail siding at David City would be approximately 0.2 mile east of the California NHT (Oxbow Trail segment) in Butler County. Pump Station 24 would be located approximately 0.4 mile from the California NHT (Oxbow Trail Alternative Route segment) in Butler County.

The general route of what is now known as the Ponca Removal Trail crosses the MAR study corridor somewhere near the Big Blue River in Seward County. This route was used for the forced removal of the Ponca Tribe from northern Nebraska in 1877. Although no evidence exists pointing to the exact location of the trail in this area, a short segment of an old trail known as the Ulysses to Seward Settlement Trail has been documented at a nearby archaeological site; it is possible that this road segment, which is located approximately 1 kilometer (0.65 mile) southeast of the MAR centerline, represents a small portion of the trail that was used by the Ponca. Because the locations of happenings (such as camp sites and burials) during the Ponca's forced removal were documented in detail as they occurred (specifically several miles to the north and the south, near the present-day towns of Ulysses and Staplehurst, respectively), there is no evidence associating the settlement trail with significant events that occurred during the Ponca's removal in 1877 (Exp and American Resources Group, Ltd. 2018a).

Since completion of the 2014 Keystone XL Final SEIS, the Tanderup Family, whose farm is located in proximity to the Ponca Removal Trail, deeded land to the Ponca Tribe of Nebraska and the Ponca Nation of Oklahoma along the Preferred Route, approximately 11 miles northwest of the start of the MAR. Sacred Ponca Corn has been planted on the Tanderup Farm and deeded land. The Ponca Removal Trail has been reported to cross this property where the corn has been planted, however, during the Nebraska Public Service Commission hearings, it was determined that the Ponca Trail is located approximately 1 mile east of the Tanderup property based on GIS locations provided by Chief Standing Bear (Nebraska Commission on Indian Affairs 2019). Stipulation V.B.2.a of the Programmatic Agreement states "In the identification and evaluation of historic properties to which Indian tribes may attach religious and cultural significance, the Department will take into consideration information submitted by Indian tribes to the Department prior to construction through consultations."

3.9.2.1 Cultural Resources Investigations Conducted Along the Preferred Route Since the 2014 Keystone XL Final SEIS

Table 3.9-6 provides information on sites identified in Montana during the 2018 and 2019 field surveys.

Table 3.9-6. Summary of Cultural Resources Identified in Montana since 2014

Site Number	Description	Land Ownership	Evaluation
24FA0751	Debris Scatter	Private	Not Eligible; No Effect
24FA0973	**Windmill and Tank**	**Private**	**Not Eligible; No Effect**
24PH1760	**Stone Ring**	**State**	**Unevaluated; Fence and Monitor**
24PH4373	**Stone Feature**	**Private**	**Unevaluated; Fence and Monitor**
24PH4374	**Irrigation System**	**Private**	**Not Eligible; No Further Work**
24PH4644	**Farmstead**	**Private**	**Not Eligible; No Further Work**
24PH4665	**Stone Ring**	**State**	**Unevaluated; Fence and Monitor**
24PH4666	**Borrow Pit; Cairn**	**BLM**	**Not Eligible; No Further Work**
24VL4695	**Rock Cairn**	**Private**	**Unevaluated; Fence and Monitor**
24PH4696	**Stone Feature**	**Private**	**Unevaluated; Fence and Monitor**
24PH4697	**Rock Cairn**	**Private**	**Unevaluated; Fence and Monitor**
24VL0805	**Stone Feature**	**BLM**	**Unevaluated; Fence and Monitor**
24VL1893	**Stone Ring**	**BLM**	**Unevaluated; Outside of ROW; No Further Work**
24VL1906	**Rock Alignment**	**BLM**	**Unevaluated; Outside of ROW; No Further Work**
24VL2162	**Stone Ring**	**Private**	**Unevaluated; No Further Work**
24VL2163	**Stone Ring**	**Private**	**Unevaluated; Fence and Monitor**
24VL2164	**Stone Ring**	**Private**	**Unevaluated; No Further Work**
24VL2165	**Stone Feature**	**Private**	**Unevaluated; Fence and Monitor**
24VL2166	**Lithic Scatter**	**BLM**	**Not Eligible; No Further Work**
24VL2167	**Rock Cairn**	**BLM**	**Unevaluated; Outside of ROW; No Further Work**
24VL2168	**Lithic Scatter**	**BLM**	**Not Eligible; No Further Work**
24VL2169	**Stone Ring**	**BLM**	**Unevaluated; Outside of ROW; No Further Work**
24VL2170	**Stone Feature**	**BLM**	**Not Eligible**

Table 3.9-6. Summary of Cultural Resources Identified in Montana since 2014

Site Number	Description	Land Ownership	Evaluation
24VL2171	Stone Feature	BLM	Unevaluated; Bore, Fence and Monitor
24VL2172	Stone Ring	BLM	Unevaluated; Outside of ROW; No Further Work
24VL2173	Rock Cairn	BLM	Unevaluated; Outside of ROW; No Further Work
24VL2174	Stone Ring	BLM	Unevaluated; Fence and Monitor
24VL2175	Stone Ring	BLM	Unevaluated; Fence and Monitor
24VL2176	Lithic Scatter	BLM	Not Eligible; No Further Work
24VL2177	Stone Ring	BLM	Unevaluated; Outside of ROW; No Further Work
24VL2178	Stone Ring	BLM	Unevaluated; Outside of ROW; No Further Work
24VL2180	Stone Ring	BLM	Unevaluated; Outside of ROW; No Further Work
24VL2182	Stone Feature	Private	Unevaluated; Fence and Monitor
24VL2183	Stone Arc	BLM	Unevaluated; Fence and Monitor
24VL2184	Cairns	Private	Not Eligible; No Further Work
24VL2185	Rock Pile	Private	Not Eligible; No Further Work
24VL2186	Stone Ring	State	Unevaluated; Fence and Monitor
24VL2187	Stone Ring	State	Unevaluated; Fence and Monitor
24VL2188	Rock Alignment	State	Unevaluated; Fence and Monitor
24VL2189	Stone Ring	BLM	Unevaluated; Fence and Monitor
24VL2190	Stone Feature	BLM	Unevaluated; Fence and Monitor
24VL2191	Stone Ring	BLM	Unevaluated; Fence and Monitor
24VL2193	Stone Feature	BLM	Unevaluated; Fence and Monitor
24VL2194	Stone Feature	Private	Unevaluated; Fence and Monitor
24VL2195	Rock Alignment	Private	Unevaluated; Fence and Monitor
24VL2196	Stone Feature	Private	Unevaluated; Fence and Monitor
24VL2197	Stone Ring	BLM	Unevaluated; Fence and Monitor
24VL2198	Rock Alignment	BLM	Unevaluated; Fence and Monitor
24VL2199	Rock Cairn	BLM	Unevaluated; Fence and Monitor
24VL2200	Rock Cairn	BLM	Unevaluated; Fence and Monitor
24VL2201	Irrigation System	BLM	Not Eligible; No Further Work
24VL2202	Stone Ring	BLM	Unevaluated; Fence and Monitor
24VL2203	Stone Ring	Private	Unevaluated; Fence and Monitor
24VL2204	Stone Arc	BLM	Unevaluated; Fence and Monitor
24FA0751	Debris Scatter	Private	Not Eligible; No Further Work
24FA0973	Windmill and Tank	Private	Not Eligible; No Further Work
24FA0988	Trash Scatter	Private	Not Eligible; No Further Work

Source: Exp and Ethnoscience 2018a
Note: Table summarizes sites identified in Montana since the 2014 Keystone XL Final SEIS.

The 2018 surveys in South Dakota identified two new isolated finds; both determined not eligible (Exp and Ethnoscience 2018b). **The 2019 field surveys identified one eligible historic property (a historic railroad; Site Number 39HK2003) on private lands.**

The 2018 **and 2019** surveys in Nebraska **also** included accessible portions of the 2014 Keystone XL Final SEIS Preferred Route that were not previously surveyed during past field efforts between 2008 and 2013. Three historic archaeological sites (farmstead/rural households) and one historic architectural property (windmill/water tank for livestock) were investigated during the survey; all of which are recommended not eligible for NRHP listing (Exp and American Resources Group, Ltd. 2018b).

Following the aforementioned inventory (2018), the centerline ROW in Montana was re-inspected for historic properties from milepost 0 to 77 during the summer of 2019. All tribal consulting parties were invited to participate in the field work. The investigation was performed with tribal representation from the Chippewa Cree Indians of the Rocky Boy's Reservation, Blackfeet Nation, Little Shell Tribe of Chippewa Indians of Montana (non- federally recognized) and the Otoe-Missouria Tribe. These efforts resulted in the documentation of additional historic and precontact archaeological sites within the defined ROW. All sites that were recorded during this additional fieldwork are recommended for avoidance, however the eligibility and management recommendations have not been established at this time. As of the date of this document a report on the historic properties re-inspection is being prepared and will be sent to all applicable federal and state agencies and all tribal consulting parties for review and comment in accordance with the Programmatic Agreement. Appendix D CUL Sub-Theme – Unsurveyed Locations (4-9e) contains additional information on the reasoning for re-inspection.

With consideration of the above recent findings and not including the approximate **526** acres remaining to be surveyed, the cultural resource inventory for the Keystone XL Project to date has identified hundreds of sites or segments of linear sites within the APE in all three states. In identifying a route for the Project, Keystone made every attempt to avoid impacts to **historic properties**. In instances where **historic propertie**s were identified along the route, Keystone explored multiple options for avoiding or minimizing impacts through detailed planning and mapping efforts. Route and footprint revisions have successfully avoided many of these sites. If impacts to a particular **historic property** cannot be avoided, the Department, pursuant to the Programmatic Agreement, will work with cooperating agencies, Indian tribes, SHPO(s) and Keystone to develop a treatment plan.

Section 4.9 considers potential impacts to these newly identified eligible, potentially eligible or unevaluated NRHP sites within the MAR and those portions of the 2014 Keystone XL Final SEIS Preferred Route that were not previously surveyed, and the proposed mitigation measures.

3.10 GREENHOUSE GASES AND CLIMATE CHANGE

This section presents information on how greenhouse gases affect the climate, trends in greenhouse gas emissions globally and within the United States, and observed changes in climatic conditions. There is increasing concern that rising atmospheric greenhouse gas concentrations are significantly altering global climate systems with the potential for long-term impacts on human society and the environment. The ROI for greenhouse gases differs from other resource areas considered in this SEIS since the concerns about greenhouse gas emissions are primarily related to climate change, which is global and cumulative in nature. Therefore, the affected environment is discussed broadly using a global, national and regional framework to provide context for the analysis of potential greenhouse gas impacts from the proposed Project (see Chapter 4, Environmental Consequences from Construction and Normal Operations).

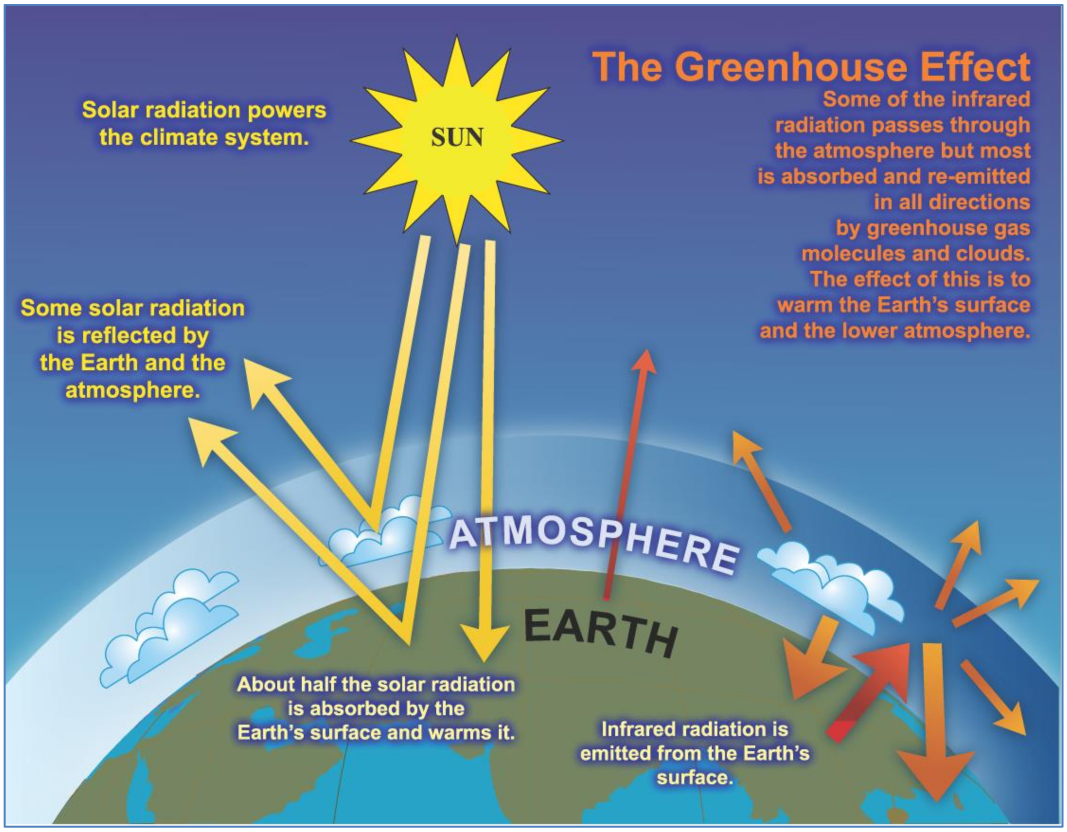
This SEIS considers the following data sources for characterizing greenhouse gases and climate change:

- 2014 Keystone XL Final SEIS and 2017 Final SEIS for the Line 67 Expansion
- Intergovernmental Panel on Climate Change (IPCC), *Special Report – Global Warming of 1.5°C* (2018)
- U.S. Global Change Research Program, *Fourth National Climate Assessment, Volume I* (2017) *and Volume II* (2018)
- USEPA *Inventory of U.S. Greenhouse Gas Emissions* (2018)
- World Resources Institute *Historical Emissions Data* (2018)
- International Energy Agency (IEA) *Perspectives for the Energy Transition, Investment Needs for a Low-Carbon Energy System* (2017)
- NOAA *Trends in Atmospheric Carbon Dioxide (2018) and Oak Ridge National Laboratory Current Greenhouse Gas Concentrations* (2018)
- U.S. Energy Information Administration (EIA), *Annual Energy Outlook 2018 with Projections to 2050* (2018)
- Other reports that provide current global assessments of climate change including basic scientific information on causes of climate change, greenhouse gas emissions, and observed and projected climate change impacts

3.10.1 Greenhouse Gases Overview

Greenhouse gases in the earth's atmosphere help regulate the temperature of the planet by trapping solar heat. When solar radiation (sunlight) reaches the earth, part is reflected back into space, and about half is absorbed by the earth's surface and then re-emitted as infrared radiation. Figure 3.10-1 illustrates the greenhouse effect that occurs when gases in the earth's atmosphere absorb some of this emitted infrared radiation and cause the atmosphere's temperature to rise.

Greenhouse Gases – Greenhouse gases include water vapor, CO_2, ozone, methane, nitrous oxide and several classes of halogenated substances that contain fluorine, chlorine or bromine (including chlorofluorocarbons). After water vapor, CO_2 is the most abundant greenhouse gas and could remain in the atmosphere for centuries.



Source: IPCC 2007

Figure 3.10-1. The Greenhouse Effect

After water vapor, carbon dioxide (CO_2) is the second most abundant greenhouse gas in the atmosphere and accounts for the majority of anthropogenic greenhouse gas emissions. It can remain in the atmosphere for centuries and tends to mix quickly and evenly throughout the lower levels of the global atmosphere. Other significant greenhouse gases include methane, nitrous oxide and industrial fluorinated gases. In addition, gases such as carbon monoxide, nitrogen oxides and non-methane volatile organic compounds (VOCs) have an indirect effect on terrestrial or solar radiation absorption by influencing the formation or destruction of greenhouse gases such as ozone. Extremely small particles, such as sulfur dioxide or elemental carbon emissions, can also affect the absorptive characteristics of the atmosphere and therefore influence the greenhouse effect.

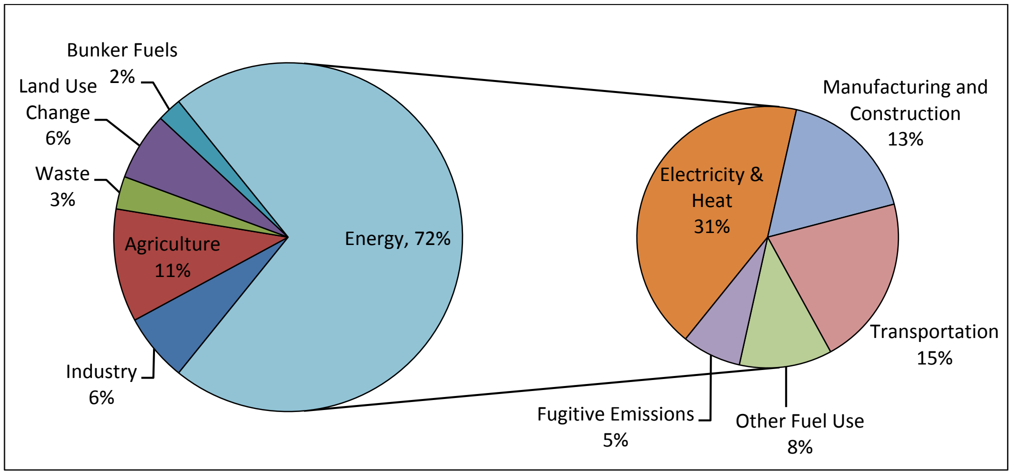
3.10.2 Greenhouse Gas Emissions

Trends in Global Emissions

> **CO_2-equivalent (CO_2-eq)** – Greenhouse gas emissions are typically reported as metric tons of CO_2-eq, which is a measurement that normalizes all greenhouse gases in terms of their climate change impact relative to CO_2, the predominant global greenhouse gas.

Increased atmospheric concentrations of greenhouse gases have been attributed primarily to human activities (IPCC 2018). Global greenhouse gas emissions have increased steadily since the onset of the Industrial Revolution around 250 years ago, with the rate of emissions accelerating rapidly in the 20th century. For example, about half of all CO_2 emissions from human activity have occurred in the decades since 1970. Global greenhouse gas emissions equaled approximately 48,892 million metric tons of carbon dioxide equivalent (CO_2-eq) in 2014, up from 22,341 million metric tons CO_2-eq in 1970 and 33,823 million metric tons CO_2-eq in 1990 (World Resources Institute 2018).

Human activities from all sectors of the economy emit greenhouse gases into the atmosphere. Notably, energy generation, transportation, and industrial and agricultural activities release CO_2, methane, nitrous oxide, ozone and chlorofluorocarbons. Greenhouse gas emissions from burning fossil fuels account for the majority of global emissions, and the contribution of fossil fuel emissions toward climate change has continued to increase in recent decades (World Resources Institute 2018). Figure 3.10-2 shows the contribution to global emissions by economic sector.



Source: World Resources Institute 2018, based on 2014 emissions data.
Note: All ratios are expressed in terms of CO_2-eq. Energy sub-sector emissions, shown as percentage of total global emissions, add up to 72 percent.

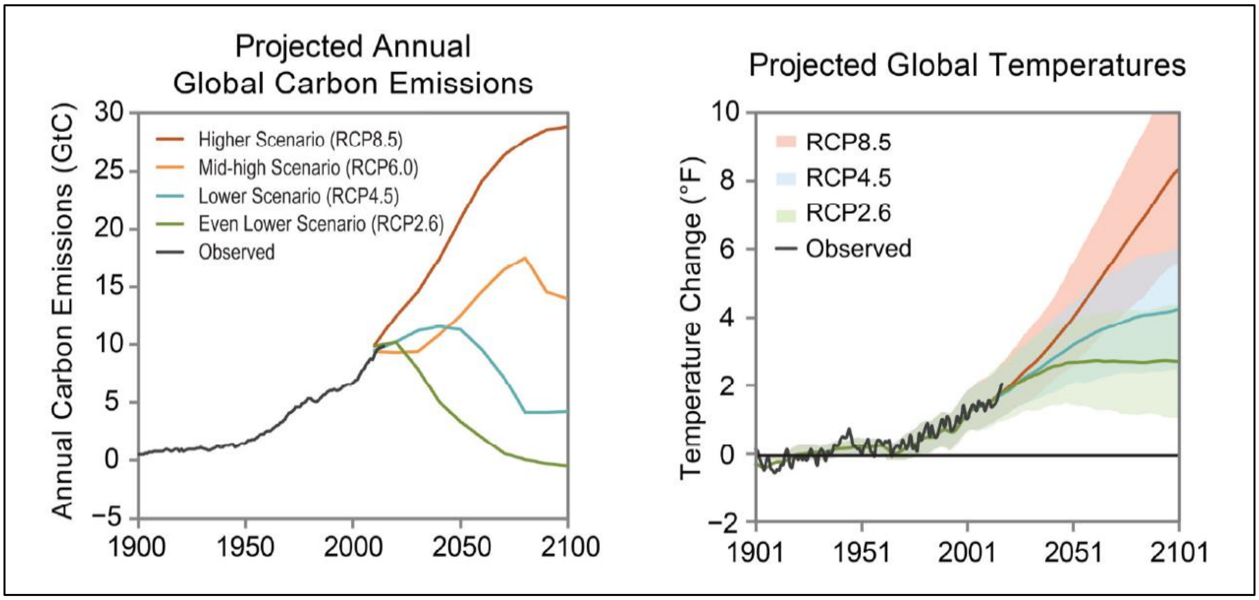
Figure 3.10-2. Global Greenhouse Gas Emissions by Economic Sector

The United Nations Framework Convention on Climate Change agreed that the long-term increase in global temperature should be limited to well below 3.6°F (2°C) above pre-industrial levels (i.e., 1850 to 1900 levels), with the goal to limit the temperature increase to 2.7°F (1.5°C) above pre-industrial levels in order to avert the most severe and widespread impacts of climate change (IPCC 2018). **Other studies have also suggested that if global temperatures rise more than about 3.6°F (2°C) above pre-industrial levels, risks rise significantly that the Earth could enter a "hothouse" state where temperatures and sea levels would continue to rise for millennia, rather than stabilizing at some intermediate state (Steffen et al 2018). Modeling suggests that in order to keep global temperature increase to below 2.7°F (1.5°C), global anthropogenic greenhouse gas emissions need to decline by about 45 percent from 2010 levels by 2030, and reach net zero by around 2050.**

The IEA predicts global energy demand and greenhouse gas emissions **will** continue to rise in the near future, but the growth rate of global energy demand is likely to slow down after 2025. However, the IEA's predicted central scenario puts the world economy on a path consistent with a significantly higher long-term temperature increase, unless there is coordinated global action to reduce greenhouse gas emissions. Fossil fuels, including coal, gas and petroleum, will likely continue to fulfill the majority of global energy demand, with low-carbon sources (including nuclear) accounting for approximately one-fourth of global supply by 2040. A recent study suggests that limiting temperature increase to 3.6°F (2°C) or less would require the share of fossil fuels in primary energy demand to decrease in half by 2050, with renewable sources meeting 65 percent of the world's energy needs (OECD/IEA and IRENA 2017). **More recently, the IEA estimated that with policies currently in place, global greenhouse gas emissions in 2030 would overshoot the emissions needed to limit warming to 3.6°F (2°C) by about 16 billion metric tons CO_2-eq (IEA 2019). Some scholars have suggested that in order to avoid the worst effects of climate change, globally, a third of oil reserves, half of gas reserves and over 80 percent of current coal reserves should remain unused from 2010 to 2050 (McGlade and Elkins 2015).**

The IPCC has analyzed available model data and projections of future greenhouse gas emissions, and developed four representative concentration pathways (RCPs), each of which corresponds to a range of future emissions. The RCPs serve to illustrate a range of possible future climate outcomes, depending on the extent to which actions are taken globally to limit greenhouse gas emissions (IPCC 2014). Higher emissions, corresponding to a higher RCP, are projected to lead to more severe climate change impacts as discussed in Section 3.10.4. Figure 3.10-3 illustrates the range of projected future emissions and global surface temperature change for these scenarios.

> **Representative Concentration Pathways (RCPs)** describe four different potential 21st century pathways of greenhouse gas emissions and atmospheric concentrations, air pollutant emissions and land use. The RCPs are:
>
> - **RCP8.5** – scenario with very high greenhouse gas emissions
> - **RCP4.5** and **RCP6.0** – two intermediate scenarios
> - **RCP2.6** – stringent mitigation scenario
>
> (IPCC 2014)



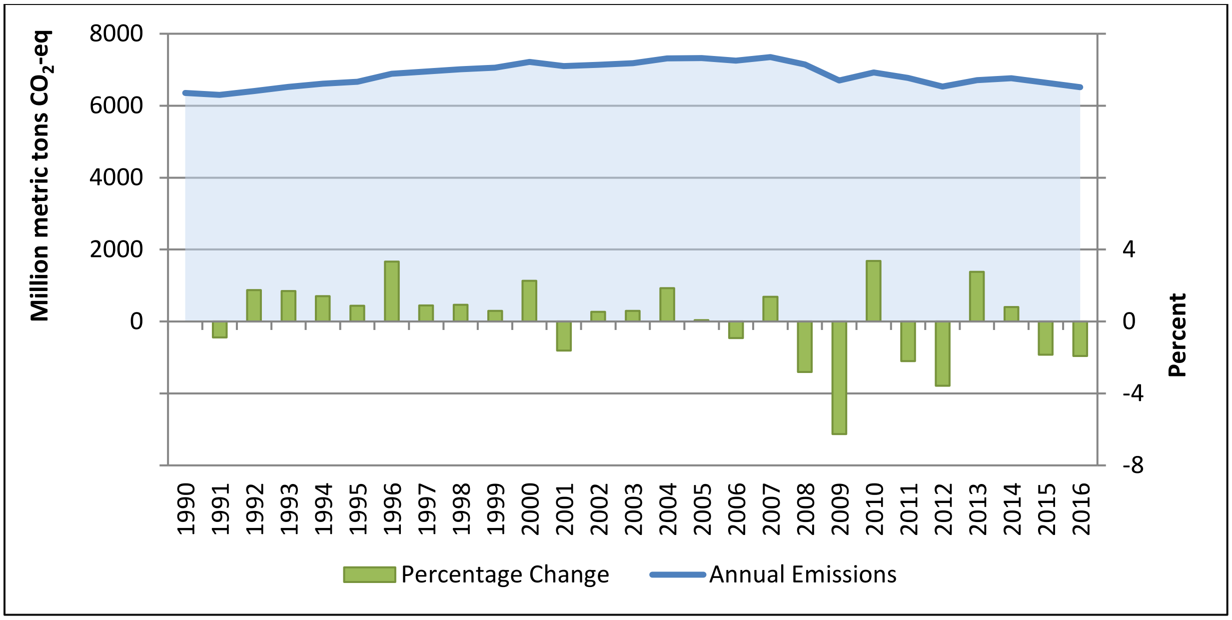
Source: USGCRP 2017

°F= degrees Fahrenheit; GtC = gigatonnes (billion metric tons) of carbon; RCP = representative concentration pathway

Figure 3.10-3. Projected Carbon Emissions and Temperature Change

Trends in U.S. Emissions

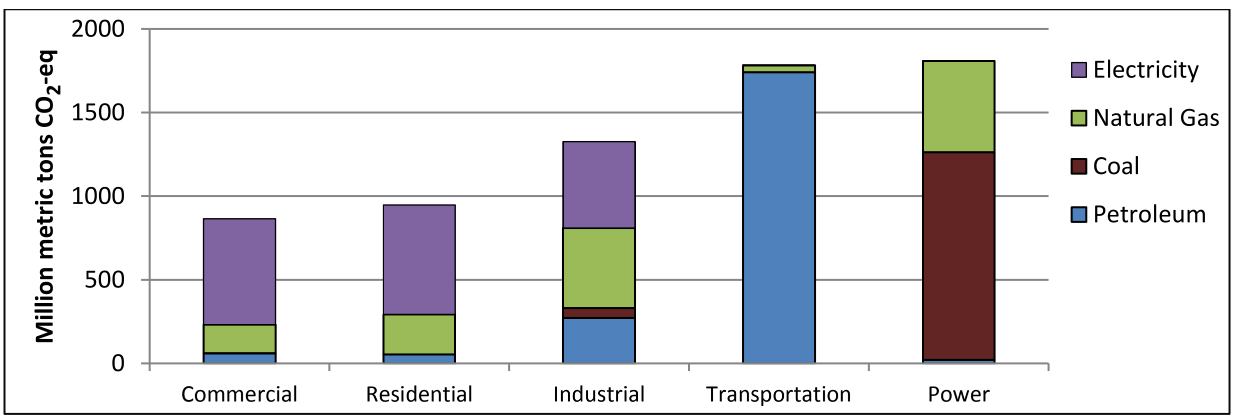
Within the United States, overall anthropogenic greenhouse gas emissions in 2016 totaled approximately 6,511 million metric tons CO_2-eq. Annual U.S. emissions have increased by 2.4 percent from 1990 to 2016. However, emissions decreased in 2008 and 2009 due to the economic slowdown, and more recently due to the shift in power generation from coal to natural gas. Additionally, warmer winter conditions in 2016 resulting in decreased heating demand (USEPA 2018d). Figure 3.10-4 shows annual U.S. greenhouse gas emissions and annual percentage change in greenhouse gas emissions from 1990 to 2016.



Developed from USEPA 2018d, Figure ES-1
CO_2-eq = carbon dioxide equivalent; U.S. = United States

Figure 3.10-4. Trends in U.S. Greenhouse Gas Emissions, 1990 to 2016

Fossil fuel combustion is the predominant source of greenhouse gas emissions in the United States, accounting for nearly 77 percent of cumulative greenhouse gas emissions since 1990. In 2016, emissions of CO_2 from fossil fuel combustion equaled approximately 4,966 million metric tons, which was 93.5 percent of U.S. CO_2 emissions. Petroleum use accounted for approximately 41 percent of these emissions, with the transportation sector consuming most of the petroleum (USEPA 2015d). Figure 3.10-5 shows the relative contribution of fossil fuels and sectors to total U.S. CO_2 emissions.



Source: Developed from USEPA 2018d, Tables ES-3 and 3-5
CO_2 = carbon dioxide; CO_2-eq = carbon dioxide equivalent; U.S. = United States

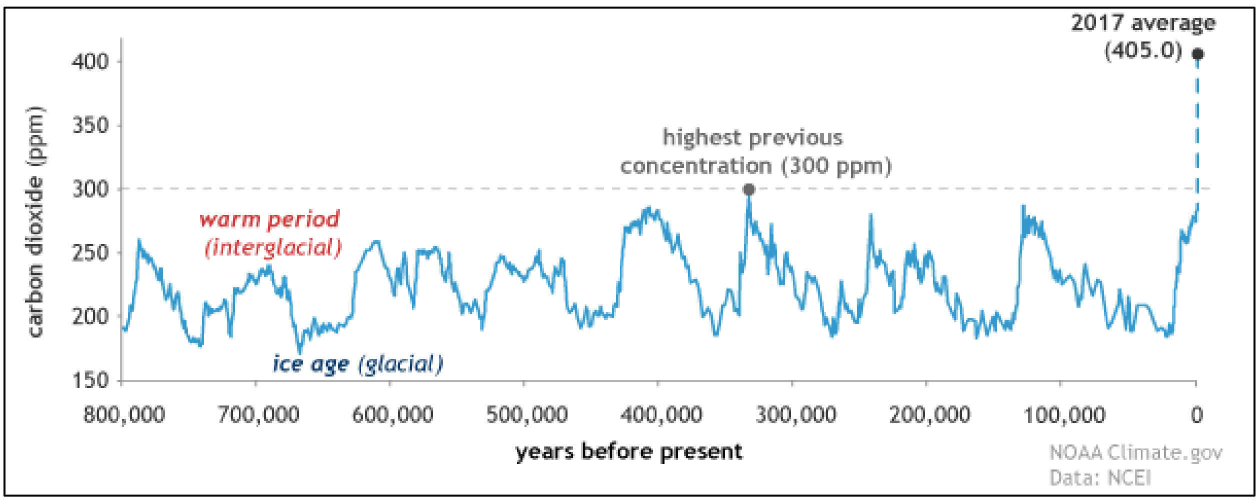
Figure 3.10-5. U.S. CO_2 Emissions in 2016 by Fuel and Sector

In the United States, the transportation sector generates the largest share of greenhouse gas emissions, nearly 28.5 percent of 2016 U.S. greenhouse gas emissions. Greenhouse gas emissions from transportation primarily come from burning fossil fuel for our cars, trucks, ships, trains and planes. Over 90 percent of the fuel used for transportation is petroleum based, which includes gasoline and diesel (USEPA 2018e).

The U.S. Annual Energy Outlook for 2018 (EIA 2018a) projections indicate that energy-related CO_2 emissions within the United States will increase by approximately 0.6 percent annually from 2017 to 2050, with much of the increase coming from rising industrial activity fueled by natural gas. The amount of energy used per unit of economic growth and the associated CO_2 emissions are declining and will continue to decline through 2050 due to energy efficiency, fuel economy improvements and structural changes in the economy. Furthermore, changes in the U.S. energy mix of less carbon-intensive fuels and increasing low- or no-carbon fuels result in additional CO_2 reductions per unit of economic growth. Electric power sector CO_2 emissions are projected to be relatively flat through 2050 as a result of favorable market conditions for natural gas and supportive policies for renewables compared with coal. CO_2 emissions in the transportation sector is projected to decline by 0.2 percent per year through 2050 (EIA 2018a).

3.10.3 Atmospheric Greenhouse Gas Concentrations

Increasing greenhouse gas concentrations in the atmosphere are a leading contributor to a range of ongoing and predicted changes in global climate, including rising surface temperatures, changes in precipitation, rising sea levels and increase in extreme weather events. The global atmospheric CO_2 concentration in 2017 reached 405 parts per million (ppm), a level that is higher than at any point in the past 800,000 years. As shown in Figure 3.10-6, the annual rate of increase in atmospheric CO_2 over the past 60 years has been about 100 times faster than during any previous era in history, including the end of the last ice age 11,000 – 17,000 years ago when earth underwent a natural warming period (NOAA 2018a).

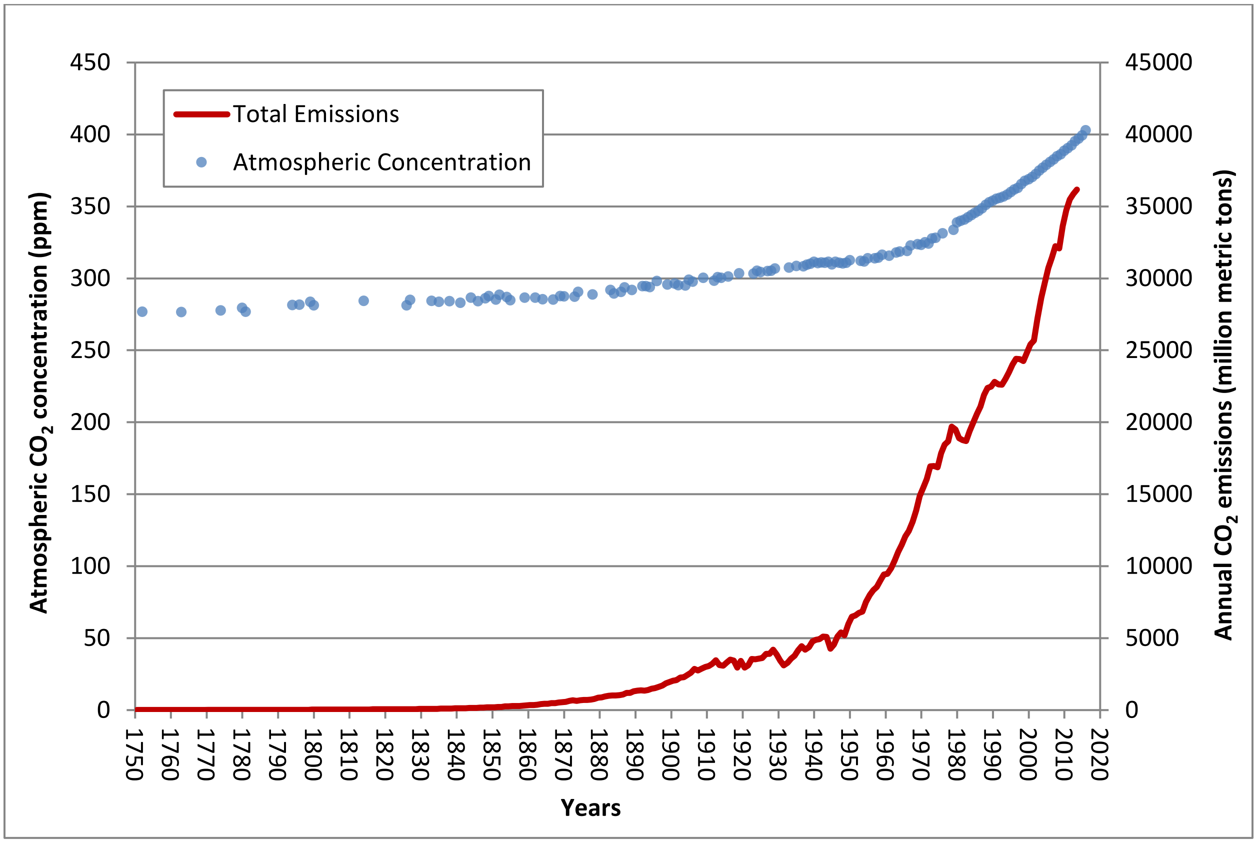


Source: NOAA 2018a

Figure 3.10-6. Historical CO_2 Levels from Ice Age to Present

At the beginning of the industrial era (circa 1750 AD), the concentration of CO_2 in the atmosphere was approximately 280 ppm (Etheridge et al. 1998). From the 1700s to the present, global atmospheric concentrations of CO_2 have risen approximately 44 percent (USEPA 2018d). In 1958, C.D. Keeling and others began measuring the concentration of atmospheric CO_2 at Mauna Loa in Hawaii. These measurements show that the amount of CO_2 in the atmosphere has been steadily increasing. In 1959, the concentration of CO_2 at Mauna Loa was approximately 316 ppm, and in November 2017 it was approximately 405 ppm and in November 2018 it was 408 ppm. The average annual CO_2 concentration growth rate at Mauna Loa has been significantly higher during the last decade (2001–2010 average: 2.04 ppm per year) than the average CO_2 growth rate during the previous decade (1991–2000 average: 1.55 ppm per year) or during the last 50 years (1961–2010 average: 1.47 ppm per year) (NOAA 2018b).

The trend in atmospheric CO_2 concentrations observed at Mauna Loa is similar to other global observation sites. In 2017, the annual global mean CO_2 concentration was approximately 405 ppm, and between 2001 and 2010, annual global mean CO_2 concentration increased by an average of 2.01 ppm per year (Dlugokencky and Tans 2018; NOAA 2018b). Data analysis correlates this increase in global concentrations of CO_2 with increased greenhouse gas emissions resulting from human activities, such as the use of fossil fuels and changes in land use. Figure 3.10-7 depicts the changes in global CO_2 concentrations and CO_2 emissions from fossil fuel use since the beginning of the industrial era (circa 1750).



Source: Developed from Boden et al. 2017; Dlugokencky and Tans 2018; Etheridge et al. 1998
CO_2 = carbon dioxide; ppm = parts per million

Figure 3.10-7. Historical Trends in Global Atmospheric CO_2 Concentrations and Emissions

Like CO_2, atmospheric concentrations of other greenhouse gases have also increased since the start of the Industrial Revolution (Pre-1750). Methane concentrations have increased from approximately 720 parts per billion (ppb) to around 1,860 ppb in 2018 (NOAA 2018c), while nitrous oxide concentrations have increased from approximately 270 ppb to approximately 330 ppb. Current atmospheric concentrations of other industrial greenhouse gases, including chlorofluorocarbons, hydrofluorocarbons and halons, were essentially zero in the pre-industrial era, but currently range from a few parts per trillion to a few hundred parts per trillion (Oak Ridge National Laboratory 2016).

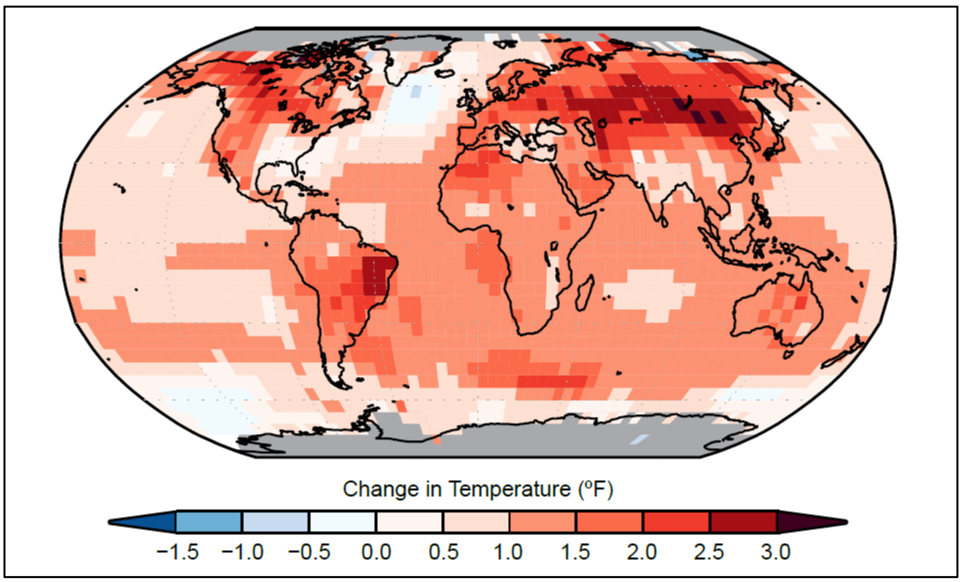
3.10.4 Changes to Climatic Conditions

Scientific research has linked increasing greenhouse gas concentrations in the atmosphere to a range of ongoing and potential changes to global climate. Assessments of future climate change are strongly dependent on predicted trends in greenhouse gas emissions, which depend on future policy and other actions to reduce greenhouse gas emissions. The remainder of this section provides a summary of current climatic conditions, observed trends in recent decades and predictions of future climate change.

3.10.4.1 Changes to Global and U.S. Climate

Rising greenhouse gas concentrations in the atmosphere affect a range of ongoing and predicted changes in global climate, including rising surface temperatures, changes in precipitation, rising sea levels and an increase in extreme weather events. These changes are not geographically uniform across the planet, however, as some regions are likely to experience greater change than others (IPCC 2018).

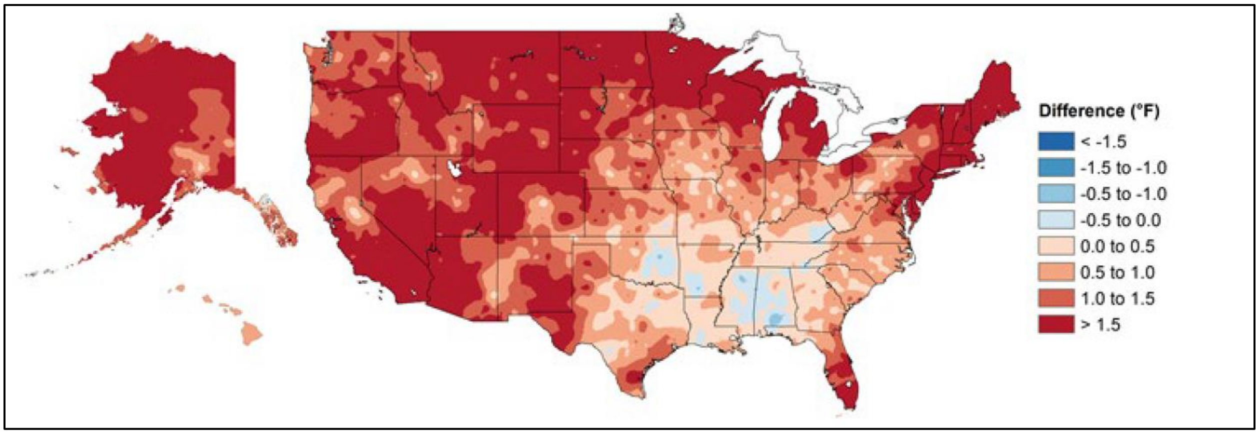
Rising Surface Temperatures: Global surface temperatures have increased by approximately 1.8°F (1.0°C) over the last 115 years (1901 to 2016), which is the warmest in the history of modern civilization (USGCRP 2017). Across the globe, 16 of the 17 warmest years on record have occurred since 2000, with the 3 sequential years of 2014, 2015 and 2016 each setting new records for global average surface temperatures (NASA 2017). Observations indicate the greatest changes have occurred in the polar regions (USGCRP 2017). Figure 3.10-8 illustrates observed global changes in annual average temperature and precipitation for the period 1986 to 2015, relative to 1901 to 1960.



Source: USGCRP 2017

Figure 3.10-8. Observed Global Temperature Change, 1986 to 2015, Relative to 1901 to 1960

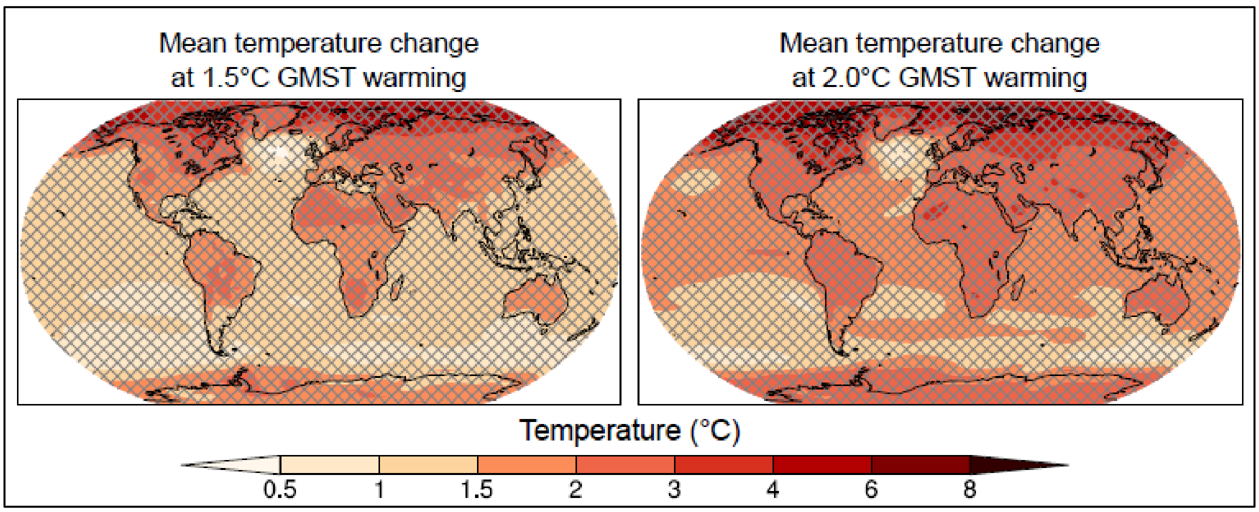
Annual average temperature over the contiguous United States increased by 1.8°F (1.0°C) since the beginning of the 20th century. Alaska is warming faster than any other state, at a rate twice as fast as the global average (USGCRP 2018). Figure 3.10-9 illustrates this change and highlights the geographical variability in temperature changes across the country. Along with the increase in annual average temperatures, there have been marked changes in temperature extremes across the contiguous United States. The frequency of cold waves has decreased since the early 1900s, and the frequency of heat waves has increased since the mid-1960s. The number of high temperature records set in the past two decades far exceeds the number of low temperature records (USGCRP 2017).



Source: USGCRP 2017

Figure 3.10-9. Observed U.S. Temperature Change, 1986 to 2015, Relative to 1901 to 1960

The IPCC's 2018 report states that if temperatures continue to increase at the current rate, global warming is likely to reach 2.7°F (1.5°C) over pre-industrial levels between 2030 and 2052. If global warming reaches 3.6°F (2°C), changes to the planet's climate would be even more significant. The IPCC report presents projected changes to environmental systems if the global mean temperature were to reach either of the two global warming scenarios of 2.7°F (1.5°C) and 3.6°F (2°C) over pre-industrial levels (IPCC 2018). Figure 3.10-10 presents changes to mean temperatures for both of these scenarios.

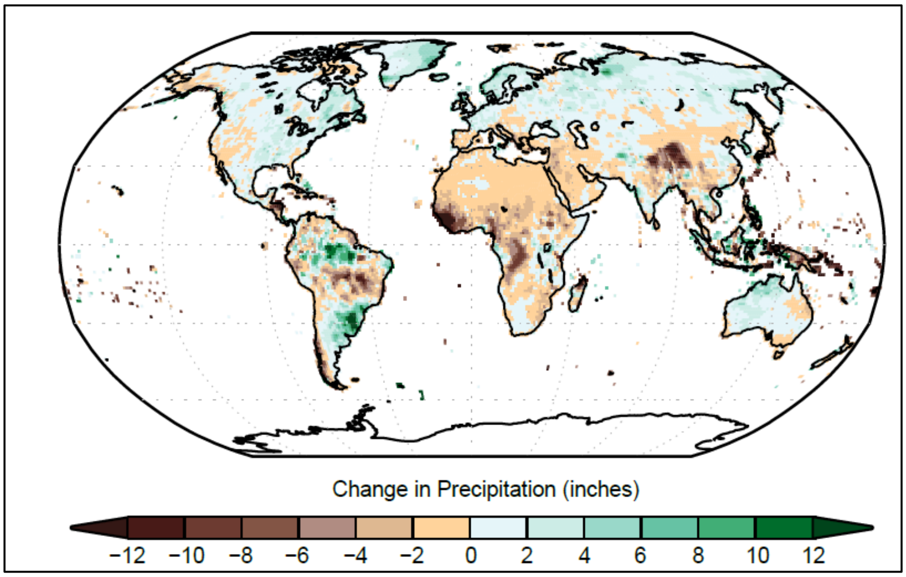


Source: IPCC 2018

Figure 3.10-10. Projected Changes to Mean Temperature at 2.7°F (1.5°C) and 3.6°F (2.0°C) of Global Warming Compared to Pre-Industrial Period (1861 to 1880)

The National Climate Assessment (USGCRP 2017) projects annual average temperature over the contiguous United States will continue to rise in the future. Increases of approximately 2.5°F are projected for the period 2021 to 2050 relative to 1976 to 2005 in all RCP scenarios, and larger rises are projected by late century (2071 to 2100): 2.8° to 7.3°F in a lower scenario (RCP4.5) and 5.8° to 11.9°F in the higher scenario (RCP8.5). Extreme temperatures in the contiguous United States are projected to increase even more than average temperatures. The temperatures of extremely cold days and extremely warm days are both expected to increase. Cold waves are projected to become less intense and the number of days below freezing is projected to decline. On other hand, heat waves will likely become more intense and the number of days above 90°F is expected to rise (USGCRP 2017).

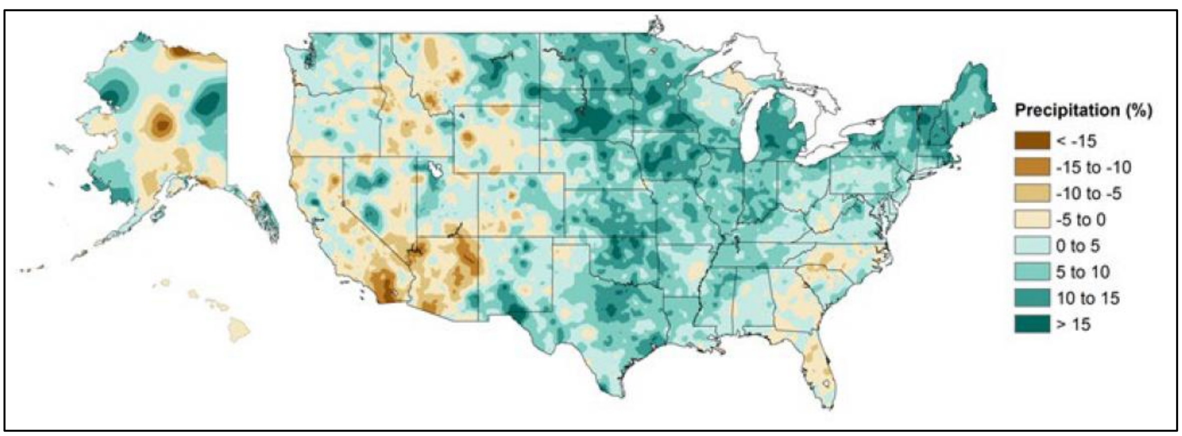
Changes in Precipitation: Global warming has resulted in changes to earth's water cycle and the amount of global precipitation. Over the past century, atmospheric moisture levels and annual averaged precipitation across global land areas have increased. Changes in precipitation regimes include an increase in precipitation in some areas and reduced precipitation and longer dry spells in others (USGCRP 2017). Figure 3.10-11 illustrates observed global changes in annual average precipitation for the period 1986 to 2015, relative to 1901 to 1960.



Source: USGCRP 2017

Figure 3.10-11. Observed Global Precipitation Change, 1986 to 2015, Relative to 1901 to 1960

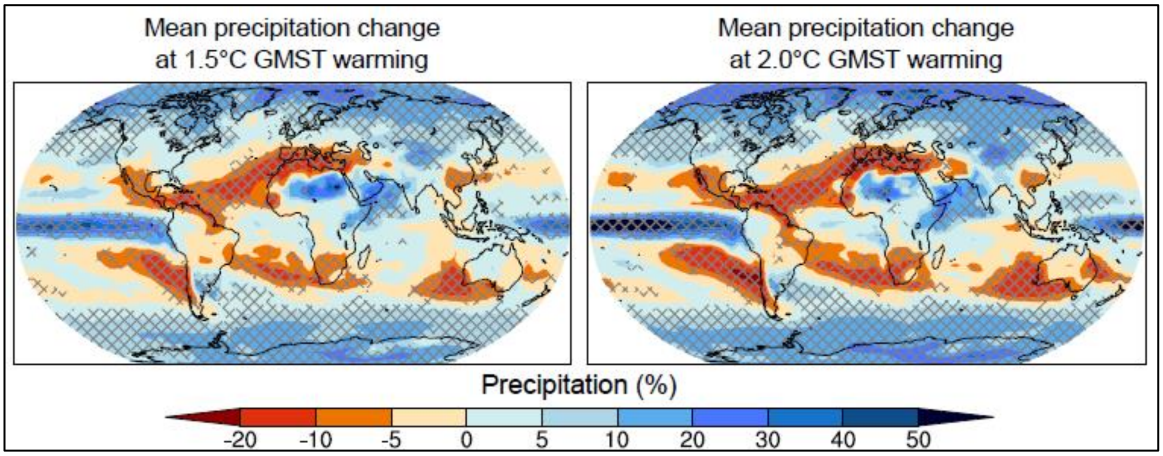
In the United States, annual precipitation has decreased in much of the West, Southwest and Southeast and increased in most of the northern and southern Great Plains, Midwest and Northeast (USGCRP 2017). A national average increase of 4 percent in annual precipitation since 1901 is mostly a result of large increases in the fall season. Heavy precipitation events in most parts of the United States have increased in both intensity and frequency since 1901, as shown in Figure 3.10-12. There are important regional differences in trends, with the largest increases occurring in the northeastern United States. In particular, mesoscale convective systems (organized clusters of thunderstorms) – the main mechanism for warm season precipitation in the central part of the United States – appear to have increased in occurrence and precipitation amounts since 1979 (USGCRP 2017).



Source: USGCRP 2017

Figure 3.10-12. Observed U.S. Annual Precipitation Change, 1986 to 2015, Relative to 1901 to 1960

The IPCC's 2018 report projects changes to mean precipitation levels under the two global warming scenarios of reaching 2.7°F (1.5°C) and 3.6°F (2°C) over pre-industrial levels (IPCC 2018). Figure 3.10-13 presents these projected changes to mean precipitation for both scenarios.



Source: IPCC 2018

Figure 3.10-13. Projected Changes to Mean Precipitation at 2.7°F (1.5°C) and 3.6°F (2.0°C) of Global Warming Compared to Pre-Industrial Period (1861 to 1880)

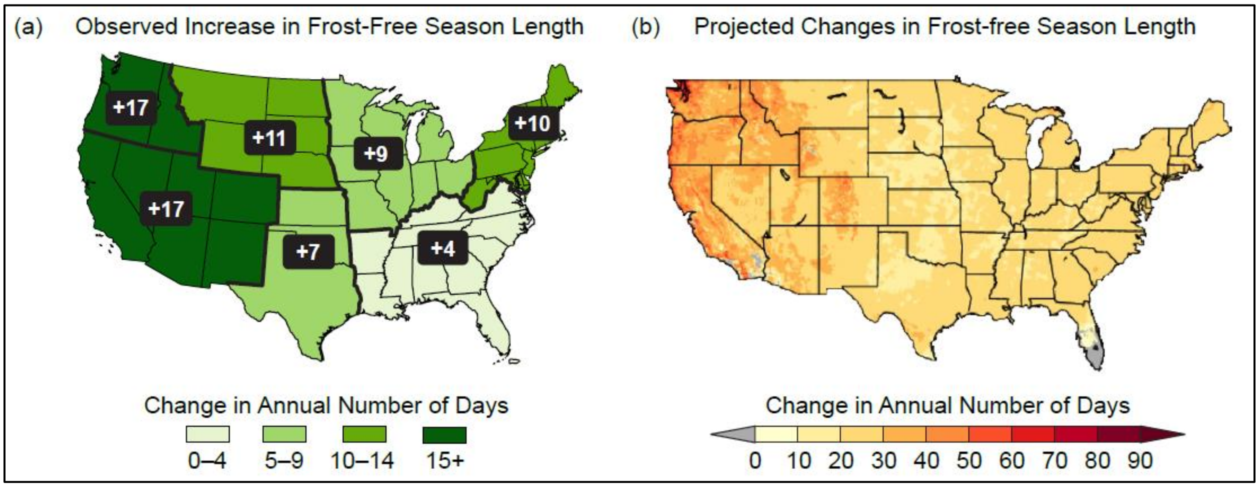
The National Climate Assessment (USGCRP 2017) projects the frequency and intensity of heavy precipitation events in the United States will continue to increase over the 21st century. Mesoscale convective systems in the central United States are expected to continue to increase in number and intensity in the future. There are, however, important regional and seasonal differences in projected changes in total precipitation: the northern United States, including Alaska, is projected to receive more precipitation in the winter and spring, and parts of the southwestern United States are projected to receive less precipitation in the winter and spring (USGCRP 2017).

Decreasing Ice Cover: As global temperatures are rising, sea ice cover is decreasing. The minimum extent of Arctic sea ice cover (typically occurring in September has decreased at a rate of 11 to 16 percent per decade, since the early 1980s. In the Arctic, annual average temperatures have increased more than twice as fast as the global average. Studies predict that by mid-21st century, the Arctic will be nearly free of sea ice in late summer (USGCRP 2018). Ice loss results in increased expanses of open water, that can increase evaporation and add more water vapor to the atmosphere. Ice loss can also increase the north-south meanders of the jet stream. Both of these phenomena are consistent with the occurrence of unusually cold and snowy winters in the northern United States in several recent years (USGCRP 2018).

Because of rising temperatures, permafrost (frozen soil found in the Arctic regions) is thawing earlier and freezing later in the year, which allows microbes to decompose organic matter that was previously locked away within the frozen ground (Mooney 2017). Observational and modeling evidence indicates that permafrost is thawing and releasing CO_2 and methane, accounting for additional warming of approximately 0.14°F (0.08°C) to 0.9°F (0.5°C) on top of climate model projections.

Sea Level Rise: Across the globe, melting ice is contributing to rising sea levels. Over the 20th century, global sea levels rose by about 7 to 8 inches, with almost half (about 3 inches) of that rise occurring since 1993. This rate of sea level rise is greater than during any preceding century in at least 2,800 years (USGCRP 2017). Recent studies predict sea levels will likely rise to 1 to 4 feet by 2100, with the possibility of rise being even higher depending on the future stability of the Antarctic ice sheet. Predictions of sea level rise coupled with a possible increase in extreme weather events are leading to rising concerns about potential damage to infrastructure and communities, especially in coastal areas. Along the U.S. coast, annual median sea level (with land motion removed) has increased by about 9 inches since the early 20th century as oceans have warmed and land ice has melted (USGCRP 2018).

Changes in Land-Based Ecosystems: Other consequences of rising surface temperatures are changes to land-based ecosystems, such as lengthening of the annual growing season. Across the contiguous United States, the average length of the growing season has increased since the early 20th century, such that on average, the last spring frost occurs earlier, and the first fall frost arrives later (USGCRP 2017). Figure 3.10-14 displays observed and projected changes in the length of the frost-free season in the United States, where the frost-free season is defined as the number of days between the last spring occurrence and the first fall occurrence of a minimum temperature at or below 32°F.



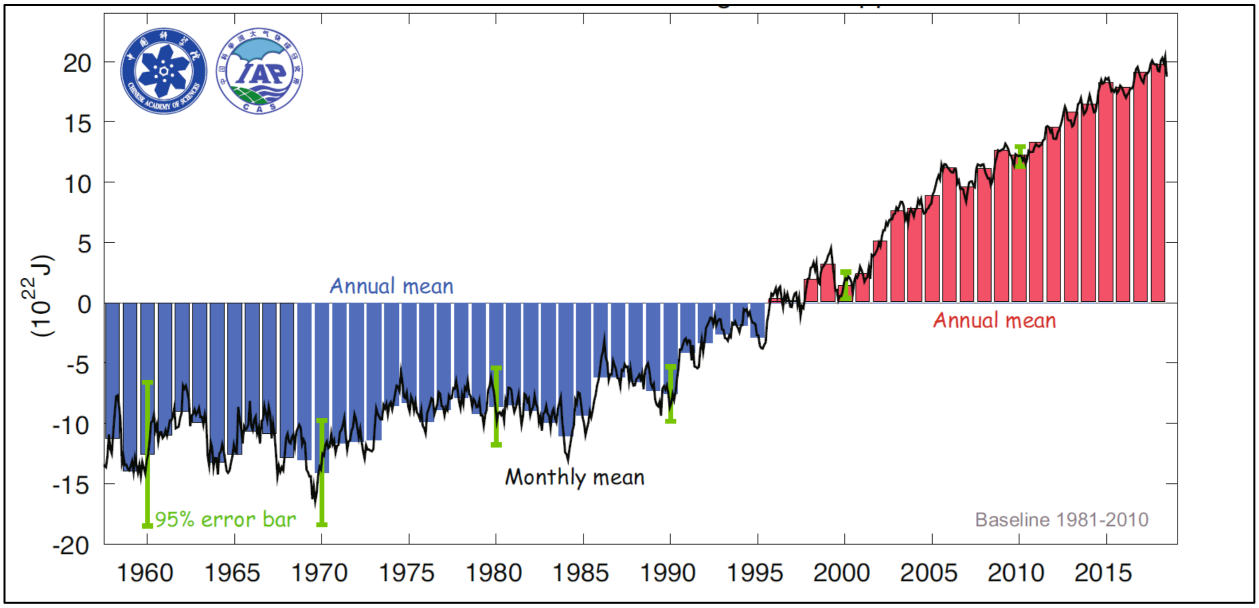
Source: USGCRP 2017

Note: Figure (a) reflects observed changes to average number of frost-free days in 1986 to 2015 compared to 1901 to 1960. Figure (b) reflects projected changes to length of the frost-free season during 2036 to 2065 compared to 1976 to 2005 (under the higher scenario RCP8.5). Frost-free season is number of days between the last spring occurrence and the first fall occurrence of a minimum temperature at or below 32°F. Gray indicates areas that are not projected to experience freeze in more than 10 of the 30 years.

Figure 3.10-14. Observed and Projected Increases in U.S. Frost-Free Season Length

In hotter, drier areas, plants may face increasing heat and water stress, and may also face an increased risk of a longer fire season. Plant hardiness zones may shift northwards, consistent with changes in surface temperatures and growing seasons. Changes to growing seasons impact the animals dependent on the ecosystem's food sources. A recent study of 48 migratory bird species found that 9 of the species did not keep pace with the changing spring "greening" of plants in the period 2001 to 2012. This mismatch in timing between arrival of migratory birds and peak resource availability can cause declines in adult survival and breeding success. Climate change also exacerbates the spread of invasive species, as conditions could become more advantageous to non-native species (USGCRP 2018).

Changes to Ocean Temperatures and Chemistry: As global surface temperatures rise, ocean temperatures also rise as the oceans absorb heat. Studies report that the oceans absorb more than 90 percent of the heat that anthropogenic greenhouse gas emissions trap in the atmosphere, and have warmed nearly 40 percent faster in recent decades than they did in the mid-20th century. The earth's oceans in 2018 were the hottest on record. The upper layer of the ocean (6,560 feet) has warmed by about 1.3°F from 1900 to 2016 (USGCRP 2018). Further, the rate of warming appears to have accelerated in recent decades; the rate of observed ocean warming from 2005 to 2017 was 50 to 75 percent higher than from 1971 to 2010 (Cheng et al. 2019a). Figure 3.10-15 shows recent trends in ocean warming. The oceans act as a buffer, protecting the atmosphere from significantly higher temperature increases, but increased ocean temperatures enhance evaporation and wind speeds that in turn intensify the frequency and severity of storms (Borunda 2019; Mora et al. 2018).



Source: Cheng et al. 2019b
J = joules

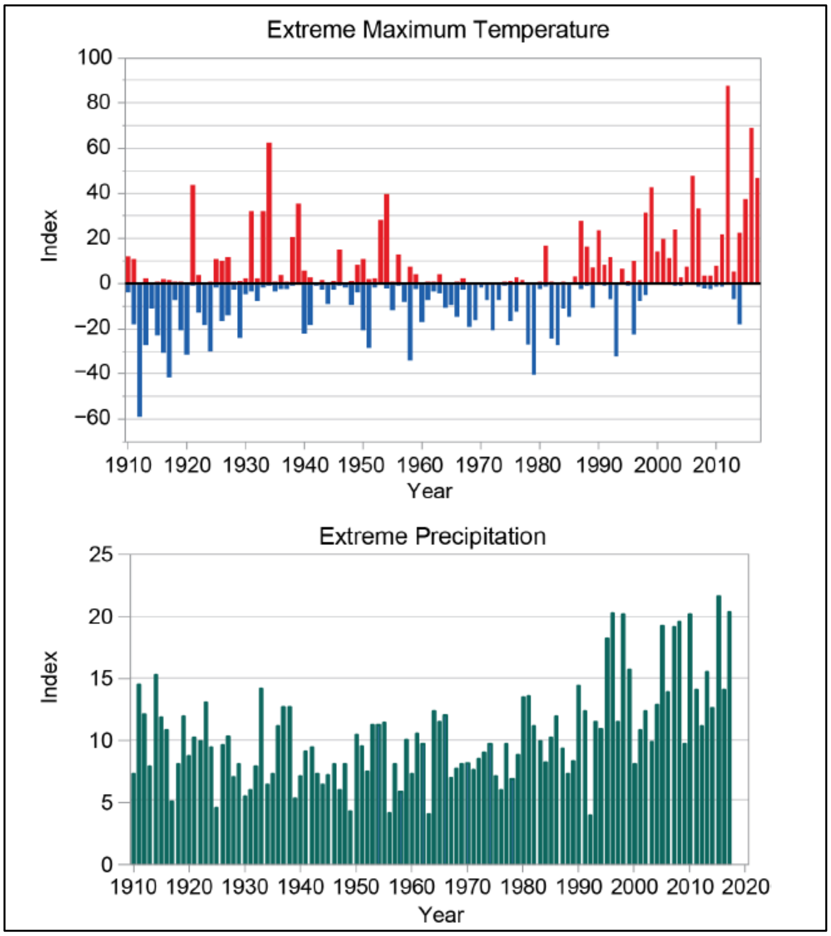
Figure 3.10-15. Global Ocean Heat Content Change in the Upper 2,000 m (6,600 feet)

Warming water temperatures, along with increased atmospheric CO_2 levels, changes in precipitation and evaporation, and other climate changes also result in impacts to the chemistry of the ocean. Oceans uptake approximately 25 percent of the CO_2 emitted to the atmosphere annually from human activities; and this increase in dissolved CO_2 makes the oceans more acidic (USGCRP 2018). Since the pre-industrial period, there has been a decrease in ocean pH by 0.1 pH units, which represents an approximate 30 percent increase in acidity (NOAA 2018d). This ocean acidification results in a reduction in the concentration of carbonate ions, which many marine organisms use to form calcium carbonate, an important building block of sea shells and coral skeletons. When the concentration of carbonate ions in ocean water is too low, it is difficult for calcifying organisms (such as oysters, clams, sea urchins, corals and calcareous plankton) to build and maintain their structures, and exposed calcium carbonate structures begin to dissolve (USGCRP 2018).

Changes in ocean temperatures, rates of precipitation and evaporation, and other climate changes have also caused changes in ocean salinity and levels of dissolved oxygen. The northern oceans and Arctic have decreased in salinity from melting glaciers and ice sheets, while other regions on the planet have increased in salinity from higher evaporation rates. Warming ocean temperatures hold less oxygen. Average oxygen levels in the world's oceans have reduced by 2 percent since 1960. These reductions in dissolved oxygen has increased the frequency of marine 'dead zones,' where oxygen levels are too low to support oxygen-dependent life (IPCC 2018).

Extreme Weather Events, Flooding and Wildfires: Across the United States, over the last 50 years, there has been an increase in extreme weather events, including prolonged periods of excessively high temperatures, heavy downpours, more intense hurricanes and tornadoes, severe floods and droughts. As average global temperatures have risen, extreme high temperatures have become more frequent and extreme cold temperatures less frequent. From 2001 to 2012, more than twice as many daily high temperature records were broken in the United States, compared to low temperature records. In U.S. cities, heat waves, which are periods of abnormally hot weather that last days to weeks, have increased by over 40 days since the 1960s (USGCRP 2018).

Because warmer air can hold more moisture, heavy rainfall events have increased in frequency and severity across the United States. Observed changes in heavy precipitation events above the 99th percentile of daily values average 55 percent and 42 percent in the Northeast and Midwest, respectively, and studies project such events to continue to occur (USGCRP 2018). As shown in Figure 3.10-16, a much greater area of the United States has experienced warmer extreme maximum temperatures and extreme rainfall during the past 25 years compared to the years since 1910.



Source: USGCRP 2018
Note: The top panel shows the percentage of land area in the contiguous United States that experienced temperatures greatly above or below normal (upper or lower 10th percentile, respectively). The bottom panel shows the percentage of the land area for the contiguous United States that experienced extreme 1-day precipitation amounts that were greatly above normal.

Figure 3.10-16. Extreme Temperature and Precipitation Events in Contiguous United States

Studies reveal that the heaviest rainfall amounts from intense storms, including hurricanes, have increased by 6 to 7 percent, on average, compared to what they would have been a century ago. In particular, the 2017 hurricanes Harvey and Maria set record rainfall amounts. Harvey's multiday total rainfall in Texas and Louisiana exceeded that of any known historical storm in the continental United States, while Maria's rainfall intensity was likely even greater than Harvey's, with some locations in Puerto Rico receiving multiple feet of rain in just 24 hours (USGCRP 2018). Hurricanes Harvey and Maria were the 2nd and 3rd most costly hurricanes in United States, at over $125 billion and $90 billion, respectively (with Katrina in 2005 being the costliest) (NOAA 2018e). Most models agree that climate change through the 21st century is likely to increase the average intensity and rainfall rates of hurricanes in the Atlantic and other basins (USGCRP 2018).

Tornado activity in the United States has become more variable, particularly over the 2000s, with a decrease in the number of days per year with tornadoes but an increase in the number of tornadoes on these days. And, as the climate has warmed, the incidence of large forest fires in the western United States and Alaska has increased since the early 1980s and is projected to further increase in those regions, with profound changes to affected ecosystems and potential impacts on communities in those areas (USGCRP 2017). Monitoring data from the National Interagency Fire Center indicate that since at least the early 1980s, wildfires in the United States have been getting larger and fire seasons are lasting longer (Ingrahm 2018).

Impacts to Human Society and Health: Future changes to surface temperature, hydrology and ecosystems (discussed earlier) are likely to affect the availability of food through impacts to agriculture, livestock and fisheries, as well as the quantity and quality of water available for human use. Sea level rise, extreme weather events, wildfires and other climate-related hazards can have adverse impacts on infrastructure including power generation and distribution, transportation and buildings; as well as other economic impacts such as property damage, loss of productivity, and impacts to tourism, natural resources and other economic sectors. Finally, all of these changes have the potential to result in increased societal stress and conflict due to increasing competition for resources, population migrations and the temporary breakdown of law and order following extreme weather events (Mora et al. 2018; USGCRP 2018).

Climate changes are increasingly having an adverse impact on the health and well-being of people, particularly populations that are already vulnerable. Climate change exposes more people in more places to extreme weather-related events like heat waves, floods, droughts, wildfires and heavy rainfalls. These events cause economic and personal stress to victims as it costs money to repair any damages, and the events may result in forced relocations of households and disruptions to businesses. Increased stress may exacerbate underlying medical conditions and lead to adverse mental health effects (USGCRP 2018; Mora et al. 2018).

Climate change also results in changes to the spread of infectious diseases through vectors, food and water. For example, climate change alters the geographic range, seasonal distribution and abundance of vector borne diseases like Lyme disease carried by ticks, and viruses carried by mosquitos (e.g., West Nile, Zika, etc.). Increasing water temperatures alter the geographical range and growth of harmful algae and coastal pathogens. Increased runoff and flooding from more intense storms can compromise the quality and safety of recreational waters and drinking water sources, including more frequent sewage overflow events. Climate change also affects global and U.S. food production when responding to extreme weather events and is also projected to adversely affect global and U.S. food security and safety by altering exposures to certain food pathogens and toxins (USGCRP 2018).

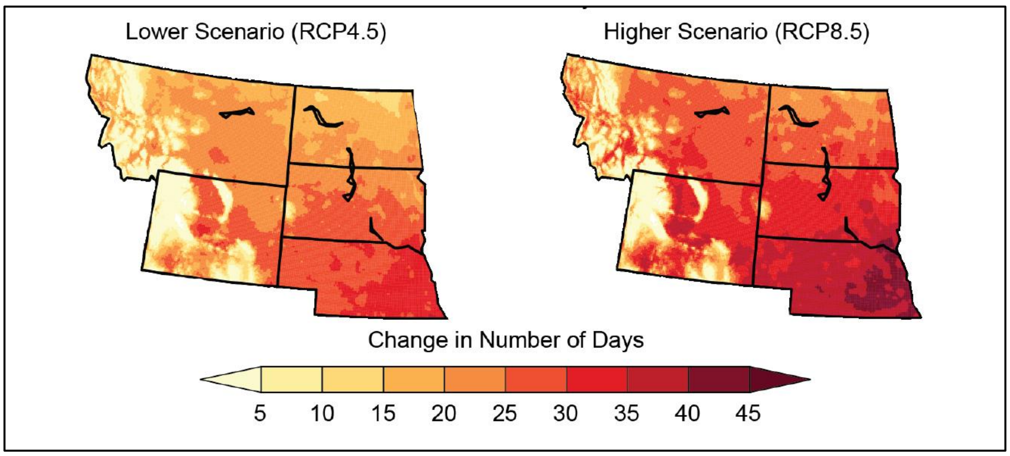
Climate is also an important factor in influencing air quality and its impact on human health. The National Climate Assessment (USGCRP 2018) states that higher temperatures and drier conditions will worsen levels of ground-level ozone and particulate matter, resulting in increases in adverse respiratory and cardiovascular health effects, including premature deaths. More frequent and severe wildfires would increase incidences of respiratory illnesses from exposure to wildfire smoke. Also, climate changes, like earlier spring arrival, warmer temperatures and changes in precipitation, will also increase exposure to airborne pollen allergens, increasing the frequency and severity of allergic illnesses, including asthma and hay fever (USGCRP 2018).

The health impacts of climate change are not felt equally, as some populations are at higher risk than others, such as older adults, children, and low-income and minority communities. Low-income and minority communities are often disproportionally affected, and less resilient to, the adverse health impacts of climate change (USGCRP 2018).

3.10.4.2 Regional Climate Changes (Northern Great Plains of the United States)

The northern Great Plains of the United States, where the Keystone XL is located, is rich in agricultural lands and diverse ecosystems. The climate is highly variable, in part because of the dramatic elevation changes across the region. According to the National Climate Assessment (USGCRP 2018), studies project that the northern Great Plains, presently susceptible to heat waves, floods, droughts and severe storms, will experience more intense episodes of these conditions, threatening vulnerable communities and ecosystems throughout the region. These climate impacts could affect agricultural productivity, recreation and tourism, energy systems, human health and traditional ways of life among Indian tribes (USGCRP 2018; Melillo et al. 2014).

Temperature and Precipitation Changes: Temperatures in the northern Great Plains are projected to increase 2°F to 4°F by 2050 under the lower scenario (RCP4.5) and even more under the higher scenario (RCP8.5), resulting in an increase in the occurrence of both drought and heat waves. As shown in Figure 3.10-17, the number of days above 90°F is expected to increase significantly by the mid-21st century (2036 to 2065) compared to the average temperatures during 1976 to 2005. These hot days contribute to heat stress on agriculture, livestock and ecosystems; decreased water supplies; adverse impacts to human health, and increased electricity demand for cooling during summer months (USGCRP 2018).



Source: USGCRP 2018

Note: Projected changes are shown for the annual number of very hot days (days with maximum temperatures above 90°F, an indicator of crop stress and impacts on human health). Projections are shown as changes from the 1976 to 2005 average for the mid-21st century (2036 to 2065).

Figure 3.10-17. U.S. Northern Great Plains, Projected Change in Number of Days Above 90°F for 2036 to 2065 for Lower and Higher Scenarios, Relative to 1976 to 2005 Average

The amount, distribution and variability of annual precipitation in the northern Great Plains are also anticipated to change, with increases in winter and spring precipitation of 10 to 30 percent by the end of this century and a decrease of precipitation falling as snow under a higher scenario (RCP8.5). Summer precipitation is expected to vary across the region, ranging from no change under the lower scenario (RCP4.5) to 10 to 20 percent reductions under a higher scenario. Under the higher scenario (RCP8.5), the frequency of 2-day heavy rainfall events will increase about 50 percent by 2050; and the amount falling in single-day heavy events is projected to increase 8 to 10 percent by mid-century depending on the scenario. Although fewer hail days are expected, a 40 percent increase in damage potential from hail due to a more frequent occurrence of larger hail is predicted for the spring months by mid-century under a higher scenario (RCP8.5). Even with increases in precipitation, warmer temperatures are expected to increase evaporative demand, leading to more frequent and severe droughts (USGCRP 2018).

Impacts to Water Systems: Future predicted changes in precipitation patterns, warmer temperatures and the potential for more extreme rainfall events are likely to challenge the regions water management systems that are critical to the crops and livestock, ecosystems and energy industry. Parts of the northern Great Plains are among the most arid in the nation, with high evaporation rates resulting in lower soil moisture and streamflow compared with more humid regions of the country. Due to these arid conditions, less than 10 percent of the regional precipitation reaches streams and the Missouri River (the primary surface water feature in the region), and relatively small changes in annual precipitation can produce large changes in runoff that can have significant effects downstream.

The Northern High Plains Aquifer, which includes the Ogallala Group, (see Section 3.6) is a nationally important water resource stretching across multiple states and vital to the region primarily for drinking water and irrigation. The aquifer has experienced long-term declines in volume due to large withdrawals for irrigation (USGCRP 2018). Climate change and shifts in precipitation intensity and frequency would have impacts to groundwater recharge rates (Thomas et al. 2016). Increased precipitation events would contribute to replenishment of the aquifer, though periods of drought would exacerbate the declining levels. Warmer temperatures increase evaporation, thus reducing infiltration into groundwater systems. In the Central and Southern Plains, projected declines in precipitation and greater evaporation due to higher temperatures are likely to increase irrigation demand; increased water withdrawals from the Ogallala Aquifer and High Plains Aquifer would accelerate ongoing depletion in the southern parts of the aquifers and limit the ability to irrigate (USGCRP 2018).

Another important component to the hydrology of the northern Great Plains is the seasonal melt process from the regions 39 glaciers that contribute to streamflows and are critically important for local watersheds and ecosystems. These glaciers have experienced sustained loss over recent decades, attributable to higher atmospheric temperatures (USGCRP 2018).

Agriculture: In the northern Great Plains, the economy, history and culture are integrally dependent on agriculture. The region has the largest remaining tracts of native rangeland in North America and substantial areas of cropland and pasture. Despite having only 1.5 percent of the population, the northern Great Plains contributes 12.7 percent of the market value of agricultural products sold in the United States. Although agriculture has recently benefited from some climatic changes such as longer growing seasons, future rising temperatures and more frequent and severe extreme weather events will likely have adverse impacts on parts of the region. Changing climatic and market conditions have already resulted in agricultural land use changes such as agricultural shifts from pasture to small grains, or small grains to corn and soybeans, or conversion of winter-seeded crops to spring-seeded crops (USGCRP 2018).

Recreation and Tourism: The northern Great Plains provide many popular recreational opportunities in the region, including fishing, hunting and wildlife watching. Each of these activities and their associated goods and services now face challenges under a changing climate. According to the National Climate Assessment (USGCRP 2018), winter snowpack is melting earlier and more rapidly due to springtime warming, which has resulted in lower steamflows, especially in late summer. Lower streamflows, combined with warmer air temperatures, have caused stream temperatures to rise, which can negatively affect aquatic biodiversity and ecosystem functions. Higher stream temperatures can make some coldwater fish species more susceptible to particular diseases. In 2016, the proliferative kidney disease killed thousands of native mountain whitefish in Montana, thus triggering a month-long closure of 180 miles of the Yellowstone River to all water-based recreation. The region has also seen brief river closures to fishing activities in order to minimize additional stress on sensitive fish species.

Reduced snowfall and shorter snow seasons will negatively affect the region's winter recreational opportunities, including downhill skiing, cross-country skiing and snowmobiling, as well as the local economies that depend on them. Models project snowfall to decline in the mountains of western

Wyoming and Montana by 25 to 40 percent by 2100 under a lower scenario (RCP4.5); and the last day of the snow season is expected to arrive approximately 20 days sooner by 2050 and 30 days sooner by 2100 under a lower scenario (RCP4.5) and 80 days sooner by 2100 under a higher scenario. These types of climate change impacts will negatively affect the local economies that depend on the region's recreational activities (USGCRP 2018).

Climate Change on Energy Systems: The northern Great Plains continue to experience economic and energy impacts of climate change. As temperatures warm, demands for indoor air conditioning will likely increase, placing greater stress on the aging electric grid and energy resources. Severe weather events, such as floods, are likely to increase in frequency, disrupting regional livelihoods and damaging infrastructure. More intense freeze-thaw cycles will also damage roads and other infrastructure (USGCRP 2018). Energy resources are abundant in the northern Great Plains, including crude oil, natural gas, coal, wind, stored water, and to a lesser extent, corn-based ethanol, solar energy and uranium. Climate changes such as higher temperatures and heat waves, decreasing water availability in the summer, and more severe precipitation and flooding events can threaten the infrastructure and operations of these energy systems. Pipelines such as the proposed Keystone XL, as well as railroads and other physical energy and transportation infrastructures, are vulnerable to damage or disruption from increasing heavy precipitation events and associated flooding and erosion. Declining water availability in the summer and during droughts would likely increase costs for oil production operations, which require freshwater resources. Summer heat waves are expected to increase demand for cooling in the summer, further stressing the power grid and potentially increasing costs to the power system (USGCRP 2018).

Climate Change Impacts to Native People: Climate change in the northern Great Plains threatens regional Indian tribe communities and their traditional ways of life. **The Fourth National Climate Assessment describes in detail the potential impacts of climate change on native communities. These** include damage to settlements and infrastructure, endangering natural resources, decreasing water quality and quantity, and jeopardizing food security **(USGCRP 2018)**. Climate change-related impacts may also exacerbate poverty and the vulnerability of traditional cultures and threaten the health and economies in many tribal communities. Observed impacts include changes in hydrological and seasonal cycles, bird migrations and bear hibernation cycles, as well as reduced availability of traditional plant-based foods. Reduced streamflow and warmer water temperatures are impacting subsistence fisheries and riparian ecosystem health, including declines in salmon, trout, frogs and mussels. Furthermore, Tribal lands are experiencing increased fire frequency and intensity that is projected to continue and worsen, raising concern for the health of the forests, wildlife, freshwater systems and fisheries on which the tribes depend. The 2014 Keystone XL Final SEIS and Section 3.9 of this SEIS presents further discussion on tribal communities potentially affected by the Keystone XL Project.

Tribal communities are particularly vulnerable to climate change impacts to water systems in the form of extreme flooding and droughts, changes in snowpack and changes in precipitation. The Fourth National Climate Assessment (USGCRP 2018) states these climate sensitivities, along with substandard water infrastructure and complex institutions and water rights, combine to create water insecurity. Approximately 76 percent of Native American households in the northern Great Plains need new or improved sanitation facilities, and approximately 5,000 households lack safe water supply, sewage facilities or both. Climate change has already begun to exacerbate the problem of decreased water availability, such as in 2003 when the Standing Rock Reservation ran out of water during drought conditions. Livestock ranching and crop agriculture, primary tribal livelihoods in the region, are particularly vulnerable to climate change impacts. Warmer temperatures and changes to water cycles are resulting in drying soils, reduced forage production, increased livestock stress, and reduced water availability for irrigation systems (USGCRP 2018).

4 ENVIRONMENTAL CONSEQUENCES FROM CONSTRUCTION AND NORMAL OPERATIONS

4.1 INTRODUCTION

This chapter presents the potential direct and indirect impacts of the Proposed Action and No Action Alternative from construction and during normal operations and maintenance of the proposed Keystone XL Project (proposed Project) based on information presented in Chapter 3, Affected Environment. As stated in Section 1.1 the focus of this SEIS is to supplement the 2014 Keystone XL Final SEIS to include the MAR. This chapter considers the direct, indirect and cumulative impacts related to the MAR and identifies any potential mitigation measures to minimize adverse effects. This chapter also contains impact analysis of resources outside of the MAR along the Preferred Route analyzed in the 2014 Keystone XL Final SEIS based on new information, including changes to federally-protected species **and historic properties** identified since 2014 along the entire proposed Project (Section 4.9), and an updated analysis of greenhouse gas emissions for the entire proposed Project using recently published lifecycle greenhouse gas emissions studies for WCSB and other crude oils as well as the GREET model (Section 4.10).

For analysis of potential impacts that could occur from an accidental release of petroleum product related to the proposed Project, see Chapter 5, Environmental Consequences from Accidental Releases. Chapter 6, Electrical Power Infrastructure, discusses the potential for adverse impacts relating to construction and operations of power lines required for the Project. Chapter 7, Cumulative Impacts, discusses the potential for adverse cumulative effects.

4.1.1 Characterization of Potential Impacts

The analyses presented in this section quantify the potential impacts associated with the Proposed Action related to the proposed Project and No Action Alternative, wherever possible. Where impacts cannot be quantified, the analyses present a qualitative assessment of the potential impacts. The following descriptors qualitatively characterize impacts on the respective resources:

- **Beneficial** – Impacts would improve or enhance the resource.
- **Negligible** – No apparent or measurable impacts are expected, and may also be described as "none," if appropriate.
- **Minor** – The action would have a barely noticeable or measurable adverse impact on the resource.
- **Moderate** – The action would have a noticeable or measurable adverse impact on the resource. This category could include potentially significant impacts that could be reduced by the implementation of mitigation measures.
- **Significant** – The action would have obvious and extensive adverse impacts that could result in potentially significant impacts on a resource despite mitigation measures.

Negligible, minor and moderate adverse impacts are characterized as "less than significant."

Additionally, impacts may consist of direct or indirect impacts defined as follows:

- **Direct impacts** – Those caused by the proposed Project and occurring at the same time and place (e.g., habitat destruction, wetland disturbance, air emissions and water use)
- **Indirect impacts** – Those caused by the proposed Project but occurring later in time or farther removed in distance from the action (e.g., changes in surface water quality resulting from runoff).

This SEIS generally describes impacts as either "temporary" or "permanent." In addition, a subset of temporary impacts would include areas that would be disturbed intermittently for shorter periods during a construction or maintenance phase. The following terms describe these impact areas:

- **Temporary, short-term impacts** generally occur during construction with the resource returning to its preconstruction condition almost immediately afterward. A short-term impact could continue for up to 3 years following construction. An impact is considered long-term if the resource would require more than 3 years to recover. Areas subject to temporary impacts would also occur in off-ROW locations, such as equipment laydown areas, and areas for trailers and worker parking. For the MAR, the 110-foot- wide construction ROW includes the 50-foot-wide permanent, operational ROW centered on the pipeline.
- **Permanent, long-term impacts** could occur as a result of any activity that modifies a resource to the extent that it would not return to preconstruction conditions during the life of the portion of the proposed Project within the MAR, such as with the construction of a pump station.

4.1.2 Summary of Impacts

Table 4.1-1 provides a comparison of findings by resource from construction and operations of the proposed Project between the 2014 Keystone XL Final SEIS and the impacts analysis and conclusions detailed within this chapter. As indicated by the table, impact determinations are consistent with findings in the 2014 Keystone XL Final SEIS.

Table 4.1-1. Comparison of Impact Findings

Resource Area	2014 Keystone XL Final SEIS[a]	Current Analysis[a]
Land Use, Recreation and Visual Resources	Less than significant	Less than significant
Geology and Soils	Less than significant	Less than significant
Air Quality	Less than significant	Less than significant
Noise and Vibration	Less than significant	Less than significant
Water Resources	Less than significant	Less than significant
Biological Resources	Less than significant	Less than significant
Socioeconomics	Less than significant	Less than significant
Cultural Resources	Less than significant	Less than significant
Greenhouse Gases and Climate Change[b]	Construction emissions: 0.24 mmt CO_2-eq Operational emissions: 1.44 mmt CO_2-eq/yr Operational indirect lifecycle emissions: 147 to 168 mmt CO_2-eq/yr; 1.3 to 27.4 mmt CO_2-eq/yr if other crude oils are fully displaced from the market[d]	**Significant[c]** Construction emissions: 0.26 mmt CO_2-eq Operational emissions: 1.31 mmt CO_2-eq/yr Operational indirect lifecycle emissions: 178.3 mmt CO_2-eq/yr; 37.3 to 120.5 mmt CO_2-eq/yr if other crude oils are partially displaced[e]; or 2.1 to 33.9 mmt CO_2-eq/yr if other crude oils are fully displaced[d]

a. Impact determinations are based on the best management practices and impact avoidance measures contained within the CMRP located in Appendix G of the 2014 Keystone XL Final SEIS and resource protection measures discussed within this chapter and summarized in Chapter 8.

b. Emissions estimates shown here reflect transport of 830,000 barrels per day of WCSB crude oil.

c. **In this SEIS, the Department has determined that greenhouse gas emissions from the proposed Project would likely represent a potentially significant impact. Greenhouse gas impacts are discussed further in Section 4.10.**

d. Each barrel of WCSB crude oil assumed to displace one barrel of other medium to heavy crude oils.

e. Each barrel of WCSB crude oil assumed to displace 0.8 to 0.4 barrel of other medium to heavy crude oils.

CO_2-eq = carbon dioxide equivalent; mmt = million metric tons; SEIS = Supplemental Environmental Impact Statement; WCSB = Western Canadian Sedimentary Basin; yr = year

4.2 LAND USE, RECREATION AND VISUAL RESOURCES

4.2.1 Environmental Consequences

The 2014 Keystone XL Final SEIS discusses impacts to land use, recreation and visual resources along the Preferred Route. This section supplements the 2014 analysis to include impacts to land use, recreation and visual resources along the MAR. Chapter 5, Environmental Consequences from Accidental Releases, assesses the risk to land use, recreation and visual resources in the event of an accidental release. Chapter 6, Electrical Power Infrastructure, provides a description of land use, recreation and visual resources and an assessment of impacts from connected actions relating to electrical supply needs required for the proposed pipeline. Chapter 7, Cumulative Impacts, provides an assessment of the impacts to land use, recreation and visual resources from the proposed Project (including the electrical supply needs) in combination with other past, present and reasonably foreseeable future actions.

To evaluate the impacts on land use, recreation and visual resources, the Department reviewed the Proposed Action and No Action Alternative to determine whether any activities have the potential to cause the following:

- Changes in land use or zoning
- Changes in land ownership
- Changes in or reduction of public use of recreational areas or special interest areas
- Incompatible change to the visual character of the region

Adverse impacts would occur if the action were incompatible with adjacent land uses along the pipeline ROW. The following analysis estimates and assesses the impact to land use, recreation and visual resources during construction, normal operations and maintenance activities. Chapter 5, Environmental Consequences from Accidental Releases, discusses potential impacts to these resources in the event of an accidental release.

4.2.2 No Action Alternative

Under the No Action Alternative, construction and operations of the proposed Project would not occur. No impacts to land use, recreation and visual resources would occur.

4.2.3 Proposed Action

This SEIS quantifies potential direct and indirect impacts to land use, recreation and visual resources using an assessment of data sources presented in Section 3.2. Potential construction- and operations-related impacts would include:

- Changes to vegetative cover, including potential loss of forest cover.
- Temporary loss of agricultural productivity within the ROW.
- Potential damage to agricultural features such as drain tiles and fences during construction.
- Temporary impacts such as construction noise and dust to nearby residences, as well as longer-term impacts due to restrictions on construction within the permanent ROW.

- Temporary restrictions on access to recreational resources, as well as noise and visual impacts, in the vicinity of ongoing construction activity.
- Visual impacts from construction and vegetation clearing, and from the construction of pump stations and other aboveground facilities.

Keystone would implement measures within the 2014 Keystone XL Final SEIS CMRP to reduce impacts on land use, recreation and visual resources within the construction and permanent ROW (U.S. Department of State 2014). Keystone would implement general best management practices, including worksite appearance, maintenance and noise and dust control. Other applicable measures to reduce construction and operations impacts to various types of land use are described below. These measures would also help mitigate impacts to recreational and visual resources. Section 4.5 discusses potential impacts from noise and vibration. Applicable measures to reduce construction and operations impacts to land use, recreation and visual resources include:

Agricultural Land

- Segregating **up to** 12 inches of agricultural topsoil during construction and replacing it during site restoration (Section 4.3 describes the topsoil segregation methods that would be used);
- Avoiding functional loss (stopping or obstructing) of active irrigation ditches during construction or providing alternate sources of water; and
- Avoiding or minimizing potential damage to drain tile systems and repairing damaged drain tiles using original or new material.

Rangeland

- Restoring disturbed areas per the Construction/Reclamation Plans and Documentation contained in Appendix R of the 2014 Keystone XL Final SEIS (Con/Rec units) and landowner agreements;
- Minimizing construction noise in the immediate vicinity of herds of livestock;
- Installing temporary fences with gates around construction areas to prevent injury to livestock or workers;
- Leaving hard plugs (short lengths of unexcavated trench) or installing soft plugs (areas where the trench is excavated and replaced with minimally compacted material) to allow livestock and wildlife to cross the trench safely where required by the landowner; and
- Maintaining all existing improvements such as fences, gates, irrigation ditches, cattle guards and reservoirs to the degree practicable where required by the landowner agreement.

Forest

- Routing the proposed pipeline along existing ROWs in forest lands, when practicable; and
- Felling trees toward the pipeline centerline to minimize additional tree disturbance.

Developed Land

- Providing construction shielding for certain land improvements (e.g., fences and sheds) and to preserve landscaping and mature trees; and
- Restoring all fences, landscaping improvements, shrubs, lawn areas and other structures to landowner- agreed requirements following construction.

4.2.3.1 Construction

Land Use

Construction of the MAR would have temporary and minor adverse effects on land uses and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to land use would be less than significant. Temporary impacts within the construction ROW could include:

- Potential damage to agricultural features such as irrigation systems or drain tiles;
- Loss of the agricultural productivity of the land;
- Disruption to livestock during construction;
- Loss of forested and wetland areas;
- Increased dust and noise to neighboring residential and commercial areas (which could limit the landowner's ability to use their land as desired and permitted).

As shown in Table 3.2-2, agricultural land and rangelands are the predominant land uses along the MAR, together accounting for approximately 94 percent of the total land area. Uses within these locations would be temporarily affected during construction, primarily from the potential for loss of agricultural productivity, potential damage to tile and irrigation ditches and impacts to livestock from construction noise. It is estimated that disturbed pastures, croplands and grassy rangelands may take 1 to 5 years to recover to pre-construction levels (U.S. Department of State 2014). The level of effects would be minimized through implementation of the conservation measures identified at the beginning of this section and through implementation of the CMRP.

Forested areas account for approximately 1 percent of the MAR (see acreages in Table 3.2-2). During construction, trees would be removed from the ROW. Landowners would be consulted to determine if timber within the ROW has a commercial or salvage value, and timber with commercial or salvage value would be salvaged according to landowner wishes. Tree removal and disposal would be accomplished in accordance with all local, state and federal permit requirements. Trees would be allowed to regrow in the temporary ROW after construction, but the impact would be considered long-term as forest lands take a long time to recover to pre-construction state.

Wetlands account for **less than** 1 percent of the MAR (see acreages in Table 3.2-2). Impacts of wetlands in locations requiring disturbance would be mitigated and restored through measures described in Section 4.6. Construction of the MAR and associated facilities would not impact any special management areas or land under conservation easements.

Construction would require the acquisition of temporary easements from landowners and land managers along the pipeline ROW and at the locations of proposed temporary ancillary facilities (e.g., laydown areas and TWAs). As discussed in the 2014 Keystone XL Final SEIS, easement agreements would typically include monetary compensation to landowners for long-term land use losses (e.g., property use during construction, operation and maintenance), and for temporary land use losses (e.g., crop production impairment and private road damage or obstruction) (U.S. Department of State 2014). Easements would also address restoration of land or compensation to landowners for any unavoidable construction-related damage to property. Construction of permanent aboveground facilities (e.g., MLVs, pump stations) would require leasing or acquiring land. The nearest residence to the MAR is located approximately 140 feet from the construction ROW. Homeowners located close to the construction ROW would likely experience frequent inconveniences during the construction period (typically 7 to 30 days), including disruptions to privacy and restrictions on ingress and egress from their property. Homes located further away from the ROW could experience minor inconveniences such as increased noise levels and dust from construction (also see Section 4.4 for air quality impacts and Section 4.5 for noise impacts).

In some locations, TWAs may be needed outside the construction ROW. Existing commercial or industrial sites with public or private road access would be used for temporary workspace needs where practical, and TWAs would be restored to preconstruction levels.

Recreation

Construction of the MAR would have temporary and minor adverse effects on recreation and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to recreation would be less than significant. Temporary impacts within the construction ROW could include restricted access to recreational resources within and adjacent to the construction ROW. The construction ROW would not directly affect recreational activity on any federal lands and the MAR does not cross any river reaches that have been designated by federal, state or local authorities as Wild, Scenic and/or Recreational. Construction of the MAR would potentially affect the Cowboy Recreational Trail during installation of the pipeline across the trail. Similar to irrigation ditch crossing, it is anticipated that impacts to the affected areas would be 1 day (or less) in duration. TransCanada would coordinate with the NGPC to secure any necessary leases and permits before beginning construction activities within the Cowboy Recreational Trail ROW.

The MAR would also cross one scenic byway (U.S. Route 30) by boring beneath the roadway, which would result in minimal to no disruption to traffic (U.S. Department of State 2014). U.S. Route 30 is a divided four-lane highway in the vicinity of the MAR crossing, and completing the road crossing could take up to 10 days.

Waterbodies with recreationally and/or commercially valuable fish species would be crossed using site-specific waterbody crossing plans designed to reduce impacts to these important resources. As discussed in Section 3.2.1.2, the Project would cross five waterbodies with recreational use designations. Impacts to recreational use on waterbodies due to construction would generally be temporary and could include temporary restrictions on access to certain portions of the waterbody upstream and downstream of HDD activity and/or other ongoing construction work. Impacts to water quality and fisheries are discussed in greater detail in Sections 4.6 and 4.7, respectively.

Visual Resources

Construction of the MAR would have temporary and minor to moderate adverse effects on visual resources and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to visual resources would be less than significant. Visual impacts associated with construction would include construction activities (e.g., clearing and removal of existing vegetation, exposure of bare soils, earthwork and grading scars, trenching and rock formation alteration) and the presence of ancillary facilities (e.g., machinery and pipe yards and new aboveground structures such as pump stations and pipeline markers). Some of these visual effects, particularly those associated with ROW disturbance in agricultural areas, would endure beyond the construction period. Most of these longer-term effects would likely be substantially reduced with the first crop growth. During the final stages of construction, backfilling and grading would restore the construction ROW to its approximate previous contours, and restoration and revegetation would ultimately return the ROW to its approximate previous condition except in currently forested areas along the permanent ROW. Landowners would be consulted to address visual aesthetic issues that arise as a result of construction activities.

Construction of the MAR would have minor to moderate visual impacts to the NHTs and the Cowboy Recreational Trail in the vicinity of the ROW due to the presence of active construction sites, construction vehicles and traffic and nighttime lighting of pipeline work sites. To the degree that pipeline construction activities take place within sight of portions of the California and Mormon Pioneer NHTs and the Cowboy Recreational Trail, the proposed Project's construction impacts on visual resources for these

NHTs could be temporary and minor to moderate. Similarly, recreational users and visitors on U.S. Route 30 would experience temporary visual impacts during periods of construction activity in the vicinity of the roadway.

4.2.3.2 Operations and Maintenance

Land Use

Operations and maintenance of the MAR would have negligible to minor adverse effects on land uses and is consistent with the 2014 Keystone XL Final SEIS conclusion that operational impacts to land use would be less than significant. The pipeline would require the establishment of a permanent (for the lifetime of the Project, typically 50 years) 50-foot-wide ROW. The permanent pipeline ROW would require occasional trimming to remove woody vegetation and trees from the permanent easement/ROW to facilitate aerial inspection. Forested areas within the permanent ROW would be permanently converted to other uses agreed to with the landowner.

Negligible effects are anticipated for agricultural and range lands. The top of the proposed pipeline would be buried at least 48 inches below the ground surface in cultivated agricultural areas (and at least 42 inches in all other areas) (U.S. Department of State 2014, Appendix B). Therefore, agricultural land and rangeland use would be able to continue for the most part across the permanent ROW. Landowners would be permitted to cultivate crops and graze livestock within the permanent easement.

Operation of the MAR and associated facilities would not impact any special management areas or land under conservation easements.

Minor effects to land use would occur from restrictions placed on activities within the permanent ROW. Improvements including landscaping, catch basins, leaching fields, garages, guy-wires, houses, utility poles, septic tanks, sheds, swimming pools or any other structures that are not easily removed would be prohibited from the permanent ROW. Land within pump station and MLV fence lines (approximately 36 acres in total) would be converted to long-term utility use.

As discussed above, easement agreements would typically include monetary compensation to landowners for long-term land use losses (e.g., property use during construction, operation and maintenance), and for temporary land use losses (e.g., crop production impairment). In some cases, land for aboveground facilities would be purchased rather than acquired through easements.

Recreation

Operation and maintenance of the MAR would have negligible effects on recreation and is consistent with the 2014 Keystone XL Final SEIS conclusion that operational impacts to recreation would be less than significant. Noise impacts from operating pump stations are not expected to extent into recreational areas. Recreational use access would not be affected by MAR operations within special management areas or on private land. This includes no recreation use impacts regarding the Cowboy Recreational Trail.

Operation of permanent aboveground facilities associated with the MAR would not be expected to impact recreational land use. Pump Station 24 is located approximately 0.4 mile from the California NHT and, as discussed in Section 4.5, effects of pump station noise would be minimal at this distance. Visual effects of pump station operations on NHT recreational users are discussed below.

Visual Resources

Operations and maintenance of the MAR would have minor adverse effects on visual resources and is consistent with the 2014 Keystone XL Final SEIS conclusion that operational impacts to visual resources would be less than significant. Where restoration and revegetation result in returning the ROW to visual conditions similar to existing conditions, there would be either no impact or only minor impacts to visual resources during operation. The primary impact would occur in the locations of the pump stations and MLVs. However, effects to visual resources in these remote and rural areas would be minor. Aboveground facilities would be painted in accordance with standard industry painting practices to reduce visual impacts. In addition, as requested by the landowner, vegetative buffers would be planted around pump stations to reduce the visual impacts of these facilities. The actual pipeline within the permanent ROW would be buried and, with the exception of forested areas, land cover would be restored to pre-construction conditions.

The MAR pump stations would include exterior lighting, with intensities of 1 foot-candle in general areas, and 5 foot-candles in areas where active work would occur (U.S. Department of State 2014). For comparison, emergency egress lighting from a building is typically required to be at least 1 foot-candle, while a lighting intensity of 10 foot-candles is consistent with an indoor work environment. However, exterior lighting would only be used during periods of active nighttime maintenance. Overall, nighttime visual impacts associated with pump stations would be intermittent and localized to the area surrounding each facility.

Lighting from Pump Station 24 may be visible from segments of the California NHT. However, given the low intensity and intermittent duration of pump station lighting, the low likelihood that visitors explore the NHTs at night and the presence of vehicle headlights and lights from surrounding buildings (for users on the NHT driving route), pump station lighting would have minimal impact on the visual resources of the NHTs. No impacts are anticipated on the visual resources of the Cowboy Recreational Trail.

4.3 GEOLOGY AND SOILS

4.3.1 Environmental Consequences

The 2014 Keystone XL Final SEIS discusses impacts to geology and soils along the Preferred Route. This section supplements the 2014 analysis to include impacts to geology and soils along the MAR. Chapter 5, Environmental Consequences from Accidental Releases, assesses the risk to geology and soils in the event of an accidental release. Chapter 6, Electrical Power Infrastructure, provides a description of geology and soils and an assessment of impacts from connected actions relating to electrical supply needs required for the proposed pipeline. Chapter 7, Cumulative Impacts, provides an assessment of the impacts to geology and soils from the proposed Project (including the electrical supply needs) in combination with other past, present and reasonably foreseeable future actions.

To evaluate the impacts on geology, the Department reviewed the Proposed Action and No Action Alternative to determine whether any activities have the potential to cause the following:

- Alter surficial geology or lithology;
- Alter the availability of mineral resources for current or future uses; or
- Increase the probability of geologic hazards (e.g., seismic activity, landslides and subsidence).

To evaluate the impacts on soil resources, the Department reviewed activities associated with the Proposed Action and No Action Alternative to determine whether any activities have the potential to cause the following:

- Affect the soil's ability to support plant growth (e.g., resulting from decreased soil porosity through compaction, or degraded soil structure consistency and integrity);
- Modify soils such that they no longer meet the criteria for prime farmland soils;
- Change the availability of soil resources, including prime farmland soils, for current or future uses (this is also a potential land use concern); or
- Accelerate erosion of soil by wind or water resulting from loss of vegetative cover.

The following analysis estimates and assesses the impact to geology and soil during construction, normal operations and maintenance activities. Chapter 5, Environmental Consequences from Accidental Releases, discusses potential impacts to geology and soils in the event of an accidental release.

4.3.2 No Action Alternative

Under the No Action Alternative, construction and operations of the proposed Project would not occur. No impacts to geology and soils would occur.

4.3.3 Proposed Action

This SEIS quantifies potential direct and indirect impacts to geology and soil resources using an assessment of data sources presented in Section 3.3. Impacts to soils would occur a result of construction activities, including vegetation clearing, topsoil segregation, grading, excavation, operation of construction equipment, alteration of surface drainage patterns and long-term loss of soil productivity. Impacts to soils could also occur during operations due to the operation of vehicles for pipeline inspections, as well as integrity digs and other maintenance activities. Potential construction- and operations-related impacts would include:

- Soil erosion, loss of topsoil, soil compaction and damage to wet soils and soils with poor drainage (hydric), an increase in the proportion of large rocks in the topsoil, soil mixing, soil contamination and related reductions in the productivity of desirable vegetation or crops.
- Increased potential for landslides.
- Prime farmland soil may be degraded by construction, grading and heavy equipment traffic which could compact soil, reduce porosity and percolation rates and increase the potential for runoff.

Operation and maintenance activities could result in accelerated erosion, soil compaction and related reductions in the productivity of desirable vegetation or crops. Keystone would implement measures within the 2014 Keystone XL Final SEIS CMRP to reduce impacts on soils within the construction and permanent ROW (U.S. Department of State 2014). Keystone would implement general best management practice measures including worksite appearance, maintenance and noise and dust control. Applicable measures to reduce construction and operations impacts to soils include:

- Installation of sediment barriers (e.g., silt fencing, straw or hay bales and sand bags), trench plugs, temporary slope breakers, drainage channels or ditches and use of mulching in areas of high erosion potential as outlined in the CMRP.
- Restoration and revegetation of areas disturbed by construction along the pipeline ROW consistent with the CMRP and specific landowner requirements.

- Implementation of compaction control measures, including ripping (loosening of compacted soils with a dozer equipped with a ripper blade or deep plow) to relieve compaction, particularly in areas where topsoil has been removed.
- Monitoring the ROW following construction for erosion, settling and landslide activity, and, in areas of prime farmland, monitoring for any degradation in soil productivity.
- Removal and segregation of **up to** 12 inches of topsoil in non-forested agricultural areas located within prime farmland during excavation to a windrow along the edge of the ROW, with care taken to minimize the potential for mixing topsoil and subsoil.
- Implementation of erosion and sediment control and reclamation (including revegetation) procedures similar to those described for construction activities and also as described in the CMRP for operations wherever soil is exposed and steep slopes are present or erosion potential is high.

4.3.3.1 Construction

Geology

Construction of the MAR would have negligible adverse effects on geology and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to geology would be less than significant. Construction of the MAR would not increase geological hazards or hinder development of any mineral resources. Construction activities would likely affect surficial geology and could potentially harm paleontological resources. Keystone would adhere to Paleontological Monitoring and Mitigation Plans developed for federal as well as certain state and local government lands.

The risk of pipeline rupture from a seismic event is considered to be minimal. The proposed MAR would not cross any known active faults and is located outside known zones of high seismic hazard, including the New Madrid Fault Zone, which is located approximately 500 miles from the pipeline end point in Steele City, Nebraska. The proposed pipeline would be constructed to withstand probable seismic events within the seismic risk zones crossed by the proposed pipeline and in accordance with USDOT regulations (49 CFR 195, Transportation of Hazardous Liquids by Pipeline) and all other applicable federal and state regulations, which are designed to help prevent crude oil pipeline accidents and to provide adequate protection for members of the public. In accordance with the USDOT regulations, internal inspection of the proposed pipeline would occur if an earthquake, landslide or soil liquefaction event were suspected of causing abnormal pipeline movement or rupture. In addition, as the MAR has a low potential for sinkhole formation, risk of subsidence along the proposed pipeline route is negligible.

While the MAR does not cross any active surface mines or quarries or any oil or gas wells, it would cross deposits of sand, gravel, clay and stone. As such, construction (and operation) of the proposed Project would limit access to sand, gravel, clay and stone resources that are located within the permanent ROW. The total area of deposits crossed by the proposed ROW is minimal when compared to the amounts of available deposits for extraction throughout the region.

Rock ripping and the pipeline installations at some locations (e.g., certain river crossings) would involve some disturbance and modification of the surficial geology, but the impacts are anticipated to be minor. River crossings using the HDD method would require depths greater than 8 feet and thereby could potentially affect additional bedrock, if it is encountered. At other stream crossings, Keystone has indicated that burial depth would be a minimum of 60 inches. Excavation activities, erosion of fossil beds exposed due to grading and unauthorized collection could damage or destroy paleontological resources during construction. Keystone would adhere to Paleontological Monitoring and Mitigation Plans developed for federal as well as certain state and local government lands.

Soils

Construction of the MAR would have minor adverse effects on soils and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to soils would be less than significant. Clearing of the temporary and permanent ROW would remove protective vegetative cover and potentially increase soil erosion. Soil erosion could also occur from open-cut trenching and during spoil storage. Soil erosion could result in the loss of valuable topsoil from its original location through wind and/or water erosion and increase the sedimentation of surface water through runoff. Soil erosion can also impair revegetation which is crucial for soil stabilization and restoration. The majority of construction-related soil impacts would include soil erosion, loss of topsoil, soil compaction and damage to wet soils and soils with poor drainage (hydric), an increase in the proportion of large rocks in the topsoil, soil mixing, soil contamination and related reductions in the productivity of desirable vegetation or crops. Construction also could result in damage to existing tile drainage systems (an agricultural practice that removes excess water from soil subsurface), irrigation systems and shelterbelts. Measures identified at the beginning of this section and contained within the CMRP would reduce potential adverse effects to minor.

With respect to landslides, the proposed pipeline would be designed and constructed in accordance with 49 CFR 192 and 193, which require pipeline facilities to be designed and constructed in a manner to provide adequate protection from washouts, floods, unstable soils, landslides or other hazards that could cause the proposed pipeline facilities to move or sustain abnormal loads. Keystone also proposes to use specialized pipeline installation techniques, such as padding and the use of rock-free backfill, which are designed to effectively insulate the proposed pipeline from minor earth movements.

A small portion (6 percent) of the MAR would cross drought-prone soils, which would be relatively more prone to wind erosion during construction and be more difficult to stabilize and revegetate after construction. Erosion control measures as described in the CMRP include construction procedures designed to reduce the likelihood and severity of proposed Project impacts.

Approximately 23 percent (655 acres) of the overall MAR would affect soils characterized as highly erodible by either wind (3 percent) or water (20 percent). Areas of more highly erodible soils are found north and south of the Platte River crossing. These areas would require mitigation and reclamation procedures to minimize soil loss and retain crop productivity. Best management construction methods to reduce soil erosion include installation of sediment barriers (e.g., silt fencing, straw or hay bales and sand bags), trench plugs, temporary slope breakers, drainage channels or ditches and mulching. Such measures would be implemented wherever soil is exposed, steep slopes are present or erosion potential is high. An Environmental Inspector would be assigned to each construction spread to enforce the use of these methods and ensure corrective action is taken in the event that construction activities deviate from the measures outlined in the CMRP, agreed landowner requirements or conditions of applicable permits. Additional sediment control measures would be implemented if heavy precipitation or snowmelt events create erosion channels where soil is exposed along the MAR. In addition, areas disturbed by construction along the pipeline ROW would be revegetated and restored consistent with the CMRP and specific landowner or land manager requirements. Following construction, areas of erosion or settling would be monitored.

A high portion of the proposed MAR contains soils that are compaction prone (86 percent or nearly 2,446 acres). Soil compaction may result from the movement of construction vehicles along the construction ROW, within TWAs and on temporary access roads. The extent of compaction would depend on the moisture content and texture of the soils at the time of construction, with compaction occurring most severely on moist to wet soils with high clay content. Compaction control measures would reduce adverse effects to minor and include ripping (loosening of compacted soils with a dozer equipped with a ripper blade or deep plow) to relieve compaction, particularly in areas where topsoil has been removed.

The proposed MAR also contains a high percentage of prime farmland (nearly 2,050 acres or 72 percent of the route), which would be directly affected by MAR construction. The existing structure of prime farmland soil may be degraded by construction, where grading and heavy equipment traffic could compact soil, reduce porosity and percolation rates, and therefore increase the potential for runoff. Depending on the amount of topsoil actually present, in non-forested agricultural areas along the route, **up to** 12 inches of topsoil would be removed and segregated during excavation to a windrow along the edge of the ROW, with care taken to minimize the potential for mixing topsoil and subsoil. In addition, other measures identified at the beginning of this section and contained within the CMRP would reduce potential adverse effects to minor.

4.3.3.2 Operations and Maintenance

Operations and maintenance of the MAR would have negligible impacts to geology and minor impacts to soils and is consistent with the 2014 Keystone XL Final SEIS conclusion that operational impacts to geology and soils would be less than significant. During the operational phase of the proposed Project, small-scale isolated surface disturbance impacts could occur from pipeline maintenance traffic and incidental repairs. Routine pipeline operation and maintenance activities would not be expected to affect physiography or bedrock geology. The depth to the bottom of the pipeline is, on average, 7 feet below ground surface, which is below the frost line.

Operation and maintenance activities could result in accelerated erosion, soil compaction and related reductions in the productivity of desirable vegetation or crops. However, they would be very localized in nature, limited to small areas where pipeline maintenance activities occur, and the impacts are expected to be minor. During operation, these types of impacts would be addressed with the affected landowner or land management agency and a mutually agreeable resolution reached. In the event that agricultural productivity is impaired by vehicular compaction, landowners and land managers would be compensated for demonstrated losses associated with decreased productivity.

4.4 AIR QUALITY

4.4.1 Environmental Consequences

The 2014 Keystone XL Final SEIS discusses impacts to air quality along the Preferred Route. This section supplements the 2014 analysis to include impacts to air quality along the MAR. Chapter 5, Environmental Consequences from Accidental Releases, assesses the impacts to air quality in the event of an accidental release. Chapter 6, Electrical Power Infrastructure, provides a description of air quality and an assessment of impacts from connected actions relating to electrical supply needs required for the proposed pipeline. Chapter 7, Cumulative Impacts, provides an assessment of the impacts to air quality from the proposed Project (including the electrical supply needs) in combination with other past, present and reasonably foreseeable future actions.

To evaluate the impacts on air quality, the Department reviewed the Proposed Action and No Action Alternative to determine whether any activities have the potential to cause any of the following:

- Emissions of criteria pollutants that could exceed relevant air quality or health standards;
- An adverse change in air quality attainment status related to the NAAQS or Nebraska standards;
- A violation of any federal or state permits;
- Effects on visibility and regional haze in Class I areas;

- Conflicts with local or regional air quality management plans to attain or maintain compliance with federal or state air quality regulations; and
- Impacts to human health from the inhalation of fugitive vapors from the petroleum product.

The following analysis estimates and assesses the impact to air quality during construction, normal operations and maintenance activities. Chapter 5, Environmental Consequences from Accidental Releases, discusses potential impacts to air quality in the event of an accidental release.

4.4.2 No Action Alternative

Under the No Action Alternative, construction and operations of the proposed Project would not occur. No impacts to air quality would occur.

4.4.3 Proposed Action

This SEIS quantifies direct and indirect impacts to air quality and quantifies the increase in emissions from the construction and operation of the additional Project components that were not analyzed in the 2014 Keystone XL Final SEIS; these include 7 additional miles of pipeline, 1 additional pump station and 3 new construction camps. In addition, 1,047 acres of land would be disturbed beyond what was analyzed in the 2014 Keystone XL Final SEIS. These changes have occurred primarily as a result of the MAR being selected as the pipeline route through Nebraska, instead of the Preferred Route analyzed in the 2014 Keystone XL Final SEIS. This analysis considers the affected environment for air quality discussed in Section 3.4. A short-term, minor increase in air pollutant emissions would occur during construction of these additional Project components.

The 2014 Keystone XL Final SEIS concluded emissions from construction and operations would not have an adverse effect on regional air quality. Emissions resulting from construction and operations of the additional Project components discussed within this section would be consistent with the 2014 Keystone XL Final SEIS findings, and would not be expected to have an adverse effect on regional air quality.

Keystone would implement measures within the 2014 Keystone XL Final SEIS CMRP to reduce impacts on air quality during construction of the proposed Project (U.S. Department of State 2014). As described in the CMRP, mitigation measures would be employed and enforced by an environmental inspector assigned to each construction spread. Construction mitigation measures applicable to air quality emissions would include:

- Control dust levels during construction activities by employing water trucks, sprinklers or calcium chloride (limited to roads).
- Control speed of all contractor vehicles in work areas and on roads.
- Control emissions from construction equipment combustion, open burning and temporary fuel transfer systems and associated tanks to the extent required by state and local agencies through the permit process.
- Place curtains of suitable material, as necessary, to prevent wind-blown particles from sand blasting operations from reaching any residence or public building.
- Comply with all applicable state regulations and local ordinances with respect to truck transportation and fugitive dust emissions.

4.4.3.1 Construction

Construction of the MAR would have short-term and minor adverse effects on air quality and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to air quality would be less than significant. A short-term, minor increase in air pollutant emissions would occur during construction of the additional Project components that were not analyzed in the 2014 Keystone XL Final SEIS. As discussed in Section 2.4.8, Keystone would design, construct, test and operate the proposed Project in accordance with all applicable requirements included in the USDOT regulations at 49 CFR 195, Transportation of Hazardous Liquids by Pipeline, and other applicable regulations. The 2014 Keystone XL Final SEIS contains detailed descriptions of procedures Keystone would use for pipeline construction. Construction would involve ground-disturbing activities such as land clearing and open burning, pipeline trenching and installation and equipment staging.

Table 4.4-1 presents the estimated criteria air pollutant emissions generated from construction of the Project components that were not analyzed in the 2014 Keystone XL Final SEIS and Table 4.4-2 presents estimates of hazardous air pollutant (HAP) emissions from construction. Estimates of criteria pollutants and HAPs from construction are based on emissions estimates presented in the 2014 Keystone XL Final SEIS, after adjusting for pipeline length, acres disturbed and the number of pump stations. Construction emissions would not change attainment status or violate federal or state ambient air quality standards.

Table 4.4-1. Estimated Emissions of Criteria Air Pollutants from Construction

Activity/Source	Criteria Air Pollutant Emissions (tons)[a]							
	HC/VOC	CO	NO_x	SO_2	PM	PM_{10}	$PM_{2.5}$	Pb
Pipeline construction	0.8	11.7	8.6	0.4	0.4	0.4	0.4	0.0
Pump station construction	1.7	52.4	6.6	0.3	0.3	0.3	0.3	0.0
Construction camp emergency generators[b]	0.2	2.3	2.4	0.0	0.1	0.1	0.1	0.0
Open burning	0.1	0.7	0.0	0.0	0.1	0.1	0.1	0.0
Fugitive dust	0.0	0.0	0.0	0.0	1315.7	460.5	92.1	0.0
Total	**2.8**	**67.1**	**17.7**	**0.6**	**1316.5**	**461.3**	**92.9**	**0.0**

a. Developed from estimates presented in the 2014 Keystone XL Final SEIS, Table 4.14-1, adjusting for construction of additional Project components including: 7 miles of pipeline, 1 pump station, and 1,047 acres of land disturbance (assuming 0.5% of that land would be open burned); in addition to 3 new construction camps added since the 2014 Keystone XL Final SEIS.

b. Since the 2014 Keystone XL Final SEIS, Keystone has added 3 new construction camps to the proposed Project.

% = percent; CO = carbon monoxide; HC = hydrocarbons; MAR = Mainline Alternative Route; NO_x = nitrogen oxides; Pb = lead; PM = particulate matter; PM_{10} = particulate matter of diameter 10 microns or less; $PM_{2.5}$ = particulate matter of diameter 2.5 microns or less; SEIS = Supplemental Environmental Impact Statement; SO_2 = sulfur dioxide; VOC = volatile organic compound

Table 4.4-2. Estimated Emissions of Hazardous Air Pollutants from Construction

Activity/ Source	Hazardous Air Pollutant Emissions (tons)[a]								
	Benzene	Toluene	Xylenes	Acrolein	PAHs	1,3-Buta-diene	Formal-dehyde	Acetal-dehyde	Total HAPs
Pipeline construction	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.05
Pump station construction	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.04
Construction camp emergency generators[b]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Total	**0.02**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**0.03**	**0.02**	**0.09**

a. Developed from estimates presented in the 2014 Keystone XL Final SEIS, Table 4.14-1, adjusting for construction of 7 additional miles of pipeline, 1 additional pump station and 3 additional construction camps added since the 2014 Keystone XL Final SEIS.

b. Since the 2014 Keystone XL Final SEIS, Keystone has added three new construction camps to the proposed Project.

Note: Individual numbers may not add up to totals due to rounding.

HAP = hazardous air pollutant; PAH = polycyclic aromatic hydrocarbon; SEIS = Supplemental Environmental Impact Statement

4.4.3.2 Operations and Maintenance

Operations and maintenance of the MAR would have minor adverse effects on air quality and is consistent with the 2014 Keystone XL Final SEIS conclusion that operational impacts to air quality would be less than significant. Operations of the pipeline and associated facilities would not result in direct stationary source emissions of air pollutants because the pump stations would be operated by electricity generated offsite, except in the event of a power failure when emergency generators would be used to operate essential equipment. Indirect emissions would occur from generation of electrical power at grid-connected power plants needed to operate the pump stations. In addition, operation of the pipeline and associated facilities would produce fugitive (i.e., unintended) emissions from the pipeline, pump station components and MLVs, as well as infrequent direct emissions from the operation of emergency generators located at pump stations and MLVs, in the event of a power failure. The pipeline and pump stations would have valves, flanges, connectors and other components as described in the 2014 Keystone XL Final SEIS.

Operation of the additional Project components would cause a long-term but negligible direct impact on air quality and minor indirect impact from generation of electrical power used to power the pump stations. Estimates of fugitive emissions and emissions from emergency generators are based on estimates for the full Keystone XL pipeline presented in the 2014 Keystone XL Final SEIS, after adjusting for changes to pipeline length and the number of pump stations. Indirect criteria air pollutant emissions from electricity generation to operate the pump stations were estimated using the USEPA eGRID 2016 database (USEPA 2018c). Table 4.4-3 presents estimated criteria air pollutant emissions generated from operation of the additional Project components associated with the MAR. Operational emissions would not change attainment status or violate federal or state ambient air quality standards.

Table 4.4-3. Estimated Emissions of Criteria Air Pollutants from Operations

Activity/Source	Criteria Air Pollutant Emissions (tons)							
	HC/VOC	CO	NO_x	SO_2	PM	PM_{10}	$PM_{2.5}$	Pb
Fugitive emissions[a]	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Emergency generators[a]	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Electricity generation[b]	12.8	ND	116.0	154.8	ND	ND	ND	ND
Total	**12.8**	**0.0**	**116.0**	**154.8**	**<0.1**	**<0.1**	**<0.1**	**<0.1**

a. Developed from estimates presented in the 2014 Keystone XL Final SEIS, Table 4.14-1, adjusting for operation of 7 miles of pipeline and 1 pump station.

b. Estimated using eGRID 2016 and pump station electricity usage data provided in the 2014 Keystone XL Final SEIS for one pump station, assuming 4.5% distribution loss.

< = less than; % = percent; CO = carbon monoxide; HC = hydrocarbons; ND = no data; NO_x = nitrogen oxides; Pb = lead; PM = particulate matter; PM_{10} = particulate matter of diameter 10 microns or less; $PM_{2.5}$ = particulate matter of diameter 2.5 microns or less; SEIS = Supplemental Environmental Impact Statement; SO_2 = sulfur dioxide; VOC = volatile organic compound

Emissions of HAPs from operations of the additional Project components would be negligible. In addition, maintenance activities would include pipeline inspections, integrity surveys and periodic clearing of vegetation along the pipeline ROW to maintain accessibility. Air pollutants would be emitted from the operation of vehicles and equipment during these activities, as well as due to the generation of fugitive dust. However, it is expected that the amount of air pollutants emitted during ongoing maintenance activities would be very similar to estimates presented in the 2014 Keystone XL Final SEIS, and any contribution of the additional Project components would be negligible.

4.5 NOISE AND VIBRATION

4.5.1 Environmental Consequences

The 2014 Keystone XL Final SEIS discusses impacts to noise and vibration levels along the Preferred Route. This section supplements the 2014 analysis to include impacts to noise and vibration levels along the MAR. Chapter 5, Environmental Consequences from Accidental Releases, assesses the impacts to noise conditions in the event of an accidental release. Chapter 6, Electrical Power Infrastructure, provides a description of noise conditions and an assessment of impacts from connected actions relating to electrical supply needs required for the proposed pipeline. Chapter 7, Cumulative Impacts, provides an assessment of the impacts to noise conditions from the proposed Project (including the electrical supply needs) in combination with other past, present and reasonably foreseeable future actions.

To evaluate impacts from noise and vibration, the Department considered the potential for noise and vibration levels to change as a result of the Proposed Action and No Action Alternative. Considerations of the potential for changes in noise and vibration include new mobile and stationary sources from activities associated with construction and operation of the pipeline, pump stations, valves and associated infrastructure. For the purposes of this environmental consequences analysis the Proposed Action and No Action Alternative would result in adverse noise and vibration effects if the Project were to cause any of the following:

- Addition of new mobile and stationary noise sources from activities associated with the pipeline, pump stations and valves;
- Conflict with any federal, state or local noise ordinances;

- Long-term perceptible increase in ambient noise levels above regulatory thresholds at sensitive receptors during operations; or
- Excessive ground-borne vibration to persons or property.

Adverse impacts would occur if noise and vibration from construction or operation were to cause harm or injury to adjacent communities or sensitive receptors (i.e., residences, schools, hospitals), or exceed applicable environmental noise limit guidelines.

This SEIS uses aerial mapping to identify the closest noise and vibration sensitive receptors within the ROI. The analysis estimates and assesses the impact of noise and vibrations at these receptors during construction, normal operations and maintenance activities.

4.5.2 No Action Alternative

Under the No Action Alternative, construction and operations of the proposed Project would not occur. No impacts to noise or vibration would occur.

4.5.3 Proposed Action

Implementation of the proposed Project would result in minor to moderate short-term impacts to noise and vibration from construction of the MAR and negligible to minor operational noise and vibration impacts as described below.

4.5.3.1 Construction

Construction of the MAR would have minor to moderate temporary adverse effects to noise and vibration and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to noise and vibration would be less than significant. Minor to moderate, short-term, adverse noise and vibration impacts would be expected along the MAR pipeline ROW during construction. Construction activities would cause temporary increases in ambient noise levels in the immediate vicinity of the construction sites. Construction noise levels are rarely steady in nature, but instead fluctuate depending on the number and type of equipment in use at any given time. There would be times when no large equipment is operating and noise would be at or near ambient levels. In addition, construction-related sound levels would vary by distance.

Pipeline construction generally proceeds at a rate of approximately 20 completed miles per calendar month per spread. However, due to the assembly-line method of construction, pipeline construction activities in any one area within a construction spread or sequence could last from 30 days to 7 weeks (U.S. Department of State 2014). Construction of each pump station would take approximately 18 to 24 months to complete. The total duration of construction at each pump station would vary somewhat depending on site conditions and environmental restrictions specific to each site. Keystone generally anticipates a total duration of 11 months for major construction activities (e.g., foundations, structures). This duration is not necessarily continuous as there may be breaks required for such factors as harsh winter conditions, environmental restrictions or optimization of construction efforts. Construction-related noise impacts typically would be localized, intermittent and short term since construction spreads move relatively quickly (several hundred feet to roughly 1.5 miles per day) (U.S. Department of State 2014).

Onsite construction noise would mainly occur from site preparations, clearing and grading, construction of new pipeline, vehicle traffic and other associated construction activities including the use of heavy-duty construction equipment (e.g., trucks, backhoes, front end loaders, cranes, etc.). Table 4.5-1 presents typical pipeline construction equipment (mobile and stationary) and the corresponding noise emissions levels.

Table 4.5-1. Estimated Construction Noise from Pipeline Construction Activities

Equipment[a]	Typical Noise Level at 50 feet (dBA)	Typical Noise Level at 500 feet (dBA)	Typical Noise Level at 1,000 feet (dBA)	Typical Noise Level at 1,500 feet (dBA)
Front Loaders	85	65	59	55
Backhoes, excavators	80	60	54	50
Tractors, dozers	85	65	59	55
Graders, scrapers	89	69	63	59
Trucks	88	68	62	58
Concrete pumps, mixers	85	65	59	55
Cranes (movable)	83	63	57	53
Cranes (derrick)	88	68	62	58
Pumps	76	56	50	46
Generators	81	61	55	51
Compressors	81	61	55	51
Pneumatic tools	85	65	59	55
Jack hammers	88	68	62	58
Pavers Compactors	89	69	63	59
Compactors	82	62	56	52

Source: Lamancusa 2009; USDOT 2012

[a] Keystone does not anticipate the need for blasting during construction of the MAR. Section 4.12.3.2 of the 2014 Keystone XL Final SEIS discusses the potential impacts from blasting and measures to reduce impacts.

dBA = A-weighted decibel

In general, average equivalent noise levels from typical construction sites range from 79 to 89 dBA at 50 feet (Bolt et al. 1971). Construction noise levels fluctuate depending on the type, number and duration of use of heavy equipment for construction activities, and differ by the type of activity, distance to noise-sensitive uses, existing site conditions (vegetation to buffer sound) and ambient noise levels. With multiple items of construction equipment operating concurrently, noise levels could be relatively high during daytime periods at locations within several hundred feet of active construction sites. Accounting for the concurrent use of the construction equipment, it is conservatively estimated that noise levels could be up to approximately 86 dBA at 100 feet. Combined construction noise reduces to approximately 66 dBA at 1,000 feet. The closest noise-sensitive receptor is located approximately 140 feet from the pipeline construction ROW. Using typical noise reductions over a distance, this analysis conservatively estimated a combined pipeline construction level of approximately 92 dBA at 50 feet would reduce to approximately 83 dBA at 140 feet (closest receptor).

During some time periods, pipeline construction noise levels would likely exceed the USEPA threshold of 55 dBA (L_{dn}). Section 3.5.1.2 details the USEPA thresholds that state that noise levels above 55 dBA outdoors can cause interference or annoyance. The noise levels due to construction could occur at noise-sensitive areas located in the immediate vicinity of the pipeline route, but the construction noise would be short-term and would diminish as the pipeline construction activity moves along the route and away from the noise-sensitive areas. Typically, there would not be nighttime construction. Nighttime construction would only occur under specific conditions, such as when an HDD project is required to be completed.

The closest state park is the Blue River State Recreational Area in Seward County, which is 0.9-mile (4,689 feet) west of the construction ROW. During pipeline construction activities, noise levels could reach approximately 46 dBA at that location. The closest federal park is the De Soto National Wildlife Refuge, which is approximately 78 miles from the construction ROW, at which construction noise from this Project would not be audible. The closest recreational area is the Oxbow Trail, which is 0.4-mile (2,112 feet) south of pump station 24 in Butler County, and which the pipeline crosses on private property. Noise levels at this location on the Oxbow Trail could reach up to approximately 53 dBA during construction activities.

In addition to conventional pipeline construction techniques, current Project plans anticipate four stream crossings (Elkhorn River, Platte River, Big Blue River and Union Creek) and a roadway crossing that would require HDD techniques to install the pipeline. HDD operations could generate relatively high noise levels for long periods compared to conventional pipeline construction, in that HDD operations may occur 24 hours per day and on a 7-day-per-week basis for 8 weeks at each location. Aerial photography was used to estimate the closest noise receptor distances and direction to the HDD activity sites. Table 4.5-2 presents the closest noise receptors to the entrance and exit locations of HDD activity. Noise impacts from HDD operations were estimated at the closest noise receptors using sound level data of typical HDD operations of 77 dBA at entrance location and 68 dBA at exit location at 300 feet (U.S. Department of State 2014). Without installing noise barriers or controls, HDD activities plus existing levels would be as high as 67 dBA at 909 feet (closest receptor located northwest of Platte River entrance location), 66 dBA at 1,017 feet (closest receptor located east of Elkhorn River entrance location and northwest of the Big Blue River entrance location). Therefore, L_{dn} levels associated with the 24-hour continuous HDD activities are expected to be below the USDOT's recommended 30-day average L_{dn} criterion of 75 dBA at nearest residential areas (see Section 3.5.1.2). HDD activities would be conducted consistent with any applicable local noise ordinances.

Table 4.5-2. Estimated Construction Noise from Pipeline HDD Activities

Location	Closest Noise Receptor (feet)	Typical Noise Level of HDD Activity at 300 feet (dBA)	Typical Noise Level at Closest Receptor from HDD Activity (dBA)	Typical Noise Level at Closest Receptor from HDD Activity plus Baseline Levels (dBA)[a]
Elkhorn River (entrance)	1,017	77	66	66
Elkhorn River (exit)	1,160	68	56	56
Platte River (entrance)	909	77	67	67
Platte River (exit)	1,671	68	53	53
Big Blue River (entrance)	1,020	77	66	66
Big Blue River (exit)	2,684	68	49	49
Union Creek (entrance)	6,711	77	50	50
Union Creek (exit)	5,997	68	42	42
I-80 (entrance)	1,973	77	61	61
I-80 (exit)	790	68	60	60

Source: Lamancusa 2009; USDOT 2012; U.S. Department of State 2014

a. Baseline noise levels are assumed to be 35 dBA (see Section 3.5.1.1). Combined noise levels at the closest nearby receptor was estimated using logarithmic addition.

dBA = A-weighted decibel; HDD = horizontal directional drill

There are approximately 16 sensitive noise receptors (i.e., homes, dwellings) within 0.5 mile of the proposed MAR pump stations. The closest receptor is located approximately 0.15 mile (798 feet) southwest of pump station 23B. Considering typical noise reductions over distance, the combined pump station construction noise level of 92 dBA at 50 feet from the construction site would be reduced to approximately 68 dBA at 798 feet. Similar to pipeline construction noise, noise associated with construction of the proposed aboveground facilities (pump stations) would be intermittent during the construction period, but the overall impact would be temporary and is not expected to be significant. Daytime L_{eq} associated with the construction of the pump stations are expected to be below the USDOT's recommended daytime 8-hour L_{eq} criterion of 80 dBA at residential areas. Further, nighttime noise levels would normally be unaffected because most construction activities would be limited to daylight hours. Potential exceptions include completion of critical tie-ins on the ROW; HDD operations if determined by the contractor to be necessary; and other work if determined necessary based on weather conditions, safety or other Project requirements.

A detailed description of Keystone's proposed mitigation measures during Project construction are provided in Section 2.12 of the CMRP. Measures relevant to construction of the pipeline within the MAR include (U.S. Department of State 2014):

- In areas near residences and businesses where construction activities or noise levels may be considered disruptive, pipeline work schedules would be coordinated to minimize disruption.
- The contractor would minimize noise during non-daylight hours and within 1 mile of residences or other noise-sensitive areas such as hospitals, motels, campgrounds or state and federal parks.
- Keystone would give advance notice to landowners within 500 feet of the ROW prior to construction, limit the hours during which construction activities with high decibel noise levels are conducted, coordinate work schedules and ensure that construction proceeds quickly through such areas.
- Using the noise control measures identified above, the contractor would minimize noise in the immediate vicinity of herds of livestock or poultry operations, which are particularly sensitive to noise.
- Keystone would set up a toll-free telephone line for landowners to report any construction noise-related issues and follow-up on appropriate mitigation measures, as necessary.

Additional analysis on potential impacts from construction noise indicated that although the construction noise would be temporary (lasting no more than 10 to 14 days in any one area), there is a possibility that due to the unusual nature of the noise in otherwise relatively quiet farmland, members of the public might experience a lingering annoyance effect for up to a few days when the construction work reaches a new area. But any effects would be temporary and reduced by the mitigation measures described above.

Groundborne vibration would be present along the ROW during construction from site preparations, HDD, construction of new pipeline, vehicle traffic and other associated construction activities. Construction vibration would be temporary during construction and could be transient (e.g., single impact equipment), random (e.g., heavy construction equipment) or continuous (e.g., HDD). However, due to the distance to the nearest sensitive noise receptors along the pipeline, pump stations and HDD locations, groundborne vibration is expected to be below the threshold of human perception (refer to Section 3.5.1). As a result, less than significant impacts would be expected.

4.5.3.2 Operations and Maintenance

Operations and maintenance of the MAR would have negligible to minor adverse effects to noise and vibration and is consistent with the 2014 Keystone XL Final SEIS conclusion that operational impacts to noise and vibration would be less than significant. Negligible to minor adverse noise and vibration impacts would result from operation and maintenance along the MAR considering implementation of noise reduction measures. Noise impacts from operations would be limited to the pump stations. Crude oil traveling through the buried pipeline would not emit audible noise above the surface, nor would there be perceptible levels of vibration associated with crude oil movement through the pipeline. MLVs would have backup emergency generators, which would only be used during times of power interruption and routine maintenance operation. As such, potential noise impacts from the use of these generators would be infrequent and negligible. Aerial inspection of the pipeline would be done at least 26 times per year (at least once every 2 weeks), and MLVs would be inspected at least twice per year. Noise from infrequent use of aircraft for maintenance purposes would be localized, intermittent and short term. Since, as presented in Table 2-2, 88.7 miles of the ROW are co-located with the existing Keystone Mainline ROW, the receptors within that portion of the ROW would already experience aerial inspections. Residences along the portion of new ROW along the MAR would experience the aerial inspections as a change in conditions. As a result, the few residences within the proposed pipeline ROW could experience temporary inconvenience from noise associated with low-level aircraft overflights (U.S. Department of State 2014).

During operation of the proposed pipeline, the noise associated with the electrically driven pump stations would be limited to the vicinity of the facilities. The major source of noise at the pump stations are the pumps (each rated at 6,500 horse power), followed by motor noise. Other sources such as piping noise are expected to be less dominant and were excluded from the analysis. Refer to Section 7.3.5 for discussion of cumulative noise impacts associated with the electrical power lines and substation at the pump stations.

Each pump station could have up to five pumps and motors. The 2014 Keystone XL Final SEIS details the noise emissions produced by the pump stations. According to the manufacturer's specification for each pump and associated motor, the overall octave band sound power level (Lw) for one pump plus its associated motor is approximately 112 dBA (U.S. Department of State 2014). Using logarithmic addition, the MAR pump stations (assuming each has five pumps and motors operating concurrently) would generate an overall Lw of approximately 119 dBA.

There are approximately 16 residences (i.e., homes, mobile homes, cabins) within 0.5 mile (2,640 feet) of the proposed pump stations (see Table 3.5-3). Table 4.5-3 presents the estimated noise contribution of the MAR pump stations (uncontrolled) at the closest sensitive receptors. The noise estimates consider the existing estimated ambient noise level of 35 dBA (the baseline L_{dn} levels were estimated from population density; actual sound level measurements were not taken).

Table 4.5-3. Estimated Noise Contribution of the MAR Pump Stations at Nearby Receptors

Pump Station	County	Distance from Pump Station to Sensitive Receptor (feet)	Estimated Noise Contribution (dBA)[a]
Pump Station 23B	Platte	798	63
Pump Station 24	Butler	1,520	58
Pump Station 25	Seward	2,031	55

Source: U.S. Census Bureau 2010a; USDOT 2012; U.S. Department of State 2014

[a.] Estimated noise levels from the pump stations include the combined noise levels from the pumping units, motors and existing ambient noise levels; along with noise reductions associated with geometric divergence (hemispherical spreading loss) and atmospheric absorption (USDOT 2012).

dBA = A-weighted decibel; MAR = Mainline Alternative Route

The closest recreational area is the Oxbow Trail, which is 0.4-mile (2,112 feet) south of pump station 24 in Butler County, and which the pipeline crosses on private property. During operation of the pump station, noise levels in the recreational area could reach approximately 55 dBA.

Noise generated from the pump stations may be a source of long-term impacts to nearby sensitive receptors. Keystone would consider the following noise abatement options: aboveground pipe lagging, pump blankets, motor air intake enclosures and engineering sound barriers (U.S. Department of State 2014). To the extent practicable, Keystone would not site pump stations close to noise-sensitive receptors. For all pump stations, Keystone would observe the USEPA noise standard of 55 decibels on the A-weighted scale (day-night sound level) for each pump station, as measured from the closest receptor. Vibrations could occur because of the industrial nature of the facilities. However, the design of pump station equipment minimizes vibrations, such that vibrations would not likely be perceptible outside of the facilities. As a result, the proposed Project should have negligible impacts associated with vibration.

Noise modeling results indicate that noise reductions of approximately 10 to 18 dBA could be required for Pump Station 23B, Pump Station 24 and Pump Station 25 (located 798 to 2,031 feet away from receptors) to ensure they do not exceed the recommended criterion for each affected state, the USEPA L_{dn} criterion of 55 dBA, and the recommended 10 dBA increase above baseline limit. These noise reductions are expected to be achieved by applying Keystone's three-step noise control plan for pump station operations described below and installing the sound barriers as necessary. Keystone would implement a three-step noise control plan in a progressive order: (1) install pipe lagging for all pipe suction pipes and discharge pipes; (2) install acoustic blankets for all pumps; and (3) upgrade enclosures for all motors, which would provide 3 dB noise attenuation for each motor compared with a standard motor enclosure. Each step produces an incremental reduction in the overall noise emission level. If the three-step noise control plan is insufficient to bring the stations into compliance, then Keystone would install sound barriers, which could take the form of freestanding walls or earth berms. The location and dimensions of the proposed sound barriers/earth berm would vary with site specification (i.e., relative elevation and distance between the proposed pump stations and nearest receptors). The barrier wall panel would have sufficient transmission loss such that sound passing through it would not contribute to the noise level at the receptor (U.S. Department of State 2014).

After implementation of Keystone's planned noise control measures, the controlled pump stations would be expected to have a potentially minor impact on nearby residences and businesses (i.e., pump station noise at nearest receptors would be reduced to an acceptable level).

Similar to human sensitive receptors, wildlife can experience noise and vibration impacts from human activities. Stress, avoidance of feeding and loss of breeding success can result from elevated noise and vibration exposure to species. Section 4.7 considers these noise effects on wildlife species within the MAR.

4.6 WATER RESOURCES

4.6.1 Environmental Consequences

The 2014 Keystone XL Final SEIS discusses impacts to water resources along the Preferred Route. This section supplements the 2014 analysis to include impacts to water resources along the MAR. Chapter 5, Environmental Consequences from Accidental Releases, assesses the risk to water resources in the event of an accidental release; this includes new information related to the proposed Keystone XL pipeline's crossing of the Missouri River in Montana, and an updated evaluation of surface water intakes extending 40 river-miles downstream of proposed pipeline crossings. Chapter 6, Electrical Power Infrastructure, provides a description of water resources and an assessment of impacts from connected actions relating to electrical supply needs required for the proposed pipeline. Chapter 7, Cumulative Impacts, provides an assessment of the impacts to water resources from the proposed Project (including the electrical supply needs) in combination with other past, present and reasonably foreseeable future actions.

For the purposes of this environmental consequences analysis, the Proposed Action and No Action Alternative would result in adverse effects to water resources if activities were to cause any of the following:

- Alteration of stormwater discharges or infiltration rates, which could adversely affect drainage patterns, flooding, erosion and sedimentation
- Violation of any federal, state or regional water quality standards or discharge limitations
- Modification of surface waters such that water quality no longer meets water quality criteria or standards established in accordance with the Clean Water Act, state regulations or permits (including downgrades of surface water use classification or listing on the Nationwide Rivers Inventory)
- Changes to the availability of surface water resources for current or future uses
- Change in stream channel morphology – slope and stability
- Loss of wetlands from the placement of dredge or fill material
- Alteration or conversion of wetland function caused by the removal of vegetation or contamination from a spill
- Increased flooding (flooding risk to nearby properties) through altered land uses (e.g., development in floodplain areas) that change current flooding levels or patterns

The following analysis estimates and assesses the impact to these water resources during construction, normal operations and maintenance activities. Chapter 5, Environmental Consequences from Accidental Releases, discusses potential impacts to water resources in the event of an accidental release.

4.6.2 No Action Alternative

Under the No Action Alternative, construction and operations of the proposed Project would not occur. No impacts to water resources would occur.

4.6.3 Proposed Action

This SEIS quantifies potential direct and indirect impacts to water resources using an assessment of data sources presented in Section 3.6. Potential construction- and operations-related impacts would include:

- Temporary increases in total suspended solids concentrations, increased sedimentation and turbidity within surface waters streams or wetlands.
- Temporary changes in channel morphology and stability caused by installation of the pipeline beneath the waterbody. Reclamation and revegetation of stream banks helps to ensure long-term stability of the banks.
- Temporary resultant increase in total suspended solids concentrations from construction. Reclamation of vegetation removed from banks during construction helps to ensure no long-term erosion or sedimentation occurs.
- Temporary reductions in stream flow and potential other adverse effects during hydrostatic testing activities and stream crossing construction.
- Impacts to water resources associated with hazardous liquids spills and leaks (see Chapter 5).
- Construction and pipeline testing withdrawals from water resources.
- Permanent loss of wetlands as a result of permanent fill (e.g., backfilling at permanent ancillary facility locations or improper removal of temporarily staged soils in wetlands adjacent to the pipeline trench) or placement of fill in a floodplain.
- Disturbances that result in permanent wetland loss or reduced productivity as a result of improperly maintained wetland integrity (hydrology, hydric soil strata or hydrophytic vegetation).
- Temporary to permanent modification of wetland vegetation community composition and structure from clearing and operational maintenance (e.g., conversion of scrub-shrub and forested wetlands to herbaceous wetlands within the permanent ROW).
- Loss or alteration of wetland soil integrity as a result of improperly restored hydric soil strata (topsoil and root stock, clays and gravels/cobbles), rutting and compaction that could result in altered biological activities and chemical conditions that could affect re-establishment and natural recruitment of native wetland vegetation after restoration.
- Introduction of invasive species to wetlands, degrading wetland habitat and negatively impacting wetland functions such as native plant richness, wildlife habitat quality, water quality and shoreline stabilization.
- Permanent alteration in vegetation productivity and life-stage timing to wetlands located directly over the pipeline due to increased soil temperatures associated with heat generation of the pipeline.

Keystone would implement measures within the 2014 Keystone XL Final SEIS CMRP to reduce impacts on water resources within the construction and permanent ROW (U.S. Department of State 2014). Applicable measures considered within this analysis to reduce impacts water resources in the MAR in Nebraska include:

- Implementation of the Project’s Spill Prevention, Control and Countermeasure (SPCC) Plan to avoid or minimize the potential impact of harmful spills and leaks during construction.
- Compliance with requirements of all permits issued for the waterbody and wetland crossings by federal, state or local agencies. This includes requirements imposed by USACE during **general permit verifications or required permit approvals**. USACE will determine compliance with the ESA and Section 106 within permit areas using information from the SEIS documents and any additional supporting information provided by the applicant.

- Installation of sediment barriers immediately after initial disturbance of the waterbody, wetland or adjacent upland per the CMRP.
- Selection of most appropriate method at each crossing based on site-specific conditions (i.e., environmental sensitivity of the waterbody, depth, rate of flow, subsurface soil conditions and the expected time and duration of construction) at the time of crossing.
- Use of non-toxic drilling fluids and additives during HDD activities.
- Development of a contingency plan to address a frac-out during an HDD. The plan shall include instructions for monitoring during the directional drill and mitigation in the event that there is a release of drilling fluids. Additionally, the waterbody shall be monitored downstream for any signs of drilling fluid.
- Re-establishment of the streambank contour and stabilization of streambanks and installation of temporary sediment barriers following the measures provided in the CMRP and applicable permits.
- Reduction of construction ROW crossing widths to 85 feet or less in standard wetlands unless non-cohesive soil conditions require utilization of a greater width and unless the USACE during review of pre-construction notifications or other regulatory authority authorizes a greater width.
- Limiting the duration of construction-related disturbance within wetlands in accordance with USACE permit requirements.
- Performing all equipment maintenance and repairs on upland locations at least 100 feet from waterbodies and wetlands.
- As much as is feasible, replace topsoil and restore original contours with no crown over the trench. Remove excess spoil and stabilize wetland edges and adjacent upland areas by establishing permanent erosion control measures and revegetation, as applicable, during final clean up.
- As described in the CMRP, restore wetlands affected by construction activities to the extent practicable.

4.6.3.1 Construction

Groundwater

Construction of the MAR would have negligible adverse effects on groundwater and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to groundwater would be less than significant. Negligible impacts to groundwater are anticipated from construction activities along the MAR. The primary impact to groundwater resources during construction would result from incidental spills of fuels and other hazardous materials from construction equipment. Impacts, however, would be avoided through the Project's SPCC Plan. Spills of fuel and other hazardous materials would be cleaned-up immediately in accordance with the plan and hazardous wastes associated with spills and leaks would be disposed of in accordance with applicable laws and regulations.

During construction, groundwater withdrawals could have a short-term and minor impact to groundwater. The primary need for water would be during hydrostatic testing, which would be obtained from three surface waters (see Surface Water discussion below). Additional water sources for smaller water volume needs if deemed necessary could consist of private sources located in proximity to the pipeline route. Agreements would be executed with the respective landowners prior to extraction of water for Project use.

Surface Water

Construction of the MAR would have temporary and minor adverse effects on surface water and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to surface water would be less than significant. Overall impacts to surface waters along the MAR are anticipated to be minor with the implementation of the mitigation measures highlighted at the beginning of the section. Construction of the pipeline within the MAR would result in minor temporary impacts such as short term increases in turbidity and sedimentation (locally and downstream) and temporary reduction in stream flow during waterbody crossings. In general, the magnitude of impact would depend on the type, location, physical dimensions, stream bottom composition, streamflow (seasonal condition of the waterbody) and water quality of the waterbody at the time of construction. Potential impacts could occur from activities such as clearing and grading adjacent to waterbodies and wetlands, and during trenching, trench dewatering, backfilling and hydrostatic testing. These activities could result in temporary impacts such as short-term increases in turbidity and sedimentation (locally and downstream) and temporary reduction in stream flow during waterbody crossings. In general, the magnitude of impact would depend on the type, location, physical dimensions, stream bottom composition, streamflow (seasonal condition of the waterbody) and water quality of the waterbody at the time of construction. Table 3.6-4 identifies the type of construction method for each perennial stream within the MAR; 4 out of the 31 crossings would use HDD, including three major rivers (Elkhorn, Platte and Big Blue) as well as perennial Union Creek. Other perennial waterbody crossings would use variations of pipeline installations to protect habitat and aquatic species that depend on the flowing water. Yet still others would require site specific design and permitting based on protected conditions or areas determined to be of high consequence. The crossing method for each waterbody would also depend on permit conditions from the USACE, but ultimately be determined based on site-specific conditions at the time of crossing.

Generally, open-cut crossing impacts would include alteration of the streambed and bank structure, habitat reduction or alteration, increased sediment, riparian vegetation loss and introduction of non-native vegetation. Implementation of various best management practices and mitigation measures outlined in the CMRP and described at the beginning of this section would help reduce adverse impacts resulting from open cut wet crossings. All contractors would be required to follow the identified procedures to limit erosion and other land disturbances. The CMRP describes the use of buffer strips, drainage diversion structures, sediment barrier installations and clearing limits, as well as procedures for waterbody restoration at crossings. Measures to minimize bed and bank impact include temporary vehicle bridges and minimizing in-stream use of equipment. Other potential bank protection measures could include installing rock, wood or other materials keyed into the bank to provide protection from further erosion or re-grading the banks to reduce bank slope. Following completion of waterbody crossings, waterbody banks would be restored to preconstruction contours or a stable slope. Seeds would be dispersed (with native vegetation and mulch) and erosion control fabric and other erosion control measures would be installed, as specified in the CMRP and permit documents. Prior to commencing any stream-crossing construction activities, at a minimum, permits would be required under Section 404 of the Clean Water Act through USACE, and Section 401 Water Quality Certification, per state regulations. Additional erosion control measures would be installed, if necessary, in accordance with permit requirements.

Water withdrawal from surface water resources by the proposed Project would be used for construction processes and would consist of hydrostatic testing, HDD make-up water (drilling mud) and dust control. Three primary sources would be used for hydrostatic testing: the Elkhorn River (37 million gallons), the Platte River (47 million gallons) and the Big Blue River (40 million gallons). As a basis for comparison of water withdrawals, the USGS estimated the annual surface water withdrawals in Nebraska as 3,320 million gallons per day (USGS 2010). Total withdrawal requirements during hydrostatic testing would represent 1 percent of daily surface water withdrawal in Nebraska. Additional water sources for smaller water volume needs, if deemed necessary, could consist of private sources located in proximity to the pipeline route. Agreements would be executed with the respective landowners prior to extraction of water for Project use. The proposed Project may temporarily impact surface water volume in locations designated for proposed Project water withdrawals. During withdrawals, minimal disruption of the normal access to and use of surface water resources would be anticipated in the proposed Project ROW and adjacent areas. The water resources affected by the proposed Project construction, as well as landowner and recreational access, would be restored in accordance with the CMRP following construction.

Hydrostatic testing, construction stormwater and dewatering activities during construction would require National Pollutant Discharge Elimination System permits that would include measures to protect Nebraska’s surface water quality. Planned withdrawal rates for each water resource would be evaluated and approved by appropriate agencies prior to testing. No resource would be utilized for hydrostatic testing without receipt of applicable permits. As stated in Keystone’s CMRP, Keystone would be responsible for obtaining required water analyses prior to any filling and discharging operations associated with hydrostatic testing. Keystone has developed an HDD contingency plan defining specific responsibilities, procedures and actions necessary to manage the detection of and response to drilling fluid releases or frac-outs during pipeline installations using HDD techniques. The HDD contractor would be responsible for execution of the HDD operation, including actions for detecting and controlling the inadvertent release of drilling fluid.

The NDEQ has indicated Keystone would in many cases need to secure a surface water right from Nebraska Department of Natural Resources (NDNR) to withdraw water for construction from sources along the pipeline alignment. These permits or water rights for specific use locations, purposes and/or quantity and may include seasonal stipulations. In instances where a river identified by NDNR as being either fully appropriated or over-appropriated would be affected, Keystone would need to comply with any plan or program implemented to protect existing water uses in the affected basins. In an effort to avoid or minimize impacts to sensitive waterbodies, Keystone has conducted consultations with the cooperating agencies during the proposed Project’s planning phase. Additional consultation may be required in accordance with additional regulatory and permitting review during the final design and permitting phases.

Wetlands

Construction of the MAR would have minor adverse effects on wetlands and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to wetlands would be less than significant. Overall impacts to wetlands along the MAR are anticipated to be minor with the implementation of the mitigation measures highlighted at the beginning of this section. Section 404 of the Clean Water Act requires that wetland impacts are avoided, minimized and mitigated to the greatest practicable extent possible. In general, co-location of the MAR within existing utility corridors and use of HDD along riparian crossings containing larger wetland complexes have helped minimize the total wetland acreage that would be affected by the Project.

Construction of the pipeline is expected to impact approximately 0.6 acre of forested and 24.4 acres of emergent wetlands. No wetlands were observed in the construction footprints of the pump stations and ancillary facilities during the Spring 2018 field survey.

Construction across wetlands would be similar to typical conventional upland cross-country construction, with modifications to reduce the potential for effects to wetland hydrology and soil structure. The wetland crossing methods used would depend largely on the stability of the soils at the crossing location at the time of construction. Potential impacts to wetlands during the construction phase of the proposed Project include cutting, clearing or removing wetland vegetation within the construction work area.

These activities would result in impacts to wetland flow patterns, composition, function and value **and** the conversion of one wetland type to another (e.g., conversion of forested wetland to herbaceous wetland). HDD crossings would avoid impacts to approximately 0.4 acre of forested and 0.2 acre of emergent wetlands.

Following construction, 0.6 acre of forested wetland would be converted to and permanently maintained in an herbaceous scrub-shrub state on the permanent ROW. The herbaceous wetlands temporarily affected by construction would be restored and allowed to revert to their previous condition. Generally, the wetland vegetation community eventually would transition back into a community functionally similar to that of the wetland prior to construction, if pre-construction conditions such as elevation, grade and soil structure are successfully restored. In emergent wetlands, the herbaceous vegetation would regenerate quickly (typically within 3 to 5 years). In forested wetlands, the effects of construction would be extended due to the longer period needed to regenerate a mature forest or shrub community.

The USACE's Regulatory Program regulates discharges of dredged or fill material into waters of the United States and structures or work in navigable waters of the United States, under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899 (33 CFR 320-332). A proposed project's impacts to these regulated areas determines what permit type is required. A general permit is issued for structures, work or discharges that would result in only minimal adverse effects. General permits are issued on a nationwide, regional or state basis for particular categories of activities. There are three types of general permits: Nationwide Permits, Regional General Permits, and Programmatic General Permits. General permits are usually valid for 5 years and may be re-authorized by USACE.

The proposed MAR activities may require permits from the USACE. Non-reporting general permit authorization for some minor activities would not require applying or reporting to USACE. Where required by the terms of Nationwide Permit Number 12, *Utility Line Activities*, Keystone must notify the USACE District Engineer by submitting a pre- construction notification to USACE. Nationwide Permit 12 was reissued in the *Federal Register* on January 6, 2017 (82 FR 1860) and contains general permit conditions that the applicant must adhere to for the minimization or avoidance of impacts, including impacts to navigation, aquatic life, migratory bird breeding areas, public water supply intakes, wild and scenic rivers, tribal rights, federally protected species, and protected cultural sites. **General permit verifications or required permit approvals will not be known until Keystone submits Pre-Construction Notifications to the USACE. At that time, USACE will review information provided by Keystone within the Pre-Construction Notifications and determine the appropriate verification or approval process.**

In addition, Keystone has prepared a CMRP that summarizes the proposed wetland avoidance, minimization and mitigation measures. These measures include staging, maintaining and refueling equipment outside of wetlands to the greatest extent possible; employing special construction techniques for wetlands depending on how wet conditions are; and reclaiming impacted wetlands to near preconstruction conditions following pipeline installation.

Floodplains

Construction of the MAR would have negligible adverse effects on floodplains and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to floodplains would be less than significant. Construction work within the floodplain could result in construction equipment, supplies or fill materials placed within the floodplain. During construction, staging areas and storage of equipment would be outside of floodplain areas, and all facilities would be cited outside of flood-prone locations. Following construction, contours would be restored to as close to previously existing contours as practical, preserving local flood elevations.

Wild and Scenic Rivers

The 2014 Keystone XL Final SEIS concluded construction impacts to wild and scenic rivers would be less than significant. The proposed MAR would not cross any wild and scenic rivers, so there would be no adverse impacts to this resource.

4.6.3.2 Operations and Maintenance

Groundwater

Operations and maintenance of the MAR would have negligible adverse effects on groundwater and is consistent with the 2014 Keystone XL Final SEIS conclusion that operational impacts to groundwater would be less than significant. The primary impact to groundwater resources would result from incidental spills of fuels and other hazardous materials from construction equipment used for maintenance. Impacts, however, would be avoided through the Project's SPCC Plan. Spills of fuel and other hazardous materials would be cleaned-up immediately in accordance with the plan, and hazardous wastes associated with spills and leaks would be disposed of in accordance with applicable laws and regulations.

Surface Water

Operations and maintenance of the MAR would have infrequent and minor adverse effects on surface water and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to surface water would be less than significant. Types of impacts would be similar to those described for construction where maintenance activities requiring digging are located in proximity to streams. Measures to avoid or minimize maintenance and repair induced surface water impacts would include aerial and ground surveillance, maintenance of non-forested vegetation and restoration and revegetation measures conducted in accordance with the CMRP. The permit requirements of federal, state and local regulatory agencies would further reduce potential impacts to surface water resources from construction, maintenance and operational activities.

Wetlands

Operations and maintenance of the MAR would have infrequent and minor adverse effects on wetlands and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to wetlands would be less than significant. Types of impacts from pipeline maintenance would be similar to those described for construction where maintenance activities requiring digging are located in proximity to wetland areas. Keystone would implement impact minimization and restoration efforts described in the CMRP for maintenance activities involving wetlands or located in the vicinity of wetlands.

During ROW maintenance, there would be little impacts on emergent wetland vegetation because these areas naturally consist of, and would remain as, an herbaceous community. Herbaceous wetland vegetation in the pipeline ROW generally would not be mowed or otherwise maintained, although Keystone's CMRP allows for annual maintenance of a 20- to 30-foot-wide strip centered over the pipeline. Trees would not be allowed to regenerate within the maintained ROW; therefore, the removal of approximately 0.6 acre of forested wetland habitats due to pipeline construction would be long term, and the maintained ROW would represent a permanent conversion of forested wetlands to herbaceous wetlands.

Floodplains

Operations and maintenance of the MAR would have no adverse effects on floodplains and is consistent with the 2014 Keystone XL Final SEIS conclusion that operational impacts to floodplains would be less than significant. Routine maintenance activities along the MAR would have no impact to the floodplain elevations or the floodplain functioning. During operations, the temporary placement of equipment, vehicles and materials could occur within the floodplain as part of routine maintenance and inspection activities. These disturbances would be negligible and temporary. Such activities would have no effect on floodplain contours or elevations. With revegetation and restoration, the pipeline would not obstruct flows over floodplains and would have minimal impact on topography and/or flood elevation.

Wild and Scenic Rivers

The 2014 Keystone XL Final SEIS concluded operational impacts to wild and scenic rivers would be less than significant. The proposed MAR would not cross any wild and scenic rivers, so there would be no adverse impacts to this resource.

4.7 BIOLOGICAL RESOURCES

4.7.1 Environmental Consequences

The 2014 Keystone XL Final SEIS discusses impacts to biological resources along the Preferred Route. This section supplements the 2014 analysis to include impacts to biological resources within the MAR. This section also includes potential impacts on big game priority areas in Montana along the Preferred Route that were established by the February 9, 2018 Secretarial Order 3362, Improving Habitat Quality in Western Big-Game Winter Range and Migration Corridors and impacts to federally-protected species based on changes to status or occurrence since the 2014 Keystone XL Final SEIS. Chapter 5, Environmental Consequences from Accidental Releases, assesses the risk to biological resources in the event of an accidental release. Chapter 6, Electrical Power Infrastructure, provides a description of biological resources and an assessment of impacts from connected actions relating to electrical supply needs required for the proposed pipeline. Chapter 7, Cumulative Impacts, provides an assessment of the impacts to biological resources from the proposed Project (including the electrical supply needs) in combination with other past, present and reasonably foreseeable future actions.

To evaluate the impacts on biological resources, the Department reviewed the Proposed Action and No Action Alternative to determine whether any activities have the potential to cause the following:

- Displacement of terrestrial or aquatic communities or loss of habitat
- Diminished value of habitat for wildlife, plants or aquatic species
- Interference with the movement of native resident or migratory wildlife species
- Conflicts with applicable management plans for terrestrial, avian and aquatic species and their habitat
- Introduction of noxious or invasive plant species
- Decline in native fish populations
- Impacts on or displacement of endangered, threatened or other protected status species
- Encroachment or impacts on designated critical habitat for a federally listed species

A significant adverse impact to biological resources would occur if the action would result in:

- Long-term loss, degradation or loss of diversity within unique or high-quality (e.g., riparian) plant communities
- Unpermitted "take" of federally listed species
- Local extirpation of rare or sensitive species not currently listed under the ESA
- Unacceptable loss of critical habitat, as determined by the USFWS
- Violation of the MBTA or Bald and Golden Eagle Protection Act

The following analysis estimates and assesses the impact to biological resources during construction, normal operations and maintenance activities. Chapter 5, Environmental Consequences from Accidental Releases, discusses potential impacts to biological resources in the event of an accidental release.

4.7.2 No Action Alternative

Under the No Action Alternative, construction and operations of the proposed Project would not occur. No impacts to biological resources would occur.

4.7.3 Proposed Action

This SEIS quantifies potential direct and indirect impacts to biological resources using an assessment of data sources presented in Section 3.7. Impacts to biological resources from construction and operation of the MAR would result from cutting, clearing and removal of the existing vegetation within the construction work area, potential invasion by noxious weeds and maintenance activities associated with the proposed MAR and ancillary facilities (e.g., access roads and pump stations). Potential construction- and operations-related impacts would include:

Vegetation

- Temporary and permanent modification of vegetation community composition and structure from clearing and operational maintenance;
- Increased risk of soil erosion due to lack of vegetative cover;
- Expansion of invasive and noxious weed populations along the proposed pipeline route as a result of construction and operational vegetation maintenance;
- Soil and sod disturbance (mixing of topsoil with subsoil with altered biological activities and chemical conditions that could affect re-establishment and natural recruitment of native vegetation after restoration);
- Compaction and rutting of soils from movement of heavy machinery and transport of pipe sections, altering natural hydrologic patterns and inhibiting water infiltration, which could affect seed germination;
- Alteration in vegetation productivity and the timing of lifecycle stages due to increased soil temperatures associated with heat emanating from the pipeline; and
- Loss of vegetation due to exposure from a crude oil release incident (see Chapter 5).

Wildlife and Fisheries

- Habitat loss, alteration and fragmentation;
- Direct mortality during construction and operation (e.g., vehicle collisions, power line/power pole collisions);
- Indirect mortality because of stress or avoidance of feeding due to exposure to construction and operations noise (e.g., low-level helicopter or airplane monitoring overflights), and from increased human activity;
- Reduced breeding success from exposure to construction and operations noise and from increased human activity;
- Reduced survival or reproduction due to decreased availability of edible plants, reduced cover and increased exotics and invasives;
- Increased predation (e.g., nest parasitism, creation of predator travel corridors and poaching) from fragmentation;
- Increase of temporary elevated suspended sediment levels and excessive suspended sediment which can interfere with respiration in fish and invertebrates and cause mortality or reduced productivity in rearing and spawning;
- Short-term impairment of foraging efficiency in streams impaired with suspended sediments for species that are visual predators;
- Increased mortality and reduced recruitment to the aquatic species populations from sediment cover on spawning gravels, preventing water exchange and oxygen to developing eggs or young fish;
- Loss of riparian vegetation which reduces shading and can cause an increase in water temperature and a reduction in dissolved oxygen, nutrient input, food input and hiding cover;
- Alteration of benthic communities and change in food availability from loss of riparian vegetation and disturbance to the bank and substrate; and
- Local increase in water temperature due to increased turbidity and a temporary reduction in water quality and short-term impacts to fish and macroinvertebrates.

Keystone would implement measures within the 2014 Keystone XL Final SEIS CMRP to reduce impacts on vegetation within the construction and permanent ROW and to improve the probability of successful revegetation of disturbed areas (U.S. Department of State 2014). Applicable measures considered within this analysis to reduce general impacts to biological resources in the MAR in Nebraska include:

- Limit construction traffic to the ROW, existing roads, newly constructed roads and approved private roads; and
- Clearly stake construction ROW boundaries, including pre-approved TWAs, to prevent disturbance to unauthorized areas.

Measures to restore disturbed areas to pre-construction use and vegetation cover include:

- Implement reclamation and revegetation measures as described in the proposed CMRP and Con/Rec units;
- Use certified seed mixes to limit the introduction of noxious weeds within 12 months of seed germination testing, and adjust seeding rates based on test results per the Con/Rec unit; and

- Seed at a rate appropriate for the region and for the stability of the reclaimed surface based on pure live seed.

Measures to control the introduction and spread of noxious weeds following construction and restoration procedures include:

- Develop and adhere to a weed control plan for Nebraska in consultation with County Weed Boards;
- Use pre-construction treatment such as mowing prior to seed development or herbicide application (in consultation with county or state regulatory agencies and landowners) for areas of noxious weed infestations prior to clearing grading, trenching or other soil disturbing work to weed infestation locations identified on construction drawings;
- Strip and store topsoil contaminated with weed populations separately from clean topsoil and subsoil;
- Use mulch and straw or hay bales that are free of noxious weeds for temporary erosion and sediment control;
- Clean all construction equipment, including timber mats, with air or high-pressure washing equipment prior to moving equipment to the next job site; clean the tracks, tires and blades of equipment by hand or compressed air to remove excess soil prior to movement of equipment out of weed infested areas; or use cleaning stations to remove vegetative materials with high pressure washing equipment; and
- Implement weed control measures as required by any applicable plan and in conjunction with the landowner.

Measures to reduce potential construction- and operations-related effects to wildlife and habitat include:

- Reseed disturbed native range with native seed mixes after topsoil replacement consistent with applicable Con/Rec and landowner requirements;
- Develop and implement a conservation plan, in consultation with the USFWS, consistent with the MBTA and the Bald and Golden Eagle Protection Act where the pipeline would be constructed, operated and maintained;
- If applicable, develop construction timing restrictions and buffer zones through consultation with regulatory agencies;
- If construction would occur during the bald and golden eagle nesting season during January to August, complete pre-construction surveys to locate active nest sites and follow current applicable USFWS guidance;
- On BLM lands, avoiding construction within identified big game winter ranges from December 1 to May 15 of each year; and
- Installing bird flight diverters (BFDs) on power lines across and for 0.25 mile on either side of large rivers.

Measures to minimize the amount of sediment from streambank and upland erosion entering waterbodies and protect aquatic habitat include:

- Installation of sediment barriers immediately after initial disturbance of waterbodies or adjacent uplands;
- Maintaining the ROW width and limiting the extent of riparian vegetation loss;
- Minimization of grading and grubbing along stream banks;

- Minimizing in-stream use of equipment, locating workspaces at least 10 feet from waterbodies to the extent practicable; and
- Using dry-ditch techniques at crossings where the timing of construction does not adequately protect environmentally sensitive waterbodies, as determined by the appropriate regulatory authority.

4.7.3.1 Construction

Vegetation Communities

Construction of the MAR would have minor to moderate adverse effects on vegetation and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to vegetation would be less than significant. Table 4.7-1 provides an estimate of the types of vegetation disturbance using land cover types along the MAR. Keystone would restore vegetation communities within the 60-foot temporary ROW and temporary construction and staging areas following construction. Keystone would perform maintenance to vegetation cover and periodic pipeline maintenance within the permanent ROW (discussed in Section 4.7.3.2). Permanent facility construction (e.g., pump station and permanent access roads) would constitute a permanent impact (loss) of the resource (discussed in Section 4.7.3.2).

Table 4.7-1. Land Cover Types Crossed by the MAR

Land Cover Type	Temporary ROW[a] and Construction Areas (acres)	Permanent Pipeline ROW[a] (acres)	Permanent Facilities (acres)
Cultivated Cropland	2,319.1	798.5	33.8
Pasture/Hay	10.1	3.3	0
Grassland Herbaceous	335.1	124.6	0.8
Forest	34.5	11.6	0
Emergent Herbaceous Wetlands[b]	7.7	0.26	0
Woody Wetlands	5.9	2.3	0
Open Water	3.7	0.3	0
Developed	115.7	38.1	1.8

Source: USGS 2011a

a. The temporary and permanent ROW values do not include acreages for vegetation communities that would be avoided through use of HDD. This includes approximately 5 acres of cultivated cropland, 0.1 acre of grassland, 1.3 acres of forest, 2 acres of woody wetlands and 3.4 acres of open water.

b. Acreage within this table based on USGS 2011 data. See Section 3.6, Water Resources, for field delineated wetland values.

HDD = horizontal directional drill; MAR = Mainline Alternative Route; ROW = right-of-way

Table 4.7-1 indicates the greatest impact to vegetation communities would occur to cultivated cropland, followed by grassland (of which 65.3 acres consist of native grasslands with the remainder dominated primarily by smooth brome). Impacts to these communities would be short- to long-term, with vegetation typically re-establishing within 1 to 3 years in non-native grasslands, and 3 to 5 years in native grasslands. Grasslands may require as long as 5 to 8 years to establish cover similar to adjacent undisturbed lands, especially when drought conditions or livestock grazing interfere with re-establishment. Approximately 34.6 acres, predominantly consisting of cultivated cropland, would be permanently lost to accommodate permanent pipeline facilities (e.g., pump stations and permanent access roads).

As shown in Table 4.7-1, construction would require clearing of approximately 34.5 acres of forest and 5.9 acres of woody wetlands. (As discussed in Section 4.6, approximately 0.6 acre of forested wetland would be disturbed based on field delineation). Clearing of deciduous forest and woody wetland vegetation within the temporary ROW would result in moderate long-term impacts on these communities given the length of time needed for the community to mature to pre-construction conditions. In addition, approximately 13.2 acres of these communities within the permanent ROW would be permanently converted from forest to herbaceous cover. In these areas, trees would be removed and would not be allowed to re-establish due to periodic mowing and brush clearing during pipeline operation. Routine maintenance vegetation clearing would occur no more than every 1 to 3 years.

Following construction, re-establishment of native vegetation communities could be delayed or prevented by infestations of noxious weeds and invasive plants. Vegetation removal and soil disturbance during construction could create optimal conditions for the establishment of many weeds. Construction equipment traveling from weed-infested areas into weed-free areas could disperse noxious weed seeds or propagules (such as buds or spores), resulting in the establishment of noxious weeds in previously weed-free areas. Common noxious weeds in Nebraska include Canada thistle, leafy spurge, musk thistle, plumeless thistle, purple loosestrife, spotted and diffuse knapweeds, saltcedar, phragmites, sericea lespedeza, Chinese bush-clover, Japanese knotweed, bohemian knotweed and giant knotweed (Nebraska Department of Agriculture 2018). Keystone would implement measures discussed at the beginning of this section to aid in the restoration of pre-construction communities following construction to include preservation of soil integrity, management for invasive species and reseeding and site restoration to community compositions prior to construction. Impacts of invasive species are anticipated to be minor provided measures to identify and control these species are implemented.

Biologically Unique Landscapes and Vegetation Communities of Conservation Concern

Construction of the MAR would have minor to moderate adverse effects on biologically unique landscapes and vegetation communities of conservation concern and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to biologically unique landscapes and vegetation communities of conservation concern would be less than significant. Table 4.7-2 provides an estimate of potential disturbance to biologically unique landscapes and vegetation communities of conservation concern from construction, operations and normal maintenance of the pipeline along the MAR. Overall impacts to these communities have been reduced as the MAR maximizes use of existing ROW and predominately crosses cultivated cropland.

Table 4.7-2. Biologically Unique Landscapes and Vegetation Communities of Concern Crossed by the MAR

Feature Name	Temporary ROW and Construction Areas (acres)	Permanent Pipeline ROW (acres)	Permanent Facilities (acres)
Rainwater Basin Landscape	296.9	80.7	0
Lower Platte River Landscape	44.3	22.01	0
Forest Communities	21.4	7.0	0
Native Grasslands	47.0	18.3	0
Riparian Habitats and Bottomland Hardwood	19.9	14.4	0

Source: NNHP 2011; Westech 2018
MAR = Mainline Alternative Route; ROW = right-of-way

The MAR crosses approximately 296.9 acres in the rainwater basin management district. As discussed in Section 3.7, this landscape is of management concern due to the unique habitat it provides for migrating bird species and historical losses due to cultivation. A review of wetland crossings by the MAR within this district indicates that wetland areas have been highly influenced by agricultural production and provide minimal habitat to migrating bird species. None of the wetlands crossed by the MAR within this district meet the definition of a traditional rainwater basin wetland. Section 4.6 discusses impacts to wetlands from construction and operations along with mitigation measures to restore areas following disturbance.

The MAR crosses approximately 44.3 acres of the Lower Platte River biologically unique landscape. As discussed in Section 3.7, this landscape is of concern due to the unique habitat it provides for federally protected piping plovers and least terns, as well as large river fish species it supports, including lake sturgeon, blue sucker, sturgeon chub and pallid sturgeon. Crossing the Lower Platte River landscape would require an HDD crossing of the Platte River, as discussed in Sections 3.6 and 4.6.

As shown in Table 4.7-2, construction would require clearing of approximately 41.3 acres of forest and riparian woodlands. As discussed in Section 3.7, native grasslands were once prevalent in Nebraska, but suppression of fires, agriculture, urbanization and mineral exploration have considerably reduced this community's occurrence. Clearing of forested vegetation within the temporary ROW would result in moderate long-term impacts on these communities given the length of time needed for the community to mature to pre-construction conditions. In addition, approximately 21.4 acres of these communities within the permanent ROW would be permanently converted from forest to herbaceous cover. In these areas, trees would be removed and would not be allowed to re-establish due to periodic mowing and brush clearing during pipeline operation. Routine maintenance vegetation clearing would occur no more than every 1 to 3 years. As stated in Table 4.7-1, Keystone has reduced the amount of riparian forest clearing through use of HDD; avoiding impacts to 3.3 acres of riparian forest located along the Elkhorn River, Union Creek, Platte River and Big Blue River. Keystone would also implement measures identified in the CMRP and Con/Rec units as described at the beginning of this section to minimize impacts to forested uplands and wetlands. Keystone has developed native seed mixes with input from the local Natural Resources Conservation Service offices and collaboration with regional experts for each Con/Rec unit.

The MAR would cross an estimated 47 acres of native grassland. As discussed in Section 3.7, these communities are of management concern due to the unique habitat provided and due to losses from agricultural uses, levee construction and urban development. Although native grasslands would be reseeded with native seed in the proposed ROW, impacts would be minor to moderate as construction effects on previously untilled native prairies could be long term. Typically, shortgrass prairie and mixed-grass prairie areas may take 5 to 8 or more years to re-establish if there are poor soil conditions and low moisture levels. In addition, destruction of the prairie sod during trenching may require more than 100 years for complete recovery. Construction through native grasslands would expose the fragile soils to erosion by wind and water; re-establishing cover of native grasses is expected to be successful based on the fertile soils that are present and adequate rainfall as evidenced by native grass establishment on the original Keystone pipeline. Native vegetation is expected to establish within 3 to 5 years. Also, as discussed in the 2014 Keystone XL Final SEIS, heat dissipated from the pipeline could potentially lead to early germination and increased productivity of native prairie grasses, but may also lead to decreased soil water content, which could be detrimental to native prairie plants (U.S. Department of State 2014). Invasion of non-native plants as well as altered land management (e.g., suppression of wildfires) also may prevent recovery of prairie grasslands; wildfires help to maintain prairie sod.

Keystone would implement the following measures identified in the CMRP and Con/Rec units implemented to minimize impacts specifically to native grasslands (U.S. Department of State 2014):

- Keystone has developed noxious-weed-free native seed mixes with input from the local Natural Resources Conservation Service offices and through collaboration with regional experts and outlined in their Con/Rec units.
- Reseed native grasslands with a native seed mix per the Con/Rec units.
- Mulch and crimp into the soil noxious-weed-free straw or native prairie hay to prevent wind erosion.
- Monitor the ROW to determine the success of revegetation after the first growing season, and for areas in which vegetation has not been successfully re-established, reseed the area.
- Strive to reduce width of disturbance to the native prairie landscape by adopting trench-line or blade-width stripping procedures where practicable.

Big Game Priority Areas

Construction of the pipeline would cause temporary, minor to moderate impacts to the big game Priority Area D, primarily from the potential to cause temporary barriers to movement/migration of species along active areas of pipeline construction. The severity of these impacts, however, would be reduced by project phasing which would reduce the linear amount of active construction along the proposed route at a given time, enabling large mammals to move/migrate around active construction areas. Riparian/wetland areas would largely be avoided through directional drilling, avoiding fragmentation of habitat within these communities. Minor fragmentation impacts to grasslands and sagebrush would occur during pipeline construction from vegetation clearing within the construction footprint. This includes approximately 600 acres of lowland/prairie grasslands and 3 acres of sagebrush steppe within Priority Area D. Following construction, areas would be restored according to respective CMRP Con/Rec units and landowner agreements. Impacts would be temporary, requiring 3 to 5 years to recover following construction or up to 8 years when drought conditions or livestock grazing interfere with re-establishment. Keystone would implement measures discussed in Section 4.7.3 to aid in the restoration of pre-construction communities following construction to include management for invasive species and reseeding and site restoration to community compositions prior to construction. This includes implementation of a noxious and invasive weed control program consistent with the CMRP and Con/Rec units to reduce the potential for spread or invasion by weeds.

Wildlife and Fisheries

Construction of the MAR would have minor adverse effects on wildlife and fisheries and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to wildlife and fisheries would be less than significant. Potential impacts to habitat and species can be inferred by the types of vegetation communities potentially affected from construction of the MAR in Table 4.7-1. Construction of the MAR would result in disturbance of about 2,712 acres of various habitat types, a majority of which, approximately 2,319.1 acres (including the approximately 34.6 acres permanently lost to accommodate permanent pipeline facilities) consists of cultivated cropland which provides marginal habitat for wildlife.

Wildlife

The 2014 Keystone XL Final SEIS details the potential effects of pipeline construction, operations and routine maintenance on wildlife. Pipeline construction would remove vegetation, including native grasses, shrubs and trees, creating an unvegetated strip over the proposed pipeline trench and the adjacent construction areas. Direct and indirect as well as temporary (short-term) and permanent (long-term) impacts on wildlife resources would occur due to vegetation removal or conversion, obstructions to movement patterns or the removal of native habitats that may be used for foraging, nesting, roosting or other wildlife uses. Construction activities and noise could cause indirect mortality of species from stress or avoidance of feeding during construction due to exposure from increased human activity. Increased noise levels from construction and human activity during the breeding season could also reduce breeding success. Short-term impacts on wildlife would occur during construction and may extend beyond construction activities. Temporarily disturbed habitats may not be returned to former levels of functionality for up to 3 years following restoration efforts, but long-term impacts on wildlife could extend through the life of a project and possibly longer for those habitats (e.g., forested, wetland and native grassland) that require many decades to be restored (U.S. Department of State 2014). These potential effects would be similar to those along the MAR. Overall impacts on wildlife due to the predominately cultivated landscape are anticipated to be minor.

Construction of the pipeline would require clearing of approximately 34.5 acres of forest and 5.9 acres of woody wetlands, of which approximately 13.2 acres would be permanently converted. Removal of forested areas would constitute a long-term impact for this type of habitat given the length of time needed for the community to mature to pre-construction conditions. The proposed pipeline ROW would be maintained free of trees, resulting in long-term alteration of wildlife habitat structure and value. Subsequent revegetation may not provide habitat features comparable to pre-MAR habitats, and restoration of wetlands in semi-arid regions is not always successful. Removal of vegetation also increases the potential for the establishment and spread of noxious weeds and other invasive plants that have little use or value for wildlife and that displace native plants, resulting in degraded wildlife habitat (U.S. Department of State 2014).

Pipeline construction within the MAR would also create habitat fragmentation (splitting of a large continuous expanse of habitat into numerous smaller patches of habitat). The 2014 Keystone XL Final SEIS also details the potential effects of habitat fragmentation that would result from the clearing of native vegetation to accommodate the pipeline. A review of aerial photography along the MAR for forest and shrubland communities greater than 250 feet in width indicates the following areas susceptible to fragmentation:

- The crossing of the Elkhorn River near MP 716 contains approximately 300 feet of riparian woodland on either side of the crossing. Impacts to the vegetation along this area, however, would be avoided as Keystone would use the HDD method to install the pipeline underneath the river and bordering riparian areas.
- The crossing of an approximate 21-acre forested/shrubland community right before MP 739. The MAR would fragment the eastern third of this community. The area, however, is not contiguous with other forested/shrubland communities and represents a fragment of forest in agriculturally-dominated landscape. Keystone would use the open cut crossing method here.

- The crossing of Union Creek near MP 747 contains approximately 250 feet of riparian woodland on either side of the crossing. Impacts to the vegetation along this area, however, would be avoided as Keystone would use the HDD method to install the pipeline underneath the river and bordering riparian areas.
- The crossing of the Platte River near MP 781 contains approximately 1,750 feet of riparian woodland on the south side of the river. Impacts to the vegetation along this area, however, would be avoided as Keystone would use the HDD method to install the pipeline underneath the river and bordering riparian areas.
- The crossing of the Big Blue River near MP 808 contains approximately 400 feet of riparian woodland, primarily concentrated on the south side of the river. Impacts to the vegetation along this area, however, would be avoided as Keystone would use the HDD method to install the pipeline underneath the river and bordering riparian areas.

Fragmentation of native grasslands would generally be considered short term until sufficient herbaceous cover is re-established to allow small mammals, amphibians and reptiles to cross without exposure. Overall effects of habitat fragmentation from the MAR have been minimized through the use of HDD in forested riparian areas and due to the collocation of the MAR with the existing Keystone Mainline.

Total habitat loss due to pipeline construction would likely be small in the context of available habitat, both because of the linear nature of the proposed Project and because restoration would follow construction. During restoration, the area would be reseeded as directed by the landowner or land management agency, such that in some instances areas of native vegetation could be converted to non-native species. Such conversion could reduce suitable or preferred habitat for wildlife.

Fisheries

Direct impacts to aquatic habitat and fisheries from construction would occur at stream crossings. The pipeline would cross waterbodies along the MAR using one of the following methods: non-flowing open cut, flowing open-cut, dry flume open-cut, dry dam-and-pump or HDD. Keystone proposes to use HDD techniques at 4 of the perennial waterbody crossings and various open-cut methods at the remaining 27 perennial stream crossings (see Table 3.7-2). Potential direct impacts to fisheries and aquatic resources from open cut construction trenching activities would include alteration of the streambed and bank structure, reduction or alteration of habitat and increased sediment. Indirect impacts would include increased water temperature from loss of riparian vegetation and increased sedimentation. Construction activities within the streambed could also result in mortality, behavioral modifications, delays in movement and introduction of non-native aquatic species (either plant or animal). Implementation of measures discussed at the beginning of this section and within the CMRP would result in minor short term and temporary impacts to fisheries resources (U.S. Department of State 2014).

Impacts to aquatic habitat could occur if there is an unintended release of drilling fluids (i.e., a frac-out) during HDD operations. A frac-out could release bentonitic drilling mud into the aquatic environment that would readily disperse in flowing water or eventually settle in standing water. Although bentonite is non-toxic, suspended bentonite may produce short-term impacts to the respiration of fish and aquatic invertebrates due to fouled gills. Longer-term effects could result if larval fish are covered and suffocate due to fouled gills and/or lack of oxygen. If the frac-out occurred during a spawning period, egg masses of fish could be covered, thus inhibiting the flow of dissolved oxygen to the egg masses. Benthic invertebrates and the larval stages of pelagic organisms could also be covered and suffocate (U.S. Department of State 2014). A response to a frac-out could also adversely affect aquatic resources. Frac-out response activities would likely increase local boat and human traffic, which could alter the existing aquatic habitat or disturb local flora and fauna.

To minimize the potential for these impacts to occur, a contingency plan would be implemented to address an HDD frac-out. This plan would include preventive and response measures to control the inadvertent release of drilling fluids. The contingency plan would also include instructions for downstream monitoring for any signs of drilling fluid during drilling operations, and would describe the response plan and impact reduction measures in the event a release of drilling fluids occurred. Drill cuttings and drilling mud would be disposed of according to applicable regulations; disposal/management options may include spreading over the construction ROW in an upland location with landowner permission or hauling to an approved offsite, licensed landfill or other approved sites.

Water withdrawal and discharge for hydrostatic testing, HDD operations (drilling mud) and dust control could also potentially impact fisheries and aquatic resources through reduced streamflow, which may result in reduced habitat quantity and quality including increased water temperature; entrainment of fish, eggs and invertebrates; transfer of aquatic invasive species; and increased sediment. The potential for increased water temperature may result from reduced streamflow, as flow rates may have a direct effect on water temperatures. As flow decreases, the amount of energy required to change water temperature also decreases. In addition, discharged and augmented flows may further entrain sediment, leading to increased turbidity, which may result in increased temperature due to greater solar radiation absorption by the darker sediments in the water column. Measures to minimize or avoid these impacts include controlling water withdrawal rates, using alternative water sources (wells or municipal sources), use of fine mesh screens at intakes, discharge in upland locations and energy dissipating structures (U.S. Department of State 2014).

Migratory Birds

Construction of the MAR would have minor adverse effects on migratory birds and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to migratory birds would be less than significant. Keystone would develop a Conservation Plan consistent with the **Interior Solicitor's Opinion M-37050 (December 22, 2017)** and current applicable USFWS guidance.

Threatened and Endangered Species

Construction of the MAR would have less than significant effects on threatened or endangered species and is consistent with the 2014 Keystone XL Final SEIS conclusions. Table 4.7-3 summarizes potential impacts to each federally listed species **during construction and is consistent with the amended BA (BLM 2019). Table 4.7-4 summarizes** species-specific conservation measures that Keystone would implement to prevent adverse effects. Chapter 6. Electrical Power Infrastructure, contains additional conservation measures related to power required for proposed Project operations. Chapter 8, Summary of Consequences, provides additional information on measures to protect state-listed species.

Table 4.7-3. Potential Impacts from Construction

Interior least tern (*Sterna antillarum)*
Effects could occur to individuals or habitat from construction clearing and pipeline installation activities, however, the use of the HDD crossing method would avoid effects on interior least tern nesting habitat during pipeline construction through avoidance of riparian habitats and nesting locations (including nesting habitat along the Niobrara, Elkhorn, and Platte rivers in Nebraska, the Cheyenne River in South Dakota, and the Yellowstone River in Montana). No effects are anticipated because construction activities, including HDD activities, would cease if interior least terns are identified during daily pre-construction surveys. Drilling equipment pads and staging areas for HDD would have required set-backs from the riparian zone in each river and would be determined during the federal, state, and local permitting processes. Setbacks can vary from 50 to 100 feet, depending on the river and local jurisdictions.

Table 4.7-3. Potential Impacts from Construction

Effects could occur to individuals or habitat from construction clearing and pipeline installation activities, however, the use of the HDD crossing method would avoid effects on interior least tern nesting habitat during pipeline construction through avoidance of riparian habitats and nesting locations (including nesting habitat along the Niobrara, Elkhorn, and Platte rivers in Nebraska, the Cheyenne River in South Dakota, and the Yellowstone River in Montana). No effects are anticipated because construction activities, including HDD activities, would cease if interior least terns are identified during daily pre-construction surveys. Drilling equipment pads and staging areas for HDD would have required set-backs from the riparian zone in each river and would be determined during the federal, state, and local permitting processes. Setbacks can vary from 50 to 100 feet, depending on the river and local jurisdictions. **Effects could also occur from exposure to small fuel spills and leaks from construction machinery, if they were to occur. These effects would be temporary and construction-related spills within interior least tern habitat would be minimal because all hazardous materials such as fuels and oils would be stored at least 100 feet away from surface waters, and these types of spills or leaks generally are small in volume and are cleaned up quickly.** **Temporary effects could result from increased noise and human presence at work site locations if nesting interior least terns are located within 0.25 mile of the proposed Project and may lead to reduced reproductive success or mortality to eggs, chicks, or adults. Prior to beginning construction-related activities in areas of nesting interior least tern habitat, Keystone will conduct presence/absence surveys to identify active colony and nest sites, in coordination with the USFWS. If active colonies and nest sites are identified, the USFWS will be notified and appropriate protection measures would be implemented on a site-specific basis in coordination with the USFWS. Should nighttime HDD work occur, lights would be down-shielded to help avoid disruption of behavior.** **Temporary withdrawals of water (e.g., for hydrostatic pipeline testing) have some potential for effects on suitable nesting and foraging habitat. However, implementation of conservation measures as outlined in Table 4.7-4, in Keystone's CMRP, and the requirements found in Appendix Z of the 2014 Keystone XL Final SEIS would help minimize effects, and these effects, if any, will be minor (insignificant and discountable).** **While migrating interior least terns may encounter construction activities during spring and fall migration, temporary effects, if any, are expected to be minor (insignificant and discountable) as migrating individuals would either be flying over during migration, or utilize areas of the rivers upstream or downstream of construction areas as stopover sites.**
Piping plover (*Charadrius melodus)*
Effects could occur to individuals or habitat from construction clearing and pipeline installation activities, however, the use of the HDD crossing method would avoid effects on piping plover habitat during pipeline construction through avoidance of riparian habitats and nesting locations (including nesting habitat along the Platte and Niobrara rivers in Nebraska and in the Fort Peck Reservoir in Montana). No effects are anticipated because construction activities, including HDD activities, would cease if interior least terns are identified during daily pre-construction surveys. Drilling equipment pads and staging areas for HDD would have required set-backs from the riparian zone in each river and would be determined during the federal, state, and local permitting processes. **Effects could also occur from exposure to small fuel spills and leaks from construction machinery, if they were to occur. These effects would be temporary and construction-related spills within piping plover habitat would be minimal because all hazardous materials such as fuels and oils would be stored at least 100 feet away from surface waters, and these types of spills or leaks generally are small in volume and are cleaned up quickly.** **Temporary effects could result from increased noise and human presence at work site locations if nesting piping plover are located within 0.25 mile of the proposed Project and may lead to reduced reproductive success or mortality to eggs, chicks, or adults. Prior to beginning construction-related activities in areas of nesting piping plover habitat, Keystone will conduct presence/absence surveys to identify active colony and nest sites, in coordination with the USFWS. If active colonies and nest sites are identified, the USFWS will be notified and appropriate protection measures would be implemented on a site-specific basis in coordination with the USFWS. Should nighttime HDD work occur, lights would be down-shielded to help avoid disruption of behavior.** **Temporary withdrawals of water (e.g., for hydrostatic pipeline testing) have some potential for effects on suitable nesting and foraging habitat. However, implementation of conservation measures as outlined in Table 4.7-4, in Keystone's CMRP, and the requirements found in Appendix Z of the 2014 Keystone XL Final SEIS would help minimize effects, and these effects, if any, will be minor (insignificant and discountable).**

Table 4.7-3. Potential Impacts from Construction

While migrating piping plover may encounter construction activities during spring and fall migration, temporary effects, if any, are expected to be minor (insignificant and discountable) as migrating individuals would either be flying over during migration, or utilize areas of the rivers upstream or downstream of construction areas as stopover sites.
Rufa red knot (*Calidris canutus rufa)*
As the rufa red knot occurs sporadically during spring and fall migration and there are no records within 1 mile of the proposed pipeline route, no temporary effects to rufa red knots are expected as a result of Project construction. Further, given that there is no specific and consistent habitat used by migrating rufa red knots on or near the Project area, construction-related effects to potentially suitable stopover habitat, including reductions in wetland, riparian, and riverine habitats, would not be expected to result from construction of the proposed Project. **Effects could occur from exposure to small fuel spills and leaks from construction machinery, if they were to occur. These effects would be temporary and construction-related spills within rufa red knot habitat would be minimal because all hazardous materials such as fuels and oils would be stored at least 100 feet away from surface waters, and these types of spills or leaks generally are small in volume and are cleaned up quickly.**
Whooping crane (Grus americana)
Effects could occur to individuals or habitat from construction clearing and pipeline installation activities, however, the use of the HDD crossing method would avoid effects on whooping crane habitat during pipeline construction through avoidance of riparian habitats and nesting locations (including nesting habitat along the Yellowstone River in Montana, the Cheyenne and White rivers in South Dakota, and the Niobrara, Elkhorn, and Platte rivers in Nebraska). No effects are anticipated because construction activities, including HDD activities, would cease if whooping cranes are identified during daily pre-construction surveys. Drilling equipment pads and staging areas for HDD would have required set-backs from the riparian zone in each river and would be determined during the federal, state, and local permitting processes. Any vegetation disturbance adjacent to suitable riverine habitat would be allowed to completely revegetate following construction. Based on the current migration pathway of this species, potential occurrence on the ground within or near the Project area could occur but would be extremely rare and would be limited to a few individuals or small groups of migrant birds. Furthermore, to the greatest extent practicable, wetland habitat with the potential to be used by migrating whooping cranes would be avoided as part of the USACE required wetland avoidance and minimization. Standard sediment and erosion control BMPs would also be applied to adjacent habitats to protect wetland resources that may be used by migrating whooping cranes. **Effects could also occur from exposure to small fuel spills and leaks from construction machinery, if they were to occur. These effects would be temporary and construction-related spills within whooping crane habitat would be minimal because all hazardous materials such as fuels and oils would be stored at least 100 feet away from surface waters, and these types of spills or leaks generally are small in volume and are cleaned up quickly.** **Temporary effects could result from migrating individuals being disturbed and displaced due to noise, lighting from nighttime operations, and human presence during construction, if construction were to occur during spring or fall migrations, resulting in increased energy expenditure. However, these effects are not likely to be biologically significant and potentially suitable habitat is widespread throughout the migration corridor.** **Temporary withdrawals of water (e.g., for hydrostatic pipeline testing) have some potential for effects on suitable nesting and foraging habitat for this species. However, implementation of conservation measures as outlined in Table 4.7-4, in Keystone's CMRP, and the requirements found in Appendix Z of the 2014 Keystone XL Final SEIS would help minimize effects, and these effects, if any, will be insignificant and discountable.** **In remote areas where construction camps are required, additional temporary effects on migrating whooping cranes resulting from disturbance and loss of potential suitable habitat may occur if construction occurs during the spring or fall migration periods. All of the proposed construction camps are located on sites currently in active row-crop production. Similar suitable foraging habitat occurs in the immediate vicinity of the proposed camps would remain available to migrating whooping cranes, therefore effects resulting from disturbance or loss of potentially suitable foraging habitat, if any, would be minor (insignificant and discountable).**

Table 4.7-3. Potential Impacts from Construction

Eskimo curlew (*Numenius borealis*)
Species is presumed extinct, therefore, no impacts are anticipated.
Northern long-eared bat *(Myotis septentrionalis)*
Effects on the northern long-eared bat from construction activities in South Dakota and Nebraska are highly unlikely as this species is highly unlikely to occur within the Project area which contains limited suitable habitat. For Montana, however, review of aerial imagery within the Project area in Valley and McCone counties indicated the proposed Project construction footprint would overlap 6.7 acres of forested habitat potentially suitable for use by roosting and/or foraging northern long-eared bats in Montana. Any tree removal activities will be conducted in accordance with the final northern long-eared bat 4(d) rule, and incidental take, if any, would not be prohibited.
Black-footed ferret *(Mustela nigripes)*
Effects on the black-footed ferret from construction activities are highly unlikely as there are currently no black-footed ferret populations along the proposed pipeline route and no potentially suitable habitat (i.e., prairie dog towns in Montana) would be affected by the proposed route. **Potential temporary effects on black-footed ferrets, if they were present, could include disturbance and displacement due to increased noise and human presence during construction, habitat loss and habitat fragmentation due to disturbance of sparsely vegetated habitat in prairie dog towns, and reduced prey availability due to mortality or reduced reproduction of black-tailed prairie dogs. While potentially suitable habitat within the construction corridor would be unavailable during construction activities, disturbed areas would become potentially suitable following final restoration of the ROW and would be available for use by prairie dogs and/or black-footed ferrets. Effects would be minor (insignificant and discountable) through application of the conservation measures outlined in Table 4.7-4.**
Grey wolf (*Canis lupus*)
Species does not occur in the proposed Project area in South Dakota and Nebraska, and is no longer listed in Montana; therefore no impacts are anticipated.
Pallid sturgeon (*Scaphirhynchus albus)*
Effects could occur to individuals or aquatic habitat from construction of the pipeline at stream crossings, however, the use of the HDD crossing method would avoid effects on river bottom habitat for pallid sturgeon during pipeline construction (including the Milk, Missouri, and Yellowstone rivers in Montana and the Lower Platte River in Nebraska). The Niobrara River would also be crossed using HDD, although pallid sturgeon are not found there because of the downstream Spencer Dam. Effects on the eggs, larvae, or other life states of the pallid sturgeon from temporary water withdrawals for HDD operations and hydrostatic testing would be minor (insignificant and discountable) based on implementation of conservation measures contained in Table 4.7-4 and measures within the CMRP. As stated in the CMRP, care would be taken during the discharge to prevent erosion or scouring of the waterbody bed and banks to avoid effects on pallid sturgeon spawning habitat. Hydrostatic test water would be discharged in upland locations near the source of the water over several days and through a velocity reduction and erosion control device. **Effects could also occur from exposure to small fuel spills and leaks from construction machinery. Effects of construction-related spills would be unlikely, temporary, and minimal because all hazardous materials such as fuels and oils would be stored at least 100 feet away from surface waters, and these types of spills or leaks generally are small in volume and are cleaned up quickly.** **During HDD activities, an accidental release of pressurized drilling mud from the borehole, or frac-out, could potentially occur. In some instances, the pressurized fluids and drilling lubricants may escape the active bore, migrate through the soils, and come to the surface at or near the construction site. Most leaks of HDD drilling fluids occur near the drill entry and exit locations and are quickly contained and cleaned up. Frac-outs that may release drilling fluids into aquatic environments are more difficult to contain primarily because bentonite readily disperses in flowing water and quickly settles in standing water. While the HDD method poses a small risk of frac-out, potential releases would be contained by BMPs that are described within the HDD contingency plans required for drilled crossings. These contingency plans are prepared by the pipeline contractor prior to construction. These practices include monitoring the HDD, monitoring downstream for evidence of drilling fluids, and mitigation measures to address a frac-out should one occur. Additionally, effects to the species are unlikely as if a frac-out were to release fluids into an aquatic environment (increasing turbidity), adult and larval pallid sturgeon are adapted to high turbidity environments.**

Table 4.7-3. Potential Impacts from Construction

Topeka shiner (*Notropis topeka*)
The proposed construction activities are unlikely to affect the Topeka shiner or its habitat, as none of the proposed pipeline corridor would encounter potentially suitable habitat. The proposed Project would implement the sediment and erosion control measures in Keystone's CMRP to avoid and minimize the potential effects of erosion and sedimentation. The proposed Project would implement the sediment and erosion control measures in Keystone's CMRP to avoid and minimize the potential effects of erosion and sedimentation; this includes along perennial tributaries to Taylor Creek, which is designated as critical habitat for this species. **Effects could occur from exposure to small fuel spills and leaks from construction machinery. Effects of construction-related spills would be unlikely, temporary, and minimal because all hazardous materials such as fuels and oils would be stored at least 100 feet away from surface waters, and these types of spills or leaks generally are small in volume and are cleaned up quickly.** **All water withdrawals would be conducted consistent with permit requirements and compliant with the conservation measures contained in Table 4.7-4. During HDD activities, an accidental release of pressurized drilling mud from the borehole, or frac-out, could potentially occur. In some instances, the pressurized fluids and drilling lubricants may escape the active bore, migrate through the soils, and come to the surface at or near the construction site. Most leaks of HDD drilling fluids occur near the drill entry and exit locations and are quickly contained and cleaned up. Frac-outs that may release drilling fluids into aquatic environments are more difficult to contain primarily because bentonite readily disperses in flowing water and quickly settles in standing water. While the HDD method poses a small risk of frac-out, potential releases would be contained by BMPs that are described within the HDD contingency plans required for drilled crossings. These contingency plans are prepared by the pipeline contractor prior to construction. These practices include monitoring the HDD, monitoring downstream for evidence of drilling fluids, and mitigation measures to address a frac-out should one occur. Additionally, effects to the species are unlikely as the existing substrate within Union Creek at the proposed crossing is clay (similar to the bentonite clay that is the main component of drilling fluid), which is not suitable habitat for this species at the HDD location.**
American burying beetle (*Nicrophorus americanus*)
Effects on individual American burying beetles could occur as a result of vegetation clearing, grading, and trench excavation. This could include temporary disturbance, potential injury and/or potential mortality to eggs, larvae, pupae, and adults through construction vehicle traffic and exposure during excavation. Construction activities could also lead to effects on the species through effects on its habitat, namely temporary habitat loss, potential permanent alteration of suitable habitat to unsuitable habitat, and habitat fragmentation where the pipeline is not already co-located with other utilities. The use of temporary access roads would not affect this species because all of the proposed temporary access roads within the range of this species are existing access roads and would not require grading or other maintenance to accommodate Keystone's proposed use. **Artificial lighting has the potential to temporarily disrupt foraging and increase predation on the American burying beetle. Most construction activities would take place during daylight hours and construction areas would not generally use artificial lighting. Activities that could potentially require lighting could include critical pipeline tie-ins, HDD crossings, and certain work required after sunset due to weather, safety, or other proposed-Project requirements. HDD crossings would require 24-hour operation until the crossing is completed. Localized fuel spills may occur during construction, however, Keystone would develop and implement a Spill Prevention Control and Countermeasures Plan to avoid or minimize any short-term effects.** **During construction, soil moisture may be reduced across the ROW as the site is prepared by removing vegetation and topsoil and from grading. As stated in the CMRP, disturbed areas would be restored to approximate pre-construction vegetation, use, and capability. This involves treatment of soil, as necessary, to preserve approximate pre-construction capability and stability in a manner consistent with the original vegetation cover and land use. It is anticipated that the construction methods of replacing topsoil and re-establishing appropriate, non-sod-forming vegetation would result in re-establishing natural soil hydrology within the construction ROW and would result in no long-term effects on American burying beetle habitat outside of the permanent ROW and areas occupied by facilities.**

Table 4.7-3. Potential Impacts from Construction

Western prairie fringed orchid *(Platanthera praeclara)*
The proposed pipeline construction activities are highly unlikely to disturb western prairie fringed orchid communities because the species is unlikely to occur in the proposed pipeline ROW or within the footprint of ancillary facilities; however, approximately 135 acres of potential western prairie fringed orchid habitat would experience effects due to ground disturbance during construction of the proposed pipeline. Potential effects from invasive species introduction following construction would be minimized through Keystone's weed and vegetation monitoring plans discussed within the CMRP which would be updated prior to construction. Temporary withdrawals of water (e.g., for hydrostatic pipeline testing) have some potential for effects on potentially suitable habitat for this species. However, implementation of conservation measures as outlined in Table 4.7-4 and in the CMRP would help minimize effects, and these effects, if any, would be minor (insignificant and discountable).
Blowout penstemon (*Penstemon haydenii*)
Species does not occur in area of proposed Project; therefore no impacts are anticipated.

BMP = best management practice; CMRP = Construction Mitigation and Reclamation Plan; HDD = horizontal directional drill; ROW = right-of-way; SEIS = Supplemental Environmental Impact Statement

Table 4.7-4. Species Conservation Measures

Interior least tern (*Sternula antillarum)*

- Crossings of major rivers and riverine habitat will be completed using HDD, resulting in a pipeline burial depth of 25 feet or greater, regardless of the season.
- Keystone will implement measures identified in the HDD contingency plan, including monitoring of the HDD bore, monitoring downstream of the HDD site for evidence of drilling fluids, and mitigation measures should a frac-out occur.
- Where practicable, vegetative screening at HDD sites will be maintained to prevent disturbance of interior least terns.
- Should HDD activities occur at night, lights will be down-shielded when the site is within 0.25 mile of potentially suitable habitat and vegetative screening is lacking.
- Pre-construction presence/probable absence surveys of pipeline crossings will occur within 0.25 mile of potentially suitable breeding habitat at the Platte, Elkhorn, and Niobrara rivers in Nebraska; the Cheyenne River in South Dakota; and the Yellowstone River in Montana during the interior least tern nesting season (April 15 to September 1) to ensure that there are no nesting pairs within 0.25 mile of the construction area. If interior least tern nests are found at the crossings, Keystone will: (1) adhere to a 0.25-mile buffer of no pipeline construction activity and (2) continue to monitor nests if any are within 0.25 mile of the construction footprint until young have fledged.
- Daily surveys for nesting terns will be conducted during the nesting season when construction activities occur within 0.25 mile of potential nesting habitat.
- If nesting terns are present, Keystone will make minor adjustments to the pipeline corridor, if practicable, to avoid nesting interior least terns, in coordination with USFWS. This may involve shifting the pipeline corridor away from nests to avoid disturbances to interior least tern nests or other modifications depending on the circumstances.
- To the extent practicable, construction will occur mostly during daytime hours and will comply with any local noise regulations.
- Construction equipment will be properly equipped with mufflers to lessen noise impacts.
- Keystone will prepare and implement a project-specific SPCC Plan.
- Keystone will mark and maintain a 100-foot buffer from river crossings, free from hazardous materials, fuel storage, and vehicle fuel transfers. These buffers will be maintained during construction except when fueling and refueling the water pump near the river edge, which is required for the HDD crossing and hydrostatic test water withdrawal. Water pump fueling will be completed by trained personnel and will use secondary containment; a spill kit will be onsite.

Table 4.7-4. Species Conservation Measures

• **Refueling and lubrication of construction equipment will occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup will conduct these activities.** • **All equipment maintenance and repairs will be performed in upland locations at least 100 feet from waterbodies and wetlands.** • **All equipment will be parked at least 100 feet from a watercourse or wetland overnight, if possible.** • **Equipment will not be washed in streams or wetlands.** • **Construction and restoration activities will be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials.** • **Each construction crew and cleanup crew will have sufficient tools and materials on hand to stop leaks, including supplies of absorbent and barrier materials that will allow for rapid containment and recovery of spilled materials.** • **Water withdrawal for hydrostatic testing will be less than 10 percent of the baseline daily flow.** • **Keystone will minimize temporary water reductions by withdrawing only the volume of water needed for hydrostatic testing as outlined in its permits. Water will be returned to its source within a 30-day period except where the hydrostatic test water is used to test multiple spreads. At the conclusion of hydrostatic testing, the remaining water will be returned to the source.** • **During aerial surveillance, aircraft will maintain at least 1,000 feet of elevation.**
Piping plover (*Charadrius melodus)*
• **Crossings of major rivers and riverine habitat will be completed using HDD, resulting in a pipeline burial depth of 25 feet or greater, regardless of the season.** • **Keystone will implement measures identified in the HDD contingency plan, including monitoring of the HDD bore, monitoring downstream of the HDD site for evidence of drilling fluids, and mitigation measures should a frac-out occur.** • **Where practicable, vegetative screening at HDD sites will be maintained to prevent disturbance of piping plovers.** • **Should HDD activities occur at night, lights will be down-shielded when the site is within 0.25 mile of potentially suitable habitat and vegetative screening is lacking.** • **Pre-construction presence/probable absence surveys of pipeline crossings will occur within 0.25 mile of potentially suitable breeding habitat at the Platte, Elkhorn, and Niobrara rivers in Nebraska; the Cheyenne River in South Dakota; and the Yellowstone River in Montana during the piping plover nesting season (April 15 to September 1) to ensure that there are no nesting pairs within 0.25 mile of the construction area. If piping plover nests are found at the crossings, Keystone will: (1) adhere to a 0.25-mile buffer of no pipeline construction activity and (2) continue to monitor nests if any are within 0.25 mile of the construction footprint until young have fledged.** • **Daily surveys for nesting piping plovers will be conducted during the nesting season when construction activities occur within 0.25 mile of potential nesting habitat.** • **If nesting piping plovers are present, Keystone will make minor adjustments to the pipeline corridor, if practicable, to avoid nesting plovers, in coordination with USFWS. This may involve shifting the pipeline corridor away from nests to avoid disturbances to piping plover nests or other modifications depending on the circumstances.** • **To the extent practicable, construction within 0.25 mile of a piping plover nest will occur mostly during daytime hours and will comply with any local noise regulations.** • **Construction equipment will be properly equipped with mufflers to lessen noise impacts.** • **Keystone will prepare and implement a project-specific SPCC Plan.** • **Keystone will mark and maintain a 100-foot buffer from river crossings, free from hazardous materials, fuel storage, and vehicle fuel transfers. These buffers will be maintained during construction except when fueling and refueling the water pump near the river edge that is required for the HDD crossing and hydrostatic test water withdrawal. Water pump fueling will be completed by trained personnel and will use secondary containment and a spill kit will be onsite.** • **Refueling and lubrication of construction equipment will occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup will conduct these activities.**

Table 4.7-4. Species Conservation Measures

- **All equipment maintenance and repairs will be performed in upland locations at least 100 feet from waterbodies and wetlands.**
- **All equipment will be parked at least 100 feet from a watercourse or wetland overnight, if possible.**
- **Equipment will not be washed in streams or wetlands.**
- **Construction and restoration activities will be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials.**
- **Each construction crew and cleanup crew will have sufficient tools and materials on hand to stop leaks, including supplies of absorbent and barrier materials that will allow for rapid containment and recovery of spilled materials.**
- **Water withdrawal for hydrostatic testing will be less than 10 percent of the baseline daily flow.**
- **Keystone will minimize temporary water reductions by withdrawing only the volume of water needed for hydrostatic testing as outlined in its permits. Water will be returned to its source within a 30-day period except where the hydrostatic test water is used to test multiple spreads. At the conclusion of hydrostatic testing, the remaining water will be returned to the source.**
- **During aerial surveillance, aircraft will maintain at least 1,000 feet of elevation**.

Rufa red knot (*Calidris canutus rufa)*

- **Crossings of major rivers and riverine habitat will be completed using HDD, resulting in a pipeline burial depth of 25 feet or greater, regardless of the season.**
- **Keystone will implement measures identified in the HDD contingency plan, including monitoring of the HDD bore, monitoring downstream of the HDD site for evidence of drilling fluids, and mitigation measures should a frac-out occur.**
- **Keystone will prepare and implement a project-specific SPCC Plan.**
- **To the extent practicable, construction will occur mostly during daytime hours and will comply with any local noise regulations.**
- **Construction equipment will be properly equipped with mufflers to lessen noise impacts.**
- **Keystone will mark and maintain a 100-foot buffer from river crossings, free from hazardous materials, fuel storage, and vehicle fuel transfers. These buffers will be maintained during construction except when fueling and refueling the water pump near the river edge that is required for the HDD crossing and hydrostatic test water withdrawal. Water pump fueling will be completed by trained personnel and will use secondary containment and a spill kit will be onsite.**
- **Refueling of lubrication of construction equipment will occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup will conduct these activities.**
- **All equipment maintenance and repairs will be performed in upland locations at least 100 feet from waterbodies and wetlands.**
- **All equipment will be parked at least 100 feet from a watercourse or wetland overnight, if possible.**
- **Equipment will not be washed in streams or wetlands.**
- **Construction and restoration activities will be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials.**
- **Each construction crew and cleanup crew will have sufficient tools and materials on hand to stop leaks, including supplies of absorbent and barrier materials that will allow for rapid containment and recovery of spilled materials.**
- **Water withdrawal for hydrostatic testing will be less than 10 percent of the baseline daily flow.**
- **Keystone will minimize temporary water reductions by withdrawing only the volume of water needed for hydrostatic testing as outlined in their permits. Water will be returned to its source within a 30-day period except where hydrostatic test water is used to test multiple spreads. At the conclusion of hydrostatic testing, the remaining water will be returned to the source.**

Table 4.7-4. Species Conservation Measures

Whooping crane (*Grus americana)*
• Crossings of major rivers and riverine habitat will be completed using HDD, resulting in a pipeline burial depth of 25 feet or greater, regardless of the season. • Keystone will implement measures identified in the HDD contingency plan, including monitoring of the HDD bore, monitoring downstream of the HDD site for evidence of drilling fluids, and mitigation measures should a frac-out occur. • Should HDD activities occur at night, lights will be down-shielded during the spring and fall whooping crane migration seasons in areas that provide potentially suitable habitat. • Where practicable, vegetative screening at HDD sites will be maintained to prevent disturbance of whooping cranes. • During spring (March–May) and fall (October–November) whooping crane migration periods, environmental monitors will complete a daily brief survey of any wetland or riverine habitat areas potentially used by whooping cranes in the morning and afternoon before starting equipment and following the Whooping Crane Survey Protocol previously developed by the USFWS and NGPC. If whooping cranes are sighted, the environmental monitor will immediately contact the USFWS and respective state agency in Nebraska, South Dakota, and/or Montana for further instruction and require that all human activity and equipment start-up be delayed. Work could proceed if whooping crane(s) leave the area. The compliance manager will record the sighting, bird departure time, and work start time on the survey form. The USFWS will notify the compliance manager of whooping crane migration locations during the spring and fall migrations through information gathered from the whooping crane tracking program. • Keystone will re-vegetate disturbed areas (particularly within riparian zones and in wetland habitats) in accordance with the CMRP and USACE permit requirements. • Use of helicopters within 0.5 mile of any whooping crane(s) will be prohibited. • Keystone will prepare and implement a project-specific SPCC Plan. • Keystone will mark and maintain a 100-foot buffer from river crossings, free from hazardous materials, fuel storage, and vehicle fuel transfers. These buffers will be maintained during construction except when fueling and refueling the water pump near the river edge that is required for the HDD crossing and hydrostatic test water withdrawal. Water pump fueling will be completed by trained personnel and will use secondary containment and a spill kit will be onsite. • Refueling and lubrication of construction equipment will occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup will conduct these activities. • All equipment maintenance and repairs will be performed in upland locations at least 100 feet from waterbodies and wetlands. • All equipment will be parked at least 100 feet from a watercourse or wetland overnight, if possible. • Equipment will not be washed in streams or wetlands. • Construction and restoration activities will be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials. • Each construction crew and cleanup crew will have sufficient tools and materials on hand to stop leaks, including supplies of absorbent and barrier materials that will allow for rapid containment and recovery of spilled materials. • Water withdrawal for hydrostatic testing will be less than 10 percent of the baseline daily flow. • Keystone will minimize temporary water reductions by withdrawing only the volume of water needed for hydrostatic testing as outlined in its permits. Water will be returned to its source within a 30-day period except where the hydrostatic test water is used to test multiple spreads. At the conclusion of hydrostatic testing, the remaining water will be returned to the source. • During aerial surveillance, aircraft will maintain at least 1,000 feet of elevation.

Table 4.7-4. Species Conservation Measures

Black-footed ferret (*Mustela nigripes)*
• Keystone will provide USFWS with the results of Montana prairie dog town surveys and continue to coordinate with the Montana USFWS Ecological Services Office to determine the need for black-footed ferret surveys, in accordance with the USFWS Black-footed Ferret Survey Guidelines. • Workers will be prohibited from keeping domestic pets in construction camps and/or worksites. • Workers will be made aware of how canine distemper and sylvatic plague diseases are spread (domestic pets and fleas). • Workers will be prohibited from feeding wildlife. • Concentrations of dead and/or apparently diseased animals (prairie dogs, ground squirrels, others) will be reported to the appropriate state and federal agencies. • Keystone will prepare and implement a Project-specific SPCC Plan.
Northern long-eared bat *(Myotis septentrionalis)*
• Keystone will implement measures identified in the HDD contingency plan, including monitoring of the HDD bore, monitoring downstream of the HDD site for evidence of drilling fluids, and mitigation measures should a frac-out occur. • Should HDD activities occur at night, lights will be down-shielded. • Where practicable, vegetative screening at HDD sites will be maintained to prevent disturbance of northern long-eared bats. • No tree removal will occur within 0.25 mile of a known occupied hibernaculum. • No tree removal will occur within 150 feet of a known occupied maternity roost tree during the pup season (June 1 to July 31). • Pre-construction presence/absence surveys will be completed if there is a need to remove potentially suitable habitat within the proposed Project area during the pup season (June 1 to July 31). If required, surveys will be conducted pursuant to local USFWS field office and state resource agency requirements and the need for any additional tree clearing restrictions, if any, will be determined in coordination with applicable state and federal resource agencies pending survey results. • During aerial surveillance, aircraft will maintain at least 1,000 feet of elevation. • Keystone will prepare and implement a project-specific SPCC Plan.
Pallid sturgeon (*Scaphirhynchus albus)*
• HDD would be used under the Milk, Missouri, Yellowstone, and Platte rivers. • At least a 100-foot setback from the water's edge for the HDD drill pads would be used at the HDD crossings at the Milk, Yellowstone, Missouri, and Platte rivers. • Potential releases during HDD (frac-outs) would be contained by BMPs that are described within the HDD contingency plans required for drilled crossings. • Broadcast applications of pesticides or herbicides would be avoided within 0.25 mile of water bodies. • Upstream and downstream fish passage would be maintained during any stream habitat disturbance. • The intake end of any water withdrawal pump would be screened with mesh having openings no larger than 0.125 inch, a floating surface intake would be used to avoid the benthic habitat used by the sturgeon; water velocity at the screen would not exceed 12 centimeters per second to prevent entrainment of larval fish, and the intake screens would be periodically checked for fish impingement. Should a sturgeon become impinged against the screen, all pumping operations would immediately cease and the compliance manager for Keystone would immediately contact the USFWS to determine if additional protection measures would be required. • Water withdrawal from the Milk, Missouri, and Yellowstone rivers for any purpose would be avoided from May 15 through July 15 of any year to avoid pallid spawning periods and the impingement and entrainment of free embryos and larval pallid sturgeon that drift with the current during that time of year. • Water withdrawal from the Platte River for any purpose would be avoided March 1 through June 30 of any year to avoid pallid spawning periods and the impingement and entrainment of free embryos and larval pallid sturgeon that drift with the current during that time of year.

Table 4.7-4. Species Conservation Measures

• Care would be taken during the discharge to prevent erosion or scouring of the waterbody bed and banks to avoid impacts to spawning habitat for the species. Hydrostatic test discharge would be in upland locations near the source of the water. Water would be discharged over several days and through a hay bale apparatus or other velocity reduction and erosion control device. • Temporary water reductions would be avoided based on Keystone's plan to withdraw the volume needed and to return water back to its source within a 30-day period for the Platte River. • Major rivers would be crossed using the HDD method with a pipeline burial depth of 25 feet or greater below the river bed to avoid direct impacts to habitat. • Proposed HDD entry and exit points are more than 600 feet from the Platte River; if these points are changed, at least a 100-foot setback from the water's edge would be maintained. • Measures identified in a required HDD contingency plan would be implemented, including monitoring of the directional drill bore, monitoring downstream for evidence of drilling fluids, and mitigation measures to address a frac-out should one occur. • Major river crossings are subject to an intensive integrity management program stipulated by the USDOT (Integrity Management Rule, 49 CFR 195) and require heavier wall pipe be used for the HDD method.
Topeka shiner (*Notropis topeka*)
• Crossing of Union Creek will be completed using HDD, resulting in a pipeline burial depth of 25 feet or greater. • Keystone will implement measures identified in the HDD contingency plan, including monitoring of the HDD bore, monitoring downstream of the HDD site for evidence of drilling fluids, and mitigation measures should a frac-out occur. • Pre-construction presence/probable absence surveys of Union and Taylor creeks will be completed during the year of construction. • A dry crossing method or HDD will be used if the Topeka shiner is identified during pre-construction surveys. • Keystone will ensure that water required for HDD operations or hydrostatic testing will be sourced from locations without Topeka shiner presence. • Keystone will maintain at least a 100-foot setback from the water's edge for any HDD drill pads, should the HDD method be used. • Keystone will implement BMPs outlined in the CMRP to prevent and minimize sediment runoff from construction areas from entering receiving streams that may provide potentially suitable Topeka shiner habitat. • Broadcast applications of pesticides or herbicides will be avoided near water bodies. • Keystone will avoid water depletions within occupied river basins. • Upstream and downstream fish passage will be maintained during any stream habitat disturbance. • The intake end of any water withdrawal pump will be screened with mesh having openings no larger than 0.125 inch. Water velocity at the screen will not exceed 0.5 feet per second, and the intake screens will be checked periodically for fish impingement. Should a Topeka shiner become impinged against the screen, all pumping operations will immediately cease and the compliance manager for Keystone will immediately contact the USFWS to determine if additional protection measures will be required. An environmental inspector will be present every day during water withdrawals to ensure compliance with permit conditions and to ensure that Keystone's commitments are met.
American burying beetle (*Nicrophorus americanus*)
• Mowing: The purpose of mowing construction areas is to ensure that the American burying beetle is not attracted to the active construction site. Mowing occurs when the American burying beetle is active, so depending on the ground disturbance timeframe, the period when these procedures will be implemented is from March 15 through October 31, based on NGPC guidance. NGPC recommends mowing construction areas 2 weeks prior to the commencement of ground disturbing activities between these dates. For winter construction activities (October 31 to March 31) mowing would occur by October 15. Mowing and raking away grass clippings allows the ground to dry out. In accordance with NGPC guidance, construction areas will be mowed such that the vegetation is as low as possible without causing erosion (less than 8 inches).

Table 4.7-4. Species Conservation Measures

Hand clearing or mechanical mowing will be used to mow uplands. Forested uplands will not be cleared ahead of mainline construction and wetlands and streams will also be avoided. This short vegetation height will be maintained for the duration of active construction during the American burying beetle overall active period (until October 31) or until construction in the vicinity is completed, whichever is earlier. Mowing will be completed every 2 weeks, if necessary, to ensure vegetation is kept less than 8 inches tall until grading commences. Once mowed, clippings will be removed. Possible methods include raking, windrowing, or baling. If the grass has stopped growing, or grading commences, mowing can stop. All construction, work vehicles and personal vehicles will be staged in mowed areas. If it is not possible to maintain vegetation under 8 inches in height, construction will avoid such areas until the vegetation can be mowed to less than 8 inches in height. Once mowing procedures have been initiated, weekly reports will be kept and submitted to USFWS, NGPC, and SDGFP. These reports will demonstrate that the conservation measures are being implemented and become part of the records. Weekly reports are only required during the American burying beetle active period (April 1 to October 31) while construction on the project is active. Photos documenting grass heights will be provided.

- **Carrion removal: Removing carrion (essential for American burying beetle feeding and reproduction) will make the work area less attractive to the American burying beetle. By removing carrion in areas where construction would occur, this ensures that American burying beetle would not be feeding or burying carcasses in an area where they could encounter construction equipment. In accordance with NGPC guidance, the work area will be prepared by removing any and all carcasses prior to construction. Carcasses as small as songbirds, snakes, and rodents are ideal food for the American burying beetle; therefore, this removal activity will be thorough. Carcass removal will occur between March 15 and October 31 or until construction is completed, whichever is earlier. Personnel will survey the ROW daily to remove carrion. Carcass removal can be done at any time throughout the day; however, the preferred timing is in the late afternoon, since the American burying beetle is active at night. This will ensure that American burying beetles are not drawn to the area by roadkill caused by daytime traffic. Disposal of carcasses will be at least 0.5 miles away from the work site. Carrion removal reports will be submitted as with the mowing reports. Once carrion removal procedures have been initiated, weekly reports will be kept and submitted to USFWS, NGPC, and SDGFP, as well as the designated Environmental Inspector for filing. These reports demonstrate that the conservation measures are being implemented and become part of the records. Weekly reports are only required during the American burying beetle active period (April 1 to October 31) while construction on the project is active. If the number and species of carrion can be easily identified (for example, deer carcass, bull snake, mouse, etc.), this information will be included in the report. Photo documentation of carrion removed will be provided.**
- **During the construction phase, most construction activity will take place in daylight hours. Construction activities taking place at night would require artificial lighting and could thereby have an effect on American burying beetle by disruption of normal behavior patterns. Construction at night and the use of lights will be limited to specific situations requiring this activity such as critical tie-ins, HDDs, and during certain weather conditions. Where such activities require lighting, the lights will be down shielded and utilize warm amber-colored lights with a color temperature of 3000 Kelvin or less and intensity no greater than 70,000 lumens. Lighting required for contractor yards and pump stations will also be down shielded, except where required for safety and security, and will utilize sodium vapor or LED lighting meeting the above specifications.**
- **Keystone will implement an education program for construction personnel engaged in the proposed Project. This will include a presentation focused on identifying the American burying beetle, explaining its life history, its current range, and its habitat requirements. Construction personnel will be instructed to report any sightings of American burying beetle or brood chambers if encountered. Education cards will be provided to all construction personnel. Signs will be placed at construction entrances identifying the area as potential American burying beetle habitat.**
- **Immediately following construction, disturbed areas will be ripped to a depth of 24 inches to relieve soil compaction existing at the site from the use of heavy equipment. This effort will improve or enhance American burying beetle habitat by making soils easier for beetles to bury in. Keystone's CMRP provides further details with regard to relief of soil compaction within ROWs following construction.**
- **Erosion control techniques such as silt fencing, hay bales, water bars, and other efforts will be used to prevent washing away of topsoil, formation of gullies, or other erosion that could negatively affect American burying beetle habitat through the action of surface water. Keystone's CMRP provides further details with regard to erosion control following construction.**

Table 4.7-4. Species Conservation Measures

- **Immediately following construction, disturbed areas will be temporarily stabilized by broadcasting cool season species such as annual rye grass or wheat seed. Where necessary, clean, weed-free wheat straw will be used as mulch to protect seed and increase soil moisture. These grasses are annual species that senesce when temperatures warm during summer; they will not become permanently established. During the spring, a mixture of native warm season grasses will be planted within the ROW. This will include species such as little bluestem, big bluestem, Indiangrass, and switchgrass. Natural recruitment of other native grasses and forbs will also occur. It should be noted that some portions of the ROW, in response to landowner requirements, will be revegetated using non-native species such as smooth brome. This type of re-vegetation will likely be restricted to areas that are currently dominated by improved grass pastures and will therefore not lead to a reduction of habitat dominated by native species. In the limited circumstance where landowners request re-vegetation of previously native vegetation to non-native vegetation, Keystone will consider this as a permanent effect on habitat and will provide appropriate mitigation for those areas. Keystone's CMRP provides further details with regard to restoration of ROWs following construction.**
- **Keystone is committed to habitat restoration following construction. The American burying beetle monitoring program will provide assurances that the acres disturbed would be restored appropriately. Failure is unlikely due to Keystone's commitment to re-seed in subsequent years if unsuccessful after the first growing season. Criteria for successful reclamation are: 1) reclamation will be measured 4 years after the commencement of construction; 2) for reclamation to be deemed successful, native grasslands restored on the ROW must be comparable to those on adjacent undisturbed lands; 3) 70 percent of the dominant species on the ROW must be the same as those that occur on adjacent off-ROW lands.**

Western prairie fringed orchid *(Platanthera praeclara)*

- **Pre-construction presence/probable absence surveys will be conducted within potentially suitable habitat that was not previously surveyed. Survey results will be submitted to the USFWS for review. Species presence will be assumed in potentially suitable habitat if surveys cannot be conducted during the flowering period.**
- **The Project alignment will be adjusted to avoid any identified populations as practicable and/or approved by the landowner.**
- **To the greatest extent practicable, the width of the construction ROW will be reduced in areas where western prairie fringed orchid populations have been identified.**
- **Keystone will develop and implement a noxious and invasive weed control program consistent with the CMRP to reduce the potential for spread or invasion of weeds.**
- **Herbicide application will occur by spot spraying.**
- **Use of herbicides within 100 feet of documented western prairie fringed orchid occurrence will be restricted.**
- **Keystone will minimize the potential for altered hydrology (e.g., surface water flow, infiltration and groundwater levels) in potentially suitable habitat through BMPs outlined in the CMRP.**
- **Keystone will salvage and segregate topsoil appropriately where populations have been identified to preserve native seed sources in the soil for use in revegetation efforts in the ROW.**
- **Keystone will restore wet meadow habitat using a USFWS- and NGPC-approved seed mix.**
- **Potentially suitable wet meadow habitats will be restored following Project construction.**
- **Restoration of construction-related impacts on wet meadow habitats identified as potentially suitable for the western prairie fringed orchid will be monitored for a 5-year period, per USACE guidelines.**

BA = Biological Assessment; BMP = best management practice; CMRP = Construction, Mitigation and Reclamation Plan; HDD = horizontal directional drill; MAR = Mainline Alternative Route; NGPC = Nebraska Game and Parks Commission; PS = Pump Station; ROW = right-of-way; SDGFP = South Dakota Game Fish and Parks; SPCC = Spill Prevention Control and Countermeasure; ROW = right-of-way; USACE = U.S. Army Corps of Engineers; USFWS = U.S. Fish and Wildlife Service

Table 4.7-**5** provides the assessment of potential for adverse effects on species protected under the ESA **for the entire project**. As noted in the table, the conclusions are based on implementation of conservation measures by Keystone. Table 4.7-**6** in Section 4.7.3.2 evaluates potential impacts from normal operations and maintenance which is considered in Table 4.7-**5** conclusions.

Table 4.7-5. Summary of Effects for Federally Protected Species

Common Name/ Scientific Name	Status	Conclusion[a]	Justification
Birds			
Eskimo curlew ***Numenius borealis***	E	**2014 Keystone XL Final SEIS: No effect** **Change from 2014 Conclusion: No**	Species is presumed extinct.
Interior least tern ***Sterna antillarum***	E	**2014 Keystone XL Final SEIS: Less than significant (insignificant and discountable); Not Likely to Adversely Affect** **Change from 2014 Conclusion: No**	**The use of the HDD crossing method would avoid effects on interior least terns or their habitat during pipeline construction. The effect of construction-related spills within interior least tern habitat would be minimal because all hazardous materials such as fuels and oils would be stored at least 100 feet away from surface waters, and these types of spills or leaks generally are small in volume and are cleaned up quickly.** In addition, conservation measures **summarized in Table 4.7-4** would further reduce potential for adverse effects on this species.
Piping plover ***Charadrius melodus***	T	**2014 Keystone XL Final SEIS: Less than significant (insignificant and discountable); Not Likely to Adversely Affect** **Change from 2014 Conclusion: No**	**The use of the HDD crossing method would avoid effects on piping plover or their habitat during pipeline construction. The effect of construction-related spills within piping plover habitat would be minimal because all hazardous materials such as fuels and oils would be stored at least 100 feet away from surface waters, and these types of spills or leaks generally are small in volume and are cleaned up quickly. In addition, conservation measures summarized in Table 4.7-4 would further reduce potential for adverse effects on this species**.
Rufa red knot ***Calidris canutus rufa***	T	**2014 Keystone XL Final SEIS: Not Applicable (species listed for protection in 2015)** **Change from 2014 Conclusion: Yes (species was not protected under the ESA at the time of the 2014 Keystone XL Final SEIS); Not Likely to Adversely Affect**	**The rufa red knot occurs sporadically during spring and fall migration. Given that there are no records within 1 mile of the proposed pipeline route, no temporary effects to rufa red knots are expected as a result construction. In addition, conservation measures summarized in Table 4.7-4 would further reduce potential for adverse effects on this species.**

Table 4.7-5. Summary of Effects for Federally Protected Species

Common Name/ Scientific Name	Status	Conclusion[a]	Justification
Whooping crane ***Grus americana***	E	**2014 Keystone XL Final SEIS: Less than significant (insignificant and discountable); Not Likely to Adversely Affect** **Change from 2014 Conclusion: No**	The whooping crane is a migratory species through the Project area. **The effect of construction-related spills within whooping crane roosting and foraging habitat would be minimal; suitable roosting and/or foraging habitats along the major rivers would be avoided by HDD. Any vegetation disturbance adjacent to suitable riverine habitat would be allowed to completely revegetate following construction. Based on the current migration pathway of this species, potential occurrence on the ground within or near the Project area could occur but would be extremely rare and would be limited to a few individuals or small groups of migrant birds. Conservation m**easures included in **Table 4.7-4** would further reduce potential for adverse effects on this species along potential stopover habitat. Chapter 6 analyzes the potential for adverse effects from newly constructed powerlines.
Mammals			
Black-footed ferret ***Mustela nigripes***	E	**2014 Keystone XL Final SEIS: Less than significant (insignificant and discountable); Not Likely to Adversely Affect[b]** **Change from 2014 Conclusion:** No	The lack of potential occurrence of wild populations of black-footed ferrets within the proposed Project area and the conservation measures **summarized in Table 4.7-4** would reduce the potential for adverse effects.
Gray wolf ***Canis Lupus***	E	**2014 Keystone XL Final SEIS: No effect** **Change from 2014 Conclusion: No**	There are no populations of gray wolves in South Dakota or Nebraska, and the species is no longer listed in Montana.
Northern long-eared bat ***Myotis septentrio-nalis***	T	**2014 Keystone XL Final SEIS: Not Applicable (species listed for protection in 2015)** **Change from 2014 Conclusion: Yes (species was not protected under the ESA at the time of the 2014 Keystone XL Final SEIS); May Affect, but complies with 4(d) rule**	**Adverse effects on the northern long-eared bat are unlikely as this species is highly unlikely to occur within the** P**roject area. Tree removal activities will be conducted in accordance with the final northern long-eared bat 4(d) rule, and incidental take, if any, would not be prohibited. Conservation measures included in Table 4.7-4 would further reduce potential for adverse effects on this species**.
Fish			
Pallid sturgeon ***Scaphirhynchus albus***	E	**2014 Keystone XL Final SEIS: Less than significant (insignificant and discountable); Not Likely to Adversely Affect** **Change from 2014 Conclusion: No**	Direct impacts to habitat would be avoided **through use of HDD**. Indirect impacts would be avoided through conservation measures included in **Table 4.7-4**.

Table 4.7-5. Summary of Effects for Federally Protected Species

Common Name/ Scientific Name	Status	Conclusion[a]	Justification
Topeka shiner ***Notropis topeka***	E	**2014 Keystone XL Final SEIS: No impact; No Effect** **Change from 2014 Conclusion: Yes (species range was outside of the original alignment analyzed in the 2014 Keystone XL Final SEIS); Less than significant (insignificant and discountable); Not Likely to Adversely Affect**	**Direct impacts to habitat would be avoided through use of HDD.** Indirect impacts would be avoided through conservation measures included **Table 4.7-4.**
Invertebrates			
American burying beetle ***Nicrophorus americanus***	E	**2014 Keystone XL Final SEIS: May Affect, Likely to Adversely Affect** **Change from 2014 Conclusion: No (species range is outside of the MAR; however, overall potential for adverse effects would be similar to those described in the 2014 Keystone XL Final SEIS for areas of suitable habitat [May Affect, Likely to Adversely Affect])**	**Effects on individual American burying beetles could occur as a result of during construction of various elements of the pipeline system, including permanent access roads, on-ROW facilities, off-ROW auxiliary sites, and the pipeline itself. Effects could occur as a result of during vegetation clearing, site grading, and trench excavation. Table 4.7-4 contains conservation measures to minimize and mitigate construction-related impacts.**
Plants			
Blowout penstemon ***haydenii***	E	**2014 Keystone XL Final SEIS: No effect** **Change from 2014 Conclusion: No**	Project avoids all potential habitat.
Western prairie fringed orchid ***Platanthera praeclara***	T	**2014 Keystone XL Final SEIS: Less than significant; Not Likely to Adversely Affect** **Change from 2014 Conclusion: No**	**Construction of the proposed pipeline and ancillary facilities is unlikely to disturb western prairie fringed orchid communities because the species is unlikely to occur in the proposed pipeline ROW or within the footprint of ancillary facilities. Revegetation of disturbed areas could introduce or expand invasive species, especially leafy spurge, Kentucky bluegrass, and Canada thistle, some potentially aggressive competitors of the western prairie fringed orchid. To avoid and minimize this risk, Keystone has developed weed and vegetation monitoring plans to prevent the spread of invasive species. Conservation measures included in Table 4.7-4 would further reduce potential for adverse effects on this species.**

[a] Terminology "may affect, not likely to adversely affect" and "insignificant and discountable" used for impact assessment under the ESA. Discountable refers to the impact or event being extremely unlikely to occur. This SEIS assumes impacts would be less than significant (insignificant and discountable) based on conservation measures identified.

[b] Adverse effects from this factor are unlikely due to the diurnal nature of the surveillance activities and the nocturnal activity of black-footed ferrets.

ESA = Endangered Species Act; HDD = horizontal directional drill; MAR = Mainline Alternative Route; SEIS = Supplemental Environmental Impact Statement

4.7.3.2 Operations and Maintenance

Vegetation

Operations and maintenance of the MAR would have minor adverse effects on vegetation and is consistent with the 2014 Keystone XL Final SEIS conclusion that operational impacts to vegetation would be less than significant. As shown in Table 4.7-1, the permanent pipeline is located predominantly within cultivated cropland (approximately 804 acres), followed by grassland (approximately 125 acres). Previously forested areas within the permanent ROW (approximately 15 acres) would be permanently converted to a non-forested vegetation type (per agreement with the landowner). Routine maintenance vegetation clearing within the permanent ROW (approximately 949 acres of vegetated areas) would occur no more than every 1 to 3 years. In addition, as required, Keystone would implement noxious and invasive weed management to control invasive species within the permanent ROW. This could include use of approved herbicides or manual removal.

As discussed in the 2014 Keystone XL Final SEIS, operation of the pipeline would cause increases in soil temperatures at the soil surface (from 4 to 8˚F) primarily during winter and greater increases would occur with increasing depth toward the pipeline (from 10 to 15˚F at 6 inches below ground surface). While many plants would not produce root systems that would penetrate much below 6 inches, the root systems of some plants, notably native prairie grasses, often penetrate well below 6 inches. Soil temperatures immediately around the buried pipeline may reach temperatures as much as 40˚F warmer than the ambient surrounding soil temperatures. In general, increased soil temperatures during early spring could cause early germination and emergence and increased productivity in annual crops such as corn and soybeans and in tallgrass prairie species (U.S. Department of State 2014).

Biologically Unique Landscapes and Vegetation Communities of Conservation Concern

Operations and maintenance of the MAR would result in minor adverse impacts to the Rainwater Basin Wetland Management District, forested areas, native grasslands and riparian woodlands and is consistent with the 2014 Keystone XL Final SEIS conclusion that operational impacts to these communities would be less than significant. Non-forested wetlands would be restored and maintained to their original condition during normal operations. Areas of forest cleared within the permanent ROW during construction would be maintained as non-forested areas during operations. As documented in Section 4.5.4 of the 2014 Keystone XL Final SEIS, heat dissipated from the pipeline during operations could potentially lead to early germination and increased productivity of plants (including native prairie grasses), but may also lead to decreased soil water content, which could be detrimental to native prairie plants (U.S. Department of State 2014). Invasion of non-native plants as well as altered land management also may prevent recovery of prairie grasslands. In addition, altered land management could include suppression of wildfires, which help to maintain prairie sod. Overall impacts, however, to these communities would be isolated and minor.

Big Game Priority Areas

Operations of the pipeline would cause minor impacts to big game Priority Area D habitat **(see Section 3.7.1.3, Big Game Priority Areas, and Figure 3.7-3 for the location of the proposed pipeline in relation to Big Game Priority Area D)**. Approximately 30 acres of lowland/prairie grasslands would be permanently lost in Priority Area D to accommodate pump stations and access roads. These impacts would be minor and localized and not contribute to the fragmentation of habitat and have negligible impacts to the conservation measures of Secretarial Order 3362.

Wildlife and Fisheries

Operations and maintenance of the MAR would have minor adverse effects on wildlife and fisheries and is consistent with the 2014 Keystone XL Final SEIS conclusion that operational impacts to wildlife and fisheries would be less than significant. The primary impacts associated with the operational phase of the pipeline include potential invasion by noxious weeds and maintenance activities associated with the pipeline and ancillary facilities (e.g., pump stations). Other than maintenance and pipeline inspections, normal operations of the proposed pipeline would generally result in negligible effects on wildlife. Direct impacts from maintenance activities, such as physical pipeline inspections or pipeline repair that would require digging up the pipeline, would be the same as those for construction. Locally elevated noise levels potentially could mask wildlife communications that are used to attract mates and defend territories, and locally reduce the use of an area by species; in addition, development could result in nest abandonment and decreased reproductive success if such activity occurs during the breeding season (U.S. Department of State 2014). Additionally, vibration detected in the soils surrounding roadways has been shown to cause certain invertebrates to ascend to soil surfaces allowing them to become prey to birds (U.S. Department of State 2014). Minor adverse effects to wildlife would occur from permanent noise generated at pump stations and temporary noise generated at sites requiring construction equipment during maintenance activities. Aerial surveillance of the pipeline (conducted 26 times per year at intervals no greater than once every 3 weeks) at an altitude of about 1,000 feet would also generate noise and potentially disturb wildlife. However, due to the elevation of aircraft and occurrence of this type of activity within the region, impacts would be minor. Potential impacts associated with accidental release of crude oil are addressed in Chapter 5, Environmental Consequences from Accidental Releases. Appropriate federal and state wildlife management agencies would be consulted prior to initiation of maintenance activities beyond standard inspection procedures.

Potential impacts to fisheries resources during the operational phase of the pipeline include reduced riparian vegetation, increased water temperature, herbicide contamination, increased bank erosion and sedimentation. Measures to avoid or minimize these impacts include aerial and ground surveillance to allow for early detection of bank stability problems and to minimize the potential for continued environmental impacts during pipeline operation, maintenance of non-forested vegetation, restrictions on herbicide use near waterbodies, use of licensed applicators for herbicides and restoration and revegetation measures presented in the CMRP. The burial depth of the proposed pipeline could mitigate potential temperature impacts, as typical pipeline burial depth under streams would be a minimum of 60 inches. HDD installation would locate the pipeline even deeper below the river bottom and would also avoid riparian vegetation clearing in these areas, thus further mitigating for potential temperature increases to streamflow. In accordance with the CMRP, no herbicides would be used within 100 feet of a wetland or waterbody, and all herbicide application would be performed by applicators appropriately licensed or certified by the state in which work is conducted. Overall adverse effects to fisheries would be minor.

Migratory Birds

Operations and maintenance of the MAR would have minor adverse effects on migratory birds and is consistent with the 2014 Keystone XL Final SEIS conclusion that operational impacts to migratory birds would be less than significant. Keystone would develop a Conservation Plan consistent with the December 2017 **Interior Solicitor's Opinion M-37050** and current applicable USFWS guidance.

Threatened and Endangered Species

Table 4.7-**6** describes the potential for adverse effect**s** on species for the **normal** operational **and maintenance** phase of the pipeline **and is consistent with the amended BA (BLM 2019)**. **Similar constraints and/or mitigation measures discussed in Table 4.7-4 would apply to any pipeline**

maintenance activities. The primary potential for adverse effects would be from aerial surveillance activities which Keystone would conduct 26 times per year at intervals no greater than once every 3 weeks **and from pipeline repairs and maintenance activities**. Chapter 6, Electrical Power Infrastructure, discusses the potential for adverse impacts relating to construction and operations of powerlines required for the Project and proposed conservation measures. Chapter 8, Summary of Consequences, provides additional information on measures to protect state-listed species.

Table 4.7-6. Potential Impacts During Normal Operations and Maintenance

Interior least tern (*Sterna antillarum)*
Surveillance flights at 1,000 feet are unlikely to disturb nesting interior least terns. Additionally, ground-based surveillance is unlikely to disturb nesting least terns as all potentially suitable least tern nesting habitat will be avoided through the use of HDD, and the pipeline would be 25 feet below the river bottom in potentially occupied habitat. **Emergency repairs and other maintenance activities are not likely to result in temporary effects on the interior least tern. Should emergency repairs be required at major river crossings, HDD methods would be used and potentially suitable habitat for interior least terns would be avoided.**
Piping plover (*Charadrius melodus)*
There are no known occurrences of piping plovers nesting within the Project area; therefore, effects during aerial and ground surveillance are unlikely to disturb nesting plovers. **All river crossings that provide potentially suitable nesting habitat or migration stopover habitats would be crossed using HDD, and the pipeline would be 25 feet below the river bottom in potentially occupied habitat.** **Emergency repairs and other maintenance activities are not likely to result in temporary effects on the piping plover. Should emergency repairs be required at major river crossings, HDD methods would be used and potentially suitable habitat for piping plover would be avoided.**
Rufa red knot (*Calidris canutus rufa)*
As there are no known transitory occurrences of rufa red knots within the Project area, effects to migrants during aerial and ground surveillance are not expected to disturb migrating knots in the unlikely event that individuals are present during surveillance flights. **Emergency repairs and other maintenance activities are not likely to result in temporary effects on the rufa red knot. Although the frequency, location, and extent of such activities cannot be predicted with certainty, it is extremely unlikely that emergency repairs would overlap with the small amount of potentially suitable stopover habitat at the time of year that the species could be present.**
Whooping crane (*Grus americana)*
Normal operation of proposed Project would not be expected to affect the whooping crane or stopover habitats used during migration. A discussion of potential long-term effects on migrating whooping cranes resulting from exposure to new power lines required for the proposed Project is contained within Chapter 6. **Aerial surveillance over-flights during migration periods would have the potential to disturb migrant whooping cranes and result in temporary effects. These flights at the 1,000 feet is altitude would be unlikely to disturb roosting or foraging cranes. Ground-based maintenance inspections that would require external pipeline examination would be unlikely to coincide with crane roosting or foraging habitats, but would have the potential to temporarily disturb migrant cranes, if present on the landscape.** **Emergency repairs and other maintenance activities could also result in temporary effects on whooping cranes if completed in or near potentially suitable habitat during spring or fall migration. Given that the frequency, location, and extent of such activities cannot be predicted with certainty, quantifying when and where individuals would be disturbed cannot be predicted. However, any such disturbance would likely be limited to individuals temporarily leaving the construction area for the duration of construction.**

Table 4.7-6. Potential Impacts During Normal Operations and Maintenance

Northern long-eared bat *(Myotis septentrionalis)*
Given that the northern long-eared bat is highly unlikely to occur within the Project area, and that no disturbance to habitat is proposed during normal operations, effects on this species from normal operations of the proposed Project are highly unlikely.   **Emergency repairs and other maintenance activities have some potential to result in temporary effects to the northern long-eared bat. Generally routine maintenance activities would be conducted within the permanent pipeline ROW, and as such, no additional impacts on potentially suitable northern long-eared bat habitat or individuals would occur. However, emergency repairs may require the removal of potentially suitable forested habitat, and may occur at any time of year, including during the active season for this species. Although the frequency, location, and extent of such activities cannot be predicted with certainty, it is possible that some activities could occur within potentially suitable habitat for the northern long-eared bat. This could lead to effects on individuals and potentially suitable habitat, as described above for pipeline construction if occupied trees are removed. However, given the species distribution relative to the Project area, temporary effects to northern long-eared bats are unlikely**.
Black-footed ferret *(Mustela nigripes)*
Routine operation of the proposed Project is not expected to affect the black-footed ferret or its habitat. Following construction, maintenance activities (e.g., vegetation management) along the ROW would not preclude the re-establishment of short-grass vegetation within both the temporary and permanent ROW. Normal pipeline operations are highly unlikely to have effects on the black-footed ferret. Potential temporary effects on black-footed ferrets, if present, could include short-term displacement due to exposure to noise, vehicles, and human disturbance during ground surveillance or aerial surveillance every two to three weeks; however, such effects are highly unlikely, due to the nocturnal activity of the black-footed ferret, the short duration of the reconnaissance, the lack of known occurrences and the lack of potentially suitable habitat within the Project area.   **Emergency repairs and other maintenance activities could also result in temporary effects on the black-footed ferret, particularly when such activities involve excavation. Although the frequency, location, and extent of such activities cannot be predicted with certainty, no effects on the black-footed ferret would be expected, as no populations occur within the Project area, and no potentially suitable habitat was identified within the Project area**.
Pallid sturgeon (*Scaphirhynchus albus)*
Routine pipeline operations are not expected to affect the pallid sturgeon. According to Keystone's Pipeline Temperature Effects Study (Appendix S of the 2014 Keystone XL Final SEIS), the pipeline does have some effect on surrounding soil temperatures, but the burial depth under rivers crossed using HDD (i.e., greater than 25 feet below the river bottom) would avoid any temperature effects on river habitats.   **Emergency repairs and other maintenance activities are not likely to result in effects on the pallid sturgeon. Although the frequency, location, and extent of such activities cannot be predicted with certainty, no effects on pallid sturgeon would be expected, as major river crossings are subject to an intensive integrity management program stipulated by the USDOT (Integrity Management Rule, 49 CFR 195) and require heavier wall pipe be used for HDD crossings. In the unlikely event that emergency repairs would be required at major river crossings, HDD methods would again be used and potentially suitable habitat for pallid sturgeon would be avoided.**
Topeka shiner (*Notropis topeka)*
According to Keystone's Pipeline Temperature Effects Study (Appendix S of the 2014 Keystone XL Final SEIS), the proposed pipeline would have some effect on surrounding soil temperatures, primarily at pipeline depth. There is limited information on the effects of pipeline temperatures in relation to surface water and wildlife. Because the pipeline would be buried greater than 25 feet below the Union Creek bottom using the HDD method, temperature effects would be negligible. Crossings completed using techniques other than HDD would be buried less deeply, but not shallower than 4 feet, and would likely have only minor effects on the temperatures of creek waters or sediment.   **Emergency repairs and other maintenance activities are not likely to affect the Topeka shiner. Regular maintenance activities would utilize the conservation measures and BMPs described in Table 4.7-4. Although the frequency, location, and extent of such activities cannot be predicted with certainty, no effects on Topeka shiner would be expected, as the species has not been documented in previous surveys and the habitat that is present at the proposed crossings is highly degraded.**

Table 4.7-6. Potential Impacts During Normal Operations and Maintenance

American burying beetle (*Nicrophorus americanus)*
American burying beetles could be affected by the operating pipeline while they hibernate. The active period for the American burying beetle across its range is usually late April through September. Proposed-Project effects that modify soil temperature could increase overwintering mortality by (1) triggering early emergence when prey is not available and when cold temperatures could result in adult mortality; (2) causing higher metabolism for these insects resulting in starvation prior to emergence; or (3) causing mortality from the beetles losing too much water because warmer temperatures result in greater desiccation risk to burying beetles. Another aspect of the proposed Project operations other than heat that may affect the American burying beetle is artificial lighting. Lights associated with aboveground facilities, particularly if the lights emit wavelengths in the ultraviolet spectrum, may attract American burying beetles, as they are known to be positively phototrophic attracted to light. However, only one sodium vapor light with down-shield attached above each pump station door would be used. **Emergency repairs and other maintenance activities could also affect the American burying beetle, particularly when such activities involve excavation. Routine maintenance would be scheduled outside of the active season for this species. However, emergency repairs may be completed at any location along the pipeline system at any time of year, including during the active season for this species, and using any equipment necessary to complete the repairs. This could lead to effects on individuals as described above for pipeline construction. Keystone estimates that less than 10 acres of suitable habitat would be affected by such activities.**
Western prairie fringed orchid *(Platanthera praeclara)*
Clearing of trees and shrubs in the ROW would be required for operational monitoring, but since this species inhabits open, native prairie, no tree or shrub clearing would occur within suitable habitat. If herbicides must be used for noxious weed control, application would be conducted by spot spraying. Populations of western prairie fringed orchid would be identified and no herbicides would be used at those locations. **Emergency repairs and other maintenance activities could potentially affect the western prairie fringed orchid, particularly when such activities involve excavation. Although the frequency, location, and extent of such activities cannot be predicted with certainty, it is possible that some could occur within suitable habitat for this species. Considering that there are no known populations within the pipeline route and that any individuals discovered would either be avoided by route micro-alignments or by reducing the size of the work area, it is highly unlikely that this species would be affected by maintenance and repairs.**

HDD = horizontal directional drill; ROW = right-of-way; SEIS = Supplemental Environmental Impact Statement

4.8 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

4.8.1 Environmental Consequences

The 2014 Keystone XL Final SEIS discusses impacts to socioeconomic conditions and minority and low-income populations along the Preferred Route. This section supplements the 2014 analysis to include impacts to socioeconomic conditions and minority and low-income populations within the MAR using an assessment of data sources presented in Section 3.8. Chapter 5, Environmental Consequences from Accidental Releases, assesses the risk to socioeconomic conditions and minority and low-income populations in the event of an accidental release. Chapter 6, Electrical Power Infrastructure, provides a description of socioeconomic conditions and minority and low-income populations and an assessment of impacts from connected actions relating to electrical supply needs required for the proposed pipeline. Chapter 7, Cumulative Impacts, provides an assessment of the impacts to socioeconomic conditions and minority and low-income populations from the proposed Project (including the electrical supply needs) in combination with other past, present and reasonably foreseeable future actions.

To evaluate the impacts on socioeconomic and environmental justice conditions, the Department reviewed the Proposed Action and No Action Alternative to determine whether any activities have the potential to cause the following:

- Adverse impacts to the local economy, housing, public services, property values or traffic and transportation, such as from an influx of workers and their families;
- Additional strain to areas currently experiencing a shortage of health professionals and medical services;
- Beneficial impacts to the local economy (e.g., increased local commerce, increased tax revenues);
- Substantial increases in daily vehicular traffic on key roadway segments, thereby degrading the Level of Service (LOS) to exceed traffic-handling capacity or resulting in delays at grade crossings. (LOS is a qualitative measure used to describe the operating conditions of a roadway based on factors such as speed, travel time, maneuverability, delay and safety);
- Conflicts with regional or local transportation improvement plans; or
- Cause a disproportionately high and adverse impact to minority or low-income populations.

The following analysis considers impacts to socioeconomic conditions and environmental justice populations during construction, normal operations and maintenance activities. Chapter 5, Environmental Consequences from Accidental Releases, discusses potential impacts to socioeconomic conditions and environmental justice populations in the event of an accidental release.

4.8.2 No Action Alternative

Under the No Action Alternative, construction and operations of the proposed Project would not occur. No changes to the existing socioeconomic conditions or adverse effects to minority or low-income populations would occur. Beneficial impacts to the local economy as described under the Proposed Action would not occur.

4.8.3 Proposed Action

This SEIS references IMPLAN Model data from the Goss and Associates report, "Socioeconomics Report for the MAR in Nebraska (Goss and Associates 2018), which describes the potential economic conditions in Nebraska resulting from the MAR. This updated report (previously updated in 2012 and 2017) focuses on the state and local taxes generated by the construction phase and operations of the MAR. Potential construction- and operations-related impacts include:

- Overburdening of the local housing stock because of demand generated by the temporary and permanent workforces;
- Substantial burden on public service providers serving the proposed Project area, such that they would need to expand their service capacities to meet those demands;
- Substantial changes to local social or economic activities, including changes in employment and income levels resulting from the proposed Project construction and operations;
- Substantial changes in economic impacts, including output and spending;
- Substantial effects to potential environmental justice populations;
- Substantial changes in fiscal revenues, including tax receipts, of local jurisdictions;
- Substantial changes in private property values; and
- Substantial effects to transportation resources.

Impacts are characterized as positive (beneficial) or negative (adverse) and, where possible, are evaluated relative to regional conditions to help assess the magnitude of socioeconomic effects.

4.8.3.1 Construction

<u>Socioeconomics</u>

Population

Construction of the MAR would have temporary and minor adverse effects on population and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to population would be less than significant. The number of residents within the counties along the MAR would increase temporarily during construction as a result of the influx of construction workers. The construction workforce of the MAR would consist of approximately 106 workers over the duration of construction, which would include Keystone employees, contractor employees and environmental inspection staff. The construction phase would support the highest number of jobs in Antelope County (approximately 20 jobs), and the lowest number in Stanton County (approximately 3 jobs) (Goss and Associates 2018). A portion of the workforce during the construction phase may be hired outside of the local area, which could result in a minor temporary increase of population.

Housing

Construction of the MAR would have short term and minor adverse effects on housing and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to housing would be less than significant. Non-local construction workers would likely seek temporary housing within the Project area, such as hotels/motels and campgrounds. There are approximately 1,572 hotels/motels and 821 campground sites within the counties along the MAR (Exp 2018). Actual vacancy rates vary seasonally, with the lowest vacancy rates likely in the spring and fall seasons, but actual vacancy rates could vary at any given time. Given the relatively low number of workers dispersed across a relatively large nine-county area and considering at least a portion of these workers would be hired locally, there would be ample temporary housing supply during construction.

Economic Base

Construction of the MAR would have beneficial effects on the economic base and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to the economic base would be beneficial. The construction phase would directly support approximately 106 jobs in the Project area. The estimated total labor income within the counties along the MAR during the 2-year construction phase would be approximately $12.1 million per year, which would generate a total direct economic output of approximately $40.7 million during the duration of construction. Construction jobs and spending could indirectly support or induce up to approximately 2,996 jobs throughout the state of Nebraska, resulting in indirect economic impacts of $340.2 million in labor income and $928.4 million in additional economic output. Specific industries experiencing most indirect economic benefits would include support activities for oil and gas operations; business support services; residential construction; and architectural, engineering and related services (Goss and Associates 2018).

Tax Revenue

The 2014 Keystone XL Final SEIS concluded construction impacts to tax revenue would be less than significant. No impacts to tax revenue would occur during construction of the pipeline within the MAR.

Public Services

Construction of the MAR would have negligible adverse effects on public services and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to public services would be less than significant. The temporary increase of construction workers into local communities has the potential to generate additional demands on local public services (e.g., emergency response, medical, police and fire protection services). Given the relatively small amount of construction workers dispersed over a relatively large area, it is anticipated existing public services would be able to handle this temporary increase in demand.

Traffic and Transportation

Construction of the MAR would have minor adverse effects on traffic and transportation and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to traffic and transportation would be less than significant. Construction activities would involve movement of people, equipment, vehicles and materials throughout the Project area, which could result in increases in traffic volumes on local roadways. There would be an increase in the number of trips taken by the 106 construction workers traveling to and from construction sites, as well as for truck trips to deliver materials to the Project site, during the 2-year construction period (Goss and Associates 2018). In some cases, construction could increase the demands for permits for oversize or wide vehicles. Some temporary traffic delays would be likely as a result of these movements, but long-term reductions in LOS are not anticipated. These movements during construction could also result in minor wear and tear on the affected roadways caused by frequent trips of heavy machinery or large trucks. These impacts would be dispersed along major roadways within the Project area throughout the different phases of construction and would result in minor impacts on roadways. The construction contractor would identify and document routes that would be used for moving materials and equipment, which would minimize potential impacts.

Construction would also require crossing small unpaved roads. Open-cut methods would be used to cross these roads, which would require temporary closure of the road to traffic and use of detours for approximately 1 to 2 days per crossing. Keystone would cross paved roads by boring beneath the roads, allowing traffic activity to continue.

After construction is complete, the roads used during this phase would be restored to their preconstruction conditions or better (U.S. Department of State 2014). During the construction phase, Keystone and the pipeline contractor would maintain roads used for construction in a condition that is safe for both members of the public and the workforce. Keystone's construction contractors would be required to submit a road use plan prior to mobilization and to coordinate with the appropriate state and county representatives to develop a mutually acceptable plan. This plan, along with monitoring of road activity related to the proposed Project, would establish measures to reduce or avoid traffic and transportation impacts on local communities.

Environmental Justice

Construction of the MAR would have temporary and minor adverse effects on environmental justice populations and is consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to environmental justice would be less than significant. Minority and low-income populations, as identified in Section 3.8.2, would experience minor, temporary impacts from noise pollution and fugitive air emissions during construction of the pipeline within the MAR. Each county within the ROI, with the exception of Seward and Pierce counties, contains a Medically Underserved Area. In addition, all counties along the MAR are designated as a Health Professional Shortage Area (see Table 3.8-7) (U.S. Department of Health & Human Services 2018). The temporary increase of construction workers in these areas could increase the competition for medical or health services during the construction phase. Impacts would be temporary and scattered throughout the length of the pipeline, and not be concentrated in any specific area. Therefore, construction activities would not result in disproportionately high and adverse impacts on environmental justice populations within the Project area.

As discussed in Section 4.7, construction of the pipeline has the potential to adversely affect wildlife and fisheries from disturbance of habitat, permanent loss of forested areas, and temporary disturbances to streams (increased turbidity) during waterbody crossings not using HDD. This could cause a temporary adverse effect to the quality of hunting, fishing and water use rights of tribes. Measures contained within the 2014 Keystone XL Final SEIS CMRP, including land restoration following construction, would minimize the level and duration of adverse effect to these resources.

The proposed Keystone XL pipeline also crosses part of the Assiniboine and Sioux Rural Water Supply waterlines at 12 locations between mileposts 82 to 86. For these crossings, Keystone has worked with and compensated the Dry Prairie Rural Water District to lower the waterlines to a minimum depth of 14 feet, which would allow for the proposed Keystone pipeline to cross over the waterlines at a typical clearance of 7 feet between the two lines and case the waterlines. This separation distance between the existing waterlines and proposed Keystone XL pipeline and casing of the existing waterlines would help prevent impacts to interruption of the Assiniboine and Sioux Rural Water Supply distribution system during construction of the proposed Keystone XL pipeline.

4.8.3.2 Operations and Maintenance

Socioeconomics

Impacts from operations and maintenance of the MAR are consistent with the 2014 Keystone XL Final SEIS conclusion that operational impacts to socioeconomic conditions would be less than significant and the economic base and tax revenue would receive beneficial impacts.

Population

Operation of the pipeline within the MAR would support approximately 13 employees per year within the counties along the MAR *(*Goss and Associates 2018). As a result of the small number of new employees, the proposed Project would result in negligible impacts on population within the Project area.

Housing

The 13 new employees associated with the proposed Project operations would result in a slight increase in demand for housing throughout the Project area (Goss and Associates 2018). As stated in Section 3.8.1.2, there are ample housing options to handle this marginal increase, and overall impacts on housing would be negligible.

Economic Base

Overall impacts to the economic base from operations and maintenance would be beneficial. Economic impacts were forecasted over the first 15 years of pipeline operation. During this period, the operations phase would directly support approximately 13 jobs in the Project area. The estimated total labor income within the counties along the MAR during the operations phase would be approximately $15.4 million, which would generate a total direct economic output of approximately $45.8 million.

Tax Revenue

Overall impacts would to tax revenue from operations and maintenance would be beneficial. During operations, Keystone would be required to pay property taxes on the proposed pipeline route for the first 15 years of operations (2019-2035). Within the MAR, Keystone would pay approximately $8.9 million in property tax per year, which would equate to a total of $134.1 million over the 15-year span. Property taxes paid would be lowest in Stanton County ($260,000/year) and highest in Seward County ($1.5 million/year) *(*Goss and Associates 2018).

Public Services

Operations and maintenance of the pipeline within the MAR would result in negligible impacts on public services based on the small increase in the number of employees during the operation of this pipeline in the Project area. There is at least one acute care facility within each county along the MAR or nearby county, which would eliminate any negative impact or concern regarding a strain on medical services.

Traffic and Transportation

Operations and maintenance of the pipeline within the MAR would have negligible to minor impacts of traffic and transportation. Routine maintenance activities would occur infrequently and most of the pipeline monitoring *would* occur remotely. Occasional maintenance activities that require minor ground disturbance may result in additional trips for workers and various equipment but impacts to traffic and transportation would likely be minor. Permanent access roads constructed for the proposed Project would not change traffic patterns on public roads.

Environmental Justice

Operations and maintenance of the MAR would have negligible adverse effects on environmental justice populations and is consistent with the 2014 Keystone XL Final SEIS conclusion that operational impacts to environmental justice would be less than significant. Impacts from maintenance activities would not be disproportionately high and adverse and would be similar, but of less intensity and duration, to those described for construction of the proposed Project.

Normal operations of the pipeline would have minor adverse impacts to wildlife and fisheries from routine maintenance activities. These effects would be localized and temporary in nature and would not have noticeable adverse effects to the quality of hunting, fishing and water use rights of tribes. Chapter 5, Environmental Consequences from Accidental Releases, discusses the potential effects of an accidental release to wildlife, fisheries and water quality.

As previously stated, the proposed Keystone XL pipeline crosses part of the Assiniboine and Sioux Rural Water Supply waterlines at 12 locations. Efforts made to increase the separation distance between the pipelines and the casing of the waterlines would help prevent impacts to interruption of the Assiniboine and Sioux Rural Water Supply distribution system should repairs of the proposed Keystone XL pipeline be required at the vicinity of a crossing location.

4.9 CULTURAL RESOURCES

4.9.1 Environmental Consequences

The 2014 Keystone XL Final SEIS discusses impacts to **historic properties** along the Preferred Route. This section supplements the 2014 analysis to include potential impacts on newly identified eligible, potentially eligible or unevaluated NRHP sites within the MAR and those portions of the 2014 Keystone XL Final SEIS Preferred Route that were not previously surveyed. Consideration is made for these resources consistent with NEPA and Section 106 of the NHPA. Chapter 5, Environmental Consequences from Accidental Releases, assesses the risk to **historic properties** in the event of an accidental release. Chapter 6, Electrical Power Infrastructure, provides a description of **historic properties** and an assessment of impacts from connected actions relating to electrical supply needs required for the proposed pipeline. Chapter 7, Cumulative Impacts, provides an assessment of the impacts to **historic properties** from the proposed Project (including the electrical supply needs) in combination with other past, present and reasonably foreseeable future actions.

Consistent with Section 106 of the NHPA, adverse impacts to historic properties would occur if the pipeline and associated facilities "may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, setting, materials, workmanship, feeling or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the NRHP. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or cumulative" (36 CFR 800.5(a)(1)).

Chapter 5, Environmental Consequences from Accidental Releases, discusses potential impacts to **historic properties** in the event of an accidental release of crude oil.

4.9.2 No Action Alternative

Under the No Action Alternative, construction and operations of the proposed Project would not occur. No impacts to cultural or heritage resources would occur.

4.9.3 Proposed Action

This SEIS quantifies potential direct and indirect impacts to **historic properties** using an assessment of informational sources presented in Section 3.9. Impacts to **historic properties** from construction and operation of the proposed Project would result from ground disturbance within the construction work area and maintenance activities associated with the 110-foot construction corridor and ancillary facilities (e.g., access roads and pump stations).

Potential construction- and operations-related impacts on cultural and heritage resources would include:

- Possible direct damage to **sites** within the construction footprint;
- Possible indirect damage to **sites** through vibrations caused by earthmoving, heavy equipment, blasting, drilling, boring, etc.;
- Potential indirect damage to **sites** from an unintended release of drilling fluids (i.e., a frac-out releasing benthic drilling mud onto nearby cultural resources) from use of HDD during construction operations;
- Temporary loss of community access to **a site**, such as Traditional Cultural Properties, during construction;
- Potential visual impacts to **sites** during construction while heavy equipment and numerous personnel are present;
- Increased dust and noise, potentially impacting **sites** near the construction area; and
- Unanticipated discovery of previously unknown **historic properties** within the construction footprint.

As stated in Section 3.9, the Department executed a Programmatic Agreement to take into account the effects of the proposed Project on historic properties listed in or eligible for listing in the NRHP resulting from construction, operations and maintenance of the proposed Project (U.S. Department of State 2014). The existing Programmatic Agreement would be implemented along the entire proposed Project. If impacts to NRHP-eligible properties could not be avoided, mitigation plans would be reviewed by the Department and the consulting parties to evaluate the submitted information following the protocols outlined in the amended Programmatic Agreement developed for the proposed Project. The following are available mitigation measures described in the 2014 Keystone XL Final SEIS which would apply to the current project (U.S. Department of State 2014):

- **Avoidance**, which could be accomplished by shifting the proposed footprint away from the **historic property**, boring underneath/around the **historic property**, limiting activities in the vicinity of the resource, monitoring construction activities near the **historic property** or any combination of these techniques.
- **Minimization**, which would reduce to the extent possible the impact to the **historic property** through avoidance measures as described above, but would not completely avoid the **historic property**. For historic structures, impacts to viewshed could be minimized by reducing the visibility of the Project such as planting of trees as a visual barrier or through fencing.
- **Mitigation**, which, when impact to a **historic property** could not be avoided, would offset that impact through some means such as protection of a similar resource nearby, detailed documentation of the **historic property** through data recovery excavations in the case of

archaeological sites or Historic American Buildings Survey/Historic American Engineering Record documentation in the case of historic structures, contributions to the preservation of cultural heritage in the affected community, interpretative exhibits highlighting information gained about **historic properties** through the Project or some combination of these strategies.

If the pipeline could not avoid a particular **historic property**, the Department would consult with the Advisory Council on Historic Preservation, SHPO, consulting Indian tribes and other federal and state consulting parties**, consistent with the stipulations in the 2013 Programmatic Agreement,** to determine those measures to be implemented by Keystone to minimize and mitigate adverse effects on eligible historic properties identified in the APE. If the Department determines that the adverse effect could not be avoided, Keystone would draft a comprehensive Treatment Plan for each adversely affected historic property. The Treatment Plan would describe the measures to minimize and mitigate the adverse effect of proposed construction activities on historic properties, the manner in which these measures would be carried out and a schedule for their implementation.

Incomplete or Unavailable Information

The cultural resource inventory remains ongoing for the proposed Project to comply with the stipulation in the Programmatic Agreement that **allows for a phased process of identifying and evaluating** historic properties within the Project APE. As stated in Section 3.9, approximately **526** acres in Nebraska require cultural resource investigations. Consistent with 40 CFR 1502.22 – Incomplete or Unavailable Information, the Department understands that **historic properties** could **be present** within these unsurveyed areas. Although the literature review examined previous investigations along the entire proposed Keystone XL pipeline alignment and the current alignment avoids significant sites identified by previous literature review, archaeological investigations are required to identify and document the occurrence of eligible sites within these remaining unsurveyed properties. At present, Keystone is unable to survey these locations due to lack of landowner permissions and landlocked areas with no access.

The Department has established a process for handling unsurveyed locations in the Programmatic Agreement. As outlined in the Programmatic Agreement, if surveys are incomplete due to landowner access prior to the commencement of construction, a coordination plan would be prepared and submitted to the Department for review and approval pursuant to Stipulation V.B.2.b of the Programmatic Agreement. The coordination plan would outline the areas that still need inventory and the schedule to complete the identification and evaluation of cultural resources in those areas prior to construction. These measures would identify resources prior to disturbance and allow for management of recorded sites per the Programmatic Agreement to avoid or mitigate adverse effects. Appendix A, Indian Tribe, Agency and Elected Officials Coordination, documents the Nebraska SHPO's approval of this process outlined in the Programmatic Agreement.

The Department will review and forward survey reports as they are completed to the applicable consulting parties consistent with 36 CFR 800. NRHP **evaluations** and any resulting avoidance or mitigation plans would be reviewed by the Department and the consulting parties to evaluate the submitted information following the protocols outlined in the amended Programmatic Agreement developed for the proposed Project. Where cultural resources have not been sufficiently **evaluated** at this time to finalize an eligibility determination for the NRHP, **the Department may treat them as historic properties subject to mitigation**.

Direct impacts, such as an unanticipated discovery of previously unknown **historic properties** during construction, could have a permanent impact on that **historic property**. Should any unanticipated discoveries of **historic properties** be made during construction or operation of the pipeline, the terms of the Unanticipated Discoveries Plan would be followed. Typically, construction activities within a 100-foot radius (including traffic) would be immediately halted, the Keystone Environmental Inspector would be notified, and interim measures would be placed to protect the discovery from looting or vandalism. The appropriate federal, state, local or tribal authorities would be notified of discovery within 48 hours of the initial find, and construction would not proceed within the discovery area until all mitigation measures defined in the Programmatic Agreement are concluded and Keystone receives approval from the appropriate agencies that construction may resume. Should a **historic property be** discovered, appropriate additional mitigation measures would be considered, as feasible and appropriate, consistent with the terms of the Programmatic Agreement.

4.9.3.1 Construction

Construction of the pipeline and ancillary facilities (e.g., access roads and pump stations) has the potential to cause an adverse effect **to historic properties** within or near the ROW. Construction-related impacts **would constitute an adverse direct effect**. These effects, however, would be less than significant through implementation of the Programmatic Agreement and are consistent with the 2014 Keystone XL Final SEIS conclusion that construction impacts to cultural resources would be less than significant. As discussed in Section 3.9, avoidance of hundreds of **historic and precontact archaeological** sites along the Preferred Route has been achieved through route and footprint revisions, a primary mitigation strategy contained in the 2014 Keystone XL Final SEIS and the Programmatic Agreement.

The duration of the construction phase could affect the degree of impact. **Beyond physical ground disturbance, adverse effects to historic properties from construction could include temporary** noise, dust, vibrations, heavy equipment traffic and changes in viewshed, **which** would be expected to last for the duration of construction in specific areas for discrete periods of time. **Adverse effects would be minimized through** use of the ancillary facilities, such as pipe and contractor yards. HDD operations during construction could also cause **adverse effects** to **historic properties**, if present. The unintended release of drilling fluids during a frac-out could release benthic drilling mud onto nearby **historic properties resulting in adverse effects**. The occurrence and extent of a frac-out would be reduced through a required HDD contingency plan for monitoring of the directional drill bore and outlining actions for detecting and controlling the inadvertent release of drilling fluid. In addition, stipulation VI.2 of the Programmatic Agreement covers unanticipated adverse effects on historic properties from pipeline construction activities, and requires the construction contractor to immediately halt all construction activity if a historic property was discovered during HDD activities or a known site was affected by a frac-out.

Potential temporary effects to **historic properties**, such as historic structures, could include visual effects from the stacked pipe, noise effects associated with loading and unloading pipe from trucks, dust from the contractor yard surface and increased truck traffic to and from the contractor yard. The low-rise of stacked pipe and vehicle equipment would have a minimal **adverse** effect on the viewshed. Noise associated with construction of ancillary facilities generally would be intermittent and limited to daytime hours when higher noise thresholds are permitted by federal agencies; therefore, noise would not be expected to be a significant factor in the development of the APE. Similarly, any increase in traffic, noise or dust associated with truck traffic, in regard to **historic properties**, such as historic structures, would be intermittent and temporary.

MAR Sites

Surveys along the MAR have identified four sites (all prehistoric lithic scatter) which remain unevaluated for NRHP eligibility. An additional historic farmstead site was also determined as potentially eligible by the Nebraska SHPO. Table 4.9-1 contains information on these five sites within the construction footprint of the MAR.

Phase II archaeological testing would be completed prior to construction to formally evaluate sites having potential for eligibility for listing to the NRHP and determine whether further work for these resources is necessary prior to construction. Keystone would first attempt to avoid **sites determined to be NRHP** eligible. Unavoidable impacts would follow requirements within the Programmatic Agreement.

The survey also reported locations where NPS NHT (Mormon Pioneer Trail and California Trail) cross the MAR in Colfax and Butler counties (Exp and American Resources Group, Ltd. 2018a). Construction of the MAR would cause a temporary disturbance to the California and Mormon NHT in Colfax County near proposed MP 780. As the crossing is directly adjacent to the existing Keystone Pipeline, overall adverse effects to the character of these trails are not anticipated. Construction would also cause a temporary disturbance to three additional areas of the California NHT near proposed MP 785 and 784 in Butler County. **The project would have no a**dverse effects to the character of the trail as the trail runs parallel to and is crossed by existing roads. Following construction, the sites would be restored to their original grades. Construction activities would only potentially affect NHT usage on private property, during installation of the pipeline across the trail. Similar to irrigation ditch crossing, it is anticipated that impacts to the affected areas would be 1 day (or less) in duration.

Table 4.9-1. Sites Within the MAR Construction Footprint and Effect Determination

Site Number	State	Land Ownership	Description	Department NRHP Eligibility Determination	Project Effect	Status / Management Recommendation	Location Notes
25AP99	NE	Private	Prehistoric Limited Activity Site	Unevaluated	Unknown Effect	Surveys Incomplete; Phase II Investigations Prior to Construction	Near proposed pipeline centerline
25AP100	NE	Private	Prehistoric Field Camp	Unevaluated	Unknown Effect	Surveys Incomplete; Phase II Investigations Prior to Construction	Near proposed pipeline centerline
25MD32	NE	Private	Prehistoric Field Camp	Unevaluated	Unknown Effect	Surveys Incomplete; Phase II Investigations Prior to Construction	Near proposed pipeline centerline
25SA81	NE	Private	Historic Farmstead	Unevaluated	Unknown Effect	Surveys Incomplete; Phase II Investigations Prior to Construction	Directly west of proposed pipeline centerline
25ST20	NE	Private	Prehistoric Base Camp/Village	Unevaluated	Unknown Effect	Surveys Incomplete; Phase II Investigations Prior to Construction	Pipeline construction corridor crosses southern half of site

Source: Exp and American Resources Group, Ltd. 2018a

NE = Nebraska**; NRHP = National Register of Historic Places**

Preferred Route Sites (Outside the MAR) Within the Project Construction Footprint

The centerline ROW in Montana was re-inspected for **historic properties** from milepost 0 to 77 during the summer of 2019. All tribal consulting parties were invited to participate in the field work. The investigation was performed with tribal representation from the Chippewa Cree Indians of the Rocky Boy’s Reservation, Blackfeet Nation, Little Shell Tribe of Chippewa Indians of Montana (Non- Federally recognized) and the Otoe-Missouria Tribe. These efforts resulted in the documentation of additional historic and precontact archaeological **sites** within the defined ROW. **Consultation with Tribes regarding their identified locations is ongoing; eligibility determinations and management recommendations have not been established at this time**. **If historic properties will be adversely affected by the Project, the Department will follow the treatment provisions in Stipulation V.C of the Programmatic Agreement.** As of the date of this document a report on the cultural resources re-inspection is being prepared and will be sent to all applicable federal and state agencies and all tribal consulting parties for review and comment in accordance with the Programmatic Agreement. **Appendix D CUL Sub-Theme – Unsurveyed Locations (4-9e) contains additional information on the reasoning for re-inspection.**

Keystone continues to engineer minor footprint revisions of the project construction footprint to successfully avoid **historic properties**. **Table 4.9-2 provides an inventory of** sites (or segments of linear resources) in Montana **that the Department has** recommended as eligible, potentially eligible or unevaluated for NRHP listing **that occur within the construction ROW**. **Summary information for sites provided in Table 4.9-2 also includes any management recommendations and the status of SHPO concurrence.**

Table 4.9-2. Sites and Site Updates Within the Keystone XL Project Construction Footprint in Montana and Effect Determination

Site Number	State	Land Ownership	Description	Department NRHP Eligibility Determination	Project Effect	Status / Management Recommendation	SHPO Concurrence
24DW0560	MT	Private	Prehistoric Open Camp	Eligible	**Adverse** Effect	**Fence and Monitor**	**Yes**
24DW0289	MT	Private	Canal	Eligible **/ Contributing Segment**	**No** Effect	Bore, Fence and Monitor	**Yes**
24DW0419	**MT**	**Private**	**Historic Railroad**	**Eligible / Contributing Segment**	**No Effect**	**Bore**	**Yes**
24MC0628	MT	Private	Historic Farmstead	Unevaluated / Non-Contributing Portion	No **Adverse** Effect	Fence and Monitor	**Yes**
24PH4372	MT	Private	Prehistoric Stone Cairn	Eligible / Non-Contributing Portion	**No** Effect	**Bore, Fence and Monitor[b]**	**Pending**
24VL0938	MT	Private	Prehistoric Stone Feature	Eligible	Adverse Effect	**Mitigated.** Fence and Monitor	**Yes**
24VL0962	MT	BLM	Prehistoric Stone Feature, Lithic Scatter, Historic Artifact Scatter	**Unevaluated – Non-Contributing Portion**	No **Adverse** Effect	**Fence and Monitor**	**Yes**
24VL0979	MT	BLM	Historic Homestead	Eligible	Adverse Effect	**Mitigated. Fence and Monitor**	**Yes**
24VL0972	MT	BLM	Prehistoric Stone Feature, Historic Fence Line	**Unevaluated – Non-Contributing Portion**	No **Adverse** Effect	**Fence and Monitor**	**Yes**
24VL099	**MT**	**Private**	**Historic Railroad**	**Eligible / Contributing Segment**	**No Effect**	**Bore**	**Yes**
24VL1194[a]	MT	Private	Historic Canal	Eligible	No Effect	Bore, Fence and Monitor	**Yes**
24VL1269/ 24VL1274 (update)	MT	BLM	Prehistoric Stone Circle	Eligible	**No** Adverse Effect	**Bore, Fence and Monitor[b]**	**Pending**
24VL1919	MT	BLM	Prehistoric Stone Circle	Eligible	Adverse Effect	**Bore Features, Fence and Monitor[b]**	**Pending**
24VL1965	MT	State (MT)	Prehistoric Stone Circle	Eligible / Non-Contributing Portion	**No** Adverse Effect	**Fence and Monitor[b]**	**Pending**

Table 4.9-2. Sites and Site Updates Within the Keystone XL Project Construction Footprint in Montana and Effect Determination

Site Number	State	Land Ownership	Description	Department NRHP Eligibility Determination	Project Effect	Status / Management Recommendation	SHPO Concurrence
24VL2170	**MT**	**BLM**	**Prehistoric Stone Features**	**Unevaluated**	**Pending**	**Bore, Fence and Monitor**	**Pending**
24VL2171	**MT**	**BLM**	**Prehistoric Stone Features**	**Unevaluated**	**Pending**	**Bore, Fence and Monitor**	**Pending**
24MC0628	MT	Private	Historic Farmstead	Unevaluated / Non-Contributing Portion	No **Adverse** Effect	Fence and Monitor	**Yes**
24FA0382	**MT**	**Private**	**Historic Railroad**	**Eligible/ Contributing Segment**	**No Adverse Effect**	**Bore and Fence Pass Through Lane**	**Yes**

[a] The Keystone XL **p**ipeline would cross Site 24VL1194, a linear canal feature, at two locations.
[b] **Mitigations are proposed but pending as of the date of this publication and the results of the 2019 reinspection along with tribal/SHPO consultation efforts will reflect the finalized plan when its established**.
APE = area of potential effect; BLM = U.S. Bureau of Land Management; MT = Montana; NRHP = National Register of Historic Places**; ROW = right-of-way; SHPO = State Historic Preservation Office**

In addition to sites within the construction footprint, **60** eligible, potentially eligible or unevaluated sites in Montana and South Dakota are close enough to the proposed Project activities (although outside of the current footprint) to require additional protections to ensure avoidance during the construction phase. Exclusion fencing would typically be installed along the edge of the ROW in these areas and the site locations would be monitored during construction. Table 4.9-3 provides information on these **60** sites outside of the Project footprint. **No historic properties will be affected by the Project in South Dakota or the remaining Nebraska (non-MAR) ROW.**

Table 4.9-3. Sites Adjacent to the Keystone XL Project

Site Number	State	Land Ownership	Description	Department NRHP Eligibility Determination	Project Effect	Status / Management Recommendation	SHPO Concurrence
24DW0561	**MT**	**Private**	**Prehistoric Stone Circle**	**Unevaluated**	**No Effect**	**Fence and Monitor**	**Yes**
24MC0461	**MT**	**State**	**Prehistoric Stone Circle**	**Unevaluated**	**No Effect**	**Fence and Monitor**	**Yes**
24MC0464	**MT**	**BLM**	**Prehistoric Homestead**	**Unevaluated**	**No Effect**	**Fence and Monitor**	**Yes**
24MC0467	**MT**	**Private**	**Unknown/ Prehistoric Stone Alignment, Lithic scatter**	**Unevaluated**	**No Effect**	**Fence and Monitor**	**Yes**
24MC0476	**MT**	**State**	**Prehistoric Stone Circle**	**Unevaluated**	**No Effect**	**Fence and Monitor**	**Yes**
24MC0481	**MT**	**Private**	**Prehistoric Stone Cairn**	**Unevaluated**	**No Effect**	**Fence and Monitor**	**Yes**
24MC0485	**MT**	**Private**	**Prehistoric Open Camp**	**Eligible**	**No Effect**	**Fence and Monitor**	**Yes**
24MC0486	**MT**	**Private**	**Prehistoric Open Camp**	**Eligible**	**No Effect**	**Fence and Monitor**	**Yes**

Table 4.9-3. Sites Adjacent to the Keystone XL Project

Site Number	State	Land Ownership	Description	Department NRHP Eligibility Determination	Project Effect	Status / Management Recommendation	SHPO Concurrence
24PH1760	MT	State	Prehistoric Stone Rings	Unevaluated	Pending	Fence and Monitor	Pending
24PH1785	MT	Private	Prehistoric Stone Cairn	Unevaluated	No Effect	Fence and Monitor	Yes
24PH4161	MT	Private	Prehistoric Stone Cairn	Unevaluated	No Effect	Fence and Monitor	Yes
24PH4162	MT	Private	Prehistoric/ Historic Stone Feature	Unevaluated	No Effect	Fence and Monitor	Yes
24PH4313	MT	Private	Prehistoric Stone Circle	Unevaluated	No Effect	Fence and Monitor	Yes
24PH4367	MT	Private	Prehistoric Stone Feature	Unevaluated	No Effect	Fence and Monitor	Yes
24PH4370	MT	Private	Prehistoric Stone Cairn	Unevaluated	No Effect	Fence and Monitor	Yes
24PH4371	MT	Private	Prehistoric Stone Cairn	Unevaluated	No Effect	Fence and Monitor	Yes
24PH4373	MT	Private	Prehistoric Stone Feature	Unevaluated	Pending	Fence and Monitor	Yes/Pending
24PH4665	MT	State	Prehistoric Stone Rings	Unevaluated	Pending	Fence and Monitor	Pending
24PH4695	MT	Private	Unknown Rock Cairn	Unevaluated	Pending	Fence and Monitor	Pending
24PH4696	MT	Private	Prehistoric Stone Features	Unevaluated	Pending	Fence and Monitor	Pending
24VL0805	MT	BLM	Prehistoric Stone Features	Unevaluated	Pending	Fence and Monitor	Pending
24VL1700	MT	State	Prehistoric Stone Feature	Unevaluated	No Effect	Fence and Monitor	Yes
24VL1712	MT	State	Prehistoric Stone Feature	Unevaluated	No Effect	Fence and Monitor	Yes
24VL1903	MT	Private	Prehistoric Stone Circle	Unevaluated	No Effect	Fence and Monitor	Yes
24VL1912	MT	Private/ BLM	Historic Homestead	Unevaluated	No Effect	Fence and Monitor	Yes
24VL1920	MT	Private	Historic Artifact Scatter	Unevaluated	No Effect	Fence and Monitor	Yes
24VL1933	MT	Private	Prehistoric Stone Circle	Unevaluated	No Effect	Fence and Monitor	Yes
24VL2082	MT	Private	Prehistoric Stone Circle	Unevaluated	No Effect	Fence and Monitor	Yes
24VL2163	MT	Private	Prehistoric Stone Ring	Unevaluated	Pending	Fence and Monitor	Pending

Table 4.9-3. Sites Adjacent to the Keystone XL Project

Site Number	State	Land Ownership	Description	Department NRHP Eligibility Determination	Project Effect	Status / Management Recommendation	SHPO Concurrence
24VL2165	MT	Private	Prehistoric Stone Features	Unevaluated	Pending	Fence and Monitor	Pending
24VL2174	MT	BLM	Prehistoric Stone Rings	Unevaluated	Pending	Fence and Monitor	Pending
24VL2175	MT	BLM	Prehistoric Stone Ring	Unevaluated	Pending	Fence and Monitor	Pending
24VL2182	MT	Private	Prehistoric Stone Feature	Unevaluated	Pending	Fence and Monitor	Pending
24VL2183	MT	BLM	Prehistoric Stone Arc	Unevaluated	Pending	Fence and Monitor	Pending
24VL2186	MT	State	Prehistoric Stone Rings	Unevaluated	Pending	Fence and Monitor	Pending
24VL2187	MT	State	Prehistoric Stone Ring	Unevaluated	Pending	Fence and Monitor	Pending
24VL2188	MT	State	Prehistoric Rock Alignment	Unevaluated	Pending	Fence and Monitor	Pending
24VL2189	MT	BLM	Prehistoric Stone Ring	Unevaluated	Pending	Fence and Monitor	Pending
24VL2190	MT	BLM	Prehistoric Stone Features	Unevaluated	Pending	Fence and Monitor	Pending
24VL2191	MT	BLM	Prehistoric Stone Rings	Unevaluated	Pending	Fence and Monitor	Pending
24VL2193	MT	BLM	Prehistoric Stone Features	Unevaluated	Pending	Fence and Monitor	Pending
24VL2194	MT	Private	Prehistoric Stone Features	Unevaluated	Pending	Fence and Monitor	Pending
24VL2195	MT	Private	Prehistoric Rock Alignment	Unevaluated	Pending	Fence and Monitor	Pending
24VL2196	MT	Private	Prehistoric Stone Features	Unevaluated	Pending	Fence and Monitor	Pending
24VL2197	MT	BLM	Prehistoric Stone Ring	Unevaluated	Pending	Fence and Monitor	Pending
24VL2198	MT	BLM	Prehistoric Rock Alignment	Unevaluated	Pending	Fence and Monitor	Pending
24VL2199	MT	BLM	Prehistoric Rock Cairn	Unevaluated	Pending	Fence and Monitor	Pending
24VL2200	MT	BLM	Prehistoric Rock Cairn	Unevaluated	Pending	Fence and Monitor	Pending
24VL2202	MT	BLM	Prehistoric Stone Ring	Unevaluated	Pending	Fence and Monitor	Pending
24VL2203	MT	Private	Prehistoric Stone Ring	Unevaluated	Pending	Fence and Monitor	Pending
24VL2204	MT	BLM	Prehistoric Stone Arc	Unevaluated	Pending	Fence and Monitor	Pending

Table 4.9-3. Sites Adjacent to the Keystone XL Project

Site Number	State	Land Ownership	Description	Department NRHP Eligibility Determination	Project Effect	Status / Management Recommendation	SHPO Concurrence
24VL4697	MT	Private	Prehistoric Rock Cairn	Unevaluated	Pending	Fence and Monitor	Pending
39HN1133	SD	State	Prehistoric Artifact Scatter	Unevaluated	No Effect	Fence and Monitor	Yes
39HN1202	SD	State	Prehistoric Artifact Scatter	Eligible	No Effect	Fence and Monitor	Yes
39PE0481	SD	Private	Prehistoric Artifact Scatter	Eligible	No Effect	Fence and Monitor	Yes
39MD0849	SD	Private	Historic Grave	Not Eligible	No Effect	Fence and Monitor	Yes
39MD0850	SD	Private	Historic Schoolhouse	Eligible	No Effect	Fence and Monitor	Yes
39MD0835	SD	Private	Historic Artifact Scatter	Eligible	No Effect	Fence and Monitor	Yes
39JN0051	SD	Private	Historic Farm	Eligible	No Effect	Fence and Monitor	Yes
39JN2007	SD	Private	Historic Railroad Grade	Eligible	No Effect	Bore, Fence and Monitor	Yes

MT = Montana; NE = Nebraska; SD = South Dakota**; NRHP = National Register of Historic Places; SHPO = State Historic Preservation Office**

In addition, as described in Section 3.9, the Tanderup Family has deeded a portion of their farm along the proposed Keystone XL pipeline route to the Ponca Tribe of Nebraska and the Ponca Nation of Oklahoma. The land transfer occurred in June of 2018 and involved approximately 1.6 acres along the Ponca Removal Trail, along which Ponca corn has been planted and growing for the past 5 years (Hefflinger 2018). Disturbance to this land and the Ponca corn would likely constitute an adverse impact to these tribes due to the presence of the sacred corn and ceremonies associated with planting. Measures to avoid adverse impacts to the Ponca corn could include construction during post-harvest or use of alternate construction methods such as boring the planted lands. Stipulation V.B.2.a, of the Programmatic Agreement states "In the identification and evaluation of historic properties to which Indian tribes may attach religious and cultural significance, the Department will take into consideration information submitted by Indian tribes to the Department prior to construction through consultations…"

4.9.3.2 Operations and Maintenance

Operations and maintenance of the pipeline would have negligible to minor adverse effects on **historic properties** and is consistent with the 2014 Keystone XL Final SEIS conclusion that operational impacts would be less than significant. During normal operations and maintenance of the pipeline, only previously disturbed areas would be expected to require periodic disturbance; therefore, the potential for additional direct **adverse** impacts to **historic properties** would be very limited and negligible to minor. **Non-maintenance** impacts during operations could consist of a permanent change in viewshed to **historic properties (**historic structures**)** near permanent ancillary facilities such as pump stations and MLVs, and a periodic increase in noise, vibration and dust created by vehicular traffic conducting operation and maintenance activities. These types of impacts have been evaluated by the Department as part of the Section 106 evaluation process for the proposed Project (U.S. Department of State 2014). Permanent ancillary facilities are unlikely to visually impact the setting and feeling of **these types of** historic

properties due to the distance separating them, their low-lying nature and the various vegetative and topographic elements of the landscape in such areas. Similarly, periodic increases in noise, vibration and dust created by vehicular traffic conducting operation and maintenance activities would not be expected to cause any adverse effects to **historic properties**.

4.10 GREENHOUSE GASES AND CLIMATE CHANGE

4.10.1 Environmental Consequences

This section presents the potential direct, indirect and lifecycle impacts of the Proposed Action and No Action Alternative on greenhouse gas emissions and climate change. As stated in Section 1.1, the focus of this SEIS is to supplement the 2014 Keystone XL Final SEIS to include the MAR as well as to update the 2014 greenhouse gas and climate change analysis to include new information. Chapter 5, Environmental Consequences from Accidental Releases, discusses potential for greenhouse gas emissions in the event of an accidental release. Chapter 7, Cumulative Impacts, discusses cumulative impacts of the Project in combination with other past, present and reasonably foreseeable future actions as related to greenhouse emissions from other WCSB crude oil pipeline projects and other regional projects or initiatives that may affect climate change.

Climate change impacts are not attributable to any single action but are the result of multiple individual sources of greenhouse gas emissions across the globe, each making a relatively small addition to global atmospheric greenhouse gas concentrations that collectively have a large impact. Therefore, this SEIS does not attempt to attribute specific climate change effects to the proposed Project. Instead, it uses estimates of greenhouse gas emissions as a proxy for assessing the extent and severity of climate change impacts that could occur from the proposed Project. Section 3.10 discusses the types of climate change impacts that could potentially occur as a result of increased greenhouse gas emissions from the proposed Project. These impacts include changes to weather events, water cycles, ecosystems, economies, public health and native people's communities and traditional ways of life that would occur globally, nationally and regionally (within the northern Great Plains, where the proposed Keystone XL Project would be located).

Increased greenhouse gas emissions from the proposed Project would contribute to total greenhouse gas emissions worldwide with the resulting effects on global, national and regional climate. **Approval or denial of the proposed Project would not by itself significantly alter the trajectory of global climate change. By contributing to an increase in global greenhouse gas emissions, however, the proposed Project would add incrementally to atmospheric greenhouse gas concentrations and the resulting climate change impacts. The climate effects of** increase**d** global greenhouse gas concentrations are likely to be of a long-term or permanent nature, since most greenhouse gases can persist in the atmosphere for decades or even centuries (Oak Ridge National Laboratory 2016). **Further, as discussed in Section 3.10, there is broad agreement among experts on the need to make large reductions to greenhouse gas emissions in the near term to avoid the worst effects of climate change. Considering the proposed Project's estimated level of lifecycle greenhouse gas emissions (discussed later in this section), the incremental contribution of these emissions to elevated global greenhouse gas concentrations, the long-term nature of these impacts, and widespread recognition of the need to urgently reduce global greenhouse gas emissions, the Department concludes that greenhouse gas emissions from the proposed Project would likely represent a potentially significant impact.**

This section describes potential direct and indirect greenhouse gas emissions from the proposed Project as follows:

- **Section 4.10.2, No Action Alternative,** summarizes impacts if the project were not constructed and operated.
- **Section 4.10.3, Proposed Action,** describes direct and indirect greenhouse gas emissions that would occur from the proposed Project. **Section 4.10.3.1** estimates greenhouse gas emissions that would take place during construction activities, while **Section 4.10.3.2** estimates greenhouse gas emissions from normal operations and maintenance.
- **Section 4.10.4, Lifecycle Greenhouse Gas Emissions,** estimates potential greenhouse gas emissions that could occur as a result of crude oil extraction, blending and upgrading, transportation, refining and end use (combustion) from the proposed Project.
- **Section 4.10.5, Potential Impacts of Climate Change on the Proposed Action,** discusses the potential for climate change to exacerbate the environmental consequences of the proposed Project, based on the nature and severity of projected climate change in the northern Great Plains region (the location of the proposed Project) over the next several decades, and the potential environmental effects of the proposed Project, as described and analyzed in this SEIS and the 2014 Keystone XL Final SEIS (U.S. Department of State 2014).

4.10.2 No Action Alternative

Under the No Action Alternative, construction of the proposed Project would not occur, and there would be no impacts related to direct and indirect greenhouse gas emissions as a result of the Project. The 2014 Keystone XL Final SEIS also considered a range of potential scenarios that could occur under the No Action Alternative, including rail/pipeline, rail/tanker and rail direct to the Gulf Coast as alternate means of crude oil transport if the proposed Project were not constructed or operated. Impacts under these scenarios are anticipated to be consistent with the findings of the 2014 Keystone XL Final SEIS contained in Chapter 5, Alternatives, and are incorporated by reference.

4.10.3 Proposed Action

This SEIS quantifies the increase in direct and indirect greenhouse gas emissions from the construction and operation of the proposed Project, in consideration of the affected environment for greenhouse gases discussed in Section 3.10. The Department reviewed the Proposed Action to determine whether any activities have the potential to cause any of the following:

- An increase of indirect emissions for mobile sources, such as construction equipment, worker vehicles and associated maintenance equipment
- An increase of fugitive emissions of greenhouse gases from pipeline and pump station operations
- An increase of indirect offsite emissions associated with the generation of electricity used to power the pumping stations

A short-term increase in greenhouse gas emissions of approximately 263,680 metric tons CO_2-eq would occur during construction of the proposed Project (see section 4.10.3.1). Operation of the proposed Project would cause a long-term increase in direct and indirect greenhouse gas emissions of approximately 1,312,620 metric tons CO_2-eq per year (see Section 4.10.3.2).

In addition, operation of the proposed Project could potentially lead to an increase in indirect lifecycle greenhouse gas emissions associated with crude oil production, transport, refining and end use (combustion), which are discussed in Section 4.10.4.

4.10.3.1 Construction

As discussed in Section 2.4.8, Construction Procedures, Keystone would design, construct, test and operate the proposed Project in accordance with all applicable requirements included in the USDOT regulations at 49 CFR 195, Transportation of Hazardous Liquids by Pipeline, and other applicable regulations. The 2014 Keystone XL Final SEIS contains detailed descriptions of procedures Keystone would use for pipeline construction. Construction would involve activities such as land clearing and open burning, pipeline trenching and installation, equipment staging, as well as construction and operation of construction camps (as described in Section 4.14.2 of the 2014 Keystone XL Final SEIS).

Table 4.10-1 presents the estimated greenhouse gas emissions generated from construction of the entire proposed Project, configured to follow the MAR through Nebraska. Estimates of greenhouse gas emissions from construction are based on emissions estimates for the proposed Project as analyzed in the 2014 Keystone XL Final SEIS, adjusting for pipeline length, acres disturbed and the number of pump stations. See Section 4.14.2.1 of the 2014 Keystone XL Final SEIS for further information on sources and activities that would generate greenhouse gas emissions during construction of the proposed Project through Montana, South Dakota, Nebraska and Kansas. Construction of the proposed Project would lead to one-time emissions of approximately 263,680 metric tons CO_2-eq of greenhouse gases.

Table 4.10-1. Estimated Greenhouse Gas Emissions from Construction Activities

Activity/Source	Greenhouse Gas Emissions (metric tons)[a]			
	CO_2	CH_4	N_2O	Total (CO_2-eq)[b]
Pipeline construction	139,610	13	6	141,841
Pump station construction	19,993	2	1	20,332
Construction camp emergency generators	1,523	0	0	1,530
Construction camp electricity usage (commercial power supply)[c]	99,364	2	2	99,913
Open burning	50	0	0	59
Total	**260,540**	**18**	**9**	**263,675**

a. Developed from estimates presented in the 2014 Keystone XL Final SEIS, Table 4.14-1, adjusting for construction of 882 miles of pipeline, 21 pump stations, 11 construction camps and 16,343 acres of land disturbance (assuming 0.5% of that land would be open burned). The 2014 Final SEIS estimates were based on 875 pipeline miles, 20 pump stations, 8 construction camps and 15,296 acres.

b. **CO_2-eq emissions were calculated using 100-year global warming potentials from 40 CFR Part 98, Subpart A, Table A-1, *Global Warming Potentials*.**

c. Adjusted to account for changes in electric grid emission factors due to changes in the regional fuel mix, based on eGRID 2012 and eGRID 2016 (USEPA 2018c).

CH_4 = methane; CO_2 = carbon dioxide; CO_2-eq = carbon dioxide equivalent; N_2O = nitrous oxide; SEIS = Supplemental Environmental Impact Statement

Keystone would implement measures within the 2014 Keystone XL Final SEIS CMRP to reduce greenhouse gas emissions from construction of the proposed Project (U.S. Department of State 2014). As described in the CMRP, mitigation measures would be employed and enforced by an environmental inspector assigned to each construction spread. Construction mitigation measures applicable to reducing greenhouse gas emissions include:

- Control speed of all contractor vehicles in work areas and on roads.
- Control emissions from construction equipment combustion, open burning, and temporary fuel transfer systems and associated tanks to the extent required by state and local agencies through the permit process.

4.10.3.2 Operations and Maintenance

Operation of the proposed Project would cause a long-term increase in greenhouse gas emissions. Operation of the proposed Project would produce direct fugitive emissions from the pipeline, pump station components and MLVs, as well as infrequent direct emissions from the operation of emergency generators located at pump stations and MLVs in the event of a power failure. The pipeline and pump stations would have valves, flanges, connectors and other components as described in the 2014 Keystone XL Final SEIS. In addition, indirect emissions would occur from generation of electrical power at grid-connected power plants needed to operate the pump stations.

Estimates of greenhouse gas emissions from operations of the proposed Project, reconfigured to follow the MAR through Nebraska, are based on emissions estimates for the proposed Project as analyzed in the 2014 Keystone XL Final SEIS, after adjusting for pipeline length, number of pump stations, and area of land disturbed**, as well as changes in electric grid emission factors due to changes in the regional fuel mix including replacement of coal with natural gas**. Table 4.10-2 presents the updated greenhouse gas emissions generated from operation of the proposed Project. Ongoing operations of the proposed Project would lead to annual emissions of approximately 1,312,620 metric tons CO_2-eq of greenhouse gases.

Table 4.10-2. Estimated Greenhouse Gas Emissions from Project Operations

Activity/Source	Greenhouse Gas Emissions (metric tons)[a]			
	CO_2	CH_4	N_2O	Total (CO_2-eq)[b]
Fugitive emissions (pipeline)	Negligible	0.001	Negligible	0.02
Fugitive emissions (pump stations)	Negligible	0.08	Negligible	1.88
Electricity generation[c]	1,303,307	123	21	1,312,623
Total	**1,303,307**	**123**	**21**	**1,312,624**

a. Developed from estimates presented in the 2014 Keystone XL Final SEIS, Table 4.14-2, adjusting for operation of 882 miles of pipeline and 21 pump stations. The 2014 Final SEIS estimates were based on 875 pipeline miles and 20 pump stations.

b. CO_2-eq emissions were calculated using 100-year global warming potentials from 40 CFR Part 98, Subpart A, Table A-1, *Global Warming Potentials*.

c. Adjusted to account for changes in electric grid emission factors due to changes in the regional fuel mix, based on eGRID 2012 and eGRID 2016 (USEPA 2018c).

CH_4 = methane; CO_2 = carbon dioxide; CO_2-eq = carbon dioxide equivalent; N_2O = nitrous oxide; SEIS = Supplemental Environmental Impact Statement

In addition, greenhouse gas emissions would occur during ongoing maintenance activities, which would include pipeline inspections, integrity surveys and periodic clearing of vegetation along the pipeline ROW to maintain accessibility. Greenhouse gases would be emitted from the operation of vehicles and equipment during these activities. However, it is expected that the amount of greenhouse gases emitted during ongoing maintenance activities on the proposed Project would be minor.

4.10.4 Lifecycle Greenhouse Gas Emissions

As part of evaluating potential indirect effects of the proposed Project on greenhouse gas emissions and climate change, this SEIS considers lifecycle greenhouse gas emissions from crude oil extraction, blending and upgrading, transportation, refining and end use (combustion). This SEIS develops a range of lifecycle greenhouse gas emissions that could occur under the proposed Project, depending upon a number of factors that are summarized in the text box below.

SEIS Approach to Analysis of Lifecycle Greenhouse Gas Emissions

Baseline for comparison.

- This SEIS estimates the change in greenhouse gas emissions under the Proposed Action relative to the No Action Alternative.

Operating scenarios for the Proposed Action.

- This SEIS estimates potential lifecycle emissions under the Proposed Action assuming that the Keystone XL Project would operate at its design capacity of 830,000 bpd.
- This SEIS estimates potential lifecycle emissions for two scenarios under the Proposed Action. Under the first scenario, the Department assumes that the Proposed Action would transport only WCSB heavy crude oil, consisting of 80 percent dilbit and 20 percent synthetic crude oil.
- The second scenario assumes that the Keystone XL Project would transport 100,000 bpd of Bakken light crude oil and 730,000 bpd of WCSB heavy crude oil.

WCSB crude oil displacing other crude oil imports.

- Consistent with the 2014 Keystone XL Final SEIS, this SEIS considers the possibility that crude oil transported under the Proposed Action could fully displace other crude oils presently refined in the United States.
- In addition, this SEIS considers two partial displacement scenarios, where a part of the crude oil transported on Keystone XL would displace other crude oils while the remainder would represent increased consumption. See discussion "Effects of Market Conditions" under Section 4.10.4.4 for further details.
  - Under low demand and low price conditions, each barrel of crude oil transported on Keystone XL would displace 0.8 barrel of another crude oil and global crude oil consumption would increase by 0.2 barrel.
  - Under high demand and high price conditions, each barrel of crude oil transported on Keystone XL would displace 0.4 barrel of another crude oil and global crude oil consumption would increase by 0.6 barrel.
- Finally, as an upper bound, this SEIS includes a "no displacement" scenario where other crude oils would not be displaced by crude oil transported under the Proposed Action.

The analysis of lifecycle greenhouse gas emissions presented in this SEIS is predicated on the market demand for heavy crude oil in the United States, and that this crude oil would come from Canada or from another foreign source (see Section 1.4). The analysis focuses on greenhouse gas emissions related to the different crude oils that would be imported to meet market demand in the United States. Evaluation of lifecycle greenhouse gas emissions associated with heavy crude oil that is not refined in the United States is considered to be out of scope of this SEIS.

In December 2015, the United States lifted a 40-year ban on the export of crude oil, primarily in response to rapidly increasing domestic production from the Bakken shale formation and other unconventional sources. The U.S. Gulf Coast, one of the markets served by the Keystone XL pipeline, is a key hub for U.S. crude oil exports. As such, it is possible that the crude oil transported on the Keystone XL pipeline could be exported outside the United States via ports on the Gulf Coast, for refining and consumption in overseas markets. If exported, the increased transport of crude oil would likely lead to a slight increase in greenhouse gas emissions, while differences in refining and vehicle technologies in foreign markets could lead to either an increase or a decrease in greenhouse gas emissions. Overall, these differences would not significantly alter the results of the lifecycle analysis presented in this SEIS.

4.10.4.1 Summary of Lifecycle Greenhouse Gas Emissions Impacts

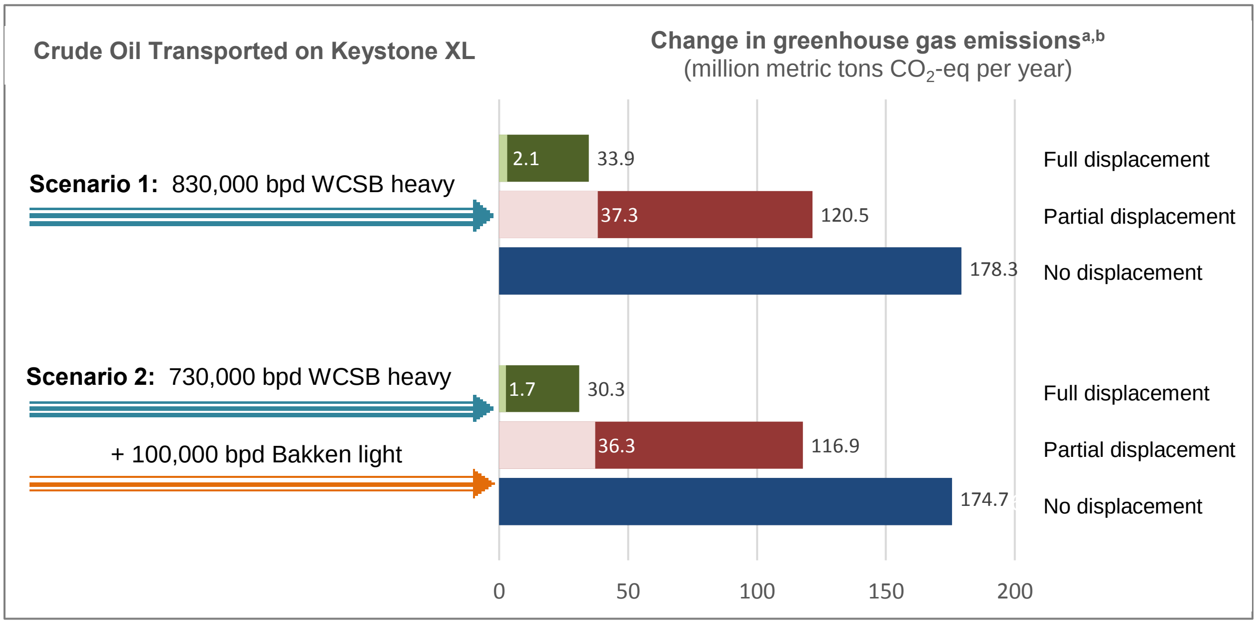
As described above, the Department estimated lifecycle greenhouse gas emissions from the various types of crude oil that could be transported by the proposed Project under the Proposed Action Alternative relative to the No Action Alternative. Separate estimates were developed for the transport of different types of crude oil and for future market conditions that could potentially have a significant effect on displacement of other crude oils, and therefore greenhouse gas emissions, from the proposed Project. Emissions estimates also vary depending on the specific crude oil assumed to be displaced by the crude oil transported by the proposed Project. The lower end of each of the ranges presented below corresponds to displacement of Venezuelan heavy crude oil, while the upper end corresponds to displacement of Saudi Arabian medium crude oil. Key results of the analysis are as follows:

- **Scenario 1: Keystone XL Project transports 830,000 bpd of WCSB heavy crude oil.** Assuming partial displacement of other crude oils, greenhouse gas emissions could potentially increase by 37.3 – 62.7 million metric tons CO_2-eq per year under a low oil price scenario, and by 107.8 – 120.5 million metric tons CO_2-eq per year under a high oil price scenario. If other crude oils are fully displaced, emissions could increase by 2.1 – 33.9 million metric tons CO_2-eq per year; if other crude oils are not displaced, emissions could increase by up to 178.3 million metric tons CO_2-eq per year.
- **Scenario 2: Keystone XL Project transports 730,000 bpd of WCSB heavy crude oil and 100,000 bpd of Bakken light crude oil.** Assuming partial displacement of other crude oils, greenhouse gas emissions could potentially increase by 36.3 – 59.2 million metric tons CO_2-eq per year under a low oil price scenario, and by 105.5 – 116.9 million metric tons CO_2-eq per year under a high oil price scenario. If other crude oils are fully displaced, emissions could potentially increase by 1.7 – 30.3 million metric tons CO_2-eq per year; if other crude oils are not displaced, emissions could increase by up to 174.7 million metric tons CO_2-eq per year.

The above estimates represent the increase in emissions associated with production and consumption of 830,000 bpd of oil sands crude oil, taking into account the potential impact of this increase in crude oil supply on global oil markets and consumption. **Based on a review of published studies, the Department considers partial displacement of other crude oils a more likely outcome compared to full displacement or no displacement. Therefore, the range of emissions associated with partial displacement reflects the likely impacts of the Proposed Action. Emissions for the no displacement and full displacement scenarios are presented as bounding conditions, and for consistency with the 2014 Keystone XL Final SEIS.**

These estimates also assume that approval of the Proposed Action would directly result in an increase in production of 830,000 bpd of WCSB crude oils in Canada. However, as discussed in Section 1.4, it is likely that even in the absence of the proposed Project, some of the crude oil that would have been transported on Keystone XL would still be produced and transported to market by other modes including rail. Therefore, these estimates represent an upper bound on the potential increase in crude oil supply, and the associated lifecycle greenhouse gas emissions, that could occur from the proposed Project.

Figure 4.10-1 presents the range of likely increase in greenhouse gas emissions from the proposed Project for full and partial displacement of other crude oils. Figure 4.10-2 compares the potential increase in greenhouse gas emissions to common greenhouse gas sources including cars, household electricity consumption, and coal-fired power plants, to place these numbers in context for readers.

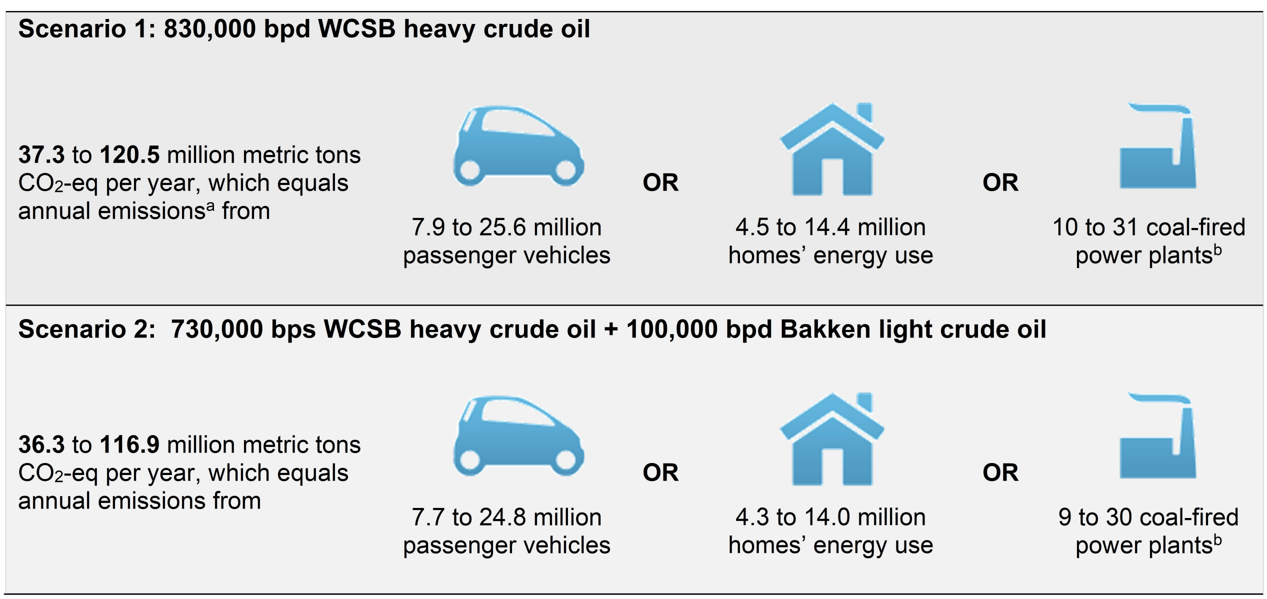


[a] Assuming each gallon of crude oil transported by the proposed Project displaces 1 gallon (full displacement), 0.8 to 0.4 gallons (partial displacement) or 0 gallons (no displacement) of other crude oils.

[b] The range of greenhouse gas emissions for full and partial displacement reflects the various crude oils that could potentially be displaced. Low-end estimates (shown as light-colored bars) are associated with displacement of Venezuelan heavy crude oil, while high-end estimates (shown as dark-colored bars) are associated with displacement of Saudi Arabian medium crude oil.

bpd = barrels per day; CO_2-eq = carbon dioxide equivalent; WCSB = Western Canadian Sedimentary Basin

Figure 4.10-1. Estimated Change in Greenhouse Gas Emissions from the Proposed Project



Source: USEPA 2019a, using estimates presented in Table 4.10-8.

[a.] One million metric tons CO_2-eq is equivalent to the annual emissions from approximately 212,300 passenger cars, the energy used by approximately 119,800 typical homes, or 26 percent of the annual emissions from a typical coal-fired power plant.

[b.] U.S. coal-fired power plants emit, on average, 3.9 million metric tons CO_2-eq per year.

bpd = barrels per day; CO_2-eq = carbon dioxide equivalent; WCSB = Western Canadian Sedimentary Basin

Figure 4.10-2. Common Greenhouse Gas Sources Equivalent to the Proposed Project, Assuming Partial Displacement of Other Crude Oils

As discussed in Section 7.4.9, greenhouse gas emissions from the proposed Project would account for:

- Up to 0.5 percent of U.S. emissions, or up to 0.07 percent of global emissions, if other crude oils are assumed to be fully displaced;
- 0.6 percent to 1.8 percent of U.S. emissions, or 0.1 percent to 0.25 percent of global emissions, if other crude oils are partially displaced; or
- 2.7 percent of U.S. emissions, or 0.4 percent of global emissions, if no displacement of other crude oils is assumed to take place.

Changes from 2014 Keystone XL Final SEIS

Like the 2014 Keystone XL Final SEIS, this SEIS considers the possibility that crude oil transported by the proposed Project could fully displace other crude oils presently refined in the United States, with no net change in global crude oil production and consumption. In addition, this SEIS includes two partial displacement scenarios, which assume that a part of the crude oil transported on Keystone XL would displace other crude oils while the remainder would represent increased consumption. These two scenarios take into account estimates of the potential increase in global oil consumption following the approval of the Proposed Action, assuming low oil prices (i.e., reduced demand relative to supply) in one case and high oil prices (i.e., increased demand relative to supply) in the other. See the discussion on "Effects of Market Conditions" under Section 4.10.4.4 for further details.

The 2014 Keystone XL Final SEIS estimated greenhouse gas emissions would increase by 1.3 to 27.4 million metric tons CO_2-eq per year from the proposed Project, assuming the proposed Project transports only WCSB heavy crude oil and other crude oils are fully displaced (U.S. Department of State 2014). With the same assumptions, this SEIS estimates that emissions would increase by 2.1 to 33.9 million metric tons CO_2-eq per year. The difference between the full displacement emissions presented in the 2014 Keystone XL Final SEIS and this SEIS can be attributed to two primary factors. First, this SEIS uses a different set of lifecycle studies than the 2014 Keystone XL Final SEIS. The majority of the studies in this SEIS are from 2015 or later, are representative of the current state of the oil sands industry, and include a wider range of greenhouse gas emissions sources.

Second, both analyses assume that refinery coke would be burned as fuel and would contribute to greenhouse gas emissions from the proposed Project (see "Consideration of Petroleum Coke" under Section 4.10.4.3). However, the 2014 Keystone XL Final SEIS also considered that refinery coke would displace an equal amount of coal (on an energy basis), and therefore included an emissions credit equal to the amount of greenhouse gases that would have been emitted by burning the displaced coal. The Department estimates that including an emissions credit for the coal displaced by refinery coke would reduce the annual lifecycle greenhouse gas emissions estimates in this SEIS by approximately 5 to 13 percent. This reduction would depend on the specific crude oil mix being transported by the proposed Project, the extent to which displacement of other crude oils is assumed to take place, and the specific crude oil being displaced. In order to present an upper-bound estimate of greenhouse gas emissions from the proposed Project, this SEIS does not include a credit for displacing coal. For purposes of comparison with the 2014 Keystone XL Final SEIS, Table 4.10-3 illustrates the effect of including this credit on greenhouse gas emissions for the proposed Project.

Table 4.10-3. Effect of Assigning Credit for Displacing Coal

Crude Oil Mix Transported by Keystone XL Project	Change in Lifecycle Greenhouse Gas Emissions[a] (million metric tons per year CO_2-eq) Displacement of Other Crude Oils			
	1[b]	0.8[c]	0.4[c]	0[d]
2014 Keystone XL Final SEIS				
830,000 bpd of WCSB heavy crude oil	1.3 – 27.4	Not calculated	Not calculated	147 – 168
This SEIS				
Scenario 1: 830,000 bpd of WCSB heavy crude oil				
Coal displacement credit not considered	2.1 – 33.9	37.3 – 62.7	107.8 – 120.5	178.3
Coal displacement credit considered	1.9 – 29.4	34.0 – 56.0	98.1 – 109.1	162.2
Scenario 2: 730,000 bpd of WCSB heavy crude oil + 100,000 bps of Bakken light crude oil				
Coal displacement credit not considered	1.7 – 30.3	36.3 – 59.2	105.5 – 116.9	174.7
Coal displacement credit considered	1.5 – 27.6	33.3 – 54.2	96.8 – 107.3	160.4

a. Calculated relative to the No Action Alternative; ranges reflect the displacement of Venezuelan heavy (lower value) and Saudi Arabian medium crude oil (higher value).

b. Reflects full displacement, where each barrel of crude oil transported by the proposed Project would displace 1 barrel of another crude oil from the market, and global crude oil consumption would not increase.

c. Reflects partial displacement, where each barrel of crude oil transported by the proposed Project would displace 0.8 to 0.4 barrels of crude oil globally (i.e., crude oil consumption would increase by 0.2 to 0.6 barrels per barrel imported).

d. Reflects no displacement, which assumes that crude oil transported by the proposed Project would not displace other crude oils from the market. Therefore, global crude oil consumption would increase by an amount equal to the flow transported by the proposed Project.

bpd = barrels per day; CO2-eq = carbon dioxide equivalent; SEIS = Supplemental Environmental Impact Statement; WCSB = Western Canadian Sedimentary Basin

4.10.4.2 Sources of Lifecycle Greenhouse Gas Emissions

This section describes the lifecycle stages and greenhouse gas emissions sources for the WCSB crude oil transported by the proposed Project. This SEIS presents a "well to wheels" lifecycle analysis of the WCSB crude oil. "Well to wheels" greenhouse gas emissions include emissions from all of the lifecycle stages including crude oil production (extraction and processing), transport to refineries, refining, finished product (fuel) delivery and dispensing, and combustion in vehicles.

Western Canadian Sedimentary Basin Crude Oil

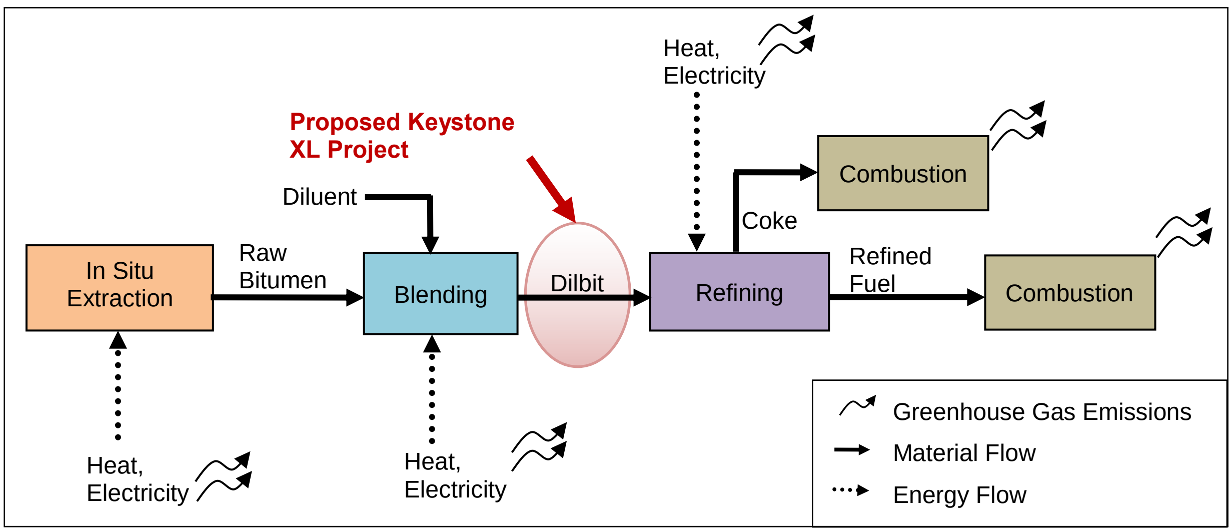
WCSB crude oil originates primarily from oil sands deposits found in the western Canadian province of Alberta. Oil sands are a mixture of bitumen (10 to 18 percent), sand and other mineral matter (80 to 85 percent), and water (5 to 10 percent) (Brandt 2012). Bitumen is a dense, viscous mixture of high-molecular-weight hydrocarbons that must be processed to lower its viscosity before it can be transported by pipeline to oil refineries. Current bitumen processing methods include blending with light hydrocarbon diluents to form diluted bitumen (dilbit); and upgrading to synthetic crude oil by either rejecting the heaviest fractions (i.e., portions) or separating them into lighter hydrocarbons. Dilbit and synthetic crude oil are produced using different processes and therefore have different lifecycle greenhouse gas emissions.

The WCSB crude oil lifecycle begins with the extraction of bitumen from oil sands deposits. About 20 percent of currently recoverable oil sands reserves are close enough to the surface to be extracted through mining. The remaining 80 percent are too deep to be mined and must be recovered by in situ extraction (drilling). Deep deposits are the largest-growing source of oil sands production. In 2017, more than three-fifths of oil sands supply came from in situ operations, and by 2030 this amount could exceed two-thirds (IHS Markit 2018b).

Surface Mining – Vegetation, soil and rocks are removed from the surface using truck-and-shovel operations, followed by mining of oil sands using diesel or electric hydraulic shovels.

In Situ Extraction – Steam is injected belowground to heat bitumen in deep deposits, which lowers the oil's viscosity enabling it to be pumped to the surface.

Figures 4.10-3 and 4.10-4 illustrate sources of greenhouse gas emissions for two WCSB crude oil pathways. Figure 4.10-3 shows in situ extraction of raw bitumen, a process used for deep oil sands deposits, followed by blending with diluents to produce dilbit. Figure 4.10-4 depicts surface mining of shallower oil sands deposits, separation of the sand and bitumen, and upgrading to a synthetic crude oil. Both pathways also include transport to a refinery, refining into useable fuels, transport of refined fuels, and finally, dispensing and end-use combustion of the fuel such as burning gasoline in vehicles. Table 4.10-4 describes the lifecycle of WCSB crude oil along with the sources of greenhouse gas emissions at each stage.

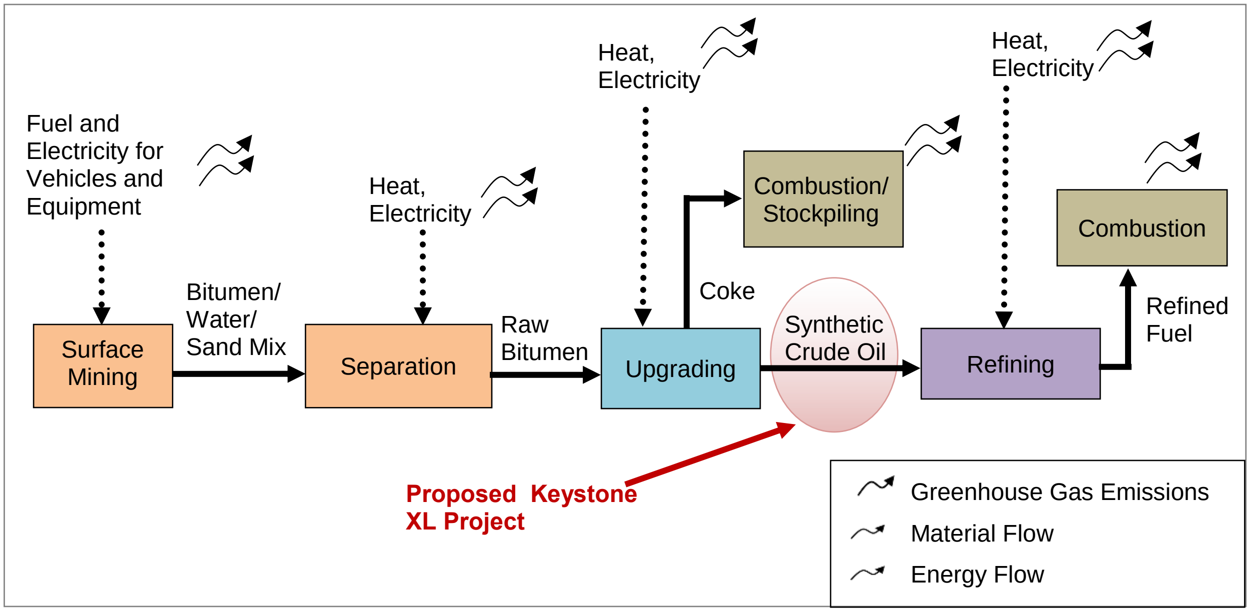


Source: Developed from Alberta Chamber of Resources 2004; Brandt 2012; U.S. Department of State 2014

dilbit = diluted bitumen; WCSB = Western Canadian Sedimentary Basin

Note: This figure is illustrative and does not show every possible source of emissions. Solid lines indicate the flow of materials (inputs and outputs). Dotted lines indicate energy input (generated onsite or purchased). Curved arrows indicate greenhouse gas emissions. The shaded ellipse locates the proposed Project's transport of WCSB crude oil relative to the complete fuel lifecycle. For simplicity, this figure does not show transportation-related greenhouse gas emissions.

Figure 4.10-3. Major Sources of Lifecycle Greenhouse Gas Emissions for Dilbit



Source: Developed from Alberta Chamber of Resources 2004; Brandt 2012; U.S. Department of State 2014

WCSB = Western Canadian Sedimentary Basin

Note: This figure is illustrative and does not show every possible source of emissions. Solid lines indicate the flow of materials (inputs and outputs). Dotted lines indicate energy input (generated onsite or purchased). Curved arrows indicate greenhouse gas emissions. The shaded ellipse locates the proposed Project's transport of WCSB crude oil relative to the complete fuel lifecycle. For simplicity, this figure does not show transportation-related greenhouse gas emissions.

Figure 4.10-4. Major Sources of Lifecycle Greenhouse Gas Emissions for Synthetic Crude Oil

Table 4.10-4. WCSB Crude Oil Lifecycle Processes and Greenhouse Gas Emissions

Process	Description	Emissions Sources
In Situ Extraction	• Used for deep bitumen deposits (>200 feet below surface). Accounted for 55 percent of total bitumen production over 5-year period between 2013 and 2017. Approximately 80 percent of total oil sands deposits in Alberta are recoverable using in situ methods. • Steam injected belowground to heat bitumen, which lowers its viscosity and enables pumping to the surface. • In cyclic steam stimulation, the same well cycles between steam injection (or soak) phases and collection phases. • Pairs of horizontal wells are drilled in steam-assisted gravity drainage. The upper well is used for steam injection and the lower well to collect bitumen.	• Fuel used to generate steam. The volume of steam needed to extract a given volume of bitumen is measured by the steam-oil ratio, which commonly ranges from 2 to 5 with an average of 3 to 3.5. • Electricity used for pumps, conveyors and process equipment. • Land use change (biomass removal and soil/peat disturbance). • Fugitive emissions and venting/flaring.
Blending	• Typically, in situ bitumen is blended with light hydrocarbon diluents in a 70:30 ratio to produce dilbit for transport to refineries via pipeline. • Nearly 98 percent of all in situ bitumen produced between 2013 and 2017 was blended into dilbit. • While most mined bitumen is upgraded, approximately 12 percent was blended into dilbit between 2013 and 2017.	• Emissions associated with diluent production and transport. Diluents are liquids typically produced along with natural gas. • Diluent production requires energy for extraction and processing and also produces fugitive emissions.

Table 4.10-4. WCSB Crude Oil Lifecycle Processes and Greenhouse Gas Emissions

Process	Description	Emissions Sources
Surface Mining	• Used to recover shallow bitumen deposits (<200 feet below surface). Accounted for 45 percent of total bitumen produced from 2013 to 2017. Approximately 20 percent of total oil sands deposits in Alberta are ultimately recoverable using surface mining. • Involves removal of vegetation, soil, rocks and other materials lying above the deposit using truck-and-shovel operations, followed by mining of oil sands using diesel or electric hydraulic shovels. • Large trucks transport the mined oil sand to processing facilities where it is crushed, mixed with hot water, screened and separated into bitumen and tailings (a mixture of water, residual hydrocarbons, sand and silt).	• Fuel use in trucks, shovels and other process equipment. • Electricity used for pumps, conveyors and process equipment and facilities. • Fuel use for producing hot water required to separate bitumen and sand. • Fugitive emissions from the mine face, tailings ponds and venting/flaring. • Land use change (biomass removal and soil/peat disturbance).
Upgrading	• Typically, mined bitumen is upgraded to synthetic crude oil. May upgrade via coking, which screens out the heaviest fractions in bitumen as petroleum coke, or via hydro-cracking, which adds hydrogen to bitumen and converts (cracks) the heavy fractions into lighter hydrocarbons. • Synthetic crude oil resembles conventional crude oil and can be transported to refineries via pipeline. • Approximately 88 percent of mined bitumen was upgraded between 2013 and 2017, but only 2 percent of in situ bitumen was upgraded over the same period.	• Fuel use for process heat, including combustion of by-product coke. • Hydrogen production from natural gas or coke gasification, in case of hydrocracking-based upgraders. • Emissions associated with electricity use for process equipment and facilities.
Crude Oil Transport	• Transportation of crude oil typically comprises a small portion of total lifecycle emissions. • Emissions depend on the distance required to transport products and the mode of delivery (e.g., pipeline, truck, rail or marine tanker).	• Vehicle fuel combustion emissions, if transported by truck, ship or rail. • Electricity generation-based emissions for pumping the product, if transported via pipeline.
Refining	• Refining energy for WCSB crude oil is similar to other heavy crude oils. • Heavy crude oils require more energy to refine and emit more greenhouse gases compared to lighter crude oils. • Sulfur and other impurities in the crude oil also affect refining energy use.	• Fuel use for process heat, including by-product coke burned onsite. • Electricity use in process equipment and facilities, whether generated onsite or imported. • Venting, flaring and fugitive emissions.
Refined Fuel Delivery	• Delivery of refined fuels from refineries to fueling stations. • Pipelines typically transport fuel to blending stations, and tanker trucks deliver the fuel from blending stations to local fueling stations. • Similar to crude oil transport, refined fuel delivery comprises a small portion of total lifecycle emissions.	• Electricity generation-based emissions for pumping the product through pipelines. • Vehicle fuel combustion emissions for truck delivery.
End Use (combus-tion)	• Largest contributor to overall lifecycle emissions. • Depends primarily on fuel type (e.g., gasoline or diesel) and vehicle characteristics including age, technology and size. • Largely independent of the type of crude oil being refined. • Lifecycle studies focusing on upstream stages (e.g., crude oil extraction and refining) often assign a fixed value to end use emissions for each type of fuel.	• Vehicle tailpipe emissions resulting from fuel combustion. • Fugitive emissions from vehicle gas tank and fuel dispensing. • Emissions from combustion of petroleum coke sold as fuel for offsite use.

Source: Alberta Energy Regulator 2018; Brandt 2012; CAPP 2018a; Keesom et al. 2012, 2009; Oil Sands Magazine 2018
> = greater than; < = less than; dilbit = diluted bitumen; WCSB = Western Canadian Sedimentary Basin

Bakken Light Crude Oil

The Bakken shale oil region extends over the Williston basin, including areas of Montana and Saskatchewan but primarily located within North Dakota. While the area has historically been explored for oil, production increased rapidly after the introduction of horizontal drilling and hydraulic fracturing to the region. Crude oil production in the Bakken averaged 2,000 bpd in 2000, but increased to 200,000 bpd in 2010, and exceeded 1.2 million bpd throughout most of 2015 (Laurenzi et al. 2016).

Wells in the Bakken region are typically drilled using diesel-fueled equipment to a depth of about 10,000 feet, before turning horizontal and extending about 10,000 feet laterally into the Middle Bakken or Three Forks formation. After drilling, the well is completed, which includes hydraulic fracturing and insertion of tubing through which the oil is produced. Initial produced fluids (including oil, gas, and water – including water injected during fracturing) flow to a temporary three-phase separator that separates crude oil from water and associated gas. Stabilization of the crude oil in the separator is accomplished via heating fueled by the associated gas that leaves the separator. Crude oil and water are sent to temporary storage tanks, and any leftover associated gas is typically flared (Laurenzi et al. 2016).

Once the flow of oil, gas and water from the well becomes steady, the well is connected to a permanent separator (known as a heater treater) and the production phase of the well begins. Associated gas not used at the well pad (e.g., as fuel for phase separation at the heater treater) is typically routed to a gas pipeline. Crude oil is intermittently transported by truck to loading facilities, from where it is sent to a refinery via pipeline or rail. Produced water is transported to designated disposal (Laurenzi et al. 2016).

Greenhouse gases are emitted during well drilling and completion, as well as from the flaring of excess produced gas. In most cases, a pipeline for the sale of associated gas is present for the complete life of a well, with the exception of flowback during well completion. However, a fraction of the gas produced may still be flared due to pipeline capacity constraints. Additionally, some wells may not be connected to a gas pipeline for several months, during which time they will continue to flare produced gas. Finally, fugitive emissions from the well and associated facilities can be a contributing source (Laurenzi et al. 2016).

Other Crude Oils

The primary difference between WCSB crude oil, Bakken crude oil and other crude oils lies in the production (e.g., extraction) processes employed. Sources of greenhouse gas emissions are generally similar between different heavy and light crude oils for the lifecycle stages of transport, refining, delivery and combustion, as described in Table 4.10-4 above. For all crude oil pathways, fuel combustion in vehicles represents the single largest source of lifecycle greenhouse gas emissions. The Department estimates that fuel combustion emissions account for 61 to 79 percent of total lifecycle greenhouse gas emissions for the various crude oils analyzed in this SEIS. Figure 4.10-6 shows lifecycle greenhouse gas emissions for these crude oils.

Conventional crude oil production can include a range of technologies depending on the reservoir type, extraction technology and oil field equipment used (Keesom et al. 2012, 2009). Petroleum production falls into three general categories of oil recovery:

- Primary recovery produces oil using the pressure of the oil reservoir.
- Secondary recovery methods pump water or gas into the reservoir to sweep trapped oil into collector wells.
- Tertiary recovery methods use the injection of steam, carbon dioxide (CO_2), solvents or polymers to increase production.

The key parameters that affect energy use and greenhouse gas emissions from crude oil production include:

- Reservoir properties, such as depth, pressure and temperature, which affect the amount of energy needed to lift the crude oil to the surface.
- Crude oil properties, including density and viscosity.
- The amount of water and gas entrained within the crude oil, measured as water-to-oil and water-to-gas ratio, which affects the energy spent in processing the oil.
- Disposition of co-produced gas, including flaring, venting, fugitive emissions, sales and re-injection.

These parameters can vary greatly from one oil field to the next. For example, many oil fields use steam injection to recover heavy crude oils, resulting in increased greenhouse gas emissions per unit of crude oil produced. Flaring and venting are another contributing source of greenhouse gas emissions, mainly methane, that vary between locations. Flaring refers to the practice of burning recovered gas along with the crude oil, when it is not practical to process and use the gas for onsite energy production or sell it as a product. Among major oil-producing countries, Nigeria, Russia and Iraq have some of the highest gas flaring rates per unit of oil produced, several times higher than flaring rates in the United States, Canada and Saudi Arabia (Keesom et al. 2012). Within the United States, methane gas flaring occurs in the Bakken oil shale region in North Dakota, as discussed above.

Crude oil production is also dynamic over time; the parameters that govern greenhouse gas emissions change over the producing life of the reservoir. As a reservoir ages, it may move from primary to secondary and even tertiary production, accompanied by a corresponding increase in production energy intensity (Keesom et al. 2012).

4.10.4.3 Calculation of Lifecycle Greenhouse Gas Emissions

This section describes the process for calculating the lifecycle greenhouse gas emissions that could occur from extracting, processing, transporting and refining WCSB crude oil, and transporting, dispensing and combusting the refined premium fuel products. The Department also estimates lifecycle emissions from other crude oils currently refined in the United States, and the annual increase in lifecycle greenhouse gas emissions that could occur as a result of WCSB crude oil replacing those other crude oils. Finally, the Department estimates emissions that could result from transport of Bakken light crude oil by the proposed Project.

Methodology for Estimating Lifecycle Greenhouse Gas Emissions

Lifecycle greenhouse gas emissions for WCSB crude oil can vary widely depending on the extraction technique used, whether the producers upgrade crude oil prior to refining, and the treatment of co-products such as petroleum coke. While the proposed Project is primarily dedicated to transporting heavy crude oil from the WCSB region, TransCanada could transport up to 100,000 bpd of Bakken light crude oil on the pipeline depending on market demand (Nebraska Public Service Commission 2017a). Therefore, to estimate impacts related to lifecycle greenhouse gas emissions, the Department considered two scenarios. Under the first scenario, the Department assumes that the proposed Project would transport only WCSB heavy crude oil, consisting of 80 percent dilbit and 20 percent synthetic crude oil. These percentages are consistent with the 2014 Keystone XL Final SEIS, and with current and projected production estimates for dilbit and synthetic crude oil in the WCSB region (U.S. Department of State 2014). For example, one forecast estimates that synthetic crude oil will constitute approximately 27 percent of total bitumen supply from Alberta over the period 2018 to 2027 (Alberta Energy Regulator

2018). Adjusting for blending of bitumen to dilbit, that equates to approximately 21 percent synthetic crude oil and 79 percent dilbit. However, the actual volumes of each product transported by the proposed Project in the future will likely vary based on market conditions.

The second scenario considers the possibility that the proposed Project could also transport light crude oil from the Bakken formation in North Dakota. Based on TransCanada's permit application submitted to the Nebraska PSC, this scenario assumes that the proposed Project would transport 100,000 bpd of Bakken light crude oil and 730,000 bpd of WCSB heavy crude oil.

The analysis of estimated lifecycle greenhouse gas emissions in this SEIS uses publicly available data from published studies to provide quantitative estimates of total lifecycle greenhouse gas emissions (on a per barrel basis) for WCSB and other crude oils. The Department relied upon 10 studies from government, industry and academic sources to obtain data on lifecycle greenhouse gas emissions for WCSB crude oil and crude oil from other sources (Brandt et al. 2015; Cai et al. 2015; Cooney et al. 2017; IHS Markit 2018b; Keesom et al. 2009; Laurenzi et al 2016; Masnadi et al 2018; Nimana et al. 2015; Orellana et al 2017; Sleep et al 2018). These studies used engineering models and industry data to generate lifecycle emissions estimates for WCSB and other crude oils.

Identifying WCSB Crude Oil Pathways

There are numerous secondary sources of variability between (and within) dilbit and synthetic crude oil (e.g., fugitive emissions, type of fuels combusted onsite, offsite electricity generation and land use change). Accordingly, this SEIS analyzes data for a range of WCSB extraction and production methods, as appropriate and reflective of current practice, to develop lifecycle greenhouse gas emissions estimates for the mix of WCSB crude oils that would be transported by the proposed Project.

As described in Table 4.10-4, producers currently extract bitumen in Alberta using three technologies: surface mining, cyclic steam stimulation and steam-assisted gravity drainage. The extracted bitumen may then be used to produce either dilbit or synthetic crude oil. Based on current and projected future production estimates, the Department identified the following four pathways (i.e., combination of extraction method and crude oil product) for analysis:

- Mining to dilbit,
- Cyclic steam stimulation to dilbit,
- Steam-assisted gravity drainage to dilbit, and
- Mining to upgraded synthetic crude oil.

The two remaining possible pathways, cyclic steam stimulation to upgraded synthetic crude oil and steam-assisted gravity drainage to upgraded synthetic crude oil, together account for less than 2 percent of current WCSB production (Alberta Energy Regulator 2018). Therefore, these two pathways were not considered further in this analysis. Sufficient data was present in the 10 studies listed above to allow estimation of greenhouse gas emissions for each of the four selected pathways.

Identifying Other Crude Oils for Comparison

The selected studies also presented greenhouse gas emissions for a number of other conventional and non-conventional crude oils. The Department selected a subset of crude oils that is analyzed in multiple studies and that accounts for a significant portion of crude oils refined in PADD 1, PADD 2 and PADD 3. Most crude oil imported from Canada is currently refined in PADD 2, while PADD 3 represents a potentially significant new market for WCSB crude oils (CAPP 2018a). PADD 1 represents a major market for Bakken light crude oil. The other crude oils selected for analysis in this SEIS are Arab medium, Mexican heavy, Nigerian light crude oil and Venezuelan heavy. With the exception of Nigerian light crude oil, these are the crude oils that were analyzed in the 2014 Final Keystone XL SEIS (U.S. Department of State 2014).

This SEIS compares WCSB heavy crude oil to other heavy and medium crude oils, and light Bakken crude oil to other light to medium crude oils. Lighter crude oils are interchangeable with heavier crude oils to a small extent in the short term, as refineries may have some (limited) flexibility in selecting the crude slate (i.e., the mix of different crude oils) that they refine. However, over longer timeframes, refineries can make investments to shift their processing capability towards heavier crude oil and away from lighter crude oil if a reliable and cost-effective supply of heavier crude oil is available. For example, several refineries in PADD 2 have recently made investments to increase their heavy crude oil processing capacity (CAPP 2018a).

Steps in Estimating Lifecycle Greenhouse Gas Emissions

The Department followed the steps outlined below to estimate the annual lifecycle emissions for WCSB and other crude oils that could be transported by the proposed Project under the Proposed Action and also the No Action Alternative:

- Converted crude oil production (extraction and upgrading) and transport greenhouse gas emissions for WCSB, Bakken and other crude oils from a per unit of fuel (energy) basis (kilogram CO_2-eq/megajoule), as reported in the selected studies, to a per unit of crude oil (volume) basis (kilogram CO_2-eq/barrel of crude oil) using lower heating values from the Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) model, and calculated an average based on the values reported for each type of crude oil.
- Estimated refinery emissions and coke and fuel yield data using the Petroleum Refinery Lifecycle Inventory Model (PRELIM) version 1.2 (Abella et al. 2017).
- Added the impact of refinery coke combustion on lifecycle emissions for WCSB and other crude oils, assuming that coke does not displace other fuels. As discussed earlier, coke is a by-product of crude oil upgrading and refining. Tables 4.10-5 summarizes these results.
- Estimated greenhouse gas emissions from refined fuel use (combustion), using product yields from PRELIM and emissions factors from GREET.
- Estimated lifecycle greenhouse gas emissions, per barrel of crude oil, for each WCSB pathway by adding together crude oil production, transport, refining and fuel use emissions estimates for each pathway, including the effects of coke combustion.
- Estimated the proportion of crude oil contributed by each WCSB pathway to the proposed Project, and used these proportions to calculate the weighted average lifecycle greenhouse gas emissions for WCSB heavy crude oil. Table 4.10-6 summarizes these results.
- Estimated average lifecycle greenhouse gas emissions per barrel of crude oil for Bakken and other crude oils currently refined in the United States, based on the studies reviewed, by adding together crude oil production, transport, refining, and fuel use emissions estimates (including coke combustion). Tables 4.10-6 and 4.10-7 summarize these results for Bakken light crude oil and other crude oils, respectively.

- Estimated total annual change in greenhouse gas emissions for WCSB, Bakken and other crude oils, based on the volumes of WCSB heavy and Bakken light crude oil delivered to market under the Proposed Acton. These calculations are described below in the subsection titled Change in Greenhouse Gas Emissions from the proposed Project. Where full or partial displacement of other crude oils was considered, the lifecycle emissions of WCSB and Bakken crude oil were compared to lifecycle emissions from other crude oils, to estimate the lifecycle impact of extracting, refining and using WCSB or Bakken crude oil in place of one of the alternative crude oils.

In addition, the Department modeled lifecycle greenhouse gas emissions for the proposed Project using the GREET 2018 Fuel Cycle Model developed by Argonne National Laboratory (Argonne National Laboratory 2018). This analysis provides an alternative method to develop lifecycle emissions for the proposed Project and conventional crude oils. The Department compared these modeled results to the results of the lifecycle analysis using published literature as described above.

Consideration of Petroleum Coke

Petroleum coke, a solid black substance composed primarily of carbon, is a by-product of crude oil upgrading and refining. Petroleum coke may contain limited amounts of elemental sulfur, metals and non-volatile inorganic compounds. Industrial boilers and power plants may burn petroleum coke as fuel (Andrews and Lattanzio 2013). In 2014, producers exported approximately 60 percent of total U.S. petroleum coke production, with India, Japan and China as the principal destinations (EIA 2018b, 2018c, 2018d). Recent publications (e.g., Oil Change International 2013) have raised concerns that the shift to WCSB bitumen-based crude oils could result in a significant increase in the amount of petroleum coke produced and combusted, which would further increase global greenhouse gas emissions. Therefore, the Department analyzed the potential impacts of coke production and combustion during WCSB crude oil upgrading and refining and included the contribution of coke combustion in its emissions estimates.

Coke production during upgrading of WCSB bitumen depends on the upgrading technology used. Coking-based upgrading currently produces approximately 80 pounds of coke per barrel of synthetic crude oil, while hydrocracking upgraders do not produce coke (Alberta Energy Regulator 2017, 2016, 2015, 2014, 2013). Currently, approximately 70 percent of all synthetic crude oil production in Alberta uses coking-based upgrading technology (Englander and Brandt 2014), for an industry-wide average of 59 pounds of coke per barrel of synthetic crude oil. Between 2013 and 2017, the industry stockpiled approximately 75 percent of all upgrader coke production, with the rest burned as fuel (Alberta Energy Regulator 2017, 2016, 2015, 2014, 2013). Inventories of petroleum coke at upgraders in Alberta have been increasing at an average rate of 5 million tons per year since 2000, and the rate has accelerated in recent years (Alberta Energy Regulator 2018). At the end of 2017, approximately 125 million tons of coke were stockpiled at upgraders in Alberta, up from 32 million tons in 2000 and 75 million tons in 2010.

Of the studies used by the Department to estimate lifecycle greenhouse gas emissions for WCSB heavy crude oil, two (Keesom et al. 2009 and Nimana et al. 2015) did not analyze the effects of burning upgrader coke for energy. In these cases, the Department estimated the additional greenhouse gas emissions that would result from burning 14.8 pounds of coke per barrel of synthetic crude oil (or 25 percent of 59 pounds), assuming that the coke would displace an equivalent amount (on an energy basis) of natural gas. The Department applied emissions factors from the GREET model to estimate total greenhouse gas emissions from combustion of natural gas and petroleum coke.

Refineries also produce petroleum coke, especially from heavy and medium crude oils. Dilbit produces approximately 49 pounds of coke per barrel while synthetic crude oil produces approximately 4 pounds per barrel. The other medium to heavy crude oils included in this analysis produce between 41 and 89 pounds of petroleum coke per barrel of crude oil refined, while Nigerian light crude oil produces 5 pounds per barrel (Abella et al. 2017). Refinery coke is typically burned as fuel onsite or sold domestically, or exported to Asia, South America and Europe. Table 4.10-5 summarizes coke production and disposition at U.S. refineries.

Table 4.10-5. U.S. Refinery Coke Production and Disposition

Year	Production[a] (million barrels)	Domestic Use (million barrels)	Net Exports (million barrels)
2008	299	170	130
2017	329	115	212

Source: EIA 2018b, 2018c, 2018d

[a.] Total production may not add up to the sum of domestic use and net exports due to year-over-year changes in petroleum coke stocks.

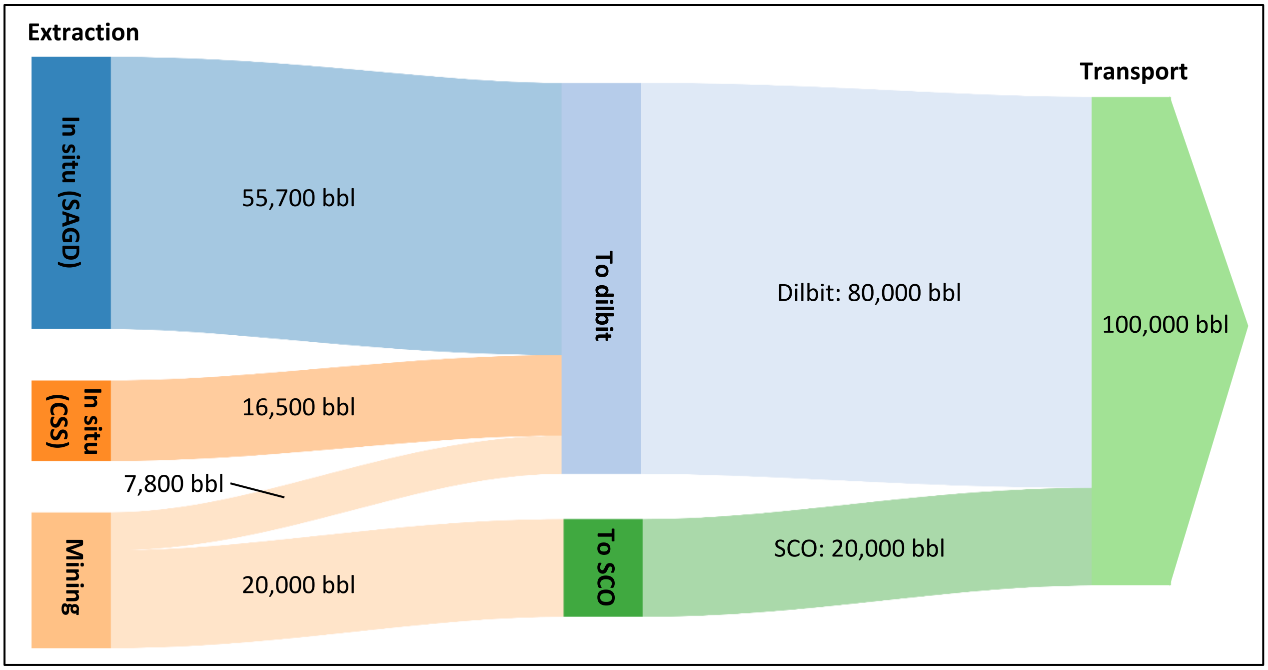
The Department applied GREET emissions factors to estimate total greenhouse gas emissions, assuming that refinery coke was being burned at large industrial boilers. The Department also considered the effect of applying an emissions credit to coke combustion emissions, assuming that coke replaces coal as fuel. Applying this credit would have lowered per barrel lifecycle greenhouse gas emissions estimates for WCSB heavy crude oil by approximately 9 percent, for other medium to heavy crude oils by approximately 8 to 16 percent, and for Bakken and Nigerian light crude oils by approximately 1 percent. However, to present an upper-bound estimate of lifecycle greenhouse gas emissions from the proposed Project, the emissions estimates presented in this SEIS do not include this credit.

Estimated Lifecycle Greenhouse Gas Emissions for WCSB and Bakken Crude Oil

As discussed above, the Department considers four WCSB crude oil pathways in its analysis of lifecycle greenhouse gas emissions from the proposed Project. These four pathways have different greenhouse gas emissions intensities and would contribute varying amounts of crude oil to the product mix transported by the proposed Project. In order to develop a single, weighted-average emissions estimate for the mix of WCSB crude oils transported by the proposed Project, the Department estimates the fraction of Keystone XL WCSB crude oil produced by each pathway using:

- The proportions of dilbit and synthetic crude oil that would be transported by the proposed Project (80 and 20 percent, respectively); and
- The amounts of dilbit and synthetic crude oil produced in Alberta from mining, cyclic steam stimulation and steam-assisted gravity drainage (Alberta Energy Regulator 2018; CAPP 2018b).

For illustrative purposes, Figure 4.10-5 presents the amount of product that each pathway would contribute for each 100,000 bpd of WCSB heavy crude oil by the proposed Project.



bbl = barrels; CSS = cyclic steam stimulation; dilbit = diluted bitumen; SAGD = steam-assisted gravity drainage; SCO = synthetic crude oil; WCSB = Western Canadian Sedimentary Basin

Note: Calculated using percentage of dilbit (80 percent) and synthetic crude oil (20 percent) that would be transported by the proposed Project, and percentage of dilbit and synthetic crude oil produced in Alberta from steam-assisted gravity drainage, cyclic steam stimulation and mining (Alberta Energy Regulator 2018, CAPP 2018b).

Figure 4.10-5. Contribution of Various Pathways to Keystone XL WCSB Crude Oil Mix

The Department then multiplied pathway-specific greenhouse gas emissions estimates with each pathway's proportional contribution to the Keystone XL crude oil mix, to develop a weighted-average greenhouse gas emissions estimate for the Keystone XL crude oil mix. Table 4.10-6 lists pathway-specific emissions estimates and shows the calculation of weighted-average emissions for WCSB crude oil transported by the proposed Project.

The proposed Project could also allow Keystone to transport light crude oil from the Bakken formation. Estimated lifecycle greenhouse gas emissions for Bakken light crude oil are included in Table 4.10-6.

Comparison of WCSB, Bakken and Other Crude Oils

As described earlier, this SEIS considers that additional WCSB heavy or Bakken light crude oil transported to market by the proposed Project, relative to the baseline condition, could fully or partially displace other crude oils. Under such a scenario, any increase in greenhouse gas emissions would depend on the difference in the lifecycle emissions of WCSB crude oil or Bakken crude oil, and the crude oil assumed to be displaced. Table 4.10-7 compares lifecycle greenhouse gas emissions for WCSB heavy crude oil to other heavy and medium crude oils, and Bakken light crude oil to other medium and light crude oils. Figure 4.10-6 illustrates the greenhouse gas intensities of the various crude oils considered in this analysis.

Table 4.10-6. Calculation of Lifecycle Emissions for Keystone XL Crude Oil

Pathway	Contribution to WCSB Heavy Crude Oil Mix (%)	Lifecycle Emissions[a] (kg CO_2-eq per barrel)	Range of Emissions (kg CO_2-eq per barrel) *[Studies Used]*[b]
WCSB Heavy Crude Oil	100.0%[c]	**588**[d]	554-619 *[See list for each pathway]*
Mining to dilbit	7.8%	547	526-569 *[C1, C2, I, K, M, N, S]*
In situ (cyclic steam stimulation) to dilbit	16.5%	593	570-618 *[C1, I, M, O]*
In situ (steam-assisted gravity drainage) to dilbit	55.7%	571	532-601 *[C1, I, K, M, N, O]*
Mining to synthetic crude oil	20.0%	649	611-688 *[C1, C2, I, K, M, N, S]*
Bakken Light Crude Oil	–	**491**	475-506 *[B, C2, L, M]*

a. Average of values reported by selected studies (see list in footnote b). Includes land use and coke combustion emissions.
b. Range of lifecycle emissions reported in Brandt et al. 2015 (B); Cai et al. 2015 (C1); Cooney et al. 2016 (C2); IHS Markit 2018b (I); Keesom et al. 2009 (K); Laurenzi et al. 2016 (L); Masnadi et al. 2018 (M); Nimana et al. 2015 (N); Orellana et al. 2017 (O) and Sleep et al. 2018 (S).
c. Note that percentages may not add up to 100 because of independent rounding.
d. WCSB heavy crude oil value reflects the weighted average of pathway-specific emissions, calculated by multiplying each pathway's emissions with its proportional contribution to the WCSB heavy crude oil mix as shown in this table and in Figure 4.10-5.

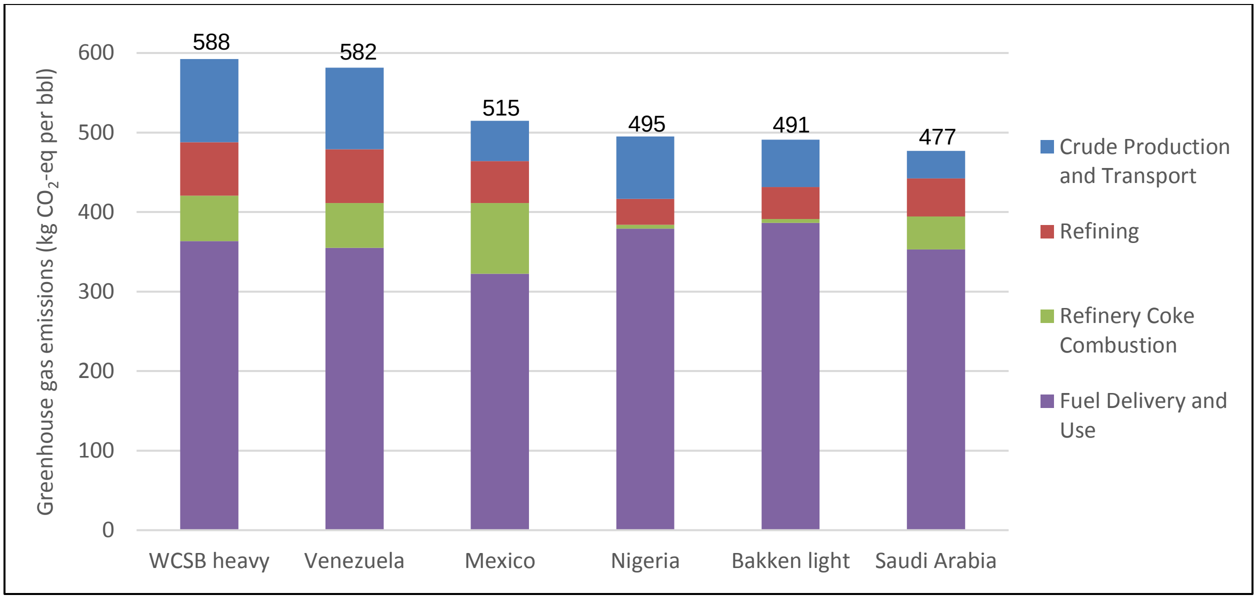
% = percent; bpd = barrels per day; CO_2-eq = carbon dioxide equivalent; dilbit = diluted bitumen; kg = kilogram; WCSB = Western Canadian Sedimentary Basin

Table 4.10-7. Comparison of WCSB, Bakken and Other Crude Oils

Crude Oil	Lifecycle Greenhouse Gas Emissions[a] (kg CO_2-eq per barrel of crude oil)	Difference in Emissions[b] (kg CO_2-eq per barrel of crude oil)	Range of Emissions (kg CO_2-eq per barrel)[c]
WCSB heavy Crude Oil	**588**	–	554-619
Venezuelan heavy	582	7	515-628
Mexican heavy	515	74	503-529
Saudi Arabian medium	477	112	468-481
Bakken Crude Oil	**491**	–	475-506
Nigerian light	495	-4	477-519
Saudi Arabian medium	477	14	468-481

a. Average of values reported by selected studies (see list in footnote c). Includes coke combustion emissions.
b. Reflects the difference in lifecycle emissions between WCSB heavy crude oil and other heavy to medium crude oils, and between Bakken light crude oil and other medium to light crude oils.
c. Range of lifecycle emissions for each crude oil as reported in Cooney et al. 2016; Keesom et al. 2009; and Masnadi et al. 2018. See Table 4.10-6 for the list of studies used to estimate lifecycle emissions for WCSB heavy and Bakken light crude oil.

bpd = barrels per day; CO_2-eq = carbon dioxide equivalent; kg = kilogram; U.S. = United States; WCSB = Western Canadian Sedimentary Basin



bbl = barrel; CO_2-eq = carbon dioxide equivalent; kg = kilogram; WCSB = Western Canadian Sedimentary Basin

Figure 4.10-6. Greenhouse Gas Emissions for Various Crude Oils

4.10.4.4 Change in Greenhouse Gas Emissions from the Proposed Project

As described above, the Department estimated lifecycle greenhouse gas emissions (in kg CO_2-eq per barrel of crude oil) for WCSB heavy crude oil, Bakken light crude oil and other crude oils currently refined in the United States. In order to develop estimates for the change in annual greenhouse gas emissions from the proposed Project, the Department multiplied per barrel greenhouse gas emissions with the total volumes of crude oil that could be transported by the proposed Project. Table 4.10-8 lists the maximum volume of WCSB heavy crude oil and Bakken oil that could potentially be transported by the proposed Project, as well as the net change in flow of heavy and light WCSB crude oil. Under the No Action Alternative, the proposed Project would not be constructed and operated, and the flow of crude oil transported into the United States would not change as a result, as explained in Chapter 2, Development of Alternatives.

Effect of Market Conditions

The 2014 Keystone XL Final SEIS estimated changes in lifecycle greenhouse gas emissions assuming that crude oil transported on Keystone XL would fully displace other crude oils from the market, i.e., global crude oil consumption would not increase. In such a case, greenhouse gas emissions would increase by an amount equal to the difference in lifecycle emissions between the imported WCSB crude oil and the displaced crude oil**, which is the lower bound scenario analyzed in this SEIS**. **This SEIS also considers an upper bound scenario in which crude oil transported on Keystone XL would not displace other crude oils from the market. In such a case, greenhouse gas emissions would increase by an amount equal to the lifecycle emissions associated with the imported WCSB crude oil.**

This SEIS also considers **a third** possibility that depending on market conditions, the crude oil transported by the proposed Project would only partially displace other crude oils from the market, leading to a net increase in global oil consumption. In this scenario, some of the crude oil displaced from U.S. refineries would be refined (and consumed) at other locations around the globe. The amount of additional crude oil consumed in this case would contribute to a further increase in greenhouse gas emissions, as compared to full displacement. The change in greenhouse gas emissions would depend on the characteristics of the specific crude oil that is assumed to be displaced by WCSB crude oil.

Recent studies (Erickson and Lazarus 2014; Erickson and Lazarus 2018; Erickson 2018) have estimated the net change in global crude oil consumption that would occur as a result of changes to crude oil supply, under a range of market conditions. Erickson and Lazarus (2018) consider the effect that a change in the supply of WCSB crude oil would have on global crude oil consumption. They estimate that under conditions of low oil prices (around $60 per barrel, which could occur as a result of weak demand and increased supply, as well as policies to combat climate change), each additional barrel of crude oil supplied to markets would result in a net increase of 0.2 barrels of crude oil consumed. In effect, each barrel of additional crude oil supplied would displace 0.8 barrels of other crude oils from the market. Conversely, under conditions of high oil prices (around $110 per barrel), each barrel of additional crude oil supplied to market would displace 0.4 barrels of other crude oils, and consumption would increase by 0.6 barrels. The Department used this range of added consumption (0.2 to 0.6 barrels) to estimate the change in greenhouse gas emissions from the proposed Project.

Estimated Greenhouse Gas Emissions

The analysis finds that the increased transport of WCSB crude oil from the proposed Project could result in an increase in greenhouse gas emissions relative to the No Action Alternative, which would in turn contribute to an increase in global atmospheric greenhouse gas concentrations. The extent to which emissions would increase depends greatly on future market conditions and the extent to which other crude oils would be displaced and, in cases where displacement of other crude oils is considered, on the specific crude oil that is assumed to be displaced. Regardless of the type of crude oil transported on Keystone XL, the Department finds that full displacement of other crude oils results in significantly lower greenhouse gas emissions as compared to partial or no displacement. Further, displacement of less-greenhouse gas intensive crude oils (such as Saudi Arabian medium crude oil) would result in a larger increase in greenhouse gas emissions than if more greenhouse gas-intensive crude oils (such as heavy Venezuelan crude oil) were displaced.

Table 4.10-8 shows the range of potential increase in annual greenhouse gas emissions from the proposed Project under the Proposed Action, relative to the No Action Alternative, under conditions of no displacement, partial displacement and full displacement of other crude oils from the market. To place these numbers in context, Figure 4.10-2 compares the likely increase in greenhouse gas emissions from the proposed Project, under conditions of partial displacement, to emissions from common greenhouse gas sources.

The estimates presented in Table 4.10-8 represent the increase in emissions associated with production and consumption of 830,000 bpd of oil sands crude, taking into account the potential impact of this increase in crude oil supply on global oil markets and consumption. These estimates also assume that approval of the Proposed Action would directly result in an increase in production of 830,000 bpd of WCSB crudes in Canada. However, as discussed in Section 1.4, it is likely that even in the absence of the Proposed Project, some of the crude oil that would have been transported on Keystone XL would still be produced and transported to market by other modes including rail. Therefore, these estimates represent an upper bound on the potential increase in crude oil supply, and the associated lifecycle greenhouse gas emissions, that could potentially from the proposed Project.

Table 4.10-9 presents estimates of the increase in emissions over an assumed 50-year operating life for the proposed Project. The 50-year emissions estimates include one-time emissions associated with the construction of the proposed Project's pipeline, pump stations, and other related facilities.

Table 4.10-8. Change in Greenhouse Gas Emissions from the Proposed Project

Alternative	Change in Crude Oil Flow (thousand barrels per day)		Change in Greenhouse Gas Emissions[a] (million metric tons per year CO_2-eq)			
			Barrels of Crude Oil Displaced per Barrel Transported through Keystone XL			
	Heavy Crude Oil	Light Crude Oil	1[b]	0.8[c]	0.4[c]	0[d]
Proposed Project						
Scenario 1: WCSB heavy crude oil only	830	0	2.1 – 33.9	37.3 – 62.7	107.8 – 120.5	178.3
Scenario 2: WCSB heavy crude oil + Bakken light crude oil	730	100	1.7 – 30.3	36.3 – 59.2	105.5 – 116.9	174.7
No Action Alternative	0	0	0.0	0.0	0.0	0.0

a. Calculated relative to the No Action Alternative; ranges reflect the range of crude oils that could potentially be displaced.
b. Reflects full displacement, where each barrel of crude oil transported by the proposed Project would displace 1 barrel of another crude oil from the market, and global crude oil consumption would not increase.
c. Reflects partial displacement, where each barrel of crude oil transported by the proposed Project would displace 0.8 to 0.4 barrels of crude oil globally (i.e., crude oil consumption would increase by 0.2 to 0.6 barrels per barrel imported).
d. Reflects no displacement, which assumes that crude oil transported by the proposed Project would not displace other crude oils from the market. Therefore, global crude oil consumption would increase by an amount equal to the flow transported by the proposed Project.
CO_2-eq = carbon dioxide equivalent; WCSB = Western Canadian Sedimentary Basin

Table 4.10-9. Change in Greenhouse Gas Emissions over a 50-year Operating Period

Alternative	Change in Greenhouse Gas Emissions[a] (million metric tons CO_2-eq)			
	Barrels of Crude Oil Displaced per Barrel Transported through Keystone XL			
	1[b]	0.8[c]	0.4[c]	0[d]
Proposed Project				
Scenario 1: WCSB heavy crude oil only	105.3 – 1,692.8	1,867.1 – 3,137.1	5,390.7 – 6,025.7	8,914.3
Scenario 2: WCSB heavy crude oil + Bakken light crude oil	85.1 – 1,514.8	1,815.3 – 2,959.1	5,275.8 – 5,847.7	8,736.3
No Action Alternative	0.0	0.0	0.0	0.0

a. Calculated relative to the No Action Alternative; ranges reflect the range of crude oils that could potentially be displaced.
b. Reflects full displacement, where each barrel of crude oil transported by the proposed Project would displace 1 barrel of another crude oil from the market, and global crude oil consumption would not increase.
c. Reflects partial displacement, where each barrel of crude oil transported by the proposed Project would displace 0.8 to 0.4 barrels of crude oil globally (i.e., crude oil consumption would increase by 0.2 to 0.6 barrels per barrel imported).
d. Reflects no displacement, which assumes that crude oil transported by the proposed Project would not displace other crude oils from the market. Therefore, global crude oil consumption would increase by an amount equal to the flow transported by the proposed Project.
CO_2-eq = carbon dioxide equivalent; WCSB = Western Canadian Sedimentary Basin

4.10.4.5 Results of GREET Modeling

The Department used the GREET model as an alternative means of estimating the increase in lifecycle greenhouse gas emissions that could occur as a result of producing, refining and using WCSB heavy and Bakken light crude oil by the proposed Project, as compared to an average mix of crude oils currently refined in the United States. GREET is a fuel-cycle model developed by the Argonne National Laboratory that allows well-to-wheels or well-to-pump analysis of a variety of fuels (Argonne National Laboratory 2018). GREET includes an extensive database of fuel lifecycle processes and pathways, including separate pathways for WCSB oil sands and Bakken shale oil.

The Department modeled emissions using GREET 2018 (released on October 10, 2018) as follows:

- Developed weightings for each WCSB pathway in GREET, based on the amount of crude oil contributed by each pathway of the proposed Project. The WCSB pathways available in GREET (and the weights for each pathway as estimated by the Department) are as follows: in situ + dilbit (72.2 percent), mining + dilbit (7.8 percent) and mining + upgrading (20.0 percent).
- For the WCSB pathways listed above, estimated lifecycle greenhouse gas emissions for each of three major fuel types (conventional gasoline, diesel and jet fuel) using default greenhouse gas emissions values from the GREET database. Added estimates of WCSB refinery coke combustion emissions to the GREET results for WCSB crude oil.
- For the U.S. average refinery mix, estimated lifecycle greenhouse gas emissions for the three major fuel types using default greenhouse gas emissions values from the GREET database. Added estimates of coke combustion emissions to GREET results, assuming that the average crude oil refined in the United States produces an amount of coke similar to Saudi Arabian medium crude oil.
- Used U.S. refinery fuel production data (EIA 2018b) to estimate the percentages of each refined fuel (gasoline, diesel and jet fuel) produced over the five-year period from 2013 to 2017, and used these percentages to calculate weighted average lifecycle emissions for WCSB, Bakken, and the average U.S. crude oil pathways.
- Estimated total annual lifecycle greenhouse gas emissions that could occur from the proposed Project based on the per barrel emissions estimates developed above.

Table 4.10-10 lists the results of the modeling steps described above. The GREET estimates of lifecycle emissions for WCSB crude oil (584 kg CO_2-eq per barrel) and Bakken light crude oil (497 kg CO_2-eq per barrel) are consistent with the estimates presented in Table 4.10-6 (588 kg CO_2-eq per barrel for WCSB heavy crude oil; 491 kg CO_2-eq per barrel for Bakken light crude oil). Similarly, the GREET estimate for the U.S. average refinery mix (528 kg CO_2-eq per barrel) lies within the range of lifecycle emissions for the other crude oils presented in Table 4.10-7 (477 to 582 kg CO_2-eq per barrel). Using GREET, the Department estimates lifecycle emissions for WCSB heavy crude oil to be greater than the average crude oil input into U.S. refineries by approximately 55 kg CO_2-eq per barrel, which lies well within the range presented in Table 4.10-7 (7 to 112 kg CO_2-eq per barrel).

Table 4.10-11 presents estimates of the annual change in greenhouse gas emissions from the proposed Project, based on the results presented in Table 4.10-10. These estimates lie well within the ranges presented in Table 4.10-8. Note that the GREET estimate of lifecycle emissions for the U.S. average refinery mix includes both light and heavy crude oils. Therefore, comparing lifecycle greenhouse gas emissions to the U.S. average mix could potentially lead to an over-estimate of the change from using WCSB heavy crude oil, and an under-estimate of the change from using Bakken light crude oil.

Table 4.10-10. GREET Lifecycle Estimates for WCSB, Bakken and Other Crude Oils

Crude Oil	Lifecycle Greenhouse Gas Emissions	Difference in Emissions[a]
	(kg CO_2-eq per barrel of crude oil)	
WCSB heavy crude oil	584	+55
Bakken crude oil	497	-32
U.S. average refinery mix	528	-

[a] Reflects the difference between WCSB heavy crude oil or Bakken light crude oil, and the U.S. average refinery mix.
CO_2-eq = carbon dioxide equivalent; kg = kilogram; U.S. = United States; WCSB = Western Canadian Sedimentary Basin

Table 4.10-11. Estimates of Change in Annual Greenhouse Gas Emissions using GREET

Alternative	Change in Crude Oil Flow[a] (thousand barrels per day)		Change in Greenhouse Gas Emissions[b] (million metric tons per year CO_2-eq)			
	Heavy Crude Oil	Light Crude Oil	Barrels of Crude Oil Displaced per Barrel Transported through Keystone XL			
			1[b]	0.8[c]	0.4[c]	0[d]
Proposed Project						
Scenario 1 - WCSB heavy crude oil only	830	0	16.8	48.8	112.8	176.8
Scenario 2 - WCSB heavy crude oil + Bakken light crude oil	730	100	13.6	45.6	109.6	173.7
No Action Alternative	0	0	0.0	0.0	0.0	0.0

[a] Reflects full displacement, where each barrel of crude oil transported by the proposed Project would displace 1 barrel of another crude oil from the market, and global crude oil consumption would not increase.
[b] Calculated relative to the No Action Alternative.
[c] Reflects partial displacement, where each barrel of crude oil transported by the proposed Project would displace 0.8 to 0.4 barrels of crude oil globally (i.e., crude oil consumption would increase by 0.2 to 0.6 barrels per barrel imported).
[d] Reflects no displacement, which assumes that crude oil transported by the proposed Project would not displace other crude oils from the market. Therefore, global crude oil consumption would increase by an amount equal to the flow transported by the proposed Project.
CO_2-eq = carbon dioxide equivalent; WCSB = Western Canadian Sedimentary Basin

4.10.4.6 Future Uncertainty in Lifecycle Greenhouse Gas Emissions

In its analysis of lifecycle emissions from the proposed Project under the Proposed Action Alternative and No Action Alternative, the Department considered factors that may affect future lifecycle greenhouse gas emissions for WCSB and other crude oils. While the effect of these factors cannot be quantified, they are briefly discussed below:

- **Changes in the types of crude oil transported by the Keystone XL Project** – The analysis considers the impacts of replacing heavy and medium crude oils with WCSB heavy crude oil and medium and light crude oils with Bakken light crude oil. However, if the proposed Project were to transport other light crude oils in the future, such as light WCSB synthetic crude oil (depending on market conditions), greenhouse gas emissions from the proposed Project could potentially increase or decrease, depending on the relative greenhouse gas intensities of the crude oil transported by the proposed Project and the other crude oils that would be displaced.

- **Future policies to limit greenhouse gas emissions – Emerging and future policies designed to limit greenhouse gas emissions could potentially lower lifecycle emissions for WCSB and other crude oils. For example, the Government of Alberta introduced legislation in 2019 that would establish a system to encourage energy-intensive facilities to find innovative ways to reduce emissions and invest in clean technologies. The legislation would require large emitters (including all oil sands producers) to reduce their emissions intensity over time or pay into a technology fund.**
- **Changes in crude oil production technology** – Changes in oil sands extraction technology could potentially lower lifecycle greenhouse gas emissions. Englander et al. (2013) found that the energy intensity of WCSB crude oil production decreased by approximately 37 percent from 1970 to 2010. Several innovative extraction technologies are currently under development that could lead to further reductions. These include the use of naphtha froth treatment and paraffin froth treatment to treat mined bitumen, which reduces the need for upgrading. In fact, some mining projects using paraffin froth treatment have eliminated the need for an upgrading step and are directly blending mined bitumen into dilbit, which results in lower energy use (Alberta Chamber of Resources 2004). In-pit mine face extraction is another new mining technology that involves a relocatable, modular extraction plant that can process ore and separate bitumen adjacent to mining operations, significantly reducing material transportation and associated greenhouse gas emissions (Emissions Reduction Alberta 2019). In the case of in situ extraction, energy use could be reduced through injecting solvents along with steam (Alberta Chamber of Resources 2004). A recent study estimates that adoption of new technologies and other process improvements could lower the greenhouse gas intensity of oil sands extraction by 16 to 23 percent below 2017 levels (and more than one-third below 2009 levels) by 2030 (HIS Markit 2018).
- **Changes to reservoir quality** – As conventional crude oils continue to be extracted, increasingly depleted reservoirs will continue to require greater energy inputs to maintain production, accompanied by a shift toward enhanced recovery techniques. Therefore, lifecycle greenhouse gas emissions from conventional crude oils are likely to increase over time. Similarly, it is possible that as WCSB bitumen deposits are depleted over time, the remaining bitumen could require more energy to extract, resulting in higher greenhouse gas emissions. The increase in greenhouse gas emissions varies over time and depending on the oil field characteristics and energy sources used. In California, for example, the energy intensity of crude oil production and refining almost doubled from 1955 to 2005 because of declining reservoir quality (Brandt 2011).

4.10.5 Potential Impacts of Climate Change on the Proposed Project

The discussion below summarizes potential impacts of climate change on the proposed Project (i.e., impacts on construction, operation and maintenance of the proposed Project), and discusses ways in which climate change could intensify the potential environmental impacts of the proposed Project as analyzed in this SEIS. See Sections 4.14.5 and 4.14.6 of the 2014 Keystone XL Final SEIS for further discussion.

The potential impacts of climate change (as discussed in Section 3.10) would not be likely to affect the construction of the Keystone XL pipeline and other infrastructure associated with the proposed Project. Climate change impacts include increased temperatures, more freeze-thaw cycles, increased intensity of severe weather events, an increased number of heavy precipitation events and an elevated risk of wildfire. However, climate change is a phenomenon that is expected to unfold over several decades or even centuries. Construction activities would be completed within a one- to two-year timeframe, during which climate conditions are not expected to vary significantly from the current baseline. The CMRP (Appendix G of the 2014 Keystone XL Final SEIS), which presents Keystone's construction, reclamation and post-construction procedures to minimize environmental consequences, addresses the potential effects of extreme weather conditions including high precipitation effects such as an extremely wet ROW, high steam flows, and increased scour potential, and drought effects such as increased dust and vegetation stress.

Climate change is also not likely to significantly impact normal operations of the Keystone XL pipeline and associated infrastructure. The pipeline, pump stations and associated infrastructure meet appropriate U.S. Department of Transportation (USDOT) and other industry design standards. The pipeline would be buried at least 4 feet underground, which would protect it from most surface impacts, including higher surface temperatures, freeze-thaw cycles and increased precipitation. However, severe weather conditions could potentially affect the normal operations of the proposed Project. For example, tornadoes could damage or temporarily interrupt communications with the monitoring systems or directly damage aboveground elements such as tanks, pumps, sensors, small pipes and support equipment. Flooding could damage pumps, short out electrical systems and components, or create corrosive conditions. Heavy rains, snowfall and high winds may produce conditions that would affect system integrity over time. Lightning and wildfires are unlikely to damage the system integrity directly but could cause the loss of supervisory control and data acquisition (SCADA). The pipeline and associated infrastructure would be subject to periodic inspections, which would help mitigate risk of damage from severe weather, extreme heat or other climate-related factors.

The effects of climate change on construction and operational impacts to other environmental resources would be similar to those analyzed in Section 4.14.6 of the 2014 Keystone XL Final SEIS. Climate change could exacerbate the potential environmental impacts of the proposed Project on other resource areas including soils, land use, water resources, and biological resources; those impacts are described in Chapter 4, Environmental Consequences from Construction and Normal Operations. For example, heavy precipitation and extreme weather may lead to increased soil erosion or increased surface runoff during ground-disturbing activities; climate change could potentially increase worker exposure to hazardous work conditions such as extreme heat or severe weather; and climate change could intensify the spread of invasive plant species and aquatic habitat degradation associated with construction, normal operations and maintenance activities. However, as discussed above, the effect of climate change on project impacts would likely be minimal during the construction phase because climate conditions are not likely to vary significantly from the current baseline during that timeframe. Any construction-related impacts would be mitigated in accordance with the CMRP (Appendix G of the 2014 Keystone XL Final SEIS).

Climate change could also intensify the impacts of accidental releases from the proposed Project. For example, higher ambient temperatures could increase the volatilization of air contaminants from spilled crude oil. Increased flooding and precipitation could increase the flooding- and scouring-related risks discussed in Chapter 5, Environmental Consequences from Accidental Releases, possibly resulting in the transport of spilled crude oil over greater distances. Finally, increased frequency of severe weather events could potentially have an adverse effect on spill response, including containment and cleanup actions.

5 ENVIRONMENTAL CONSEQUENCES FROM ACCIDENTAL RELEASES

5.1 INTRODUCTION

This chapter addresses the likelihood of potential accidental releases resulting from the Proposed Action and introduces information on pipeline and crude oil characteristics. This chapter also describes the potential consequences that could occur to the resources described in Chapter 3, Affected Environment, if a release of product were to occur along the proposed pipeline route, including the MAR. Table 5-1 presents key terms and definitions used in this chapter.

Table 5-1. Key Terms

Types of Releases	
Release	A *release* is a loss of integrity of a container (i.e., pipeline or its associated components) that results in a failure to contain liquid as designed.
Leak	A *leak* is a release over time.
Spill	A *spill* is a volume of liquid that escapes a containment system and enters the environment.
Categories of Spill Sizes	
Incidental Spills	*Incidental spills* release less than 0.1 barrel (5 gallons). Incidental spills are typically associated with normal operations and are further discussed in Chapter 4, Environmental Consequences from Construction and Normal Operations.
Small Spills	*Small spills* range from greater than 0.1 barrel (5 gallons) to less than or equal to 50 barrels (2,100 gallons).
Medium Spills	*Medium spills* range from greater than 50 barrels (2,100 gallons) to less than or equal to 1,000 barrels (42,000 gallons).
Large Spills	*Large spills* range from greater than 1,000 barrels (42,000 gallons) to less than or equal to 10,000 barrels (420,000 gallons).
Catastrophic Spills	*Catastrophic spills* release more than 10,000 barrels (420,000 gallons).

Source: 42 USC 9601 et seq

5.2 METHODOLOGY

To evaluate the potential effects of accidental releases of products that could be transported along the proposed pipeline, this SEIS considers the likelihood of a release and the range of potential consequences that could result if a release were to occur. The analysis of spill risk includes a review of pipeline mileage and accident data as recorded in the U.S. Department of Transportation's (USDOT's) Pipeline and Hazardous Materials Safety Administration (PHMSA) databases. The Department analyzed four spill sizes (small, medium, large and catastrophic [see Table 5-1]) and determined spill incident rates for each spill size, based on historical pipeline accident data (see Section 5.3).

The 2014 Keystone XL Final SEIS assessed effects associated with potential spills along the Preferred Route and addressed the potential for spills to affect sensitive resources within the ROI. This SEIS expands upon the analysis presented in the 2014 Keystone XL Final SEIS to consider new information related to oil spills, accident data from PHMSA through 2018, new studies related to spills of crude oil and the cleanup of dilbit, and any new or unique features or resources identified within the ROI. In addition, the methodology for assessing the likelihood of a release and the range of potential consequences has been updated to apply the Department's most current approach to assessing the potential for impacts related to spills from crude oil pipelines.

To evaluate the range of consequences related to different spill types, the Department reviewed information on accidental releases during the pipeline transport of products, including those potentially transported under the Proposed Action. This review included an evaluation of the causes and circumstances surrounding documented releases, as well as the range of environmental effects. This analysis uses analogous cases as the basis for establishing the types and extent of impacts that could occur within the environmental setting described in Chapter 3, Affected Environment. In addition, incident rates for each spill size serve as the basis for determining the likelihood of each spill size **occurring in the vicinity of a** resource. The analysis uses GIS data sets to establish the presence of environmental resources that would be susceptible to impacts from spills of different sizes.

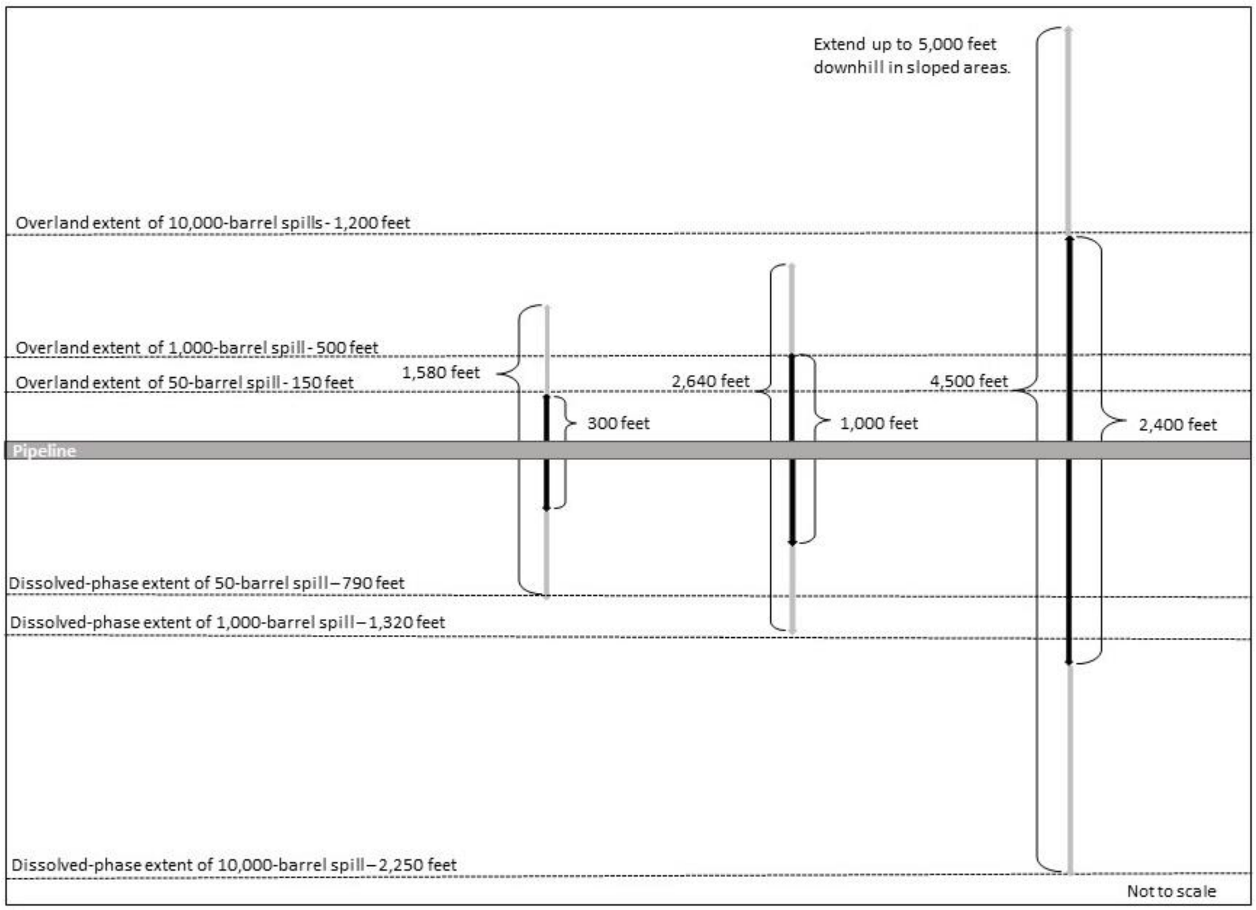
The ROI is the area that is susceptible to a release of crude oil along the proposed pipeline route. The analysis assumes the ROI is the estimated distance the crude oil would spread over land, as well as the additional distances that crude oil and its dissolved components could travel upon reaching a water source. In the case of overland flow, the analysis includes spill modeling to estimate the overland distance that crude oil could travel after a release. The model takes into account the volume released and the permeability and saturation of soil to estimate the potential areal extent of spills for each spill size category. This analysis determined that a 50-barrel (small) spill could spread over land up to 150 feet from the site of a spill; a 1,000-barrel (medium) spill could spread up to 500 feet; and a 10,000-barrel (large) spill could spread up to 1,200 feet over land from the release point. In areas of moderate to steep slopes (greater than 9 percent), the Department determined that large spills could extend up to 5,000 feet downslope from the point of release along the pipeline.

If released crude oil reached groundwater, the screening modeling conducted for the 2014 Keystone XL Final SEIS found that components in the oil, such as benzene, could spread downgradient in groundwater an additional 640 feet for a 50-barrel spill, 820 feet for a 1,000-barrel spill and 1,050 feet for a 20,000-barrel spill. This modeling effort also indicated that these spill volumes could reach groundwater at a depth of 50 feet, although larger volumes could be expected to reach groundwater at deeper depths. The results of the prior modeling were carried over to this analysis even though the volume used for large spills was 20,000 barrels, versus the 10,000 barrels used for the overland flow analysis. This permitted the Department to incorporate a more conservative approach for large spills, while continuing to use the previous modeling analysis. Thus, as shown in Figure 5-1, the greatest migration distance for a spill would be represented by a combination of the overland distance and the additional dissolved phase distance. Along surface water features where a release could spread over the extent of the waterbody’s surface area, including flowing streams and rivers, lakes and wetlands, the Department also assessed the hydraulic pathways that would be susceptible to a release of crude oil from the pipeline and their interconnections with other downstream waters.

The Department used the results of modeling data from worst-case analysis of a release on the Missouri River and information from other major oil spills to develop a maximum reasonable transport distance of 40 river-miles for reviewing potential downstream effects. The Department acknowledges that oil sheens and oil globules (small round particle) from two releases (see Laurel, Montana [2011] and Glendive, Montana [2015] in Section 5.3.4) were observed at greater downstream distances than the 40 river-mile ROI assessed within this SEIS. At a distance of 40 river-miles downstream from a spill, it would typically be expected that response resources have been able to contain the majority of the spill before it gets to that point. While circumstances may allow oil sheens or globules of oil to travel beyond this distance, their presence and potential for impacts would be limited. This is due mainly to the volume of the spilled oil present as compared with the potentially impacted water resource.

An oil sheen is typically approximately 1 micron in thickness and contains very little oil (for comparison, the thickness of a human hair ranges from 17 to 180 microns). The volume of oil in a typical sheen is less than one cubic liter per square kilometer (Goodman 2019). Sheens are readily dispersed by weathering and wave action. Oil globules are typically small in size (about the size of a coin) and will eventually sink, float ashore or stick to aquatic vegetation. At distances beyond 40 river-miles, oil globules would typically accumulate in depositional areas at concentrations that would not typically result in significant impacts to aquatic biota.

A Site-Specific Risk Assessment was prepared by Keystone as part of its Section 408 permit application to USACE for the Keystone XL Project's Missouri River crossing near the Fort Peck Reservoir in Montana (TransCanada 2017). The model analysis calculated downstream transport distances of crude oil along the Missouri River under a worst-case discharge scenario, which according to the report, would have a probability of occurring once in 2,230,000 years. The analysis calculated the distance the released crude oil might travel within 6 hours, which is the maximum response time in high-volume areas stipulated by federal pipeline safety regulations in Title 49 *Code of Federal Regulations* Part 194 (49 CFR 194). The downstream transport distance ranged from approximately 0.3 mile (at very low flow) to a maximum worst-case scenario of 33 miles (using record 2011 historic flood conditions) (TransCanada 2017). In addition, review of other major oil spill data indicates in most instances, resource impacts primarily occur within the 40 river-mile ROI being used in this SEIS to review potential downstream effects (see Section 5.3.4).



Source: U.S. Department of State 2014

Note: The potential extent of a spill is the estimated overland distance (150 feet for a 50-barrel spill; 500 feet for a 1,000-barrel spill; and up to 1,200 feet for a 10,000-barrel spill) plus the additional dissolved phase distance in groundwater (640 feet for a 50-barrel spill, 820 feet for a 1,000-barrel spill and 1,050 feet for a 10,000-barrel spill).

Figure 5-1. Spill Distances Used in the Likelihood Analysis

As part of the USACE Section 408 review process, Keystone prepared a similar site-specific risk assessment for the pipeline's Bear Creek crossing in Montana to further analyze the potential for impacts to the Fort Peck Reservoir (TransCanada 2017). The model analysis calculated downstream transport distances of crude oil along Bear Creek under several scenarios, including incidental, small, medium, large and worst-case discharge scenarios. The analysis calculated the probability of a release of any size occurring at the Bear Creek crossing to be once in 16,600 years, while the probability of a worst-case discharge occurring was calculated to be once in 5,940,000 years. The analysis also calculated maximum transport distance scenarios. The Bear Creek crossing is located 15 stream miles upstream of the mouth of Bear Creek Bay, 20.9 miles upstream of the main portion of the Fort Peck Reservoir, and 22.8 miles and 23.5 miles upstream of the Fort Peck Spillway and Fort Peck Dam, respectively. Unlike the Missouri River, which is a perennial waterbody, Bear Creek is an ephemeral stream that typically has no stream flow to help facilitate downstream movement of crude oil. However, crude oil transport distance modeling was performed under both flow and no-flow conditions. The model determined that maximum downstream transport distance would be 2.0 miles during a no-flow scenario. Under a representative high flow scenario, the model estimated that a release would take approximately 3.8 hours to reach Bear Creek Bay, and another 31.4 hours to reach the reservoir. After reaching the reservoir, the same release would take an additional 10.2 to 14.4 hours to reach the Fort Peck Spillway or Fort Peck Dam, respectively. In total, the analysis determined it would take almost 45 to 50 hours for a release at the Bear Creek Crossing to reach the Fort Peck Spillway or Fort Peck Dam. This would allow for ample time for emergency response intervention.

The 40 river-mile ROI was determined to be reasonable and appropriate for this SEIS based on the worst-case modeling results for the Missouri River crossing and because of differences in the characteristics of these releases, including pipeline construction technique at the release location (i.e., open trench versus HDD), the depth of the pipeline beneath the waterway and different product type (light crude oil versus dilbit). Both the Laurel, Montana (2011) and Glendive, Montana (2015) spills occurred at Yellowstone River crossings in which the pipeline involved was installed using open trench methods (see Section 5.3.4). As currently proposed, Keystone would utilize HDD methods (versus open trench) at 18 waterbody crossings along the proposed pipeline, including the Yellowstone River. Waterbodies that Keystone has considered for HDD include commercially navigable waterbodies, waterbodies wider than 100 feet, waterbodies with terrain features that prohibit open crossing methods, waterbodies adjacent to features such as roads and railroads, and sensitive environmental resource areas.

To evaluate the range of consequences related to different spill types, the Department reviewed information from a variety of sources related to the causes and circumstances surrounding documented crude oil releases. Sources included reports prepared by the National Academies of Sciences, Engineering and Medicine and the National Research Council, accident reports, government-sponsored studies and databases, academic research papers and others as cited throughout this chapter. The Department used analogous cases (e.g., the 2010 spill near Marshall, Michigan, as well as more recent releases such as the November 2017 spill near Amherst, South Dakota) as the basis for establishing the types and extent of impacts that could occur within the environmental setting described in Chapter 3, Affected Environment. In addition, accident rates for each spill size serve as the basis for determining the likelihood of each spill size **occurring in the vicinity of** a resource. In order to estimate the potential likelihood of an accidental release **occurring in proximity to** sensitive resources along the proposed route, the Department used GIS to measure the intersection distance between each of the modeled spill distances shown in Figure 5-1 and considered resources discussed throughout the remainder of this chapter. The Department then multiplied that intersection distance, measured in miles, by the calculated annual rate of spills per mile to estimate the annual number of spills that could **occur in proximity to** that particular resource. Tables presented in Section 5.5 provide the results of these calculations.

The 2014 Keystone XL Final SEIS considered a range of potential scenarios that could occur under the No Action Alternative, including rail/pipeline, rail/tanker and rail direct to the Gulf Coast as alternate means of crude oil transport if the Keystone XL Project were not constructed or operated. Under those No Action scenarios, impacts are anticipated to be consistent with the findings of the 2014 Keystone XL Final SEIS contained in Chapter 5, Alternatives, and are incorporated by reference.

5.3 INCIDENT ANALYSIS

This section reviews pipeline accident data for onshore crude oil pipelines in the United States in order to determine the likelihood of different types of accidental releases for consideration in this SEIS's impacts analysis.

5.3.1 Pipeline Incident Analysis

While several different sources of pipeline accident data support the pipeline incident analysis, the primary source of data is the PHMSA hazardous liquids accident database. This database contains information regarding each accident reported to PHMSA, as required under 49 CFR 195, including events involving a pipeline that result in any of the following:

- Explosion or fire not intentionally set by operator;
- Release of 5 gallons or more, except that no report is required for a release of less than 5 barrels (210 gallons) resulting from a pipeline maintenance activity if the release is:
  - Not otherwise reportable under this section;
  - Not one described in Section 195.52(a)(4) (i.e., not one that resulted in pollution of any stream, river, lake, reservoir or other similar body of water that violated applicable water quality standards, caused a discoloration of the surface of the water or adjoining shoreline, or deposited a sludge or emulsion beneath the surface of the water or upon adjoining shorelines);
  - Confined to company property or pipeline ROW; and
  - Cleaned up promptly;
- Death of any person;
- Personal injury necessitating hospitalization; and/or
- Estimated property damage, including cost of cleanup, the value of lost product and damage to property of the operator or others, or both, exceeding $50,000.

As indicated above, with a few exceptions, federal law requires pipeline operators to report to PHMSA any release that results in a spill that is 5 gallons or larger in size. Spills of less than 5 gallons (incidental spills) typically occur at pipeline facilities during normal maintenance and operational activities. Although incidental spills are common, they can readily be contained and remediated resulting in negligible impacts. Incidental spills have not been included in the incident analysis since they are not required to be reported and have very little potential to result in impacts.

A review and analysis of PHMSA pipeline accident data provide information used to calculate the frequency of spills from U.S. onshore pipelines carrying crude oil. **T**his SEIS uses a subset of data for the period 2010 to 201**8** to calculate incident rates because it represents the most complete data set and is more representative of modern-day pipeline facilities. **The Department also reviewed and analyzed data through the month of October 2019 to supplement the analysis. The data used for the incident**

analysis does not include spills from offshore pipelines or pipelines transporting other products, such as refined petroleum products or highly volatile liquids.

Table 5-2 provides PHMSA accident data compiled between 2010 and 201**8** for small, medium, large and catastrophic spills. The table also includes pipeline mileage per year and the total volume of crude oil spilled each year. Pipeline mileage has increased each year over this time period, increasing by approximately **52** percent between 2010 and 201**8**. Of the 1,**747** onshore crude oil spills reported between 2010 and 201**8** releasing 5 gallons or more, small spills accounted for approximately 8**1.2** percent, medium spills for approximately 16.**2** percent, large spills for approximately 2.2 percent and catastrophic spills for approximately 0.**3** percent.

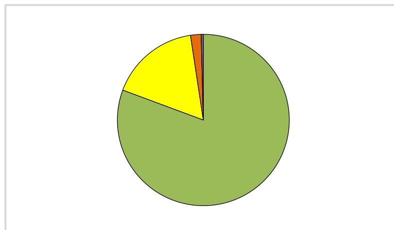
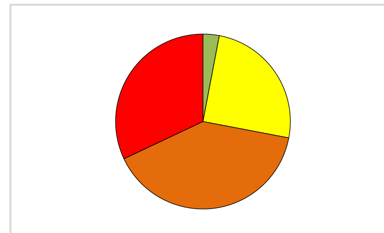
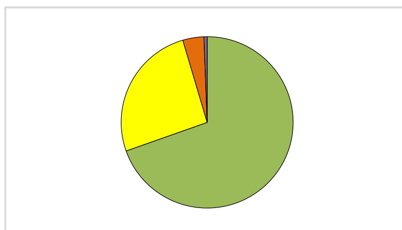
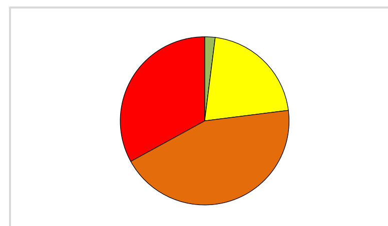
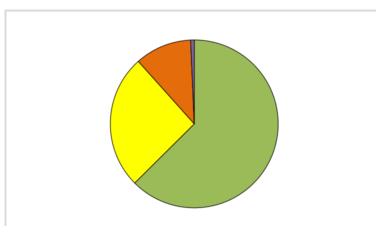
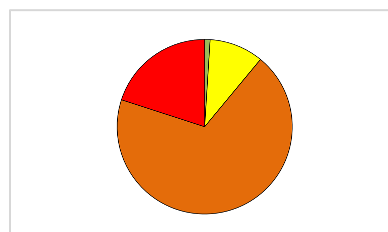
Table 5-2. Summary of Pipeline Accident Data

Year	Small Spills	Medium Spills	Large Spills	Catastrophic Spills	Miles of Onshore Crude Oil Pipelines	Volume Spilled (barrels)	Volume Spilled per Thousand Miles of Pipeline (barrels)
2010	118	24	5	2	49,460	52,710	1,066
2011	106	28	5	1	51,052	35,276	691
2012	147	31	4	0	52,657	15,025	285
2013	167	28	4	1	56,170	43,047	766
2014	196	37	1	0	61,888	17,620	285
2015	199	38	3	0	**67,896**	20,686	**305**
2016	149	37	5	1	70,**611**	42,394	60**0**
2017	15**6**	35	6	1	**74,072**	**40,603**	5**48**
2018	**181**	**25**	**6**	**0**	**75,400**	**26,022**	**345**

Source: PHMSA 201**9**a, 201**9**b

Table 5-3**A** summarizes the average annual incident frequencies and volume released for each spill size category **for the overall pipeline system, spills from the mainline pipe and those from larger diameter pipe (i.e., greater than 16 inches in diameter), while Table 5-3B summarizes incidents that were caused by a component (i.e., tank, valve or pump station) failure**. **Table 5-3A** presents the annual incident rate in total number of incidents for every 1,000 miles of pipeline**. Incident rates were not calculated for pipeline components in Table 5-3B because the numbers of tanks, valves and pump stations in operation are not documented or reported**. **In both tables**, the majority of releases were small in size (i.e., ranging from 63 percent of releases along large-diameter mainline pipelines to **89** percent of releases occurring at valves) **regardless of the source**. While small spills occur more frequently across all pipeline components, large and catastrophic spills account for a higher percentage of volume released. Valves are the only component for which this trend does not apply; medium spills account for the greatest volume lost from incidents involving valves.

Table 5-3A. Spill Volume Distribution on Mainline Pipe

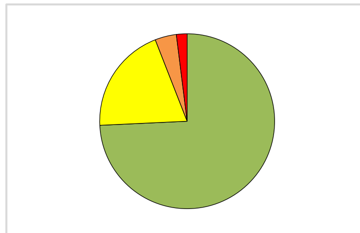
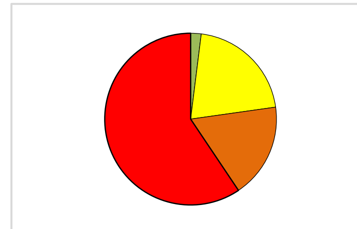
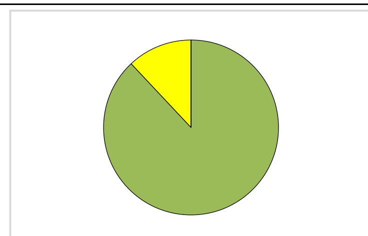
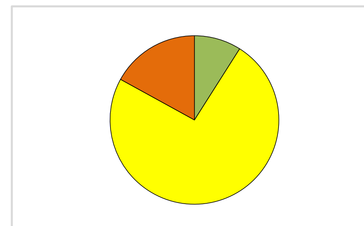
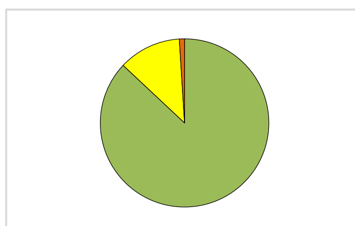
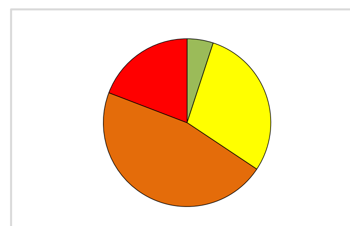
Pipeline Component (number of reported releases)	% Spills of Each Size Category				% Volume Spilled by Size Category				Pipeline Mileage[b]	Annual Incident Rate per 1,000 Mile-Years[b]
	Small	Medium	Large	Cata-strophic	Small	Medium	Large	Cata-strophic		
Pipeline System, All Elements (1,**747**)									**559,207**	**3.12**
	81%	16%	2%	0.3%	3%	29%	46%	32%		
Mainline Pipe (**526**)[a]									**559,207**	**0.94**
	69%	26%	4%	0.6%	2%	25%	**52**%	34%		
Mainline Pipe, 16-inch Diameter and Greater (**158**)[a]									**174,782**	**0.90**
	63%	25%	11%	0.6%	1%	12%	**76**%	21%		

Source: PHMSA 2019a, 2019b

[a] The PHMSA data (2010 – 2018) includes a total of **66** releases involving mainline pipe for which no pipeline diameter was reported. Therefore, these releases have been included in the total number of incidents involving mainline pipe, but are not accounted for in the number of incidents involving mainline pipe 16 inches or greater in diameter.

[b] **The number of existing tanks, valves or pump stations not known based on available information. Therefore, this table does not present the number of these components in operation nor the associated incident rates for tanks, valves and pump stations.**

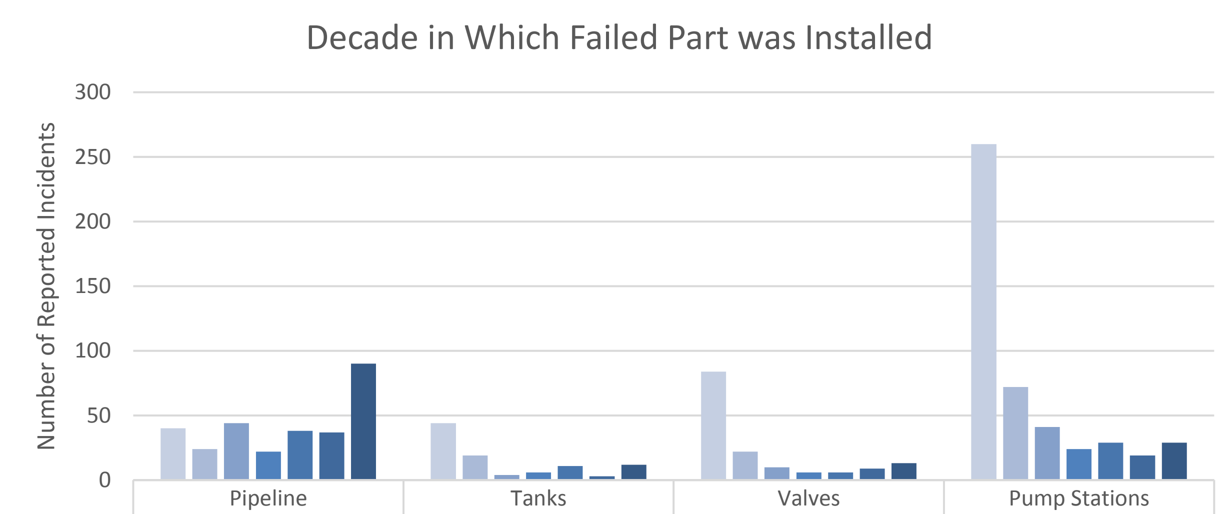
Table 5-3B. Spill Volume Distribution by Pipeline Component

Pipeline Component (number of reported releases)	% Spills of Each Size Category				% Volume Spilled by Size Category			
	Small	Medium	Large	Cata-strophic	Small	Medium	Large	Cata-strophic
Pipeline System, Tanks (1**31**)								
	77	**18**	4%	2%	2%	21%	**23**%	60%
Pipeline System, Valves (2**5**5)								
	8**9**%	1**0**%	0%	0%	**11**%	7**5**%	17%	0%
Pipeline System, Pump Stations (**839**)								
	87%	12%	1%	0%	**6**%	**33**%	46%	19%

Source: PHMSA 201**9**a, 201**9**b

Throughout the rest of this chapter, the Department uses an overall incident rate that represents the entire pipeline system as an upper bound to support the impact analysis. The overall incident rate overestimates incidents occurring along the pipeline ROW and underestimates incidents occurring at fixed facilities, such as tanks and pump stations. **As shown in Table 5-3A, approximately 30 percent of incidents occurred along the mainline pipe, while the remaining 70 percent occurred at components, most of which are located at pipeline operator-controlled facilities.** Despite the difference in incident rates between fixed facilities and the pipeline ROW, the impact analysis in the SEIS is not dependent upon incident rates for specific features within the pipeline system, but rather estimates the likelihood for spills to occur at any point along the pipeline system.

As presented in Figure 5-2, the data reveal a higher incidence of failure for older mainline pipes, but also a higher incidence of failure for newer pump stations and valves (PHMSA **2019b**). This is likely the result of pump stations and valves experiencing a "burn-in phase," which refers to the beginning of the working lifetime of these components. During this time, pump stations and valves are more susceptible to failure resulting from defects that can develop during manufacturing and construction. After this initial phase passes, these components experience a low constant failure rate until the end of their working lifetime, during which time there is once again a higher probability of failure (Muhlbauer 2004).



	Pipeline	Tanks	Valves	Pump Stations
2010s	40	44	84	260
2000s	24	19	22	72
1990s	44	4	10	41
1980s	22	6	6	24
1970s	38	11	6	29
1960s	37	3	9	19
1950s	90	12	13	29

Source: PHMSA 201**9**b

Figure 5-2. Decade in which Failed Part was Installed

5.3.2 Pipeline Incident Causes

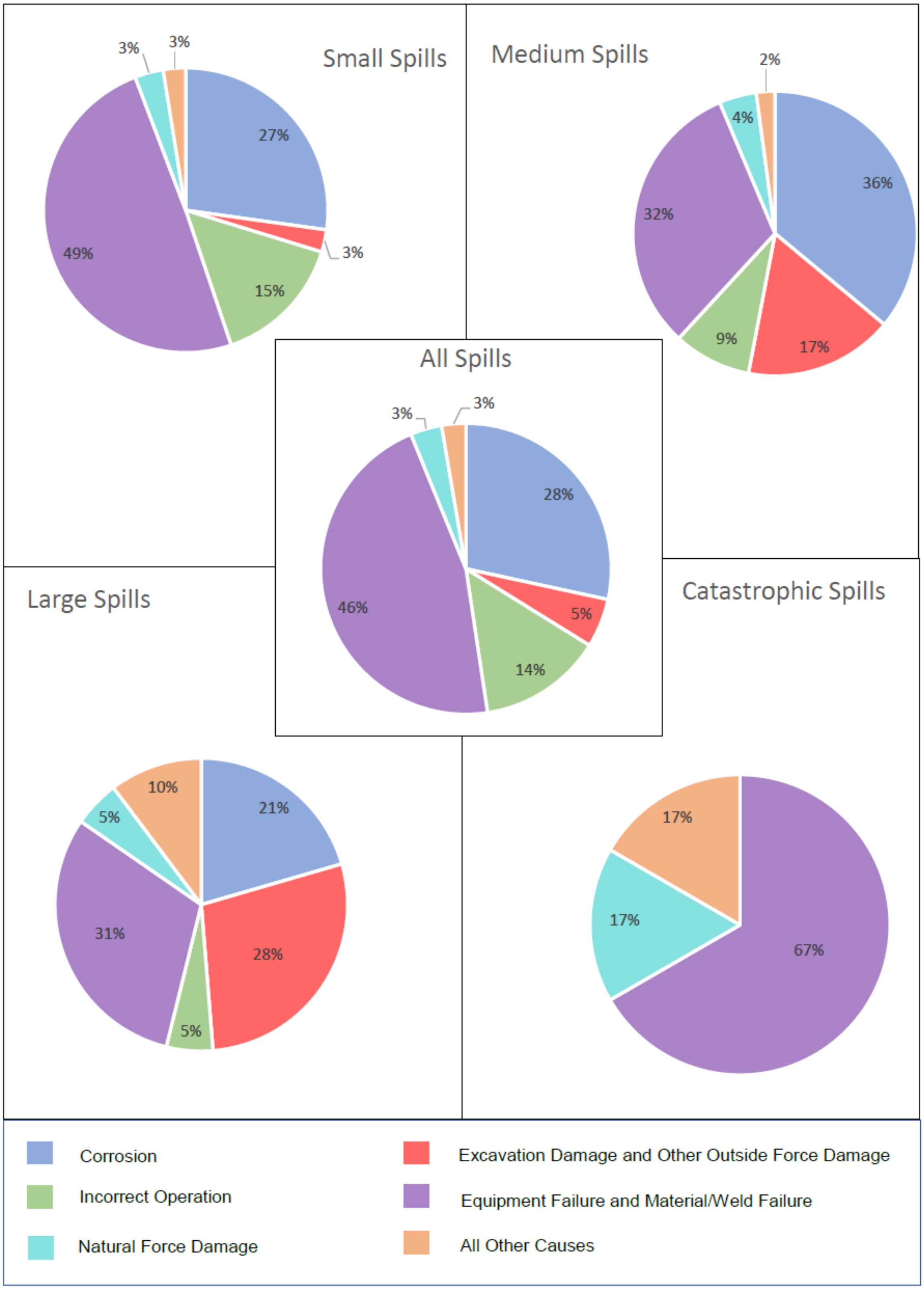
Threats to pipeline and component integrity arise from numerous sources. According to the American Society of Mechanical Engineers, threats fall within three categories: time-dependent, stable and time independent. Time-dependent threats are those that tend to increase over time. Stable threats are threats that are constantly present, but that do not manifest unless activated by a change in operations or the surrounding environment. Time-independent threats are those that are not influenced by the passing of time (ASME 2010).

Time-dependent threats include internal corrosion, external corrosion and stress corrosion cracking. Corrosion is defined as the deterioration of a material, usually a metal, by chemical reaction with its environment. Over time, this deterioration may lead to a loss of pipeline integrity and result in an accidental release. The corrosion process involves the oxidization of the metal of the pipe. This occurs as a result of electric currents flowing through the pipe body that induce the metal to combine with oxygen, creating a non-metallic by-product known as rust. In order for corrosion to occur, an oxidizing agent (most commonly water) must be present. In the case of a pipeline, water can be present inside the pipe, originating from the fluid being transported, or it can be present outside, such as from soil moisture (API 2001). External corrosion occurs when the pipeline walls, seam welds or joint welds weaken from corrosive action on the exterior surface of the pipe. Factors causing or affecting the rate at which external corrosion occurs include exposure time, pipeline coatings, cathodic protection, pitting (corrosion occurring at a surface defect in the pipeline or point where the protective coating has broken down), stray currents from underground facilities or utilities, seasonal variability in soil moisture content and temperature, and microbial activity. Internal corrosion similarly weakens the pipeline system through corrosive action on the interior surface of the pipe. Sediment and water in the pipeline can lead to internal corrosion. Factors influencing whether water may separate from the oil flowing through the pipeline include flow rate, water content, pipe diameter, physical properties of the oil and chemical additives (National Research Council 2013). Stress corrosion cracking occurs when the combined action of corrosion and applied stress results in the formation of cracks. Stresses may include normal expansion and contraction of the pipeline due to temperature changes and normal operational cycling of the pipeline's internal pressure, as well as external stresses such as vibrations or frost heaving.

Stable threats include manufacturing, construction and equipment threats. Manufacturing threats result from defects in the pipeline system during the manufacturing of the components. Construction threats result from defects caused during the construction, installation or fabrication of the pipe and its components. Equipment threats result from a failure of the equipment to perform its intended design or its operational or functional purpose.

Time-independent threats include third-party damage, incorrect operations and damage from weather or other natural forces. Third-party damage threats consist of potential actions by the pipeline operator and/or other parties that could compromise the integrity of the pipeline. Incorrect operations are those caused by human error leading to the incorrect operation of the pipeline system, which could ultimately lead to a release. Some natural hazards, such as earthquakes, floods and tornadoes, have the capacity to directly damage the pipeline and cause a leak through affecting the stability of the buried pipe, interrupting communications with the monitoring systems, directly damaging aboveground elements, shorting out electrical systems or creating corrosive conditions. Heavy rains, snowfall and high winds may produce conditions that could affect system integrity over time. Flooding may also lead to scour where continuous water currents can threaten the integrity of a pipeline. Scour is the gradual erosion by hydrodynamic forces of soil, sediment or stone surrounding a buried pipe, such that the pipe itself could become dislodged and exposed, causing it to be at higher risk of failure from fracturing or corrosion.

A review of the PHMSA accident data revealed that corrosion and equipment failure were the two primary causes of pipeline incidents; together they accounted for approximately 7**5** percent of the incidents reported between 2010 and 201**8**. The Department notes that, per the PHMSA accident database, the two notable recent spills along TransCanada-owned pipelines, as discussed in Section 5.3.3, were caused by material failure of the pipe or weld (i.e., a welding anomaly) and other incident cause (i.e., mechanical damage caused during pipeline construction). Figure 5-3 depicts the cause of pipeline incident by incident size.



Source: PHMSA 2019b

Note: Values may not add **up to** 100% due to rounding.

Figure 5-3. Reported Incident Cause by Spill Size

5.3.3 Incident Analysis for TransCanada

While several different sources of pipeline incident data support the pipeline incident analysis, the primary source of data is the PHMSA accident database. The Department reviewed information compiled in PHMSA data sets for accidents occurring between 2010 and 201**8**. This PHMSA pipeline accident data provides information used to calculate the frequency of spills from U.S. onshore pipelines carrying crude oil. This analysis does not include spills from offshore pipelines or pipelines transporting other products, such as refined petroleum products or highly volatile liquids.

Table 5-4 compares this industry incident rate to that of a subset of pipeline accident data for pipeline facilities operated by TransCanada (the parent company of Keystone) and presents the number of incidents per 1,000 miles of industry or TransCanada-operated pipeline. **The second row presents the industry data without including incidents along TransCanada-operated pipelines, allowing for a comparison of TransCanada's record with pipelines operated by other companies.** During the period between 2010 and 201**8**, TransCanada-operated pipeline facilities experienced 1**2** small spills, 2 medium spills and 1 large spill. No catastrophic spills occurred on TransCanada-operated pipelines during this time period (PHMSA 201**9**b). **As shown in Table 5-4, TransCanada's incident rate for small and medium spills is more than three times lower than the industry average, while the rate is consistent for large spills and less for catastrophic. When the incident data through October 2019 is included in this assessment, the rate for large spills from TransCanada pipelines rises to 0.12, which is 1.7 times higher than the industry average. Other incident rates remain consistent with those shown below.**

Table 5-4. Incident Rate Summary (2010-2018)

Pipeline Operator	Incident Rate Per 1,000 Miles of Onshore Crude Oil Pipeline				Total Volume Spilled (bbl)
	Small Spills	Medium Spills	Large Spills	Catastrophic Spills	
Industry Average (including TransCanada)	2.5**4**	0.5**1**	0.07	0.01	**293,383**
Industry Average (NOT including TransCanada)	**2.58**	**0.52**	**0.07**	**0.01**	**285,949**
TransCanada	0.**81**	0.1**4**	0.0**7**	0.00	**7,434**

Source: PHMSA 201**9**a, 201**9**b
bbl = barrel

The incident data from 2019 includes two new releases from TransCanada-operated pipelines. The most recent spill occurred along the existing Keystone pipeline operated by TransCanada near Edinburg, North Dakota on October 29, 2019. TransCanada shut down the affected pipeline at the point of release after the release was detected and reported the incident to PHMSA and the National Response Center. Over 9,000 barrels of crude oil were released in this large spill. While the cause of the incident remains unknown, the affected area was limited to a 4.8-acre containment area (TransCanada 2019).

A release from the existing Keystone pipeline operated by TransCanada was discovered on **February** 6**,** 2019, near St. Louis, Missouri. Upon discovery, TransCanada shut down the affected section of pipeline and reported the incident to PHMSA. **This 17-barrel (714-gallon) crude oil release was caused by an inadequate composite wrap applied to an area of pipeline experiencing an accelerated rate of corrosion due to stray direct current interference.**

A large spill occurred along the 30-inch TransCanada-operated existing Keystone Mainline releasing 9,726 barrels (408,492 gallons) of crude oil on November 16, 2017 near Amherst, South Dakota (PHMSA **2019b**). Personnel initiated pipeline shutdown and isolation 3 minutes after the SCADA system detected a drop in pressure and increase in flow rate. The release occurred in a rural agricultural area and resulted from previously undetected mechanical damage caused during construction of the pipeline in 2008 (PHMSA 2017). All remediation efforts, consisting primarily of soil removal, replacement and reseeding, have since been completed. Twelve groundwater monitoring wells were installed, but no groundwater contamination was detected as a result of this release (Exp 2018). In November 2018 PHMSA approved a request from TransCanada to revise the reported release volume to 6,592 barrels (276,864 gallons), but this change was not yet reflected in the version of the PHMSA database that was used for the incident analysis in this **Final** SEIS. Since both spills are classified as large spills, the updated spill volume would not change the incident rates calculated in this SEIS.

A medium spill occurred on April 2, 2016 when the existing Keystone Mainline released approximately 400 barrels (16,800 gallons) of crude oil onto a rural agricultural area near Freeman, South Dakota. A landowner notified a One-Call center, which then notified TransCanada. A welding anomaly caused the spill. An anomaly is a defect or imperfection, such as a change in wall thickness resulting from metal loss, a deformation of the pipe wall or a crack. During excavation, oil was discovered to have migrated into the soil farther than initially estimated. A shutdown of the affected segment of the pipeline lasted for 7 days, under the direction of PHMSA, before beginning to operate again on April 9 under increased supervision (PHMSA 2016). The state's environmental response agency stated that the release did not affect aquifers (Egan 2016).

5.3.4 Major Spills by Other Companies

The Department reviewed available data for the following major spills of crude oil on pipelines operated by companies other than TransCanada, selected based on their sizes, impacts and similar product properties, to further support the analysis of impacts resulting from releases.

- **Marshall, Michigan 2010.** A spill near Marshall, Michigan in July 2010 released approximately 20,082 barrels (843,444 gallons) of dilbit, a heavy crude oil, into a wetland, which flowed into Talmadge Creek and ultimately to the Kalamazoo River. Heavy rainfall during the 3 days preceding the spill in this same area caused the Kalamazoo River to flow near the peak of an approximate 25-year flood at the time of the spill near Marshall (USGS stream gauge station number 04103500), meaning that the water flowed higher and faster than usual (Hoard et al. 2010). Observable floating and submerged oil from the release traveled 40 river-miles downstream along the Kalamazoo River and to the western side of Morrow Lake (National Transportation Safety Board 2012). Water sampling showed no spill-related contamination below Morrow Dam to Lake Michigan (USEPA 2010). This dam, located at the western end of Morrow Lake, constrained further migration of the spill and represents the end of the 40 river-mile extent exposed to visually observed crude oil. In addition, the Ceresco and Monroe Street dams, located between the release point and Morrow Lake, and spill response containment boundaries affected the behavior and transport of crude oil within the Kalamazoo River (USEPA 2016). While this spill represents extreme circumstances regarding the volume of oil released to the environment and the flow rate of the waterway, the Marshall spill provides a conservative example of what impacts could result from a spill along a waterway.
- **Laurel, Montana 2011.** On July 1, 2011, the Silvertip Pipeline, owned by Exxon Mobil Pipeline Company, released approximately 1,509 barrels (63,378 gallons) of light, sweet crude oil into the Yellowstone River near Laurel, Montana. The Yellowstone River flowed at the peak of a 30-year flood at the time of the rupture (MDEQ 2016a). River scour and erosion had exposed the pipeline (which was installed using the open trench method and buried 5 to 8 feet below the riverbed

according to a January 2011 depth-of-cover survey), and debris became caught on the exposed line. The pressure caused by the debris and the flood-stage river flow gradually increased external stress until the pipeline failed (PHMSA 2015). The river was under flood conditions when the release occurred, which increased the river flow and allowed visible signs of the oil to spread over 70 miles downstream of the release point. The flooding also raised safety concerns, resulting in a delayed spill response. According to a USEPA incident report (USEPA 2011a), although oil was observed on land and vegetation up to 72 miles downstream from the release, no significant oil was reported beyond Pompey's Pillar (approximately 45 miles from the spill site). Beyond Pompey's Pillar, the oil observed included "only a few small sightings of pockets of emulsified oil" (i.e., globules of oil) (USEPA 2011b). The majority of the impacted areas appeared to be in a 20-mile area between Laurel and Billings, Montana. The floodwaters forced oil to wash ashore into agricultural fields along the river. Samples of groundwater and drinking water sources found no evidence of spill-related contamination (MDEQ 2016a). In 2012, ExxonMobil Pipeline Company paid $1.6 million in penalties, cleanup costs and payments of the state's costs (MDEQ 2016a). A 2015 final order from PHMSA ordered the payment of an additional $1.05 million in civil penalties (PHMSA 2015).

- **Mayflower, Arkansas 2013.** On March 29, 2013, a 3,190-barrel (133,980-gallon) Wabasca Heavy crude oil spill occurred from a 20-inch pipeline operated by ExxonMobil Pipeline Company in a residential neighborhood in Mayflower, Arkansas (Fariello 2013; PHMSA **2019b**). Metallurgical analysis determined that the spill resulted from a crack in the pipeline (Hurst Metallurgical Research Laboratory, Inc. 2013). Valves closed 16 minutes after detecting a pressure drop in the pipeline. The release did not cause any known injuries, fatalities or fires, but the city of Mayflower recommended the evacuation of 22 homes near the release. The Mayflower Police Department notified residents of these homes as to the city's recommendation. Sampling efforts conducted in support of the spill response detected elevated levels of polycyclic aromatic hydrocarbons and benzene in a small percentage of collected soil samples. The air quality remained within acceptable levels with the exception of the high pooling areas, where response crews worked with safety equipment (Arcadis 2014**a**). Total costs to respond, remediate and address property damage resulting from the spill exceeded $81 million.
- **Mountrail, North Dakota 2013.** On September 29, 2013, a local farmer observed oil in an agricultural field in Mountrail, North Dakota. An underground pipeline operated by Tesoro High Plains Pipeline had released 20,600 barrels (865,200 gallons) of Bakken crude oil (PHMSA **2019b**; Sider 2013). This spill was one of the largest in state history. At the time of the release, continuous leak detection equipment was not installed, nor required for the segment of pipeline affected (Frosch 2013). The spill was contained within a 7-acre spill zone, according to the North Dakota Department of Health, and 13 acres of land were excavated as part of the remediation phase (Nemec 2016). The spilled oil seeped into the soil to a depth of at least 30 feet, but was still well above the water table (Smith 2014). The root-cause analysis conducted by the pipeline operator determined that the release occurred at the site of a hole created by an electrical discharge through the soil, which could have been the result of a lightning strike (PHMSA **2019b**).
- **Glendive, Montana 2015.** On January 17, 2015, a pipeline operated by Bridger Pipeline ruptured beneath the Yellowstone River in Montana and released over 758 barrels (31,836 gallons) of Bakken crude oil (PHMSA **2019b**). The spill occurred from a breach in the pipe body, which had been installed using the open trench method, caused by river scour. The frozen Yellowstone River impeded cleanup efforts. USEPA Pollution Report 12 (POLREP #12; 24 March 2015) indicated that a sheen from this spill was reportedly observed as far as Crane, Montana, located 59 river-miles downstream from the pipeline crossing. Sampling efforts detected benzene at a water intake associated with the city of Glendive's public drinking water

supply located 7 miles downstream. Glendive's water treatment plant used activated carbon filtration to remove VOCs from drinking water. Daily sampling continued at the treatment plant prior to the installation of an alarm system that would shut down the plant if benzene levels reached 2 ppb (less than half of the maximum contaminant level allowed by the Clean Water Act) (MDEQ 2016b). More than a month after the release, Montana Fish, Wildlife and Parks personnel caught and tested fish in the affected area. They found detectable levels of polycyclic aromatic hydrocarbons in some of the fish muscle tissues (Montana Fish, Wildlife and Parks 2015). Section 5.5.7 provides additional information regarding potential impacts to fish and wildlife from exposure to polycyclic aromatic hydrocarbons. The section of damaged pipeline was removed from the river and sent to a lab in Oklahoma for metallurgical testing (MDEQ 2016b). Bridger and the Montana Department of Environmental Quality signed a Consent Order for the incident on February 8, 2017. In accordance with this agreement, Bridger will pay a $1 million civil penalty, which will include $200,000 toward the State's general fund and $800,000 on Supplemental Environmental Projects approved by the Montana Department of Environmental Quality (MDEQ 2017).

5.4 CRUDE OIL RELEASES

This section summarizes key information that is required to understand how crude oil behaves following release to the environment. The following characteristics are of particular importance with respect to environmental effects from a spill.

5.4.1 Characteristics of Crude Oil

Crude oils differ in their solubility, toxicity, persistence and other properties that affect their impact on the environment. The following characteristics of crude oil are of particular importance with respect to environmental effects from a spill:

- Density – determines whether the crude oil is classified as light, medium or heavy.
- American Petroleum Institute (API) gravity – (measured in degrees) indicates whether the crude oil would sink or float upon release to a waterbody.
- Viscosity – a measure of how easily the oil would flow. Typically, viscosity increases (meaning it does not flow as easily) as temperature decreases.
- Pour point – the lowest temperature at which the oil changes from a free-flowing liquid to a material that does not flow freely.
- Proportions of volatile fractions (e.g., benzene, toluene, ethylbenzene and xylenes [BTEX]) and semi-volatile fractions (e.g., polycyclic aromatic hydrocarbons) – an indicator of (1) the portion of oil that would more readily evaporate, (2) the portion of oil that would more likely physically persist in the environment (3) the portion of oil that could dissolve or disperse into an aquatic environment and cause potential toxicological effects on animals and plants. Many of the volatile and semi-volatile compounds are considered key toxic components of crude oil.
- Proportions of other elements and compounds, including sulfur and metals. Typically, crude oil with a sulfur content greater than 0.5 percent by weight is considered sour, and crude oil with less than 0.5 percent sulfur is considered sweet.

The API introduced the term API gravity (measured in degrees) to reflect how heavy or light petroleum products are in comparison with water (i.e., the product's density). If the API gravity of the oil is greater than 10 degrees, the oil is less dense than water and thus floats on water. If the API gravity of the oil is less than 10 degrees, it is denser than water and thus sinks in water (though the heavier and lighter components of crude oil may separate and behave differently in water under certain conditions, as described in Section 5.4.3.2). API gravity allows for the comparison of the relative densities of various crude oils. The higher the API gravity is, the lighter the crude oil. Light crude oil typically has an API gravity of 33 degrees or more, while heavy crude oil typically has an API gravity of 28 degrees or less (Platts 2018). However, different organizations use slightly different values of API gravity to differentiate between heavy and light crude oils.

Under the Proposed Action, the pipeline would transport a variety of crude oils. These can be categorized into three general categories: conventional light crude oil (from the Bakken formation), synthetic crude oil (e.g., Suncor Synthetic A) and dilbit (e.g., Western Canadian Blend). Table 5-5 summarizes the characteristics of these products. These products would be transported in **segregated** batches. **Mixing could occur but only at the interface point between batches; however, this mixing would be minimal. Drag reducing agents (DRA) could be added in trace amounts to the Keystone XL Pipeline to facilitate operations by reducing the viscosity of the crude oil and allowing it to flow more easily through the pipeline. Common constituents of the DRA include ethylene glycol, hydrocarbon solvents and alcohols.**

Table 5-5. Average Physiochemical Properties of Crude Oils Transported on the Keystone XL Pipeline

Parameter	Unit	Measure	**Light Conventional** (Bakken)	**Synthetic** (Suncor Synthetic A)	**Dilbit** (Western Canadian Blend)
Density	g/ml	Mean	0.82	0.86	0.92
Gravity	API	Mean	42.1	32.5	21.8
Viscosity	cSt @ 38°C	Mean	3.4	4.5	63
Pour Point	°C	Mean	3	-72	-45

Source: Crude Quality, Inc 2018a, 2018b, 2015; North Dakota Petroleum Council 2014; TransCanada 2017

% = percent; °C = degrees Celsius; API = American Petroleum Institute; cSt = centistoke; dilbit = diluted bitumen; g/ml = grams per milliliter

Conventional light crude oil, such as products derived from the Bakken formation, typically contains high concentrations of light-end petroleum hydrocarbons, such as methane, ethane, propane and butane, and may also include hydrogen sulfide. Bakken crude oil has a very high API gravity and therefore would be more volatile and buoyant in water than the heavier crude oils.

Synthetic crude oil is created when raw bitumen is partially refined (i.e., upgraded) through a process that removes many of the high molecular weight compounds present in the bitumen (e.g., asphaltenes). Synthetic crude oil is comparable to mid-weight conventional crude oils. The representative synthetic crude oil (Suncor Synthetic A) has an API gravity of 32.5, indicating that it will behave in a manner between a light and a heavy crude oil upon release to the environment with respect to spreading, evaporation or emulsification.

Dilbit is created when the highly viscous raw petroleum product extracted from the Alberta oil sands (called bitumen) is diluted so it can be transported by pipeline. Bitumen is composed of high-molecular-weight hydrocarbons, commonly called asphaltenes. Asphaltenes primarily contain heavy hydrocarbons, nitrogen, oxygen, sulfur and traces of heavy metals like nickel and vanadium. At room temperature, bitumen is a dark, sticky sand that looks similar to topsoil. In order to transport through a pipeline, diluents are added to reduce the viscosity of the product. Diluents typically include natural gas condensate, naphtha or a mixture of other light hydrocarbons. However, diluent types vary, and the mixture typically remains a trade secret. Natural gas condensate (a by-product of natural gas production) is currently the primary type of diluent used for Canadian heavy crude oil. Typically, dilbit consists of 30 percent diluent and 70 percent bitumen (Crosby et al. 2013). The ratio of diluent to bitumen in dilbit is such that it will still flow at the lowest pipeline operating temperature (42°F or 6°C). Like all the crude oils transported on the proposed pipeline, dilbit has an API gravity higher than 10, indicating it will initially float on water. In addition, dilbit is more viscous than either synthetic or conventional light crude oils, so it will spread over land and across water at a slower rate. Due to their high viscosity, heavy crude oils do not disperse in the environment as quickly as light crude oils. Heavy crude oil like Western Canadian Blend has a greater proportion of heavy molecular weight compounds (e.g., asphaltenes, resins), and tends to be more stable and thus have longer environmental persistence than lighter crude oils.

5.4.2 Propagation of Spills

Many variables influence the speed and distance a released product travels from the site of a release (referred to as propagation). This section first discusses the types of releases that could occur, and then discusses the factors specific to surface releases and water releases. Section 5.5 discusses how these general factors apply to the specific resources and conditions found within the proposed pipeline ROI.

5.4.3 Release Type

One major characteristic that affects the volume of a release is the release type (e.g., leak versus rupture). A leak is a release over time, typically over an extended duration. Leaks can result from a small crack or hole in a pipeline and may be difficult to detect. Pinhole leaks are a notable subset of this category, as the release point is very small, and therefore product may flow slowly out of the pipeline. The volume of product released would fall below the detection threshold of the SCADA system, and could continue unnoticed until the released volume is observed at the ground or water surface or is identified during a pipeline integrity inspection. An engineering study performed for the Keystone XL pipeline determined that a pinhole leak (defined as a hole with a 1/32-inch diameter) could release approximately 28 bpd (880 gallons per day) (Leis et al. 2013). Pinhole leaks may result from defects in material or faulty construction or fabrication of the pipeline.

A rupture, however, occurs because of a significant failure of the pipeline system. A rupture produces an opening in the pipeline that is capable of releasing product at a relatively high flow rate. A rupture generally renders the pipeline inoperable, as opposed to a leak, which may remain undetected during the operation of the pipeline and its facilities. Leaks and ruptures also differ in terms of fluid lost per unit of time; ruptures have a much higher rate of release than leaks. As a result, ruptures are typically easier for a leak detection system to identify, but the higher release rate could result in a larger spill.

The total volume of a pipeline release depends on a number of factors, such as the type of release, hole size, pipeline pressure, pipeline elevation and the distance between isolation valves. After detecting and confirming a leak, the pipeline control center personnel would shut down the pump stations on the pipeline, thus eliminating the force maintaining pressure on the pipeline. Personnel would then begin closing valves to isolate the leak. The volume contained in the mainline pipe between the isolation valves could also contribute to the spill even after the isolation valves are closed. The time it takes to shut down the pipeline and close valves directly affects the volume of product that escapes and depends on the pipeline equipment. For example, valves with manual controls (referred to as “manual valves”) require a person to arrive onsite and either turn a wheel crank or activate a push-button actuator. Valves that can be closed without a person at the valve’s location (referred to as “automated valves”) include remote-control valves, which can be closed via a command from a control room, and automatic-shutoff valves, which can close without human intervention based on sensor readings.

In accordance with Subpart D of 49 CFR 195, Keystone would locate remotely activated valves along the proposed pipeline at pump stations and receipt facility sites, as well as at upstream and downstream sides of each waterbody crossing greater than 100 feet in width. When planning valve placements, Keystone would consider topography, access and proximity to power.

5.4.3.1 Surface Release

The behavior and distance that spilled crude oil could travel over land from the site of a release depends upon many factors, including the viscosity of the crude oil, the topography of the area, location of the release, soil type, land cover, weather, volume of the release and the timing and effectiveness of the spill response.

Crude oil released from an underground pipeline would absorb into the soil in the area of the release. A leak with a very low flow rate would saturate the soils around the site of the release and would likely flow downwards toward the water table, potentially resulting in the contamination of groundwater. If the flow rate of the release were large enough, the product could flow to the surface and create overland flow. Lighter crude oil products, such as Bakken crude oil, have lower viscosities than heavier crude oils and could therefore spread faster from a release point than heavier products like dilbit, and they could permeate into the soil more readily.

Weathering – The weathering process includes a series of physical and chemical changes, which begin to occur immediately following a release of product into the environment. The weathering process can affect the properties of the released oil, including increasing the product's density, viscosity, flash point and adhesion. Weathering typically occurs more quickly under higher temperatures and slows as temperatures approach freezing (National Academies of Sciences, Engineering and Medicine 2016).

A release that makes it to the surface would initially accumulate at the site of the release and then spread along the surface of the land. As the oil is released and spreads from the site of the release, weathering and dispersion would occur. Major weathering and dispersion processes in soil include sorption (attachment of free oil product to soil particles), evaporation (vaporization of volatile components), photodegradation (degradation caused by sunlight) and biodegradation (degradation caused by microorganisms). These processes may act on crude oils at different rates. For instance, a spill of light crude oil would have a higher evaporation rate compared to heavy crude oils. Through evaporation, the lighter components of the crude oil would transfer from the liquid phase to the vapor phase. Evaporation would begin immediately after a release and result in a significant reduction in the volume of the release. Light crude oils can lose up to 75 percent of their released volume after just a few days because of evaporation, while medium crude oils can lose up to 40 percent of their released volume in that time period. Heavy or residual crude oils may only lose up to 10 percent of their initial volume from evaporation in the first few days following a spill (National Research Council 2003).

A report prepared by Tsaprailis (2014) documents an analysis of crude oil dispersion and an examination of how quickly representative light, medium and heavy conventional crude oils penetrated columns of sand compared to a representative dilbit. Light and medium crude oils penetrated the sand column most quickly, but heavy conventional crude oil also dispersed more quickly through the sand than dilbit, despite having a similar viscosity. These results may arise from the increasing viscosity of dilbit during the experiment as the diluent component evaporated. These conclusions suggest that, "land-based dilbit releases would not penetrate vertically into the ground as quickly as conventional crudes" (Tsaprailis 2014). The slower penetration of dilbit through the soil column may also result from the product's greater adhesion in relation to conventional crude oils. Because of the higher percentages of resins and asphaltenes in dilbit and the evaporation of the volatile diluent following a release, this type of crude oil is more likely to adhere to the surfaces with which it comes into contact, including soil particles. As such, dilbit will likely spread over and/or penetrate the ground more slowly than the less adhesive lighter conventional crude oils (National Academies of Sciences, Engineering and Medicine 2016).

The topography or terrain near the spill would affect the extent of a potential overland flow. A spill released to level, flat ground would generally not migrate as far from the release site as a spill on sloped ground. Hills, valleys, low areas and other land features could contain a release or affect how a release migrates over the ground surface. A steep slope could accelerate the rate of oil migration and cause the spill to cover a greater area. Releases near low areas or confined valleys could pool, contain the oil and reduce areal coverage of the release. A spill that flows into a drainage ditch or channel might flow a greater distance from the release site because of the funneling of oil and the slope of the channel. Smaller drainage channels could eventually connect to larger channels, which could empty to a surface water feature and increase the impacts of a spill.

Whether a release occurs in an urban, suburban or rural setting can also greatly affect spill volume and impact. In urban and suburban areas, spill response time is typically prompt, which generally decreases the size and duration of a spill event. In urban and suburban areas, excavation and construction activities occur more frequently, increasing the chances of pipeline damage and a release. Another important consideration in urban and suburban areas is population size. Because these areas are more populated than rural areas, potential release impacts to residents could be greater.

The type of soil at the site of the release also affects the spread of the spill. Sands and gravels have larger pore sizes, so the soil particles are spaced farther apart. Soils with a larger pore size allow liquid to pass through them more quickly. A release that occurs in an area of sandy soils could soak into the soil more quickly than a release that occurs in soils that are more tightly packed. Clays and silts have smaller pore sizes, which restrict crude oil from moving as freely. Thus, a spill of equal volume on sandy soils would tend to penetrate deeper than in clays and silts. Because spills are more likely to move downward in sandy soil, there are generally fewer impacts to the surface, but increased potential for impacts to groundwater. The reverse is true with clay soils. In areas with a rocky surface, spills would tend to both cover and pool between the rocks.

The moisture content of soil also influences its ability to soak up liquids. In wet or saturated soil, water partially or completely fills the pores between the soil particles, leaving little or no room for the less dense oil to move downward. A lack of downward movement generally leads to a spill that covers a larger surface area. As a spill spreads over land, the oil adheres to dry surfaces. Because saturated soils are less susceptible to the downward movement of crude oil, they tend to allow oil to flow over the ground surface.

Ground cover also affects the ability of a spill to flow over the ground surface. Ground covers, including grasses, forests, saturated ground and hardscape (e.g., concrete or asphalt) all retain different amounts of oil. Crude oil that flows over the ground surface would coat vegetation. The surface area of the affected plants and the amount of oil retained would affect the overall extent of the spill. Where the oil flows into forested areas, shallow root zones may act as conduits and allow the oil to penetrate deeper into the soil. In hardscapes, oiling tends to be surficial, except where expansion joint seams, cracks or other deformities in the cover's surface exist. Cracks and joints in roadways could allow oil to reach the potentially more permeable underlying soils and increase the depth of the impact.

5.4.3.2 Water Release

The crude oils to be transported on the proposed pipeline have an API gravity higher than 10 (see Table 5-5), indicating that if a release occurred in or flowed to a waterbody, the crude oil would initially float on the surface of the water. As the oil floats, some constituents within the crude oil would evaporate and others would dissolve. Lighter crude oils with lower densities (higher API gravities) and a higher proportion of volatile compounds have a greater propensity to float in water and evaporate more readily than heavier crude oils. In turn, the lighter components create a very thin sheen of oil that can spread farther and affect a larger area than what would be expected of a heavy crude oil (e.g., refer to Section 5.3.4 discussion of the Laurel, Montana 2011 spill of light sweet crude oil into the Yellowstone River that resulted in visible signs of oil at least 70 miles downstream). Physical factors that could affect the crude oil's mobility in water include wind speed, waterbody currents, waves, waterbody flow velocity and temperature. As the product floats, some constituents would evaporate and others would dissolve; eventually some material would disperse into the water and the remainder would sink. Heavier crude oils are more viscous than either synthetic or conventional light crude oils and would spread across water at a slower rate. As such, heavier crude oils do not disperse into the environment as much or as quickly as light crude oils following a water release. Turbulence in the water promotes dispersion, such that during storm events, dispersion can be the chief removal mechanism of the slick. During storms, the majority of the oil can be dispersed into the water column. For releases under more normal weather conditions, dispersion generally is nominal, and evaporation is the primary environmental fate process.

Flood conditions can increase the downstream spread of released crude oil, as observed following the 2010 release in Marshall, Michigan and the 2011 release in Laurel, Montana (see Section 5.3.4). Under such conditions, the rate of water flow increases, causing faster transport of product and increasing the distance over which product floats before becoming submerged. In addition, spill detection and response activities may become inhibited, unsafe and less effective during storm-related floods due to weather conditions or rate of water flow.

While crude oil would initially float on water following a release, the heavy compounds remaining after the volatile constituents evaporate are more likely to become submerged or sink after product weathering and adhere to sediment or other particles within the water column. Submerged products are heavier than water, which causes them to sink below the water surface and become suspended in the water column by current forces, whereas sunken products reach the floor of the waterbody and will collect in low-lying areas. Flowing water systems could transport submerged or sinking product downstream or result in deposits in river or stream bottoms. These deposits could become a continual source of contamination as stream flow continues to distribute them.

Evaporation is the primary mechanism responsible for the reduction in crude oil volume, particularly in the first few days following a release, through the loss of low molecular weight constituents and light oil products. Evaporation increases with spreading of a slick, higher temperature, and wind and wave action. As lighter components evaporate, remaining crude oil becomes denser and more viscous. While evaporation usually reduces the toxicity of the oil, it can also lead to greater persistence within the water if the remaining oil is not cleaned up quickly.

Dissolution of crude oil in water is not a primary fate process since most components of crude oil are relatively insoluble. Dissolution increases based on evaporation, increasing temperature, decreasing salinity and increasing concentrations of dissolved organic matter (MassDEP 2015). Photodegradation (decomposition of the oil by sunlight) is also not a primary fate process. Photodegradation tends to enhance the solubility of crude oil in water but can also increase its toxicity.

Cold temperatures could freeze waterways and greatly complicate the response to an oil release into water. The presence of ice inhibits initial detection of a spill, observations of the presence of oil and estimates of the extent of the oil within the waterway (MDEQ 2016b). A Bakken crude oil spill near Glendive, Montana in January 2015 occurred when an underwater section of the Poplar Pipeline, operated by Bridger Pipeline, LLC, ruptured and released 758 barrels (31,836 gallons) of product into the frozen Yellowstone River (PHMSA **2019b**). The ice slowed the oil's travel downstream, but also trapped VOCs within the water column that would have otherwise quickly dissipated in open water. These VOCs affected drinking water intakes downstream of the spill (Nunez 2015). Response personnel carved ice slots along the Yellowstone River to find and recover the oil. Fractures in the ice trapped some of the oil found on the surface of the frozen river (MDEQ 2016b; Nunez 2015). Oil recovery took place slowly, potentially increasing the downstream distance affected by the release.

As explained in Section 5.3.2, continuous scour caused by water currents or other hydrodynamic forces can threaten the integrity of pipelines buried beneath or along water bodies. As part of the USACE Section 408 review process (as codified at 33 USC 408), Keystone prepared a Missouri River Scour Analysis on the integrity of the Keystone XL pipeline to withstand scour action at the proposed Missouri River water crossing in Montana. At this crossing location (downstream of the Fort Peck spillway), the pipeline would be installed using HDD for 2,592 feet at a depth of approximately **53** feet below the lowest surveyed river elevation. In accordance with the Emergency Response Plan, pipeline inspections would be conducted following flash flood events to inspect for damage to or exposure of the pipeline caused by soil erosion. The hydraulic model and scour analysis estimated that the 500-year flood frequency event could result in a river-bottom scour depth of **11.9** feet, which would leave **22.1** feet of covering over the pipe. The analysis also considered a worst-case scenario, the equivalent of a 40,000-year event, whereby the Fort Peck spillway outflows exceed design capacity (resulting in a full spillway release) adding an additional 350,000 cubic feet per second of flow. Modeling indicated that this type of event could generate a river-bottom scour depth of **21.7** feet, leaving **12.3** feet of cover over the Keystone XL pipeline. Based on the hydraulic modeling analysis, the report concluded that the current design depth would be adequate to protect against potential scouring (TransCanada 2018a).

Similar modeling was also conducted for the Yellowstone River. As part of the Montana Facility Siting Act (MFSA) review, Keystone prepared a 100- and 500-year flood event scour and lateral migration analysis of the Yellowstone River. The modeling and reports were part of the 2011 FEIS and MDEQ analysis under the MFSA. The scour analysis for the Yellowstone River found that the maximum scour resulting from a 500-year event would still remain 19 feet away from the pipeline (Morrison Maierle, Inc. 2011).

Potential accidental releases into surface waters could result in impacts to vegetation, wildlife and fisheries as discussed in the 2014 Keystone XL Final SEIS and within this chapter. The intensity of impact to the resource would depend on the proximity and size of release. As discussed in Section 5.2, the Department has estimated that maximum reasonable distance for downstream transport and resulting impacts would be up to 40 river-miles downstream from the release point. Impacts to vegetation, wildlife and fisheries also have the potential to impact subsistence activities including impacts to hunting and fishing rights. The loss of access to subsistence resources as a result of an accidental release would require individuals dependent on these resources to hunt, gather, harvest and fish elsewhere until the site of an accidental release is remediated.

As discussed in the 2014 Keystone XL Final SEIS, if an accidental release did affect surface water, Keystone would be liable for all costs associated with cleanup and restoration, including damages to natural resources and for the loss of subsistence use of these natural resources (U.S. Department of State 2014).

5.4.3.3 Fire and Explosion

While crude oils are flammable petroleum products, a fire or explosion would only occur under the following conditions:

- **Fuel** – The vapors produced from the crude oil must mix with the air to a sufficient concentration (lower flammable threshold) at which the mixture would ignite.
- **Oxygen** – Oxygen must be present in the air at a concentration to support ignition.
- **Heat** – The temperature of the fuel must be heated to a point where sufficient vapors are given off for ignition to occur.

By federal definition, a substance is flammable when it has a flash point between 20°F (-6.7°C) and 100°F (37.8°C) (16 CFR 1500.3). The flash point is the temperature at which a substance reaches a sufficient fuel-to-air concentration to ignite when exposed to an open flame (Tsaprailis 2014; Platts 2018). By this flash point definition, crude oil is a flammable product. However, the appropriate concentrations of flammable vapors from the crude oil and oxygen would need to be available in the presence of an ignition source for a fire to occur. Crude oil released into confined areas could generate a sufficient concentration of flammable vapors to ignite, while crude oil released in an open environment would be less likely to reach the concentration necessary to cause a fire or explosion since the flammable vapors released from the oil would disperse throughout the surrounding area. Very low oxygen levels and the lack of an ignition source inside a closed pipeline make it unlikely that an explosion or fire would occur.

After a spill, the flammability of crude oil decreases through natural weathering and the loss of volatile components. This occurs through processes such as evaporation, wave and wind action, dispersion, dissolution, sedimentation and biodegradation, among others. The location of an oil spill plays a role in the rate of weathering, and therefore the length of time that the oil remains flammable.

The range of values reported for the flash point of Bakken crude oil varies significantly with some values reported on safety data sheets as low as less than -20°F (-28.9°C) (ConocoPhillips 2014), but more typically reported as less than 73°F (22.8°C). One reason for this variability is the test methods that are used to determine the flash point in the laboratory may allow some of the lighter compounds to evaporate from the product during sampling and analysis, which would bias the test for a higher flash point (Sandia National Labs 2015). Since it is the vapor emissions that actually burn, products containing more light components, such as Bakken crude oil, have lower flash points and are more flammable than heavier crude oils.

Dilbit, although classified as a heavy crude oil, initially acts more like a lighter crude oil, governed by the 20 to 30 percent volume of diluent component (Tsaprailis 2014). The abundance of volatile compounds in dilbit allows the product to be potentially flammable for a day or longer after a release (National Academies of Sciences, Engineering and Medicine 2016). Cold weather conditions slow the volatilization process and thus may extend the period during which the product is flammable (Tsaprailis 2014). The flash point of dilbit is comparable to light crude oil before it is released. However, initial weathering of dilbit occurs very rapidly after a release, which causes its flash point to quickly rise above the flammable limit (e.g., to greater than 148°F [60°C]) (National Academies of Sciences, Engineering and Medicine 2016).

5.4.4 Response and Remediation of Spills

After safety, the highest priority for spill response is to prevent released product from reaching water and then to reduce or avoid product migration out of the source area. When a spill occurs, one of the first challenges that first responders face is containing and recovering the spilled product. The faster a spill can be contained, the smaller the area (and number or extent of resources) that the spill would affect. The methods and technologies used to contain a spill depend on whether the spill occurs over land or water.

Many of the methods used to detect, contain and recover spilled product are well established and have been used over the past several decades. Technological refinements and advances in addressing spills continue to improve and increase the ability of responders to contain and clean up spills. Whichever methods response crews use to contain and recover the spilled product, they must weigh the effectiveness of the response and remediation technique against the intrusiveness of the remedial effort on the environment and potential receptors. Response personnel need to select technologies that provide the greatest degree of protection to human health and environmental resources.

All spill prevention, mitigation and remediation plans developed for the Keystone XL Project and discussed in the 2014 Keystone XL Final SEIS would apply to the proposed Project (refer to Section 3.13.1 and Appendix B of the 2014 Keystone XL Final SEIS). The combined implementation of industry standards and practices that Keystone would implement as part of construction and operation of the Keystone XL Project would aid in reducing the potential for spill incidents associated with the proposed Project. The standards were developed by the National Association of Corrosion Engineers, International and American Society of Mechanical Engineers, and other industry leaders.

The Department, in consultation with PHMSA, have determined that these standards and practices, combined with PHMSA regulatory requirements and the set of proposed Project-specific Special Conditions developed by PHMSA, would result in a degree of safety over any other typically constructed domestic oil pipeline system under current code and a degree of safety along the entire length of the proposed pipeline system, similar to that required in high consequence areas as defined in 49 CFR 195.450. The Project-specific Special Conditions include a list of 59 items, or “considerations,” that PHMSA recommended be included in the written design, construction, operating and maintenance plans and procedures for the Keystone XL pipeline (refer to Appendix B of the 2014 Keystone XL Final SEIS). These considerations exceed existing federal standards and would be implemented along the proposed pipeline. The 59 conditions include, among others, the items listed below separated into four categories:

- **Material requirements** for the steel used to manufacture the pipeline, manufacturing standards, fracture control measures, quality control measures, puncture resistance and pipe coatings.
- **Construction requirements** for coatings, fittings, pipeline design factor, temperature control, overpressure protection control, welding procedures, depth of cover and pressure tests.
- **Operations and Maintenance** requirements for the SCADA system, pipeline inspection, corrosion surveys, cathodic protection, pipeline markers, a damage prevention program and anomaly evaluation and repair.
- **Reporting, records retention and senior-level certification requirements.**

In accordance with 49 CFR 195, Keystone would maintain an Integrity Management Program required for pipelines that could affect a high consequence area. As stated in Section 3.13-1 of the 2014 Keystone XL Final SEIS, a Facility Response Plan would be prepared and submitted to PHMSA prior to initiating operation of the proposed Project, in accordance with requirements of 49 CFR 194. This plan relies on final permitting requirements and detailed design and construction information. A proposed Project-specific, worst-case spill scenario including location, available resources and response actions would be addressed in the Facility Response Plan once the final permitting, detailed design and construction information were available. Under current regulations, Keystone would be required to submit these plans to PHMSA for review and approval prior to operation of the proposed Project.

In addition to the above, Keystone's Emergency Response Plan details overarching strategies and specific tactics to manage various emergencies, including a potential release of crude oil into the environment. Within the Emergency Response Plan, detailed Geographic Response Plans identify specific resources and tactics that would be used if a release occurred within a specific area. A Geographic Response Plan is the corresponding tactical plan that guides emergency responders in the event of an oil release. It is composed of a series of maps and site-specific response locations termed priority protection areas. Each Geographic Response Plan map serves as a quick reference guide to the equipment and deployment tactics anticipated for a response, as well as identification of sensitive resources and a corresponding protection strategy to be used during an emergency response.

5.4.4.1 Spill Response and Containment

This section provides a summary of typical response and containment measures. All authorized response activities are discussed in the applicable Regional Contingency Plan and/or Area Contingency Plans prepared by the U.S. National Response Team. Regional and Area Contingency Plans are reference document prepared for the use of all agencies engaged in responding to environmental emergencies within a defined geographic area. They provide a mechanism to ensure that all responders have access to essential area-specific information and promote inter-agency coordination to improve the effectiveness of responses.

Mechanical containment and recovery is the primary method used in spill response. The equipment used in this method includes booms, skimmers, temporary dams or berms, sorbent materials and vacuum equipment/trucks, which response crews use to contain, capture, temporarily store and recover spilled product until it can be properly disposed. Once oil has been contained, it can be recovered using booms, skimmers, sorbents and vacuum equipment/trucks (National Academies of Sciences, Engineering and Medicine 2016).

- **Booms** – Containment booms are floating, physical barriers used to contain spills over water by blocking the flow of oil over the surface of the water. Booms float on the water's surface, while a portion called a boom skirt extends beneath the surface of the water. Responders deploy booms using mooring systems, such as anchors and landlines. Response crews can also use booms to divert floating oil or exclude floating oil from reaching selected areas and protect sensitive shoreline and resources. Booms are a common first response method, but they work best when deployed correctly and quickly in areas where released oil is contained within the banks of a waterway. Effectiveness of booms decreases with high flow rate, turbulent water and time as floating oil weathers and sinks below the water surface (National Academies of Sciences, Engineering and Medicine 2016). Since booms are only used for containment, they would be used in combination with skimmers or sorbents to recover the oil.
- **Skimmers** – Skimmers are mechanical devices used to recover floating oil from the surface of water. Skimmers may be self-propelled and may be used from the shore or operated from vessels. There are several different kinds of skimmers, but they all include some means of vacuuming or retaining oil that passes into the device. Below are three common types of skimmers provided by the USEPA (1999).
  - *Weir skimmers* use a dam or enclosure positioned at the oil/water interface. Oil floating on top of the water will spill over the dam and be trapped in a well inside, bringing with it as little water as possible. The trapped oil and water mixture can then be pumped out through a

pipe or hose to a storage tank for recycling or disposal. These skimmers are prone to becoming jammed and clogged by floating debris.

- *Oleophilic (oil-attracting) skimmers* use belts, disks or continuous mop chains of oleophilic materials to blot the oil from the water surface. The oil is then squeezed out or scraped off into a recovery tank. Oleophilic skimmers have the advantage of flexibility, allowing them to be used effectively on spills of any thickness. Some types, such as chain or "rope-mop" skimmers, work well on water that is choked with debris or rough ice.
- *Suction skimmers* operate like a household vacuum cleaner. Oil is sucked up through wide floating heads and pumped into storage tanks. Although suction skimmers are generally very efficient, they are vulnerable to becoming clogged by debris and require constant skilled observation. Suction skimmers operate best on smooth water where oil has collected against a boom or barrier.

- **Temporary dams or berms** – For spills that occur on land, response crews can create or deploy temporary dams or berms to block the flow of crude oil so that it can be contained to the greatest extent possible. Response crews typically use these methods to protect priority areas such as inlets to drains, sewers, ducts and watercourses. Materials commonly used to construct dams include soil, sandbags, absorbents, planks and pillow dams inflated with air or water. The terrain would dictate the placement of the dams. Another method of containment is to dig collection pits. This creates a new low point into which the oil will flow, providing a recovery point for removal. Temporary berms and dams are primarily used for containment only and therefore must be combined with a secondary methodology, such as skimmers, used for recovering the oil.
- **Underflow dams and weirs** – Underflow dams and weirs use inclined culverts or pipes to move water downstream while leaving the floating oil contained behind the dam. Response crews use underflow dams when there is too much water flow to allow for a complete blockage of a drainage channel, stream or river. Materials used to build the dam or weir include earth, gravel or other barriers such as sandbags or plywood sheets. Overflow dams are similar devices used for retaining spilled products heavier than water while still allowing water to flow above them. While typically effective, these methods can be subject to erosion, requiring constant maintenance. In addition, low flow rates and clogging of pipes with debris can also be problematic.
- **Sorbent materials** – Sorbents are sponge-like materials used to soak up small volumes of oil. In general, response crews use sorbents only for small spills and during the final stages of cleanup. In urban locations, such as city streets or concrete drainage ditches, a combination of sorbent booms in front of a layer of sandbags holding the boom in place can serve as an effective means to create containment along with some collection. Sorbents alone are typically insufficient; therefore, these are often used in combination with one or more of the techniques described above.

In situ burning, or burning the product in place, is a far less commonly used method of containment for inland oil spills. Response crews typically use this method only for major spills in areas where the burn can be easily controlled and confined, and it is most effective for fresh spills under calm weather conditions. In such circumstances, burning provides the only practicable means to eliminate large volumes of product quickly when they cannot contain or recover the product readily using other means. When responders burn spills over water, they can retain better control over a fire by using fire-resistant booms to cordon off portions of the overall spill, rather than igniting the entire spill at once (Barnea 1995). If utilized as a method of containment, the federal on-scene coordinator, a state representative and the responsible party must approve the use of in situ burning and conduct the process in accordance with an In Situ Burn Plan. Light crude oil has a high burnability with an efficiency range of 85 to 98 percent, compared to an efficiency range of 75 to 90 percent for heavy crude oil (MassDEP 2015). Dilbit, after weathering for 1 day, has been shown to have a lower burnability with an efficiency range of 50 to 75 percent (National Academies of Sciences, Engineering and Medicine 2016). Many regulatory agencies strictly regulate burning as a means of response; procedures for obtaining permissions for an in-situ burn can be found in applicable Regional and Area Contingency Plans.

Spills of dilbit initially float on water and therefore responders can employ the same tactics as would be used for a spill of conventional crude oil. However, the properties of dilbit change as it weathers. The lighter components volatilize, and the product becomes more dense causing it to sink below the water surface (National Academies of Sciences, Engineering and Medicine 2016). One of the most challenging aspects of responding to spills, particularly dilbit spilled in water, is detecting, containing and recovering submerged and sunken oil. Submerged and sunken oil is difficult to detect because it is often not visible from the surface. Methods to detect submerged and sunken oil are typically slow, limited by water conditions and provide only a "snapshot" of a given area (National Academies of Sciences, Engineering and Medicine 2016). Visual observation is a viable detection method in shallow water, although expert analysis is essential for this technique as aquatic biota (vegetation) in the water may be mistaken for oil. Currently, the best method for detecting submerged oil is to drop weighted sorbent materials into low areas for short distances and then visually inspect them for oil to map oil distribution. By examining the sorbent, the presence or absence of submerged or sunken oil can be determined. Collecting core samples can also detect sunken oil during subsurface contamination assessments, but the sampling area of the core may be too small to be effective. Special equipment may also be required to detect submerged oil, including the use of sonar, which response crews have used to locate submerged oil in calm water such as lakes, ponds and bays with some success. Remote and diver-operated underwater video detection systems may also be used, but success depends on visibility and the water's current. The USEPA recommends using multiple approaches to detect submerged oil. In addition to the methods discussed above, these lines of evidence would include agitation of sediments, mapping of sheens, coring, geomorphological science, fluorescence and laboratory analysis.

The containment of submerged and sunken oil also poses significant challenges. Specialized response equipment is required to contain sunken and submerged oil, including net booms, bottom-hugging weighted booms and watergate dams, submerged booms with anchored skirts, sediment traps, silt curtains and gabion baskets lined with impermeable membranes. Filter fences lined with impermeable membranes and booms with deep skirts help contain submerged oil for recovery. Response crews can use large porous containers filled with sorbent materials to capture sunken and submerged oil. Any of several types of porous containers, such as gabion baskets, prawn or crab traps, silt fences and chicken wire, can serve as the basis for the filter. The container holds sorbent materials, such as oil snares, and submerges into the water column when weighted down. Response personnel monitor the sorbent materials and replace them as needed for oil recovery. They may also use vacuum systems to recover submerged oil. In shallow water where oil remains visible from the surface, response crews have successfully used dip nets or pool nets as an effective way to collect oil. This method is useful if the oil has emulsified or is thick enough to scoop up with the nets. Another common method is to dredge the bottom and remove the oil. Where appropriate, dredging serves as a useful technique to remediate contaminated sites but may generate a large amount of waste material to manage and transport for disposal; increase sediment within the waterway; disturb plant, fish and wildlife habitat; and adversely affect water quality. However, such impacts would be temporary compared to the long-term effects of oil contamination.

5.4.4.2 Remediation

Excavation, or removal of contaminated soil and sediments, is a very common remediation method employed at spill sites. Excavation is similar to dredging, but the term dredging typically applies to work done in water, while excavation may occur on completely dry land or on streambanks. In both cases, trucks haul the contaminated soil, sediment and any associated vegetation to an approved location for treatment and disposal. For contaminated ground that cannot be removed, such as paved roads, concrete curbing or concrete drainage ditches, heated pressure washing is an effective cleaning method. The collection of wastewater, including the water used for cleaning, is important; therefore, a vacuum truck or some other type of collection must be available. Once the spill remediation effort is no longer effective or efficient, response personnel may implement more passive remediation methods to further the remediation and restoration of affected soil, groundwater and surface water.

The incorporation of hydrocarbon-affected soils into road base or in asphalt mixtures (as approved by the appropriate agencies) is one way to reuse oils affected by a crude oil spill. The remediation crew could recycle recovered product from skimming or vacuum operations by removing water and debris and re-blending. Incineration or burning of contaminated waste from spill response and remediation for energy recovery may be an option in some areas. Disposal of contaminated soil and debris at a solid or hazardous waste landfill is the least environmentally sound method of disposal and would be considered only as the last option.

Excavation would typically represent the most intrusive of the many potential options to address contaminated soil, water and groundwater. As a result, impacts to sensitive resources from excavation would be greater than those encountered through the use of other remedial technologies. In the event of a release that requires remediation, remedial technologies would be selected in accordance with state and federal regulations and in consultation with the regulators overseeing the remediation efforts.

Cleanup endpoints are those criteria set in order to determine whether response actions have been effective. Cleanup endpoints for inland oil spills generally require more specialized equipment and must meet higher standards than those for spills to water for the following reasons (National Academies of Sciences, Engineering and Medicine 2016):

- Inland habitats lack some of the physical processes that can speed the rate of natural removal of oil residues.
- The direct human uses of inland habitats, such as for drinking water, recreation and irrigation, require a higher degree of treatment to avoid human health and socioeconomic impacts.
- Spills in close proximity to where people live, work or recreate may require treatment to a higher level.
- Many states have sediment quality guidelines that must be met during the remediation phase.

5.5 IMPACTS OF RELEASES

5.5.1 Introduction

A spill of crude oil could result in impacts to the various resources discussed in Chapter 3, Affected Environment. The nature and extent of impacts would depend on many factors, including the size of the release, the proximity of the release to sensitive resources, the proximity to features that would promote the transport and migration of the crude oil, and weather conditions that could affect the mobility of the oil and accessibility of areas for response actions. This section provides a qualitative and, where practicable, quantitative description of the types of impacts that could occur from spills and the likelihood of various spill sizes affecting resources.

The remainder of this chapter addresses the likelihood and consequences of spills associated with each of the resource areas analyzed in this SEIS. This analysis takes into account the location of sensitive resources near the proposed pipeline route by evaluating which resources exist nearby that could experience adverse impacts in the event of a spill. The 2014 Keystone XL Final SEIS considered the risk of an accidental release along the Preferred Route, as well as the potential effects of such a release. This SEIS builds upon the conclusions of the prior document and assesses the risk to resources located along the entire proposed pipeline route, including the MAR, and evaluates whether any new or unique features or resources may be present along the MAR that were not previously considered in the 2014 Keystone XL Final SEIS.

A spill of crude oil from the Keystone XL Project could result in impacts to the various resources presented in Chapter 3, Affected Environment. As discussed in the 2014 Keystone XL Final SEIS and within this chapter, the nature and extent of impacts of a spill depends on many factors including the product spilled, the size of the release, the proximity of the release to sensitive resources, the proximity to features that would promote the transport and migration of the crude oil, the response time and actions taken by responders, the weather conditions that could affect the mobility of the oil and the accessibility of areas for response actions. This section provides a qualitative and, where practicable, quantitative description of the types of impacts that could occur from spills as well as the likelihood of various spill sizes affecting resources along the proposed pipeline route. This analysis considers the location of sensitive resources by evaluating which resources exist nearby that could experience adverse impacts in the event of a spill.

As explained in Section 5.2, this analysis incorporates and updates the screening-level spill modeling conducted during preparation of the 2014 Keystone XL Final SEIS to estimate the distance that crude oil could travel after a spill. This analysis determined that a 50-barrel (small) spill could spread over land up to 150 feet from the site of a spill; a 1,000-barrel (medium) spill could spread up to 500 feet; and a 10,000-barrel (large) spill could spread up to 1,200 feet over land from the release point. In areas of moderate to steep slopes, the Department has further estimated that large spills could extend up to 5,000 feet downslope from the pipeline. If released crude oil reached groundwater, the screening modeling conducted for the 2014 Keystone XL Final SEIS found that components in the oil, such as benzene, could spread downgradient in groundwater an additional 640 feet for a 50-barrel spill, 820 feet for a 1,000-barrel spill and 1,050 feet for a 20,000-barrel spill. This modeling effort also indicated that the three spill volumes could reach groundwater at a depth of 50 feet, although larger volumes could be expected to reach groundwater at deeper depths. Thus, as shown in Figure 5-1, the full extent of a spill could reach the overland distance plus the additional dissolved phase distance. Refer to the 2014 Keystone XL Final SEIS for further discussion of the screening-level modeling effort and the calculation of these distances.

The Department also considered a 40 river-mile downstream distance as the distance crude oil released to water could travel (see Section 5.2) and result in impacts to sensitive resources. For each of the modeled spill distances, the Department assessed the likelihood that a spill could affect sensitive resources, based on spill incident rates and the amount of the resource present within these areas determined to be susceptible to a spill. The following subsections present the likelihood of resources along the proposed pipeline route being affected by potential small, medium, large and catastrophic spills.

Depending upon the resource, a release could have a variety of impacts. For example, a release of crude oil could have a negligible impact on geology but could contaminate soils and groundwater. Other resources, such as biological resources and surface waters, contain sensitive receptors. Sensitive receptors can include habitat for protected species and drinking water intakes, which could experience substantial adverse effects in the event of a release. The impacts of a spill on other resources such as air quality (by the volatilization of organic compounds in the oil) and socioeconomics (through changes to commercial activity and residential properties) may also affect local residents adversely. Therefore, the analysis of impacts from a release requires a balanced consideration of the resources affected and the particular receptors that would be most at risk.

Impacts that result from accidental releases of crude oil may be short- or long-term in duration. Short-term impacts generally signify that a resource can recover within a reasonable length of time. Removal of the spilled oil typically can mitigate short-term impacts. Examples of short-term impacts include the noise and visual impacts associated with cleanup efforts, or the potential impact on air quality near the spill site. Long-term (chronic) impacts may signify that affected resources require many years to return to pre-spill conditions, or that an affected resource will not return to pre-spill conditions. Such impacts may include the substantial alteration of an existing habitat, recreational area or **historic property** to the point that it no longer serves its original function. Whether an impact is short- or long-term depends on factors such as the location of a spill, the geographic extent of a spill, resources present within that spill area and the volume of product released.

The volume of crude oil released during a spill can substantially affect the potential for impacts. However, a more critical factor is the location of the spill in relation to sensitive resources, such as waterbodies and population centers. A small spill that occurs near a sensitive resource may result in greater impacts than a large spill in an area devoid of sensitive resources and receptors. Therefore, location (i.e., proximity of the spill to sensitive resources) is a key factor that influences the actual consequences of a spill.

The location of a release relative to areas of human activity could affect its overall impact. Generally, most spills would occur within or near the pipeline ROW or ancillary features (e.g., access roads, pump stations). Spills in populated areas have a greater probability of early discovery and easier access than those that occur in a rural setting, which shortens the response time and can mitigate the extent of the impact. A spill in an urban setting generally may have different effects on human health and the environment from one in a rural setting. Spills in populated areas are much more likely to affect human receptors and their property. However, a release in a remote setting, such as a wetland or forest, may be difficult to access by response vehicles and equipment. The sparse population and infrequency of passersby may also delay the initial discovery of a spill in remote areas.

5.5.2 Land Use, Recreation and Visual Resources

An accidental release of crude oil along the proposed pipeline route could result in short- or long-term effects to land use, recreation and visual resources existing within the ROI summarized in Section 3.2. Typically, the extent of each effect would be small relative to the overall land area. However, effects from even small spills become more severe within areas of unique land use, important or unique recreation opportunities or exceptional aesthetic quality. These resources would typically be most susceptible to the physical effects of a potential release, such as physical coating of crops, recreational areas and fishing areas, including the potential accompanying nuisance odors and visual effects from the product or associated cleanup efforts. The remainder of this section discusses potential impacts to the two predominant land uses susceptible to impacts from accidental releases: agricultural and recreational land uses. Table 5-6 lists the potential direct and indirect effects to land use and recreation resulting from a release of crude oil.

Table 5-6. Potential Effects to Land Use, Recreation and Visual Resources from a Release

Resource	Direct Effect	Indirect Effect
Agricultural Land Use	Physical coating of vegetation (see Section 5.5.7).	Contaminated forage for livestock. Loss of commercial crops.
	Contaminated water (see Section 5.5.6).	Contaminated water for livestock. Contaminated irrigation water.
	Contamination of prime farmland soils (see Section 5.5.3).	Reduced soil productivity.
Recreational Land Use	Contaminated water (see Section 5.5.6).	Restricted access for boating, swimming, fishing, etc.
	Physical and toxicological effects to fish (see Section 5.5.7).	Short- or long-term loss of fishing areas or fish consumption restriction.

5.5.2.1 Agricultural Land Use

Cultivated farmland represents the dominant land use within the areas crossed by the proposed pipeline route, including corn, alfalfa, winter wheat, oats, grain sorghum, soybeans and hay. An accidental release has the potential to coat vegetation, including row crops, wild lands and rangelands; the crops within these areas might not survive or may experience physical impacts caused by oiling (see Section 5.5.7.1 for further discussion regarding potential impacts to vegetation). Affected vegetation may not be suitable for grazing animals, and any affected commercial row or field crops would likely not be marketable. Other effects on agriculture, which include farming and ranching, could occur if a water supply that is contaminated by an oil spill is used to irrigate fields or support livestock (see Section 5.5.6). Potential impacts could include loss of agricultural land use, limited production, reduced crop yields and associated income, and adverse health impacts to livestock. Additional long-term impacts may require the use of alternative sources of drinking water for livestock and water for irrigation.

Keystone has committed to a number of measures beyond spill cleanup measures, which are addressed in Appendix B, Potential Releases and Pipeline Safety, of the 2014 Keystone XL Final SEIS. In the event that a spill contaminates water supplies used for industrial**, municipal** or irrigation purposes, Keystone may provide either an alternate supply of water or appropriate compensation for those facilities impacted.

The extent and duration of the effects would depend on the number of productive areas affected, the response time, the remediation method implemented and the length of time required to return the land to pre-spill conditions. Short-term disruption in local agricultural production could result from a spill that enters agricultural lands or wild lands used by grazing livestock. A medium spill is less likely to contaminate large acreage of agricultural land. However, oil adsorbed or otherwise adhered to soil particles may be transported extended distances by processes such as wind or water erosion. Oil migration could contaminate and adversely affect agricultural land use in areas beyond the initial spill location. Contamination by a large spill could affect soil productivity adversely, and the beneficial use for farming or grazing would be restricted for the duration of the remedial period or longer. In some cases, including large-scale removal of contaminated soils during spill remediation, soil productivity would not likely return to prior levels. In an extreme event, a spill could result in the permanent loss of agricultural lands.

In order to evaluate and characterize the potential for environmental impacts to agricultural land, the Department reviewed the prevalence of these resources near potential release locations along the proposed pipeline route. The potential for a spill that could affect each resource type based on the proximity criteria presented in Section 5.2 was determined using incident rate data for the various spill sizes and the linear distances along the proposed pipeline route that met each criterion.

As presented in Table 5-7, the likelihood of a release **occurring in proximity to** agricultural lands is greatest for cultivated crops, with the highest annual incident rate being 1.1 incidents per year for any size spill that could **occur within 150 feet of** this resource. This incident rate is very high due to the presence of croplands along much of the pipeline route and the higher incident rate for small spills (2.**54** per 1,000 pipeline mile-years). The highest projected annual incident rate for pasture/hay is 0.02 incident per year of any size **that could occur within 150 feet of** such lands.

Table 5-7. Annual Likelihood of Spills Occurring in Proximity to Agricultural Land

Resource	Area within 150 Feet[a]	Area within 500 Feet[b]	Area within 1,200 Feet[c]
Cultivated crops	1.1	0.2	0.04
Pasture/hay	0.02	0.008	0.003

Source: USDA/NRCS 2011; USGS 2011a

a. The area within 150 feet of the pipeline that is susceptible to small, medium, large and catastrophic spills.

b. The area within 500 feet of the pipeline that is susceptible to medium, large and catastrophic spills.

c. The area within 1,200 feet (up to 5,000 feet in areas of moderate or steep slope) of the pipeline that is susceptible to large and catastrophic spills.

5.5.2.2 Recreational Land Use

If a spill reached recreational lands and/or waterways, areas used for hunting, fishing, sightseeing and other recreational activities could experience a short-term negative effect that could last the duration of the cleanup effort. Impacts on fish species prized for recreational fishing would be as discussed in Section 5.5.7. During response and restoration actions, access to affected areas would generally be limited or prohibited to anyone except the response and remediation personnel, thus limiting the use of recreational areas, such as NHTs or designated recreational waterbodies. Adverse publicity regarding the impacts of large spills could reduce use by recreationists for an extended period. For small spills, there would likely be a negligible effect to businesses relying on recreational uses, and it is possible that cleanup responses would not require resource closure. Once the area is clean, normal activities would likely resume. However, more long-term and damaging impacts can occur when members of the public perceive an area to be polluted even after the oil has been removed.

The Marshall, Michigan release of dilbit that occurred on July 25, 2010 provides examples of actual recreation and land use effects caused by a large spill. This incident released approximately 20,082 barrels (843,444 gallons) of dilbit into waterways near the town of Marshall, Michigan; the oil then flowed into the Kalamazoo River and Morrow Lake, which serve as recreational boating and fishing areas. Soon after the spill occurred, the Kalamazoo and Calhoun County health departments prohibited the use of affected surface waters for irrigation and the watering of livestock. The Calhoun County Public Health Department also banned recreation activities, including boating, swimming and fishing. All affected areas of Talmadge Creek and the Kalamazoo River remained closed to recreational use for almost 2 years (National Transportation Safety Board 2012).

This SEIS considers the annual likelihood of a potential release **occurring in proximity to** recreational land use within the ROI. As presented in Table 5-8, the analysis found that the highest annual incident rate for recreational land use along the proposed pipeline route was 0.004 incident per year for any size spill that could **occur within 150 feet of** a recreational waterbody. The highest annual incident rate for any size spill that could **occur within 150 feet of** an NHT is 0.0006 incident per year. Crude oil spills **that affect** NHTs and recreational waterbodies could also result in adverse impacts **on historic properties** (see Section 5.5.9), surface waters (see Section 5.5.6) and aquatic organisms (see Section 5.5.7).

Table 5-8. Annual Likelihood of Spills Occurring in Proximity to Recreational Land Use

Resource	Area within 150 Feet[a]	Area within 500 Feet[b]	Area within 1,200 Feet[c]
National Historic Trail	0.0006	0.0006	0.0002
Recreational Waterbody	0.004	0.003	0.002

Source: Montana Fish, Wildlife and Parks 2018; NDEQ 2016; South Dakota Game, Fish and Parks 2018; USFWS 2005

a. The area within 150 feet of the pipeline that is susceptible to small, medium, large and catastrophic spills.

b. The area within 500 feet of the pipeline that is susceptible to medium, large and catastrophic spills.

c. The area within 1,200 feet (up to 5,000 feet in areas of moderate or steep slope) of the pipeline that is susceptible to large and catastrophic spills.

5.5.3 Geology and Soils

As presented in Section 3.3.1, no known seismic faults or oil, natural gas or coal mining operations exist along the proposed pipeline route, and therefore, a release of crude oil is not anticipated to adversely affect the underlying geology. As such, this section focuses on soil resources. An accidental release of crude oil along the proposed pipeline route could result in short- or long-term effects to soil resources existing within the ROI summarized in Section 3.3. Table 5-9 lists the potential direct and indirect effects to soils that could result from a crude oil spill. The extent of these potential effects depends on the location of the spill and the volume of oil released.

Table 5-9. Potential Effects to Geology and Soils from a Crude Oil Release

Direct Effects	Indirect Effects
Contamination of hydric soils.	Adverse impacts to wetlands (see Section 5.5.6).
Contamination of coarse-textured soils.	Infiltration to groundwater (see Section 5.5.6).
Contamination of prime farmland soils.	Reduced soil productivity. Restricted farming or grazing.

Prime farmland soils are prevalent within the ROI. Contamination of prime farmland soils could adversely affect soil productivity, and the use of the land for farming or grazing would be restricted during remediation of the spill and potentially after remediation is complete. Remediation may require the excavation and removal of contaminated soils, which would result in a permanent loss of prime farmland soils. Vehicles and equipment used to respond to and remediate a spill may increase the potential for soil disturbance (e.g., rutting, compaction and erosion). It is also possible that wind or water erosion could carry contaminated soils off a spill site and adversely affect prime farmland soils in areas beyond the spill location.

The existence of hydric soils is one indicator of wetlands, so an accidental release near hydric soils could potentially result in wetland contamination. Section 5.5.6.3 addresses the potential for wetland contamination from an accidental release. Likewise, the existence of soils with higher permeability (e.g., with a coarse texture) could allow spilled oil to seep more readily into groundwater resources. Section 5.5.6.1 discusses the potential effects of released crude oil reaching groundwater.

As presented in Table 5-10, the analysis determined that the likelihood of a release **occurring in proximity to** designated farmland soils is greatest for farmland of statewide importance where there is a projected annual rate of 0.9 incident per year for any size spill that could **occur within 150 feet of** such soils. For prime farmland soil, there is an annual likelihood of 0.**6** incident per year of any size spill **occurring** within 150 feet of **such soils** along the proposed pipeline route. **It should be noted that no significant paleontological sites were identified within these areas.**

Table 5-10. Annual Likelihood of Spills Occurring in Proximity to Designated Farmland Soils

Resource	Area within 150 Feet[a]	Area within 500 Feet[b]	Area within 1,200 Feet[c]
Prime Farmland Soil	0.**6**	0.2	0.04
Farmland of Statewide Importance	0.9	0.2	0.05
Significant Paleo Sites[d]	**0**	**0**	**0**

Source: USDA/NRCS 2018a, 2018b**; Exp and Paleo Solutions Inc. 2018**

a. The area within 150 feet of the pipeline that is susceptible to small, medium, large and catastrophic spills.

b. The area within 500 feet of the pipeline that is susceptible to medium, large and catastrophic spills.

c. The area within 1,200 feet (up to 5,000 feet in areas of moderate or steep slope) of the pipeline that is susceptible to large and catastrophic spills.

d. No significant sites found.

5.5.4 Air Quality

An accidental release of crude oil along the proposed pipeline route could result in short- or long-term effects to air quality within the ROI summarized in Section 3.4. These direct and indirect air quality impacts would be short term in nature, ranging from a few hours to several weeks. A release of crude oil could contribute to air pollution from fugitive emissions, from combustion of fuel in vehicles and equipment used for spill response and remediation actions, and from combustion of spilled crude oil in the event of a fire. Table 5-11 presents the potential direct and indirect effects to air quality from a spill.

The most notable impacts related to air quality are adverse effects on human health. Human health impacts arise from inhalation of the hydrocarbons (organic molecules made of hydrogen and carbon atoms) that make up crude oil. The hydrocarbons that are of particular importance with respect to air quality are volatile and semi-volatile compounds, which readily evaporate and disperse through the air. Health effects from exposure depend on the concentration of the chemical in the air and the duration of exposure. In addition, degraded air quality and visual obstructions caused by smoke can disrupt professional and/or recreational activities in affected areas, negatively affecting the aesthetic and economic value of affected regions.

Table 5-11. Potential Effects to Air Quality from a Crude Oil Release

Direct Effects	Indirect Effects
Air quality degradation resulting from volatilization of hydrocarbons.	Temporary adverse effects to human health related to inhalation of hydrocarbons. Temporary adverse effects to birds and mammals related to inhalation of hydrocarbons (see Section 5.5.7).
Air quality degradation resulting from burning of crude oil.	Temporary adverse effects to human health related to inhalation of hydrocarbons and particulate matter. Temporary adverse effects to birds and mammals related to inhalation of hydrocarbons and particulate matter (see Section 5.5.7). Temporary adverse effects to recreational activities (see Section 5.5.2).

In the event of a crude oil spill, the effects on air quality would depend on the size of the spill, the type of oil spilled, environmental conditions (i.e., topography) and the weather. Oil spills spread over the ground or via waterways. The volatile and semi-volatile compounds then vaporize, emitting odors and airborne contaminants. Volatile and semi-volatile organic compounds (including BTEX and polycyclic aromatic hydrocarbons) evaporate most rapidly and disperse according to the ambient temperature and wind strength and direction. Conditions with no wind could result in the highest air concentrations, as wind serves to dissipate the contaminants. The extent of the impacts would depend on the volume of oil spilled, the size of the plume, the proximity of the incident to populated areas, the evaporative and dispersion characteristics of the weather and wind conditions, and the effectiveness of the spill response. While any release of crude oil may have an immediate and direct impact on the air quality near the release site, the potential for air quality impacts reduces with time as the material evaporates.

Emergency response teams sometimes initiate controlled burning as a measure to mitigate impacts from spills. Burning crude oil can create substantial air quality impacts, depending on the volume and type of crude oil and the wind and weather conditions. Smoke plumes can reach several hundred to several thousand feet high, carried by prevailing winds. Most of the oil burned converts to CO_2 and water. However, particulates, mostly soot, make up approximately 10 to 15 percent of the smoke plume. The combustion process also releases small amounts of sulfur dioxide, nitrogen dioxide, carbon monoxide and small amounts of polycyclic aromatic hydrocarbons. Depending on environmental conditions, the gases in the burn plume would likely dissipate to background concentrations several miles downwind and would not significantly affect human inhalation exposure to the air contaminants, unless weather conditions caused the plume to descend to ground level (Barnea 1995).

After the July 25, 2010 Marshall, Michigan oil spill, the Michigan Department of Community Health and the U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, developed air monitoring protocols for testing, levels of concern and decision trees for evacuation and re-occupancy based on benzene levels. The initial “real-time” readings at the spill site did not detect combustible gas at concentrations above the protective screening level for explosives, and all measured oxygen and carbon monoxide concentrations were within normal limits. However, measurements found elevated levels of the screening compounds of benzene, total VOCs and hydrogen sulfide. This warranted the voluntary evacuations of residents from approximately 50 houses within a designated area of approximately 400 acres between the spill site and the Kalamazoo River. During the first 3 weeks following the Marshall, Michigan spill, people in the spill area who inhaled oil-related chemicals reported short-term health effects, including headaches, nausea, respiratory discomfort and eye irritation. These short-term effects diminished or stopped when people were no longer breathing the contaminated air. By August 18, 2010 (i.e., the end of the voluntary evacuation period), approximately 3 weeks after the spill, concentrations of air contaminants fell below human health screening levels, such that individuals near the oil did not breathe oil-related chemicals at concentrations or for durations of time that would cause long-term adverse health effects (Michigan Department of Community Health 2014).

The USEPA Environmental Response Team conducted pilot scale studies of Bakken crude oil spills under both cold weather and warm weather scenarios to evaluate the difference in chemical emissions which could impact human health, particularly for first responders. These studies showed that benzene is of concern for several hours after a release and that downwind oxygen suppression occurs after a release to the point that first responders would need supplied air during the first few hours after a release (USEPA ERT 2018).

5.5.5 Noise and Vibration

An accidental release of crude oil along the proposed pipeline route could result in short-term noise impacts within the ROI summarized in Section 3.5. Noise impacts would occur primarily during response, restoration and remediation activities. Potential impacts from noise would likely be associated with the equipment and vehicles used for site access, cleanup and restoration efforts. These impacts would be similar to those of a construction site, but the activities could occur at all hours of the day and night. Equipment would likely include vehicles and construction equipment, such as bulldozers, excavators and dump trucks, as well as various types of all-terrain vehicles. In addition, response and cleanup efforts could also include the use of watercraft and aircraft.

Elevated noise levels would be similar to those related to construction activities, with noise levels in the immediate vicinity of the site generally in the range of 80 to 90 dBA. These elevated noise levels would dissipate with distance and would have the greatest effect if they were to occur near receptors during the nighttime hours, when unwanted noise is most obtrusive. The nature (i.e., location of the release and environmental setting conditions) and size of the spill would likely govern the intensity and duration of response and cleanup efforts and the related increase in noise levels. Large spills would be more likely to result in elevated noise levels across a larger area and for a longer duration. Conversely, small spills would be more localized and less likely to affect noise receptors. Regardless of spill size, however, effects from increases in noise levels would be limited to the duration of response and cleanup activities. Furthermore, residents most vulnerable to noise during the spill response would likely be the same people that officials overseeing the response effort would evacuate for health and safety reasons.

Similar to human sensitive receptors, wildlife can experience impacts from exposure to noise and vibration resulting from human activities during response, restoration and remediation activities. These impacts to wildlife species could include stress, avoidance of feeding and decreased breeding success.

5.5.6 Water Resources

An accidental release of crude oil along the proposed pipeline route could result in short- or long-term effects to existing groundwater, surface water, wetlands and floodplains within the ROI summarized in Section 3.6, if released crude oil reached these resources. This section considers potential impacts to water quality as they relate to the potential uses of the water resources, including for purposes of potable water, as summarized in Table 5-12. Section 5.5.7 presents the potential impacts of a surface water release to aquatic habitats and species.

As discussed in Section 5.4.4, in accordance with 49 CFR 195, Keystone would maintain an Integrity Management Program required for pipelines that could affect high consequence areas, which include surface water unusually sensitive areas and groundwater unusually sensitive areas identified for their potential as a drinking water resource (49 CFR 195.6 and 195.450) (refer to Section 4.13 Potential Releases of the 2014 Keystone XL Final SEIS for further discussion on drinking water resources).

Table 5-12. Potential Effects to Water Resources from a Release

Direct Effects	Indirect Effects
Contamination of groundwater by free product and dissolved hydrocarbons.	Water quality degradation downgradient of spill site. Temporary closure of groundwater wells resulting in disruption of municipal water service. Temporary human health hazards resulting from short-term ingestion or exposure to dissolved hydrocarbons.
Contamination of open waters by free product and dissolved hydrocarbons.	Water quality degradation downstream of spill. Adverse impacts to aquatic ecosystem (see Section 5.5.7). Water quality degradation to impaired waters resulting in more severe impairment. Water quality degradation of NRI streams potentially limiting use and quality of theses streams. Temporary human health hazards resulting from short-term ingestion or exposure to dissolved hydrocarbons.

NRI = Nationwide Rivers Inventory

5.5.6.1 Groundwater

As stated in Section 3.6.1, principal groundwater aquifers underlying the proposed pipeline route include alluvial aquifers and the Northern High Plains Aquifer, a nationally important water resource that underlies much of the ROI; and the Lower Cretaceous Aquifer. Groundwater impacts resulting from a release are focused on the physical fate of the product, rather than the volatilization properties. Factors that influence the potential for migration into groundwater include the type of release, areal extent of the spill, soil conditions and characteristics, and the depth to groundwater. Shallow (surficial) aquifers, particularly those overlain by hydric and coarse-textured soils, would be more susceptible to impacts than confined or deep aquifers because of their susceptibility to infiltration from the surface.

Coarse-textured soils, or sandy soils, allow for easier percolation of liquid through the soils to reach groundwater. If a spilled product reached these soils, infiltration rates could be greater than in other areas. Because the infiltration rate of the product into the underlying soil controls vertical migration, rapid emergency response measures to control the release, contain it and collect the released product would mitigate the potential for groundwater contamination. Released crude oil would become more viscous in the environment as the lighter hydrocarbons volatilize. Cooling of the product after its release would increase its viscosity, particularly in the cooler months of the year. Increasing viscosity tends to reduce vertical migration rates in soil profiles and infiltration into the shallow groundwater table. If crude oil were to infiltrate into the soil and encounter groundwater, it would tend to form a distended layer above and slightly below the water table, largely based on the size and duration of the spill and the associated vertical hydraulic pressure. The crude oil plume would then spread horizontally, primarily in the down-gradient direction, until reaching a steady state based on the crude oil hydraulic pressure, groundwater flow rate and soil characteristics. This local contamination would not be anticipated to affect the entire aquifer. Lighter crude oils would be less viscous and less adhesive when released, which could result in greater vertical migration rates than heavy crude oils (Tsaprailis 2014). As such, lighter crude oils could penetrate more deeply into the soil and could result in a greater risk of groundwater contamination. Lighter crude oils also carry higher proportions of lighter volatile hydrocarbons, which readily dissolve in water.

Impacts to groundwater resulting from a release would include water quality impacts, similar to those presented in Section 5.5.6.2 for surface water. Groundwater that serves as a source of drinking water or irrigation is of particular concern when assessing the potential for impacts, because contamination of a drinking water aquifer could affect human health. For this reason, the Department identifies private wells within 100 feet of the proposed pipeline route (see Table 3.6-2) and wellhead protection areas within 1 mile (see Table 3.6-3). Spills that occur near these areas would have the potential to impact groundwater aquifers that are used as a source of drinking water.

Keystone has committed to conducting baseline water quality testing for domestic and livestock wells within 300 feet of the final centerline of the approved route upon the request of individual landowners (NDEQ 2013). These baseline samples would be collected prior to placing the pipeline in service. Subsequently, in the event of a significant spill in the area, Keystone would conduct water well testing as required by NDEQ pursuant to Title 118, Nebraska Administrative Code. Keystone would also provide an alternative water supply for any well where water quality was found to be compromised by the spill. Should a release occur from the Keystone XL pipeline, Keystone has committed to clean up any releases that might occur. Keystone is also legally required to clean up spills under Title 118, Nebraska Administrative Code and the federal Oil Pollution Act of 1990. The Keystone XL CMRP (located in Appendix G of the 2014 Keystone XL Final SEIS) describes measures that Keystone would implement to minimize impacts on groundwater resources near the pipeline during and after construction.

The Department analyzed the annual likelihood of a potential release occurring in an area overlying the groundwater resources within the ROI. As discussed in Section 5.2, the ROI used to assess groundwater extends farther from a potential release point than the ROI discussed for an overland spill due to the potential for dissolved components of released crude oil to travel a farther distance (refer to Section 5.2 and Figure 5-1). As presented in Table 5-13, the likelihood of a release **occurring in proximity to** groundwater resources is greatest for surficial aquifers; there is an annual likelihood of 0.4 incident per year of any size spill **occurring** within 790 feet of the release point. The Department also calculated an annual rate of 0.2 incident per year of any size spill **occurring within 790 feet of an** active well and 0.00**1** incident per year of spills releasing more than 50 barrels **occurring within 1,320 feet of a** wellhead protection area.

Table 5-13. Annual Likelihood of Spills Occurring in Proximity to Groundwater Resources

Resource	Area within 790 Feet[a]	Area within 1,320 Feet[b]	Area within 2,250 Feet[c]
Surficial Aquifer	0.4	0.08	0.01
Wellhead Protection Area	0	0.00**1**	0.0005
Active Well	0.2	0.1	0.02

Source: NDEQ 2018d; NDNR 2018; SD DENR 2018a; USGS 2002

a. The area within 790 feet of the pipeline that is susceptible to small, medium, large and catastrophic spills.

b. The area within 1,320 feet of the pipeline that is susceptible to medium, large and catastrophic spills.

c. The area within 2,250 feet of the pipeline that is susceptible to large and catastrophic spills.

Note: The potential extent of a groundwater spill is the estimated overland distance (150 feet for a 50-barrel spill, 500 feet for a 1,000-barrel spill and up to 1,200 feet for a 10,000-barrel spill) plus the additional dissolved phase distance in groundwater (640 feet for a 50-barrel spill, 820 feet for a 1,000-barrel spill and 1,050 feet for a 10,000-barrel spill).

5.5.6.2 Surface Water

A crude oil spill in a stream, river or lake would have impacts resulting from the tendency of crude oil to float on the water surface and to mix with water. These impacts could include the degradation of water quality from dissolution and mixing of the oil in the water column, contamination of the water by chemical constituents (i.e., hydrocarbons) within crude oil and related degradation by-products and secondary effects such as lower levels of dissolved oxygen that occur from biodegradation of these compounds. The intensity and severity of water quality impacts would be dependent on several variables, including the volume of crude oil released into the waterbody and the characteristics of the waterbody (e.g., size, flow volume and rate at the time of the spill, etc.), which would influence propagation of the crude oil.

The hydrocarbons that make up crude oil include volatile and semi-volatile compounds, which behave differently after a release. Most of the lightweight volatile hydrocarbons, which comprise the majority of light crude oils, readily evaporate when a release occurs. However, volatile hydrocarbons (such as BTEX) also tend to be water-soluble and as a result, some portion would dissolve into the water column. Heavier semi-volatile hydrocarbons, including polycyclic hydrocarbons, are not very volatile or water-soluble and may remain in the water environment longer than lightweight volatile compounds. The more water-soluble fraction of the crude oil that volatilizes may later be washed out of the atmosphere in precipitation and reenter surface waters. The heavier constituents are generally less toxic than other more soluble compounds. Based on the combination of toxicity, solubility and bioavailability, benzene is the most toxic hydrocarbon associated with crude oil spills.

The crude oil products with higher proportions of heavier components are more likely to submerge beneath the water's surface due to their density compared to water. Submerged crude oil could result in a persistent source of contamination because of the slow rate of natural degradation of this material. Thus, submerged crude oil could result in the slow release of dissolved hydrocarbons, resulting in long-term chronic toxicological impacts to aquatic organisms (see Section 5.5.7). Removal of submerged product from the water column can be a difficult and long process, as observed in the response and cleanup efforts related to the July 2010 release in Marshall, Michigan. Cleanup efforts to remove the submerged oil from the Kalamazoo River, including dredging, excavation and aeration, continued for 4 years after the spill (Parker 2014).

The magnitude of impacts that could occur from a spill would largely depend on the size of the spill and the affected waterbody. Small releases into or close to a surface waterbody could result in minor short-term degradation of surface water quality, particularly for small waterbodies with low flow energy. Similar spills that reach larger lakes or rivers would result in minimal effects on overall water quality, assuming the lake or river volume is substantially larger than the volume of spilled product and that the flow rate of the river is sufficient to dilute the released product. Direct toxicity and contamination in small, low-flow waterbodies would generally occur at the point of the release because of the inability of the waterbody to transport and dilute the contaminants. Toxicity impacts in larger waterbodies would be unlikely or would last for relatively short periods because of the high dilution volume in these lakes or rivers, and the rapid evaporation of most of the potentially toxic lighter hydrocarbons. However, in surface waters with high energy (e.g., turbulent river flows and/or high sediment deposition), sunken oil may become buried under or mixed within stream sediment and soil along streambanks, where it may become trapped and remain for an extended duration. This buried oil may slowly biodegrade into soluble components or volatilize over time. Future disturbances to the aquatic environment, such as dredging, wave action, boat propellers or bioturbation, could re-suspend buried oil or its weathered components. The potential re-suspended oil could represent a source of contamination for an extended duration.

Cold weather, in which surface waters become partially or completely covered by ice, could affect the behavior and downstream transport of crude oil following an accidental release. The presence of ice would inhibit initial detection of a spill, observations of the presence of oil and estimates of the extent of the oil within the affected waterway (MDEQ 2016b). In addition, the light compounds that would initially volatilize under open-water (i.e., non-ice) conditions would become trapped below the ice surface and travel further downstream than under open-water conditions. One such spill occurred in January 2015 spill near Glendive, Montana (discussed in Section 5.4.3.2) during which 758 barrels of crude oil was spilled into the frozen Yellowstone River. Response crews carved ice slots downstream of the release point to collect oil from the water surface, and the detection of volatile hydrocarbons at a water intake near Glendive prompted a water consumption advisory regarding water provided by this treatment plant. This "do not drink" advisory was lifted on January 23, 5 days after the spill was initially reported. Bottled drinking water was provided to residents while this advisory was in effect, and a public meeting was held to advise residents on how to flush the water lines in their homes and businesses. A final containment area was established 30-40 miles downstream of the release point, but no oil was observed at this distance (MDEQ 2016b). It is important to note that a direct release into an ice-covered waterway is a rare occurrence; the PHMSA database only includes one such incident for the years 2010 through October 2019 (PHMSA 2019b). **Potential impacts arising from a such an incident would depend upon many factors, including whether the spill was under or on top of ice, and whether the ice was structurally competent or broken up.**

As discussed and considered in the 2014 Keystone XL Final SEIS, the potential adverse effects of a large spill to water could have potentially significant adverse effects on water quality. Following the Marshall, Michigan spill, water quality effects occurred as far as 40 river-miles downstream from the spill location, and submerged oil contaminated large areas of the river bottom. Small streams and ponds with low flow energy would be more susceptible to substantial adverse impacts from large spills, but any waterbody that experiences a spill of this magnitude could experience both short-term (during response and remediation) and long-term (dissolution of residual product) adverse impacts to water quality. Response and remediation activities would likely return the waterbody to near pre-spill conditions, but remediation could take years to complete. However, it is possible that waterbodies may not return to pre-spill conditions, as it would depend on the size and location of the spill.

The Department identified rivers and lakes within the ROI for the Proposed Action (see Section 3.6). The Department also identified four categories of waterbodies that are of particular concern with regard to potential impacts from a crude oil spill: major rivers, lakes, perennial streams with state water classifications and impaired waterbodies. The proposed pipeline route currently crosses 23 major rivers; 20 lakes, ponds or man-made reservoirs/impoundments; and 26 impaired or contaminated waterbodies. Water quality degradation resulting from a spill could affect the value of these waters and result in short- or long-term loss of scenery, habitat, recreational use, fishing and other uses or benefits. Tribal groups may be disproportionately negatively impacted by the impacts of spills on surface water resources since they typically have a greater dependence on natural resources than non-tribal members; refer to Section 5.5.9 for further discussion on impacts to Indian tribes. Impaired waters, listed under Section 303(d) of the Clean Water Act, are under environmental stress and are likely to have a lower capacity for recovery in the event that a spill was to impact the water quality of one of these waterbodies.

The Department also identified sensitive resources within the maximum reasonable transport distance of 40 river-miles for reviewing potential downstream effects. This analysis included major rivers, lakes (including reservoirs), perennial streams, impaired waterbodies, national scenic rivers and water intakes**, including drinking water and irrigation water intakes identified by tribes during the SEIS process**. A total of 1,524 miles of perennial streams with a state water classification were identified as potentially susceptible to an upstream spill, including nearly 1,100 miles of major rivers. In addition, a total of 24 named lakes and reservoirs were identified within the 40 river-mile downstream analysis. The analysis also identified 77 impaired waterbodies, totaling approximately 975 miles, as susceptible to an upstream spill. Only one national scenic river was identified as susceptible from an upstream spill; a 3.5-mile section of the Niobrara River (see Section 5.2). Four different categories of active surface water intakes were identified within the 40 river-mile downstream distance (see Table 5-14).

The first type of surface water intake that was identified within the 40-mile area is municipal water intakes, which are used to supply drinking water to a public utility. Only three such intakes were identified, all of which are located in Montana (MDEQ 2018; Montana Department of Natural Resources Conservation 2019). These included the following intakes:

- Town of Fort Peck (intake located on Fort Peck Lake),
- City of Glasgow (intake located on the Missouri River) and
- Montana Aviation Research Company (intake located on the Missouri River).

Table 5-14. Number and Type of Surface Water Intakes Within 40 River-Mile Downstream Area

Location	Municipal (public, potable)	Domestic (private, potable)	Irrigation	Other[a]
Montana	3	22	925	2,522
North Dakota	0	0	41	0
South Dakota	0	2	21	3
Nebraska	0	6	1,340	174
Kansas	0	0	99	7

Source: Kansas Department of Health and the Environment 2019; MDEQ 2018; Montana Department of Natural Resources Conservation 2019; NDNR 2019a, 2019b; North Dakota Information Technology Department 2019; SD DENR 2018b; University of Kansas 2019

a. Other uses include one or more of the following: agricultural spraying, commercial, fish and wildlife habitat/propagation, fisheries, flood control, industrial, institutional, lawn and garden, manufacturing, mining, power generation, recreation, stock water, storage and/or wetland habitat.

Based on the maximum reasonable 40 river-mile downstream transport distance used within this analysis (see Section 5.2), two additional potable water intake withdrawals considered in the 2014 Keystone XL Final SEIS would be beyond the 40-mile distance and therefore unlikely to experience impacts resulting from a release. As described in the 2014 Keystone XL Final SEIS, both the Assiniboine and Sioux Rural Water Supply System and the Mni Wiconi Rural Water Supply System (MWRWSS) operate water intakes on the Missouri River to provide potable water. The distance from the pipeline crossing at the Missouri River to the Assiniboine and Sioux Rural Water Supply System is approximately 57 miles, and the distance from the Missouri River crossing to the MWRWSS intake is over 100 miles; therefore, no impacts are anticipated.

The second group of intakes are those categorized for domestic use. These include intakes that are used to supply drinking water to private residences. A total of 22 surface water intakes in Montana, 2 surface water intakes in South Dakota and 6 surface water intakes in Nebraska are identified as domestic-use. No domestic-use surface water diversions were identified in the 40 river-mile downstream area located in North Dakota or Kansas. In Montana, the source water for these domestic-use surface water diversions include the Missouri, Yellowstone and Milk rivers, Unger Coulee, Upper Sevenmile Creek and unnamed tributaries to Cherry Creek and Frenchman Creek (Montana Department of Natural Resources Conservation 2019). In South Dakota, domestic-use surface water sources include Wolf Creek and surface water runoff in the Lower Cheyenne and Moreau River basins (SD DENR 2018b). In Nebraska, the source water for domestic-use surface water intakes identified include Big Blue River, Big Sandy Creek, Coon Creek and an unnamed tributary to Redbird Creek (NDNR 2019a).

The final two categories of intakes include those used for irrigation and other uses. This includes intakes that are used to support agriculture and livestock operations as well as other commercial and governmental operations. As shown in Table 5-14, many of these intakes were identified within the 40 river-mile downstream area, which includes portions of North Dakota and Kansas. This included a total of 13 irrigation intakes along the Milk River, all located within 15 river-miles downstream of the proposed pipeline crossing (Montana Department of Natural Resources Conservation 2019). **T**wo of these intakes **located on the Fort Peck Reservation at Wiota and Frazer** are **part of the Fort Peck Irrigation Project** used to irrigate Tribal lands within the Fort Peck Reservation and are reportedly located 10 and 14 river-miles downstream of the proposed crossing. **The Fort Peck Irrigation Project was authorized by Congress in Section 2 of the Act of May 30, 1908 as part of the federal government's policy of promoting tribal irrigated agriculture. Pursuant to the 1908 Act, the federal government allotted 40 acres of land near the Missouri River to the head of each family on the Fort Peck Reservation on land requiring irrigation to be successfully farmed. The irrigation project is the sole source of irrigation water for approximately 19,000 acres of land, including trust land on the reservation and the croplands it supports represents a sizeable portion of the reservation's agricultural economy.**

A release to surface water located upstream, and in the vicinity of any of these intakes identified, could produce both short- and long-term effects on the suitability or usability of these intakes. The degree of impacts to surface water intakes from a release would depend on many factors, such as the size of the release, the time of year of the release and the response time to address the release. A spill that contaminates an intake may make it unusable for an extended period of time until spill response and recovery activities have been completed. **Loss of these irrigation intakes during the growing season would result in economic losses to farmers, including Fort Peck's agricultural economy. For example, the January 2015 spill near Glendive, Montana resulted in the detection of volatile compounds at the town of Glendive's drinking water treatment facility, which draws raw water from the Yellowstone River. Residents were advised not to drink water from the this treatment system, and bottled drinking water was trucked in for the affected residents. The "do not drink" advisory was lifted 5 days after the spill occurred (MDEQ 2016b).**

Keystone has committed to a number of measures beyond spill cleanup measures, which are addressed in Appendix B, Potential Releases and Pipeline Safety, of the 2014 Keystone XL Final SEIS. In the event that a spill contaminates water supplies used for industrial**, municipal** or irrigation purposes, Keystone has committed to **temporarily** provide an alternate water supply for any users of wells or irrigation intakes where water quality is affected by a spill **until the water supply is restored**. **Keystone would work with regulators to restore the water supply as quickly as practical. In the meantime,** Keystone would provide either an alternate supply of water or appropriate compensation for those facilities impacted, as may be agreed upon among the affected parties and Keystone. Keystone would memorialize such arrangements through an appropriate written agreement with the USEPA. **Crop loss as a result of a spill that was not covered by a farmer's liability insurance would involve a third-party claim that would have to be directed to Keystone for review and payment.**

Surface waters contaminated with dissolved hydrocarbons could also cause indirect impacts to groundwater resources in instances where surface waters recharge these resources. The connection between surface water and groundwater is dynamic throughout the region because of the presence of shallow aquifers and coarse-textured soils. Most groundwater recharge occurs from the percolation of rainwater through surficial soils and from lakes and streams into shallow aquifers. In these areas, the potential exists for dissolved hydrocarbons from surface water to migrate to groundwater through the process of groundwater recharge.

In wet or saturated soil, water partially or completely fills the pores between the soil particles, leaving little or no room for the less dense oil to move downward. A lack of downward movement generally leads to a spill that covers a larger horizontal area. In these scenarios, shallow portions of the aquifer will be impacted, while deeper portions of the aquifer will not. As described in the 2014 Keystone XL Final SEIS, available studies and reports indicate that, in general, impacts from farming operations are present in areas of shallow groundwater water. Shallow groundwater within the Northern High Plains Aquifer and alluvial aquifers in the state exhibit low concentrations of total dissolved solids, making the water in the shallow aquifers generally suitable for irrigation, potable and industrial uses.

Table 5-15 presents the likelihood of a spill **occurring in proximity to** surface water resources, including major rivers, lakes, perennial streams with state water classifications and impaired waterbodies. As presented in Table 5-15, the likelihood of a release **occurring in proximity to these** resources is greatest for perennial streams with state water classifications, with the highest annual rate of 0.2 incident of any size spill **occurring within 150 feet of** this resource. Annual likelihoods of a potential spill of any size **occurring within 150 feet of** other surface water resources range from 0.02 incident per year for lakes to 0.00**3** incident per year for **impaired waterbodies**.

Table 5-15. Annual Likelihood of Spills Occurring in Proximity to Surface Water Resources

Resource	Area within 150 Feet[a]	Area within 500 Feet[b]	Area within 1,200 Feet[c]
Major River	0.004	0.004	0.003
Lake	0.02	0.03	0.02
Perennial Stream with State Water Classification	0.2	0.2	0.04
Impaired Waterbody	0.003	0.003	0.002

Source: USGS 2018a; USDA/NRCS 2016; USEPA 2015

a. The area within 150 feet of the pipeline that is susceptible to small, medium, large and catastrophic spills.

b. The area within 500 feet of the pipeline that is susceptible to medium, large and catastrophic spills.

c. The area within 1,200 feet (up to 5,000 feet in areas of moderate or steep slope) of the pipeline that is susceptible to large and catastrophic spills.

5.5.6.3 Wetlands

Wetlands are biologically diverse and provide habitat for many types of animals and plants. When crossing saturated wetlands with flowing waterbodies using the open-cut method, the pipe coating would be covered with reinforced concrete or concrete weights to provide negative buoyancy. The need for weighted pipe would be determined by detailed design and site conditions at the time of construction.

A spill from the proposed pipeline would impact vegetation and wildlife that directly and indirectly rely on an affected wetland. Direct impacts to wetlands would range from stress of vegetation and wildlife to species mortality and the degradation of wetland habitat and function. The severity of impacts on wetlands depends upon the volume and type of product spilled, environmental factors (e.g., time of year, type of vegetation, amount of surface water present) and the cleanup response actions. Product type is a major factor in determining the degree and type of impacts on wetland vegetation and wildlife (see Section 5.5.7).

Lighter products are more acutely toxic than heavier products. Heavy products affect wetlands through the smothering of leaves and soils (Michel and Rutherford 2013). The viscosity of the heavy products would likely restrict the geographic extent of potential spills, particularly in cooler months. Spills of less viscous crude oil, such as light crude oil extracted from the Bakken formation, could spread a farther distance and affect a larger area than the more viscous dilbit because of the higher proportion of lighter components. However, the lower viscosity of light crude oil may allow the product to migrate downward through the soil more easily and quickly than dilbit (National Academies of Sciences, Engineering and Medicine 2016). As such, light crude oil may also seep into soil more readily and therefore limit the horizontal extent of the spill.

In the event of a spill of heavy crude oil, dense stands of emergent vegetation could act like booms and collect the product at the edges of the stands, particularly given the viscosity of heavier products. Spills in interior wetlands are also likely to result in thicker product residues, higher levels of wetlands impacts and slower natural removal rates of product residues. The higher level of impacts to interior wetlands and increased product persistence are attributable to product settling and penetrating into the hydric soils. Persistence increases with deeper product penetration, soils high in organic matter and sites such as interior wetlands that are sheltered from natural removal processes. In comparison, reduced persistence occurs in coastal, riverine and open water wetlands as the active movement of surface water weathers the crude oil contents. Dilbit is more likely than lighter crude oils to persist within wetlands because of the higher amount of residual oil left behind after weathering, increased adhesion and resistance of dilbit to biodegradation (National Academies of Sciences, Engineering and Medicine 2016). Lighter crude oil would be apt to spread more quickly over the ground surface, but it can also penetrate more easily into the soil and spread vertically. Vegetation recovers more quickly from spills of any type of product during the non-growing season, compared to a spill during the growing season (Michel and Rutherford 2013).

Following a release, aggressive and intrusive cleanup methods would cause impacts to wetlands from excavation and the removal of hydric soils. Cleanup could also increase the potential for the product to mix with water and sediments. Disturbance to wetlands sediments would lead to longer lasting impacts to the wetlands by inhibiting plant growth and recovery. If the cleanup effort requires excavation, the contours of the wetland area would be restored as close to the previously existing contours as practical, and the disturbed area would subsequently be revegetated to match, as close as practicable, the pre-existing vegetation. Large spills that have wider geographic extents may have the most impact on wetlands because of the more extensive remedial requirements. In lieu of excavation, igniting the spilled product floating on the water surface in a controlled manner (in situ burning) could reduce the physical disruption of wetland resources below the water line, but would result in smoke and the potential associated effects to air quality, biological resources and human health.

Passive cleanup methods (including natural attenuation) would cause less impact to wetland resources. If no active remediation activities were undertaken, with concurrence of the regulatory body, natural biodegradation and attenuation could ultimately allow a return to preexisting conditions in both soil and groundwater. However, recovery would likely require a timeframe measured in decades.

As presented in Table 5-16, the likelihood of a release **occurring in proximity to** wetlands along the proposed pipeline route is greatest for palustrine emergent wetlands, with the highest annual incident rate being 0.1 incident per year of any size spill that could **occur within 150 feet of** these resources. The highest annual incident rates for palustrine forested and palustrine scrub-shrub wetlands were 0.005 and 0.00**09** incident per year of any size spill, respectively.

Table 5-16. Annual Likelihood of Spills Occurring in Proximity to Wetlands

Resource	Area within 150 Feet[a]	Area within 500 Feet[b]	Area within 1,200 Feet[c]
Palustrine Emergent	0.1	0.07	0.04
Palustrine Forested	0.005	0.004	0.006
Palustrine Scrub-Shrub	0.00**09**	0.000**6**	0.002

Source: Exp and Westech 2018a; USFWS 2018b, 2018h

a. The area within 150 feet of the pipeline that is susceptible to small, medium, large and catastrophic spills.

b. The area within 500 feet of the pipeline that is susceptible to medium, large and catastrophic spills.

c. The area within 1,200 feet (up to 5,000 feet in areas of moderate or steep slope) of the pipeline that is susceptible to large and catastrophic spills.

5.5.6.4 Floodplains

A release of product to a floodplain would not have direct impacts to the floodplain. Potential impacts to the specific landscapes and habitats located within nearby floodplains would remain consistent with those impacts discussed for similar resources throughout this chapter. Floodplains would, however, actively convey and disperse crude oil within the floodplain boundary if a release were to happen during a flood event. As discussed in Section 3.6.1.5, portions of the pipeline ROW are classified by FEMA as 100-year floodplains, and the remaining portions of the pipeline ROW are classified as areas of minimal flooding (FEMA 2018). These 100-year floodplains are the most likely portions of the pipeline ROW to experience flooding; areas within a 100-year floodplain have a 1 percent annual likelihood of experiencing a flood. When crossing saturated portions of the floodplains using the open-cut method, the pipe coating would be covered with reinforced concrete or concrete weights to provide negative buoyancy. The need for weighted pipe would be determined by detailed design and site conditions at the time of construction.

By definition, floodplains are areas which are more likely to experience flood events at a given time as compared to areas outside the floodplain. Consequently, these areas are more likely to be inaccessible at certain times of the year as a result of standing water. Keystone therefore would, to the extent possible, avoid the placement of ancillary equipment within floodplain areas, as releases from these features may be more difficult to remediate during flood events. As stated in the 2014 Keystone XL Final SEIS, at least one pump station (Pump Station 24 in Nance County, Nebraska) is located in a known floodplain and may be inaccessible during periods of flood. Most, if not all, access roads to Pump Station 24 cross significant floodplain areas associated with the Loup River and Prairie Creek systems; if both are experiencing flood events, Pump Station 24 could be inaccessible.

Flood events may also increase the potential for a pipeline release because of erosion and channel migration. Erosion may arise from seasonal flood events or increased stream velocities, which in turn undermine support soils, increase lateral water force and increase the impact from waterborne debris.

If a pipeline release does occur during a flood, pipeline components (e.g., valves, regulators, relief sets, pressure sensors, etc.) may become submerged and either inoperable or inaccessible. During a flood, submerged pipeline components would experience a greater risk of damage caused by floating debris, river currents and watercraft. The areas showing the highest flood hazard along the proposed route include areas along the Milk, Missouri and Yellowstone rivers in Montana; areas along various waterbodies within Butte, Harding, Meade and Tripp counties in South Dakota; and areas along the Elkhorn, Platte, Big Blue and Little Blue rivers in Nebraska. A release of product into these floodplains during a flood event could cause widespread dispersal of the product within the floodplain, especially because of flat topography in these areas.

Based upon its size, flow volumes and flow rates, erosion (i.e., scour and lateral migration) is a concern at the Missouri River crossing. A lateral migration analysis was performed as a part of the scour analysis at the crossing location. Lateral migration of up to 100 feet is projected for a 100-year project life. The scour analysis results incorporate a potential lateral migration of up to 100 feet. The potential for lateral migration of the river has been taken into account in the design for the crossing. The proposed HDD entry point is located 328 feet from the bank on the north side, while the proposed HDD exit point is located more than 1,000 feet from the bank on the south side. At these distances, it is anticipated that the pipeline would not be impacted by lateral migration.

To further mitigate the potential for a pipeline release resulting from scour along the Missouri River, Keystone would monitor the pipeline crossing for lateral migration, including obtaining a survey of the stream cross-sections at 100-foot intervals beginning 500 feet upstream and continuing to a point 500 feet downstream of the crossing location to establish baseline conditions. Thereafter, when advance notice is received from USACE for a spillway release and the flow rate is expected to exceed 20,000 cubic feet per second, Keystone would mobilize survey crews to remeasure stream cross-sections. This information would be used for verification of the scour model and to determine the extent of any lateral migration. If lateral migration greater than 50 feet is measured, additional mitigative measures would be considered to prevent further encroachment of the bank (Missouri River Waterbody Crossing Plan, 27 September 2017, Document No. KXL1399-EXP-A-PLN-0001).

Remediation efforts could encroach upon floodplains because of the movement of remedial equipment and vehicles. However, the encroachment would be short-term and minor because response personnel would not install any permanent aboveground structures in floodplains. If the cleanup effort requires excavation, the contours of the floodplain area would be restored as close to the previously existing contours as practical, and the disturbed area would subsequently be revegetated. In general, the greatest threat for impacts in the remediation phase would be the movement of heavy equipment or vehicles. Large spills that have wider geographic extents may have the most impact on floodplains because of the more extensive remedial requirements. Small or medium spills would have negligible to minor impacts on floodplains.

5.5.7 Biological Resources

An accidental release of crude oil along the proposed pipeline route could result in a variety of short- or long-term direct and indirect physical and toxicological impacts on the biological resources summarized in Section 3.7. A spill would have localized impacts on vegetation generally limited to the physical bounds of the spill, but the spill may have impacts on wildlife that could extend beyond the spill area.

Physical impacts could arise from direct contact with released crude oil. Toxicological impacts result from the chemical and biochemical actions of crude oil constituents on the biological processes of individual organisms. Toxicological impacts resulting from releases are a function of the chemical composition of the product, the solubility of each class of compounds and the sensitivity of the receptor. Toxicological impacts could include direct and acute mortality; sub-acute interference with feeding or reproductive capacity; disorientation or confusion; reduced resistance to disease; tumors; reduction or loss of various sensory perceptions; interference with metabolic, biochemical and genetic processes and many other acute or chronic effects. Biological resources encompass a wide variety of habitats, flora and fauna, all of which could experience different impacts during a release. Table 5-17 summarizes these specific resources and the potential physical and chemical effects experienced during a spill. The following subsections provide details pertaining to each of these resources and the associated specific potential impacts.

Any release of crude oil may have an immediate and direct effect on local populations of flora and fauna. The potential for physical and toxicological effects from a release of crude oil reduces with time as the volume of material diminishes, leaving behind more persistent, less volatile and less water-soluble compounds (i.e., heavy aromatic compounds, including polycyclic aromatic hydrocarbons). Although many of these remaining compounds are toxic and potentially carcinogenic, they do not readily disperse in the environment and do not bioaccumulate; thus, they have less potential for widespread impacts. Lighter products contain higher proportions of the light, more volatile and soluble compounds. The risk of impacts reduces with time as concentrations of toxic compounds dissipate, but these volatile or soluble components bioaccumulate more readily than those found in heavier products, potentially resulting in toxic effects of the magnification of impacts as the toxins move up the food chain.

Table 5-17. Potential Effects to Biological Resources from a Release

Resource	Physical Effects to Resource	Chemical Effects to Resource
Vegetation	Coating leaves could inhibit gas exchange and respiration.	Coating soil could inhibit nutrient uptake. Uptake of dissolved toxic compounds.
Wildlife and Fisheries	Short- or long-term loss of habitat. Coated fur or skin could lead to loss of insulation or buoyancy, as well as reduced cutaneous respiration in amphibians. Transfer of product to eggs or young. Physical abnormalities and poor health caused by direct exposure.	Toxicological impacts through consuming contaminated food or ingesting product while cleaning feathers or fur. Effects to eggs laid in contaminated water or substrates leading to death or physical abnormalities. Decreased dissolved oxygen.

5.5.7.1 Vegetation

A spill of crude oil could affect vegetation in several ways. A surface release could produce localized effects, in which product permeates through the soil, coating sediments and soils, which could impact plant populations. This affects the root systems and indirectly affects plant respiration and nutrient uptake by inhibiting water and gas exchange. Aboveground, physical coating of leaves could disrupt photosynthesis and further reduce the plant's ability to perform vital life processes. Without complete remediation of contaminated soil in a vegetation zone, long-term effects on vegetation could occur.

Section 3.7 discusses the biologically unique landscapes and areas of conservation concern found in areas traversed by the proposed pipeline route. While impacts to the vegetation found in these communities would be similar to those discussed above, these impacts would be amplified because of the communities' sensitivity and limited size. Table 5-18 summarizes the annual likelihood of a potential release **occurring in proximity to** biologically unique landscapes and area**s** of conservation concern. As shown in this table, the greatest annual rate of spills affecting one of these resources occurs within biologically unique landscapes, where 0.2 incident per year of any size spill could **occur within 150 feet of** this resource.

Table 5-18. Annual Likelihood of Spills Occurring in Proximity to Biologically Unique Landscapes and Areas of Conservation Concern

Resource	Area within 150 Feet[a]	Area within 500 Feet[b]	Area within 1,200 Feet[c]
Biologically Unique Landscape[d]	0.2	0.03	0.005
Perennial Waterway with Fishery Status	0.01	0.008	0.005
Wildlife Management Area	0	0	0.0004
USFWS Critical Habitat	0.1	0.02	0.003
Wild Turkey Habitat	0.03	0.007	0.001

Source: Westech 2018; USFWS 2005

a. The area within 150 feet of the pipeline that is susceptible to small, medium, large and catastrophic spills.
b. The area within 500 feet of the pipeline that is susceptible to medium, large and catastrophic spills.
c. The area within 1,200 feet (up to 5,000 feet in areas of moderate or steep slope) that is susceptible to large and catastrophic spills.
d. Biologically unique landscapes have only been identified in the state of Nebraska.
USFWS = U.S. Fish and Wildlife Service

In addition to impacts related to the actual release, cleanup efforts could also generate impacts to terrestrial vegetation, including disturbance and the inadvertent spread of invasive species. Response activities create disturbances through movement of vehicles and personnel and through the implementation of cleanup methods, including excavation, dredging and in situ burning. Creating a disturbance may remove existing, native vegetation or alter the landscape, which enables non-native species to become invasive or spread to new areas. The movement of vehicles and equipment from one area to another in support of spill response and remediation activities also increases the opportunity to transport species into new areas. The implementation of appropriate preventive measures or monitoring regimes could reduce the impact of invasive species.

5.5.7.2 Wildlife and Fisheries

A release of crude oil could affect terrestrial wildlife directly or indirectly through impacts to their habitat or sources of food. For example, surface spills could affect vegetation, which is the principal food source of wild and domestic herbivorous mammals. Some of these animals probably would not ingest contaminated vegetation because of selective grazing. In these cases, such animals would need to seek out other food sources or temporarily relocate for the duration of the spill impacts. Contaminated vegetation would temporarily reduce local forage availability, but a spill would not substantially reduce the overall abundance of food for large herbivorous mammals. Unlike aquatic organisms that often cannot avoid spills in their habitats, the behavioral response of terrestrial wildlife may help reduce potential adverse effects.

Toxicological impacts arising from ingestion of petroleum products could include direct and acute mortality; sub-acute interference with feeding or reproductive capacity; disorientation or confusion; reduced resistance to disease; tumors; reduced or lost sensory perceptions; interference with metabolic, biochemical and genetic processes; and many other acute or chronic effects.

Beyond the direct impacts caused by a potential spill, response activities could have additional adverse consequences on local flora and fauna. Cleanup activities would potentially increase local boat, vehicle and human traffic. Excavation in contaminated areas would remove soil and vegetation. Spill response activities may disturb and/or remove soil and vegetation or temporarily relocate local species. This impact increases if the species use specialized habitats or if disturbed during sensitive periods, such as nesting. Federal agencies have developed a general process for protecting listed species and critical habitat during spill planning and response activities (U.S. Coast Guard et al. 2001).

Amphibians and reptiles are by nature unable to relocate quickly to avoid physical impacts from released crude oil. Amphibians obtain a portion of their oxygen through cutaneous respiration (i.e., they breathe through their moist, porous skin). This makes amphibians particularly at risk for suffering potential toxicological impacts. Together, amphibians and reptiles represented over 93 percent of the 3,970 animals treated at the wildlife response center established by the USFWS and Michigan Department of Natural Resources and Environment following the July 2010 spill of dilbit in Marshall, Michigan (USFWS 2015a). Contact with product in the water could lead to developmental deformities as amphibians hatch or undergo metamorphosis. Water contamination after a spill or habitat disturbance during spill response efforts could lead to temporary or permanent habitat loss for these species.

Birds may experience many chemical and toxicological effects following a spill. Acute toxic effects include drying of the skin, irritation of mucous membranes, diarrhea, narcotic effects and possible mortality. Birds are likely to ingest released crude oil as they preen their feathers in an attempt to remove the product. The ingested product may cause acute liver, gastrointestinal and other systemic impacts resulting in mortality, reduced reproductive capacity, loss of weight, inability to feed and similar effects. Stress from ingested product could be an additive to ordinary environmental stresses, such as low temperatures and metabolic costs of migration. Physical impacts experienced by physically coated birds could lead to loss of water repellency and insulative capacity of feathers, and affected birds could subsequently drown or experience hypothermia. Coated females could transfer product to their eggs, which at this stage could cause mortality, reduced hatching success or potential deformities in young.

Many predators and scavengers could also experience toxic effects through feeding on birds, other mammals, reptiles or fish that have been killed or injured by the oil spill. However, polycyclic aromatic hydrocarbons, which are some of the most toxic constituents of crude oil, do not reside for long periods within the body because fish, birds and mammals are able to metabolize and excrete these compounds (Lee et al. 2011; Navarro 2013; Neff 1979; Sheffield et al. 2012; USFWS 2015b). As such, predatory or scavenging species would experience limited acute (short-term) toxic impacts through ingestion of affected food sources. However, polycyclic aromatic hydrocarbons are lipid soluble and may be carcinogenic, mutagenic or teratogenic (Sheffield et al. 2012). Some species may also experience a loss of fitness (such as illness or decreased reproduction) while detoxifying systems are overwhelmed by polycyclic aromatic hydrocarbons (Lee et al. 2011).

Fish and aquatic invertebrates could experience toxicological impacts from spilled product, and the potential impacts would generally be greater in standing water habitats (e.g., wetlands, lakes and ponds) than in flowing rivers and creeks. In general, the potential impacts would be lower in larger rivers and lakes and much lower under flood conditions since the water would rapidly dilute toxic hydrocarbon concentrations. In smaller streams, a spill could create direct aquatic toxicity in the water column because of the lower relative volume and rate of water flow. Therefore, there would be a higher likelihood of direct contact between the biota and the dispersed product. Some toxicity might persist in these streams for a few weeks or longer, until water washes out the toxic compounds trapped in the sediment or until cleaner sediment covers the contaminated sediment. Fish hatched from eggs laid on contaminated substrates have shown “frequent death or physical abnormalities, including spinal deformities, lesions, hematomas, and eye defects” (Crosby et al. 2013; Colavecchia et al. 2007, 2006, 2004).

Long-term aquatic toxicity is less likely to occur in larger lakes and rivers because currents, wind and wave action would dilute or disperse the oil within the sediment over large areas. Spills into larger rivers and creeks might result in some toxicity within the water column itself. In larger rivers, because of the large and rapid dilution of the oil relative to the flow volumes, these impacts would likely be limited to back eddies, calm water regions and reservoir pools downstream of the release point. In smaller streams, an oil spill could create direct aquatic toxicity in the water column because of the lower relative volume and rate of water flow, and thus there would be a higher likelihood of direct contact between the biota and the dispersed oil. Some toxicity might persist in these streams for a few weeks or longer, until water washes out the toxic compounds trapped in the sediment or until cleaner sediment covers the oiled sediment.

A spill that reaches a surface waterbody could also reduce dissolved oxygen concentrations, particularly from dissolved-phase hydrocarbons (e.g., BTEX). Because surficial petroleum slicks are less permeable to oxygen than water, spilled material that reaches wetlands, ponds or small lakes could lower dissolved oxygen concentrations caused by a decreased influx of atmospheric oxygen. A reduced dissolved oxygen concentration results in a lower sustainable capacity for aquatic life, thus reducing the overall waterbody population. Decreases in dissolved oxygen levels would be negligible in most cases but may be greater in large spills that cover much of the water surface for a day or more.

5.5.7.3 Threatened and Endangered Species

Threatened and endangered species, by definition, have declining population numbers, restricted habitats or are sensitive to human and natural influences. A spill that directly affects individuals of such species or indirectly affects their food sources or habitats would have a much greater impact on a threatened or endangered species than an unlisted species. Threatened and endangered species would not have the flexibility to find alternative food sources or relocate to other suitable habitat. These already limited populations would experience greater impacts through the loss of a few individuals. Impacts experienced by these plant and animal species would be similar to those discussed in Sections 5.5.7.1 and 5.5.7.2, but amplified because of the species' sensitivity and limited population numbers and range.

Major river crossings are subject to an intensive integrity management program stipulated by the USDOT (Integrity Management Rule, 49 CFR 195) and require heavier wall pipe to be used for the HDD method. To avoid surface water impacts HDD would result in a burial depth of 25 feet or more below river bottoms.

As presented in Table 3.7-3, the following federally listed threatened and endangered species have the potential to occur along the proposed pipeline route: interior least tern, piping plover, rufa red knot, whooping crane, pallid sturgeon, Topeka shiner, American burying beetle, northern long-eared bat, black-footed ferret and western prairie fringed orchid.

Table 5-19 presents the likelihood of a release to **occur within** these species**'** ranges along the entire Keystone XL pipeline route. The species range for piping plover exhibits the highest likelihood of 1.9 incidents per year of any size spill. This incident rate is very high due to the presence of piping plover species range along most of the pipeline route in combination with the higher incident rate for small spills (2.**5** per 1,000 pipeline mile-years).

Table 5-19. Annual Likelihood of Spills Occurring within the Range of Threatened and Endangered Species

Resource (Species Range)	Area within 150 Feet[a]	Area within 500 Feet[b]	Area within 1,200 Feet[c]
Interior Least Tern	0.2	0.04	0.006
Piping Plover	1.9	0.4	0.05
Rufa Red Knot	1.5	0.3	0.04
Whooping Crane	1.**7**	0.3	0.04
Pallid Sturgeon	0.2	0.04	0.005
Topeka Shiner	0.03	0.005	0.0008
American Burying Beetle	0.**5**	0.1	0.01
Northern Long-eared Bat	1.3	0.**2**	0.04
Black-footed Ferret	0.9	0.2	0.02
Western Prairie Fringed Orchid	0.5	0.0**8**	0.01

Source: NGPC 2018d, 2017a, 2017b, 2015, 2014, 2011a, 2011b, 2011c

a. The area within 150 feet of the pipeline that is susceptible to small, medium, large and catastrophic spills.

b. The area within 500 feet of the pipeline that is susceptible to medium, large and catastrophic spills.

c. The area within 1,200 feet (up to 5,000 feet in areas of moderate or steep slope) of the pipeline that is susceptible to large and catastrophic spills.

Table 5-20 summarizes the types of adverse effects these species may suffer during a potential oil spill**; findings are consistent with the amended BA (BLM 2019)**. **Significant impacts are unlikely, due to the likelihood that most spills would be small in size, the low probability of a spill contacting suitable habitat, and the low probability of the spill coinciding with the presence of individuals of any protected species other than the American burying beetle. For the American burying beetle, the Biological Assessment estimates that approximately four individuals would be affected by spills, leading to less-than-significant impacts to the species.**

Table 5-20. Federally Listed Species Potentially Affected by an Oil Spill along the Keystone XL Pipeline

Species	Habitat along the Keystone XL Pipeline	Food Source	Potential Effects from an Oil Spill
Interior least tern	Breeding and foraging habitat includes sandbars and sand/gravel pits along the Missouri and Yellowstone rivers in Montana; the Cheyenne River in South Dakota; and the Platte and Niobrara rivers in Nebraska.	Fish	May Affect, Not Likely to Adversely Affect. Depending on the oil spilled, some components of the released oil may bioaccumulate and result in potential toxicological impacts if interior least terns consume contaminated prey. While the most toxic components of crude oil do not bioaccumulate to high degrees, this species could still experience direct physical or toxicological adverse impacts from an oil spill due to ingesting oil while preening. Direct physical impacts could result from oiling, leading to loss of water repellency and insulative capacity of feathers or transfer of crude oil to eggs, which at this stage could cause mortality, reduced hatching success or potential deformities in young. Adverse effects to interior least terns would be highly unlikely, due to the low probability of a spill occurring near suitable habitat.

Table 5-20. Federally Listed Species Potentially Affected by an Oil Spill along the Keystone XL Pipeline

Species	Habitat along the Keystone XL Pipeline	Food Source	Potential Effects from an Oil Spill
Piping plover	Breeding and foraging habitat includes sandbars and sand/gravel pits along the Missouri and Yellowstone rivers in Montana; the Cheyenne River in South Dakota; and the Platte and Niobrara rivers in Nebraska.	Invertebrates	May Affect, Not Likely to Adversely Affect. Depending on the oil spilled, some components of the released oil may bioaccumulate and result in potential toxicological impacts if piping plovers consume contaminated prey. While the most toxic components of crude oil do not bioaccumulate to high degrees, this species could still experience direct physical or toxicological adverse impacts from an oil spill due to ingesting oil while preening. Direct physical impacts could result from oiling, leading to loss of water repellency and insulative capacity of feathers or transfer of crude oil to eggs, which at this stage could cause mortality, reduced hatching success or potential deformities in young. Adverse effects to piping plover would be highly unlikely due to the low probability of a spill occurring near suitable habitat and the low probability of the spill coinciding with the presence of piping plover individuals.
Rufa red knot	The rufa red knot occurs as a sporadic and somewhat uncommon migrant throughout the area of the proposed Project. Preferred stopover habitat includes ponds and wetlands with adequate mollusk foraging opportunity, which is highly limited in the Project area due to agricultural practices.	Mollusks, insects	May Affect, Not Likely to Adversely Affect. Depending on the oil spilled, some components of the released oil may bioaccumulate and result in potential toxicological impacts if rufa red knots consume contaminated prey. While the most toxic components of crude oil do not bioaccumulate to high degrees, this species could still experience direct physical or toxicological adverse impacts from an oil spill due to ingesting oil while preening. Direct physical impacts could result from oiling, leading to loss of water repellency and insulative capacity of feathers or transfer of crude oil to eggs, which at this stage could cause mortality, reduced hatching success or potential deformities in young. Adverse effects to rufa red knot would be unlikely due to the low probability of a spill, low probability of the spill coinciding with the presence of rufa red knot individuals, and low probability of the spill reaching a major waterbody in sufficient amounts to cause toxic effects.

Table 5-20. Federally Listed Species Potentially Affected by an Oil Spill along the Keystone XL Pipeline

Species	Habitat along the Keystone XL Pipeline	Food Source	Potential Effects from an Oil Spill
Whooping crane	The whooping crane occurs as a migrant throughout the proposed Project area. Possible areas used by whooping cranes during migration include major river systems and their associated wetlands, as well as palustrine wetlands and shallow areas of reservoirs, stock ponds and other lacustrine wetlands for roosting with agricultural croplands for foraging in the vicinity. All of the proposed Project route in Montana and a portion of the Project route in South Dakota are located west of the 95 percent flyway migration corridor.	Insects, crustaceans	May Affect, Not Likely to Adversely Affect. Depending on the oil spilled, some components of the released oil may bioaccumulate and result in potential toxicological impacts if whooping cranes consume contaminated prey. While the most toxic components of crude oil do not bioaccumulate to high degrees, this species could still experience direct physical or toxicological adverse impacts from an oil spill due to ingesting oil while preening. Direct physical impacts could result from oiling, leading to loss of water repellency and insulative capacity of feathers or transfer of crude oil to eggs, which at this stage could cause mortality, reduced hatching success or potential deformities in young. Adverse effects to whooping cranes would be unlikely due to the low probability of a spill, low probability of the spill coinciding with the presence of migrating whooping cranes or migration habitats, and low probability of a whooping crane contacting the spilled crude oil.
Pallid sturgeon	The potential for pallid sturgeon occurring within the proposed Project area exists at the crossing of the Milk River above the Fort Peck Reservoir, at the crossing of the Missouri River below Fort Peck Dam, at the crossing of the Yellowstone River downstream of Fallon, Montana, and the crossing of the Platte River southeast of Columbus, Nebraska.	Insects, crustaceans, mollusks, fish	May Affect, Not Likely to Adversely Affect. Depending on the oil spilled, some components of the released oil may bioaccumulate and result in potential toxicological impacts if pallid sturgeon consume contaminated prey. However, the most toxic components of crude oil do not bioaccumulate to high degrees. Direct toxicological effects could result from physical oiling although the likelihood of such impacts to pallid sturgeon are low due to their preferred habitat in flowing rivers, which would dilute and disperse spilled product. Indirect effects could result from sunken product smothering the benthic habitat, leading to reduced ability to forage or decreased reproductive success.[a]

Table 5-20. Federally Listed Species Potentially Affected by an Oil Spill along the Keystone XL Pipeline

Species	Habitat along the Keystone XL Pipeline	Food Source	Potential Effects from an Oil Spill
Topeka shiner	In the general region surrounding the proposed Project area, the estimated current range of the Topeka shiner is very localized, limited to a portion of Madison and Stanton counties in Nebraska. The proposed MAR would pass through the Union Creek system in this area.	Invertebrates	May Affect, Not Likely to Adversely Affect. Depending on the oil spilled, some components of the released oil may bioaccumulate and result in potential toxicological impacts if Topeka shiners consume contaminated prey. However, the most toxic components of crude oil do not bioaccumulate to high degrees. Direct toxicological effects could result from physical oiling if released product entered inhabited waterways.[a]
American burying beetle	The American burying beetle occurs in South Dakota and Nebraska, but it does not occur in Montana. Typical habitat includes mesic areas such as wet meadows, streams and wetlands in association with relatively undisturbed semi-arid, sandhill and loam grasslands.	Scavenger	May Affect, Is Likely to Adversely Affect (if a spill release were to occur in American burying beetle habitat). Depending on the oil spilled, some components of the released oil may bioaccumulate and result in potential toxicological impacts if American burying beetles consume contaminated carrion. However, the most toxic components of crude oil do not bioaccumulate to high degrees, and this species would not experience direct physical or toxicological adverse impacts from an oil spill. Adverse effects from this factor would be highly improbable due to the low probability of a spill and low probability of a spill coinciding with the presence of American burying beetles.

Table 5-20. Federally Listed Species Potentially Affected by an Oil Spill along the Keystone XL Pipeline

Species	Habitat along the Keystone XL Pipeline	Food Source	Potential Effects from an Oil Spill
Northern long-eared bat	The northern long-eared bat's range relative to the proposed Project includes all of South Dakota and Nebraska as well as all of Dawson, Prairie and Fallon counties in Montana.	Insects	May Affect, Not Likely to Adversely Affect. The northern long-eared bat may experience adverse toxicological impacts from ingestion of contaminated water. Depending on the oil spilled, some components of the released oil may bioaccumulate and result in potential toxicological impacts if northern long-eared bats consume contaminated prey. However, the most toxic components of crude oil do not bioaccumulate to high degrees, and this species would not experience direct physical or toxicological adverse impacts from an oil spill. Areas surrounding wetlands remain susceptible to effects resulting from oil spills and associated response efforts (see Section 5.5.6). As such, local habitat for this sensitive species may experience short-term impacts from a release of crude oil. If a spill substantially alters the function of an existing wetland, long-term impacts could also occur. Adverse effects to northern long-eared bat would be unlikely due to the low probability of a spill and low probability of a northern long-eared bat contacting the spilled crude oil.
Black-footed ferret	The proposed Project crosses the historical range of the black-footed ferret in Montana, South Dakota and Nebraska. Black-footed ferrets are not known to exist outside reintroduced populations in the western United States. Eleven reintroductions of black-footed ferrets have occurred in Montana, South Dakota and Kansas; these were outside the Keystone XL pipeline ROW.	Small mammals (prairie dogs)	May Affect, Not Likely to Adversely Affect. Impacts could occur because of oiling, leading to loss of insulative capacity of fur and adverse toxicological impacts from ingestion of contaminated water or from direct ingestion of oil during grooming. Similar impacts to prey species could lead to additional toxicological impacts and reduced prey availability. Adverse effects to the black-footed ferret would be unlikely due to the low probability of a spill, the low probability of a spill coinciding with the presence of black footed ferrets, and the low probability of a ferret contacting the spilled crude oil.

Table 5-20. Federally Listed Species Potentially Affected by an Oil Spill along the Keystone XL Pipeline

Species	Habitat along the Keystone XL Pipeline	Food Source	Potential Effects from an Oil Spill
Western prairie fringed orchid	The western prairie fringed orchid grows in wet to somewhat drier prairies in the eastern portion of Nebraska and its estimated current range overlaps the proposed MAR in Antelope, Madison, Stanton, Seward and Saline counties. However, the majority of the lands crossed by the proposed MAR are disturbed agricultural lands and are not likely to support this species.	Not applicable	May Affect, Not Likely to Adversely Affect. Impacts could occur because of direct physical oiling of plants or supporting soils or through increased human and vehicle traffic during spill response activities. Adverse effects to western prairie fringed orchid would be unlikely due to the low probability of a spill and the low probability of the spill coinciding with western prairie fringed orchid populations.

Source: Jorgensen 2015; NatureServe Explorer 2018; NGPC 2017a, 2017b, 2015, 2014, 2011a, 2011b, 2011c; USFWS 2017a

[a] Major river crossings are subject to an intensive integrity management program stipulated by the USDOT (Integrity Management Rule, 49 CFR 195) and require heavier wall pipe to be used for the HDD method. To avoid surface water impacts HDD would result in a burial depth of 25 feet or more below river bottoms

CFR = Code of Federal Regulations; HDD = horizontal directional drill; MAR = Mainline Alternative Route; ROW = right-of-way; USDOT = U.S. Department of Transportation

The bald eagle, a predatory bird species, is no longer listed under the ESA, but remains protected under federal regulations. The Bald and Golden Eagle Protection Act usually requires the maintenance of minimum buffers between a nesting bald eagle and any new or intermittent activities (such as a recovery effort after a spill), or it requires the seasonal restriction of activities that may disturb these birds or their nests. While violations of this act may carry penalties of monetary fines and/or imprisonment, criminal penalties only apply when a person without a permit "knowingly or with wanton disregard for the consequences of his act" takes an eagle or any part, feature or nest. A release of crude oil into a waterway could affect important bald eagle food sources, and spill response activities may disturb these birds. However, disturbances in these cases would be accidental and short term in nature. Should a spill alter the function of a surface water-related food source, a long-term impact could result and the bald eagle may relocate permanently.

5.5.8 Socioeconomics and Environmental Justice

An accidental release of crude oil along the proposed pipeline route could result in short- or long-term effects to the existing socioeconomic and environmental justice conditions within the ROI summarized in Section 3.8.

5.5.8.1 Socioeconomics

Potential socioeconomic effects from a release of crude oil include impacts to agricultural production, hunting and fishing, local property values and commercial activity. The extent and duration of the socioeconomic impacts would depend on the properties and uses affected, the response time, the remedial method employed by the response team, and the length of time required to return properties to conditions similar to those prior to the spill. The terrain near a spill location and the proximity of surface waters, residences and commercial uses are important factors that affect the extent of socioeconomic impacts. Releases in residential or commercial areas could require the evacuation of some residents and closure of businesses for an indeterminate period. During response and restoration actions, access to areas contaminated by crude oil would generally be limited or prohibited to anyone except the cleanup and monitoring crews. Table 5-21 lists the potential direct and indirect socioeconomic effects resulting from a crude oil release.

Table 5-21. Potential Socioeconomics Effects from a Crude Oil Release

Direct Effects	Indirect Effects
Physical covering or contamination of residential or commercial property by crude oil.	Evacuation of affected residences and businesses during response and remedial activity. Restricted access or impeded travel to residences, schools and businesses for the duration of remedial activity. Loss of business revenues and employee salaries during commercial closures. Adverse impact on property value. Noise, nuisance odors and visual effects.
Physical covering or contamination of recreational or economic resource by crude oil.	Restricted access to recreational resource area for the duration of remedial activity. Loss of business revenues associated with the resource. Loss of revenues from affected farmland, hunting or fishing resources. Potential permanent effect on recreational resources from residual contamination or perceived stigma.
Destruction of property during physical cleanup, including grading, excavation and dredging.	Accidental or intentional destruction of property during response and remedial efforts. Loss of residential property. Loss of business revenues. Adverse economic impacts for the municipal jurisdiction. Beneficial effects for some businesses (remediation firms, lodging providers, food and service businesses). **Loss of cultural practices or beliefs of a living community.**

The effects of a spill on agricultural production could result in a loss of revenue to farmers by the destruction of crops or the contamination of grazing lands. Depending upon the timing of an incident during the growing cycle and the acreage affected, a year's production could be lost in some cases. Furthermore, if the soils require substantial decontamination in the event of a large spill, losses in agricultural revenues could extend to subsequent growing seasons for the farmland affected.

Releases that occur near commercial businesses could potentially cause their closure. This would result in lost revenues to the business owners and lost income for employees. The magnitude of potential losses would depend greatly on the extent of the release and the duration and effectiveness of cleanup operations. The stigma of an oil spill, particularly in areas that are viewed as prime recreational areas or areas perceived as being of pristine environmental character, and perception of contamination for members of the public could affect some businesses well beyond the remediation phase. In particular, businesses dependent upon recreational lands contaminated by an oil spill could experience longer-term impacts from diminished public interest in the locations, even after successful remediation. In addition, industries that experience indirect economic benefits from the influx of recreational users to the area could also be affected, including food services, hotel and accommodation providers, and retail.

First responders to the scene of an accidental release would consist of police, fire and emergency medical services. Depending on the size of the spill, communities would initiate actions under mutual aid agreements during the response. In addition, police could be required throughout the duration of the cleanup effort to secure the area near the spill and prevent entry into the affected area. This could result in temporary impacts to local police forces in the area of the release.

In the event that a spill would require extensive response and remediation efforts, additional cleanup workers and police, fire and medical services could be present throughout the duration of these activities. Depending upon the size and location of the spill, as well as the corresponding size of the response team, temporary stresses to police, fire and medical services could occur. Temporary housing would also be necessary for the dedicated response team throughout the duration of cleanup. Temporary housing is available throughout the regional setting, as discussed in Section 3.8. Depending on the size of the response team, location of the spill and local availability of housing, temporary impacts to housing availability could occur. The response could stress local hospital capacity depending on the extent and severity of human exposure. Exposure pathways could include direct contact with oil, inhalation of airborne emissions or consumption of contaminated food or water.

5.5.8.2 Environmental Justice

CEQ guidance for the consideration of environmental justice during NEPA evaluations directs federal agencies to consider the following three factors to determine whether an action may have a disproportionately high and adverse impact on minority and low-income populations:

- Whether there would be a "significant" (as employed by NEPA) ecological, cultural, human health, economic or social impact that would adversely affect a minority population, low-income population or Indian tribe;
- Whether "significant" (as employed by NEPA) impacts on minority populations, low-income populations or Indian tribes may appreciably exceed those experienced by the general population; and
- Whether cumulative or multiple adverse exposures from environmental hazards would affect a minority population, low-income population or Indian tribe (CEQ 1997a).

Therefore, if a product released from the proposed pipeline would affect an environmental resource, and if the release were to occur in a Census block group or tract identified in Section 3.8, then minority or low-income populations may experience adverse effects. Impacts to these communities and environmental resources would be similar to the effects described throughout this chapter.

Because it is not possible to predict the location of a release, it is not possible to determine whether a disproportionately high and adverse impact would occur for minority or low-income populations from an accidental release potentially occurring along the proposed pipeline route. However, as discussed in Section 3.8, minority and low-income populations exist in block groups located within 2 miles of the proposed pipeline route. Section 3.8 also describes Health Professional Shortage Areas and Medically Underserved Areas/Populations. Depending on the location and extent of a spill, minority or low-income populations could be more vulnerable to health impacts associated with a crude oil release because of reduced access to health care services. This could result in disproportionately high and adverse impacts to minority and low-income populations in the event of a large release.

Section 4.10 of the 2014 Keystone XL Final SEIS describes a series of consultation meetings the Department conducted in which some of the Indian tribes identified hunting, fishing, trapping and gathering activities as important for numerous reasons, including food supply, personal income and the continuance of cultural customs and traditions.

Additionally, as part of the USACE Section 408 review process, the USACE has solicited input from Indian tribes on water supply; on the cultural importance of water, plants and wildlife as it relates to sacred and spiritual practices; and on tribal fishing and hunting rights, subsistence living and use of plants for medicinal purposes. Information provided by the Indian tribes to the USACE during this process addressed tribal water supplies and the importance of hunting, fishing, water, plants and wildlife resources on tribal culture.

It is recognized that Indian tribes **and tribal members** could be disproportionately negatively impacted by the proposed Project because they could have a greater dependence on natural resources than non-tribal members. This includes subsistence use within treaty lands in southeastern Montana, western South Dakota and northwestern Nebraska where Indian tribes still claim rights to hunting, fishing and water use. Large oil spills could significantly impact aquatic and terrestrial resources, including those considered important by Indian tribes or used in sacred and spiritual practices. Because many of the plant and animal species identified by the Indian tribes may be associated with wetland, riparian, aquatic and sagebrush habitats at the Missouri River crossing at Fort Peck, the proposed Project has the potential to impact fish and wildlife species important to Indian tribes.

Comments received from tribes and tribal members during the Draft SEIS comment period emphasized the importance of these natural resources to their culture and way of life. Rivers sustain the tribes in part by providing the water for traditional religious and cultural practices such as the Sundance and sweat lodges. These practices require water and resources, such as cottonwood trees and gathered plants, which rely on water from the rivers to thrive. Specifically, the Missouri River in certain tribal traditional beliefs holds sacred spiritual beings which would be threatened by contamination. Members of tribes also rely on rivers for subsistence including hunting of large mammals and game birds as well as gathering of plants which rely on the rivers. These subsistence activities are often used to supplement fixed incomes, and loss of these resources in the event of a spill would be a significant impact to these individuals. Contamination of these resources in the event of an accidental release would adversely affect these resources and significantly affect tribal culture and beliefs and threaten the transfer of these traditions to younger generations. Depending on the location of the accidental release, these effects could be disproportionately high and adverse to tribal communities affected by a spill.

While the impact analysis in the 2014 Keystone XL Final SEIS and this SEIS is not specific to tribal natural resources, the analysis regarding environmental resources provides insight as to how resources important to Indian tribes could be affected by the Project. For example, Sections 4.6 and 4.7 of the 2014 Keystone XL Final SEIS describe environmental consequences of, and mitigation for, the construction and operation of the project on hunting and fishing and other natural resources. Specifically, Section 4.6.3 discusses potential impacts to big and small game animals and waterfowl. Section 4.7.3 describes potential impacts to fisheries during construction (4.7.3.2) and operations (4.7.3.3).

Two Tribal lands are located adjacent to waterways within the 40-river-mile downstream area included in the ROI for the proposed Project. Cherry Creek and the Cheyenne River extend along a combined total of 40.3 miles of the Cheyenne River Reservation in South Dakota, while the Milk and Missouri Rivers border a total of 58.8 miles of the Fort Peck Reservation in Montana. Table 5-22 presents the likelihood of a release to occur within proximity to Tribal Trust Lands.

Table 5-22. Annual Likelihood of Spills Occurring in Proximity to Tribal Trust Lands

Resource	Area within 150 Feet[a]	Area within 500 Feet[b]	Area within 1,200 Feet[c]
Cultural Sites (Tribal Trust Lands)	0	0	0.0008

Source: U.S. Census Bureau 2017e

[a] **The area within 150 feet of the pipeline that is susceptible to small, medium, large and catastrophic spills.**

[b] **The area within 500 feet of the pipeline that is susceptible to medium, large and catastrophic spills.**

[c] **The area within 1,200 feet (up to 5,000 feet in areas of moderate or steep slope) of the pipeline that is susceptible to large and catastrophic spills.**

A specific concern raised by Assiniboine & Sioux Tribes of the Fort Peck Reservation is proximity of the proposed pipeline to the Assiniboine and Sioux Rural Water Supply System, the tribal municipal and industrial water supply system with an intake on the Missouri River approximately 57 miles downstream of the pipeline's proposed Missouri River crossing. The system supplies raw water to the Assiniboine and Sioux Rural Water Supply System water treatment plant in Poplar, Montana, and potable water to the Fort Peck Indian Reservation as well as to the residents of portions of Valley, Daniels, Sheridan and Roosevelt counties in Montana through the Dry Prairie Rural Water Association **(see Section 3.8.2.4)**. In the event of a release to the Missouri River, Keystone has prepared a Site-Specific Risk Assessment (refer to Section 5.2) and a Geographic Response Plan (refer to Section 5.4.4) for the Missouri River crossing to support both the protection of environmentally sensitive areas and the protection of the public's health and safety if a release were to occur. These documents were prepared to evaluate the risk of a release, the potential effects that may result in the event of a release and the tactics for responding to a release.

Information provided by the Water Commission for the Assiniboine & Sioux Rural Water Supply System state their water treatment plant is not designed nor equipped to remove hydrocarbon contaminants such as benzene, ethylbenzene and p-xylene that are present in crude oil and dilbit. If oil were to reach the intakes on the Missouri River, the water treatment plant would have to close, resulting in the loss of the sole water supply for over 30,000 residents of the Fort Peck Reservation and surrounding communities within Valley, Daniels, Sheridan and Roosevelt counties, including 4 hospitals and 13 public schools. The Assiniboine & Sioux Rural Water Supply System water supply system intake along the Missouri River is beyond the 40-river-mile downstream maximum reasonable transport distance. However, Keystone has committed to a number of measures beyond spill cleanup measures, which are addressed in Appendix B, Potential Releases and Pipeline Safety, of the 2014 Keystone XL Final SEIS. In the event that a spill contaminates water supplies used for industrial, municipal or irrigation purposes, Keystone has committed to provide an alternate water supply for any users of wells or irrigation intakes where water quality is affected by a spill. Keystone would provide either an alternate supply of water or appropriate compensation for those facilities impacted, as may be agreed upon among the affected parties and Keystone.

Water intakes used to irrigate Tribal lands within the Fort Peck Reservation are reportedly located 10 and 14 river-miles downstream of the proposed crossing. As stated in Section 5.5.6.2 of this SEIS, a release to surface water located upstream, and in the vicinity of any of these intakes identified, could produce both short- and long-term effects on the suitability or usability of these intakes. The degree of impacts to surface water intakes from a release would depend on many factors, such as the size of the release, the time of year of the release and the response time to address the release. A spill that contaminates an intake may make it unusable for an extended period of time until spill response and recovery activities have been completed. Loss of these irrigation intakes during the growing season would result in economic losses to farmers, including Fort Peck's agricultural economy. Crop loss as a result of a spill that was not covered by a farmer's liability insurance would involve a third-party claim that would have to be directed to Keystone for review and payment.

As stated within this chapter, Keystone has committed to a number of measures beyond spill cleanup measures, which are addressed in Appendix B, Potential Releases and Pipeline Safety, of the 2014 Keystone XL Final SEIS. In the event that a spill contaminates water supplies used for industrial**, municipal** or irrigation purposes, Keystone may provide either an alternate supply of water or appropriate compensation for those facilities affected. Additionally, Keystone would also provide an alternative water supply for any well water quality that was found to be compromised by the spill.

5.5.9 Cultural Resources

An accidental release of crude oil along the proposed pipeline route could result in short- or long-term adverse effects to known or unidentified **historic properties** that exist within the ROI summarized in Section 3.9. While the extent of potential effects depends on the location of the spill and the volume of crude oil released, short- and long-term effects could occur through the physical contamination of **historic properties**. Impacts c**ould** also result from cleanup efforts or a lack of access to sites during cleanup efforts. To mitigate potential impacts, Keystone has committed, whenever feasible, to avoid known **historic properties during siting of the pipeline**, minimize impacts when avoidance is not possible **(e.g., HDD beneath unavoidable sites)** and mitigate impacts when minimization is not sufficient. Table 5-2**3** lists the potential **adverse** effects to **historic properties** resulting from a crude oil release.

Table 5-23. Potential Effects to Historic Properties from a Crude Oil Release

Direct Physical Effects	Other Direct Effects
Contamination of the **historic property** (surface soils and subsurface features/artifacts) from crude oil.	Restricted access to historical **properties such as** limiting use of historic structures **and** landscapes. Acceleration of deterioration of **the historic property**. Noise, nuisance odors and visual effects **surrounding the historic property**.
Physical covering of site by crude oil.	Restricted access prevents contaminated **historic property** from being properly researched and documented. Inability to use radiocarbon dating.
Disturbance to **historic properties** from physical cleanup, including grading, excavation and dredging**,** in situ burning and water flushing.	Accidental or intentional destruction of **historic properties** during cleanup efforts.

TCP = Traditional Cultural Property

The emergency provisions contained in the regulations that implement Section 106 of the NHPA do not directly address the requirements for emergency response in the event of an oil release. Therefore, in June of 1997, the Chairman of the Advisory Council on Historic Preservation signed a Nationwide Programmatic Agreement that established a national policy and procedures for the protection of **historic properties** during emergency response under the National Contingency Plan. The USEPA, USDOT, U.S. Coast Guard, the National Conference of State Historic Preservation Officers and the U.S. Department of the Interior also signed. Responsibility for implementation of the National Contingency Plan fell to the U.S. Coast Guard for coastal areas and the USEPA for inland Areas (Advisory Council on Historic Preservation **2002**).

The Nationwide Programmatic Agreement establishes the procedures for a response to an "emergency" circumstance. An "emergency" is a situation that dictates a response action to a spill that must take place expeditiously, such that normal consideration of the Section 106 process is not reasonably practicable. The Nationwide Programmatic Agreement designates a federal on-scene coordinator to make emergency response decisions regarding **historic properties** and outlines procedures for making informed decisions that consider cultural resource information before authorizing actions that might affect such properties. In the event of a conflict between public health and safety and the protection of historic properties, the responsibility of the federal government in protecting public health and safety is paramount.

5.5.10 Greenhouse Gases and Climate Change

An accidental release of crude oil along the proposed pipeline route could result in an increase in greenhouse gas emissions within the ROI with potential impacts to climate change as summarized in Section 3.10. A release of crude oil could contribute to greenhouse gases from fugitive emissions from spilled crude oil, from combustion of fuel in vehicles and equipment used for spill response and remediation actions, and from combustion of spilled crude oil in the event of a fire. Table 5-24 presents the potential direct and indirect effects to greenhouse gases from a spill.

Table 5-24. Potential Effects to Greenhouse Gases and Climate Change from a Crude Oil Release

Direct Effects	Indirect Effects
Fugitive emissions of greenhouse gases.	Greenhouse gas emissions from vehicles and equipment used in spill response and remediation.
Greenhouse gas emissions from potential fire caused by spontaneous ignition or explosion during spill incident.	Greenhouse gas emissions from fire intentionally ignited for spill containment.

Emergency response teams sometimes initiate controlled burning as a measure to mitigate impacts from spills. Most of the oil burned converts to CO_2 and water. However, particulates, mostly soot, make up approximately 10 to 15 percent of the smoke plume (Barnea 1995). Greenhouse gas emissions could occur from open burning of released crude oil in the event of a fire occurring in conjunction with a crude oil spill. Because the lifecycle greenhouse gas impacts of the proposed Project include the combustion of fuels produced from the crude oil, crude oil fires would not greatly increase total greenhouse gas emissions. However, crude oil fires could emit greater amounts of black carbon and other particulates that contribute to atmospheric warming. Black carbon has a relatively short atmospheric lifetime of days to weeks, as compared to the longer atmospheric lifetime of the dominant greenhouse gases (Melillo et al. 2014).

6 ELECTRICAL POWER INFRASTRUCTURE

6.1 INTRODUCTION

As described in Section 2.1.12.3 of the 2014 Keystone XL Final SEIS (U.S. Department of State 2014), multiple private power companies and cooperatives **and, in Nebraska, public power entities,** would need to construct electrical power lines (both transmission and distribution) **in several places** along the pipeline to provide electric power to the proposed Project's pump stations.[1] Up to 19 electrical power lines would be required in Montana, South Dakota and Nebraska. The development of these electrical power lines is considered a connected action to the proposed Project and is therefore evaluated in this SEIS. Four federal agencies including the BLM, WAPA, Department of Agriculture's RUS, and USACE would need to take action to facilitate the delivery of electricity to five of the six pump stations in Montana and seven pump stations in South Dakota. These agencies, described in more detail below, must make decisions related to providing a ROW across federal lands, expanding substations and interconnecting with the electrical grid, and/or financing the construction and operation of the power lines. Each federal agency and its purpose and need for taking action is listed in Chapter 1, Introduction, and repeated below. The remaining pump stations, one in Montana and six in Nebraska, would not require BLM, WAPA, RUS, or USACE action.

This chapter supplements the 2014 Keystone XL Final SEIS by providing the following:

- Updated transmission and distribution line information, including new route information to coincide with the MAR in Nebraska as well as other route adjustments;
- A more detailed assessment of existing resources and potential impacts of the power infrastructure, outlined at the pump station-specific level, as practicable; and
- An update to the previously proposed Big Bend to Witten 230-kV Transmission Line project.

This chapter provides an assessment of the most recent electrical power infrastructure information to allow the Department, BLM, WAPA, RUS, and USACE to evaluate the environmental consequences associated with these connected actions. Additional analysis may be required by each federal agency to fulfill their NEPA requirements, and it is anticipated that any additional analysis, if required, could tier off the assessment included herein or supplement this SEIS.

6.2 FEDERAL AGENCY INVOLVEMENT

The following section describes the roles of the federal agencies as they relate to the construction and operation of the power infrastructure necessary to operate the proposed pump stations.

6.2.1 Bureau of Land Management

Some of the proposed electrical power infrastructure and associated facilities would occur on or cross lands managed by the BLM in Montana. The BLM is a cooperating agency and will use this document in support of issuing a Record of Decision. The BLM's purpose and need is to respond to the Keystone application under Section 28 of the Mineral Leasing Act, as amended, for a ROW grant and Temporary

[1] For purposes of this document, the terms power supplier, power provider, and local power provider are used interchangeably. The term public power entity is used in this document to refer to the entities in in Nebraska only. Power cooperatives are private, non-profit companies whose purpose is to deliver electricity to its customers or members. These entities are addressed in Table 6-1 and Section 6.3.9.

Use Permit to construct, operate, maintain and decommission a crude oil pipeline and related facilities on federal lands in compliance with the Mineral Leasing Act, BLM ROW regulations and other applicable federal laws.

The BLM will decide whether to approve, approve with modification, or deny issuance of a ROW grant and Temporary Use Permit to Keystone for the proposed Keystone XL pipeline, and if approved, under what terms and conditions. The BLM will use this SEIS, as well as the 2011 Keystone XL Final EIS, the 2014 Keystone XL Final SEIS, and other information and factors (e.g., BLM Grant Special Stipulations), to support its review of the Keystone XL pipeline. Pertinent to this chapter, for the ROW applications filed under the Federal Land Policy and Management Act of 1976 (Public Law 94-579) for power infrastructure, the BLM may use this SEIS, as well as other information and factors from **future** additional environmental review to support its consideration of the proposed electrical power lines, specifically those associated with Pump Station 9 (PS-09) and PS-10 in Montana**, including any potential reroutes**.

6.2.2 Western Area Power Administration

WAPA has agreed to continue to be a cooperating agency for this SEIS (similar to its role for the 2014 Keystone XL Final SEIS) and intends to use this document as a basis for issuing a Record of Decision regarding the interconnection of transmission facilities. WAPA has interconnection decisions for PS-09 through PS-13, PS-17 through PS-19, and PS-21. WAPA's Upper Great Plains Region (WAPA-UGP) joined Southwest Power Pool, Inc. (SPP) as a Transmission Owner Member on October 1, 2015, placing its facilities under the functional control of SPP. A request under the SPP Open Access Transmission Tariff has been made on behalf of electric cooperatives to interconnect new loads (pumping stations) to **SPP** facilities**. Some of these SPP facilities currently exist**, **some would** be built under the functional control of SPP, and some are either owned by WAPA or connected to WAPA-owned facilities. WAPA's purpose and need is to consider and respond to these interconnection requests from the local power cooperatives, and the related construction or upgrading of any WAPA-owned facilities as a result of the requests.

The following provides a summary of WAPA's federal activities that are part of the Proposed Action:

- PS-09—Construction and ownership of a new substation (the Bowdoin Substation) and interconnection;
- PS-10—An expansion of the existing Fort Peck Substation and interconnection;
- PS-11—Construction and ownership of a new substation **(the Coal Hill Substation)** and interconnection;
- PS-12—Interconnection and minimal work within the existing Circle Substation footprint to accommodate the interconnection;
- PS-13—An expansion of the existing O'Fallon Substation and interconnection;
- PS-17—Interconnection and minimal work within the existing Maurine Substation footprint to accommodate the interconnection;
- PS-18—Interconnection and minimal work within the existing Philip Substation footprint to accommodate the interconnection;
- PS-19—Expansion of the existing Midland Substation and interconnection; and
- PS-21—Rebuilding of the existing Gregory Substation and interconnection.

6.2.3 U.S. Department of Agriculture's Rural Utilities Service

RUS has agreed to be a cooperating agency and intends to use this document in support of issuing a Record of Decision. RUS administers programs that provide infrastructure and infrastructure improvement to rural areas, including water and wastewater treatment, telecommunications services, and electric power. For electric power, RUS provides financing through loans and loan guarantees for the construction, operation, and improvement of electric transmission and generation facilities in rural areas. In South Dakota, the Grand Electric Cooperative, West Central Electric Cooperative and Rosebud Electric Cooperative have applied for RUS financing for the construction of power lines to deliver power to PS-15 through PS-21. RUS's purpose and need for taking action is to determine whether to provide federal financing to these electric cooperatives, thus allowing them to construct and operate the transmission line facilities necessary to supply the proposed Project's pump stations with power.

6.2.4 U.S. Army Corps of Engineers

The USACE has agreed to continue to be a cooperating agency for this SEIS and intends to use this document in support of its determination whether to grant permission for Keystone to modify lands administered by the USACE at the Fort Peck project by concurring with the BLM's inclusion of USACE project land in the proposed ROW grant to Keystone for the Keystone XL Project. The proposed transmission line that would deliver power to PS-10 would pass over the Fort Peck dam.

USACE's purpose and need is to determine whether USACE may allow the BLM to include federal land administered by USACE for the Fort Peck Project in a ROW granted by BLM to Keystone for the installation of the Keystone XL pipeline on Fort Peck Project land. In addition, USACE anticipates receiving and acting upon applications submitted by Keystone pursuant to Section 404 of the Clean Water Act of 1972 (33 USC 1344) (Section 404).

6.3 ELECTRICAL POWER INFRASTRUCTURE DESCRIPTION

The following section describes the actions that would be necessary to provide electricity to the pump stations from existing power providers. Table 6-1 describes the proposed electric power infrastructure needed to serve the 19 pump stations in Montana, South Dakota and Nebraska. For the purpose of this analysis, the electric power lines are classified based on their voltage as either transmission (higher than 69 kV) or distribution (69 kV and lower). Power lines range from 0.1 mile to **approximately** 61 miles in length. However, the lengths and routes used for the analyses presented in this chapter are preliminary and could require minor adjustments before construction would begin. The route of each proposed power line is shown in Figures 6-1a–b, 6-2a–c, and 6-3a–c.

Keystone and the local power providers may make minor adjustments to their proposed alignments and temporary work spaces during final design. These minor route variations (micro-alignments) could be implemented to address specific landowner concerns, avoid certain features (such as structures, wells, or irrigation systems), minimize effects on environmental or cultural resources, or facilitate construction in such areas as steep terrain or waterbody crossings. This evaluation has utilized the best information available at the time. Micro-alignments may change the lengths of power line, areas of ROW, and the number of power line support structures, but would not likely result in a substantial increase in the impacts of the proposed infrastructure.

In the 2014 Keystone XL Final SEIS, the Department described the Big Bend to Witten 230-kV Electrical Transmission Line Project (Big Bend to Witten Project) as a connected action. WAPA-UGP studied whether the existing transmission system could sustain the added load of pumping stations necessary for the Keystone XL pipeline. Due to the increased electrical demands of the Keystone XL Project, WAPA-UGP determined at that time that a 230-kV transmission line would reinforce the current electrical grid system and provide reliable electricity service to the Fort Thompson/Big Bend Dam area in South Dakota. To address this need, WAPA-UGP had proposed the Big Bend to Witten Project.

Since the 2014 Keystone XL Final SEIS, WAPA-UGP joined SPP and placed its eligible transmission facilities under the SPP Open Access Transmission Tariff to become part of the SPP Transmission System. By joining SPP, WAPA-UGP relinquished some of its previous control of directing system improvements and reinforcements (called “network upgrades”). SPP, in its official role as the Transmission Service Provider under the SPP Open Access Transmission Tariff, identified the network upgrades needed to accommodate the Keystone XL pumping station loads.

Upon further study, SPP and WAPA-UGP have concluded that a static var compensator (SVC) installed at the existing Rosebud Electric Cooperative Witten 115-kV Substation in Tripp County, South Dakota, along with remedial action schemes (RAS) and other minor modifications to existing facilities (capacitors or other devices), would maintain stability and reliability within the affected WAPA-UGP footprint. A SVC is an electrical device that provides fast-acting reactive power to the transmission system. A RAS is an automatic protection system designed to detect abnormal or predetermined system conditions, and take corrective actions other than and/or in addition to the isolation of faulted components to maintain system reliability. Such action may include changes in demand, generation (MW and Mvar), or system configuration to maintain system stability, acceptable voltage, or power flows. As a result of the proposed SVC and RAS additions, the previously proposed Big Bend to Witten Project is no longer required.

Table 6-1. Summary of Proposed Electric Power Infrastructure

Pump Station	County	Substation	Cooperating Agency Involvement	Power Supplier	Voltage (kV)	Approx. Power Line Length (miles)	Permanent ROW Width (feet)	Approx. ROW (Acres)	Approx. Number of Structures
Montana									
PS-09[a]	Phillips	Bowdoin[b] (new)	BLM and WAPA	Big Flat Electric Cooperative	115	61.4 (30.4 on BLM lands)[c]	100	744.**1** (294.8 permanent and another 74.0 temporary on BLM lands)	8**52**
PS-10	Valley	Fort Peck[b]	BLM and WAPA	NorVal Electric Cooperative	115	48.**8** (4.3 on BLM lands)	80	4**73.2** (41.5 on BLM lands)	1,036
PS-11	McCone	Coal Hill[b] (new)	WAPA	NorVal Electric Cooperative	**230**	0.2	80	1.9	3[d]
PS-12	McCone	Circle[b]	WAPA	McCone Electric Cooperative	115	4.6	80	44.4	**81**
PS-13	Prairie	O'Fallon[b]	WAPA	Tongue River Electric Cooperative	115	15.7	80	152.4	**251**
PS-14	Fallon	**Existing Source**	None	Montana-Dakota Utilities Company	115	6.9	50	41.6	**91**[d]
South Dakota									
PS-15	Harding	Harding	RUS	Grand Electric Cooperative	115	24.7	50	149.**6**	326[d]
PS-16	Harding/ Perkins	Buffalo	RUS	Grand Electric Cooperative	115	41.9	50	253.**7**	553[d]
PS-17	Meade	Maurine[b]	WAPA and RUS	Grand Electric Cooperative	115	10.9	50	65.8	230[d]
PS-18	Haakon	Philip[b]	WAPA and RUS	West Central Electric Cooperative	115	26	50	157.**2**	3**2**0

Table 6-1. Summary of Proposed Electric Power Infrastructure

Pump Station	County	Substation	Cooperating Agency Involvement	Power Supplier	Voltage (kV)	Approx. Power Line Length (miles)	Permanent ROW Width (feet)	Approx. ROW (Acres)	Approx. Number of Structures
PS-19	Haakon/ Jones	Midland[b]	WAPA and RUS	West Central Electric Cooperative	115	20.5	50	124.**1**	2**19**
PS-20	Tripp	Witten	RUS	Rosebud Electric Cooperative	115	17.2	50	104.5	36**4**
PS-21	Tripp/ Gregory	Gregory[b]	WAPA and RUS	Rosebud Electric Cooperative	115	20.5	50	124.5	43**4**
Nebraska									
PS-22	Holt	Eagle Creek (new)	None	NPPD **&** Niobrara Valley Electric	115	2.5	**5**0	**15.4**	**54**
PS-23	Antelope	Existing Source	None	Elkhorn PPD	69	3.**0**	100	3**7.0**	**65**
PS-23B	Platte	Existing Source	None	Cornhusker PPD	34.5	3.4	100	40.8	**69**[d]
PS-24	Butler	Existing Source	None	Butler PPD	69	1.**0**	100	12.4	2**2**[d]
PS-25	Seward	Existing Source	None	Norris PPD	69	9.3	100	112.2	1**97**[d]
PS-26	Jefferson	Existing Source	None	NPPD **&** Norris PPD	115	0.1	100	1.3	3

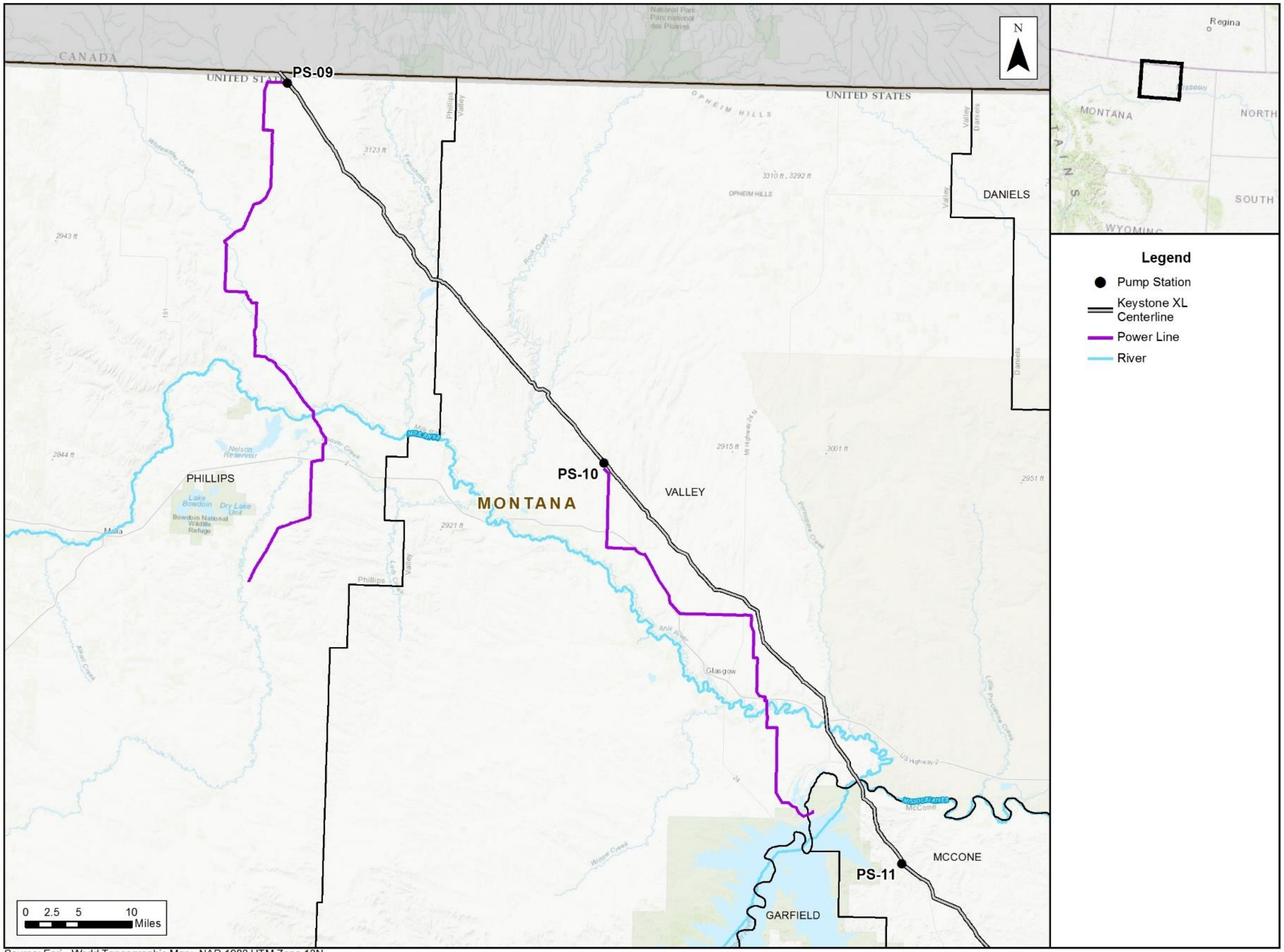
[a.] Pump station numbers begin at 09 because the first eight pump stations for this pipeline are located in Canada and are not part of this assessment.

[b.] WAPA substation

[c.] **Potential route variations could increase these distances to approximately 64 miles (approximately 33 miles on BLM lands); ROW areas could also increase accordingly.**

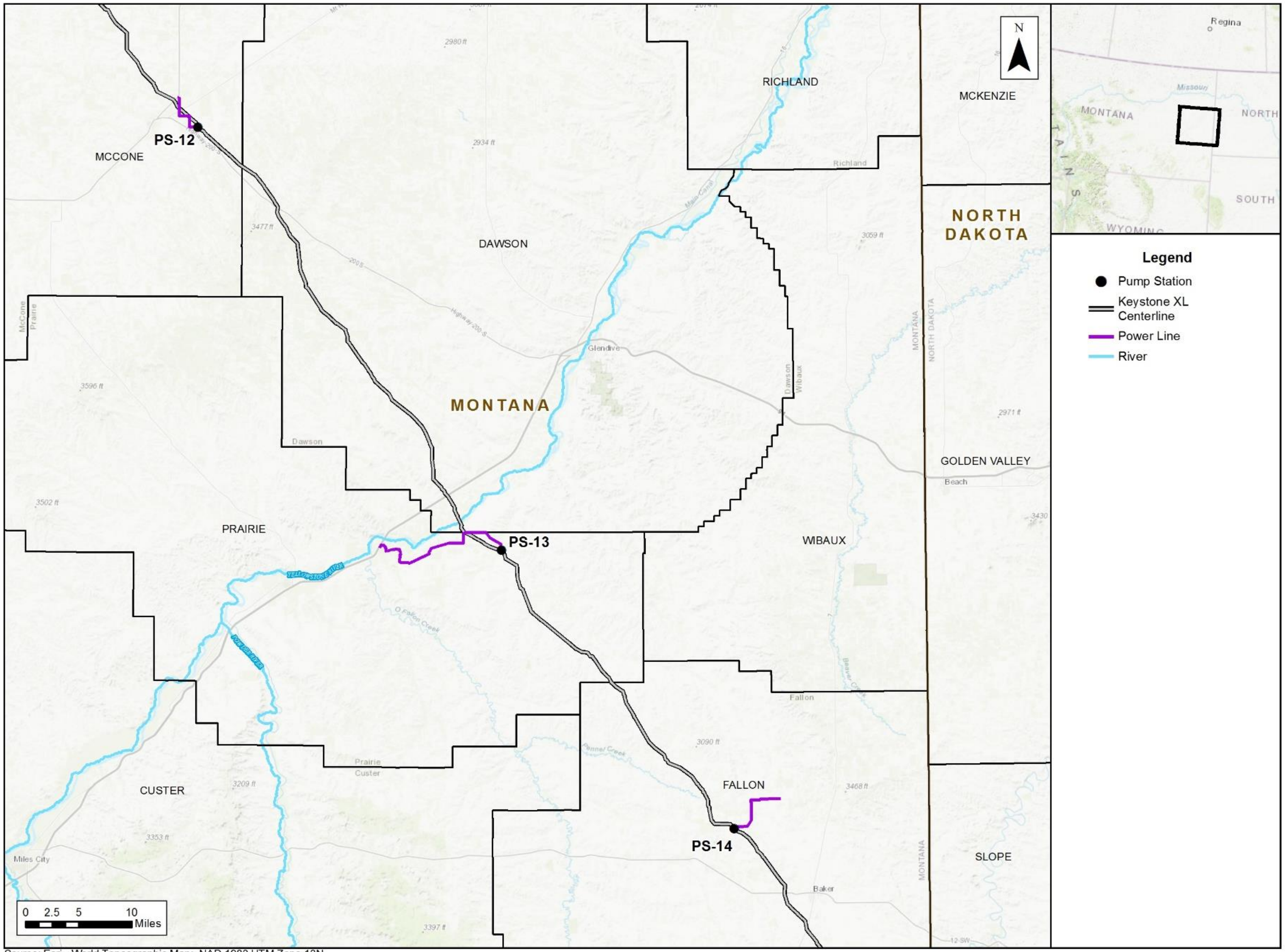
[d.] **For lines where specific information was not available, the number of structures for 115-kV or 230-kV lines is based on an assumption of one structure every 400 feet; the number of structures for 69-kV or 34.5-kV lines is based on an assumption of one structure every 250 feet.**

BLM = Bureau of Land Management; kV = kilovolt; NPPD = Nebraska Public Power District; PPD = Public Power District; ROW = right-of-way; RUS = Rural Utilities Service; WAPA = Western Area Power Administration



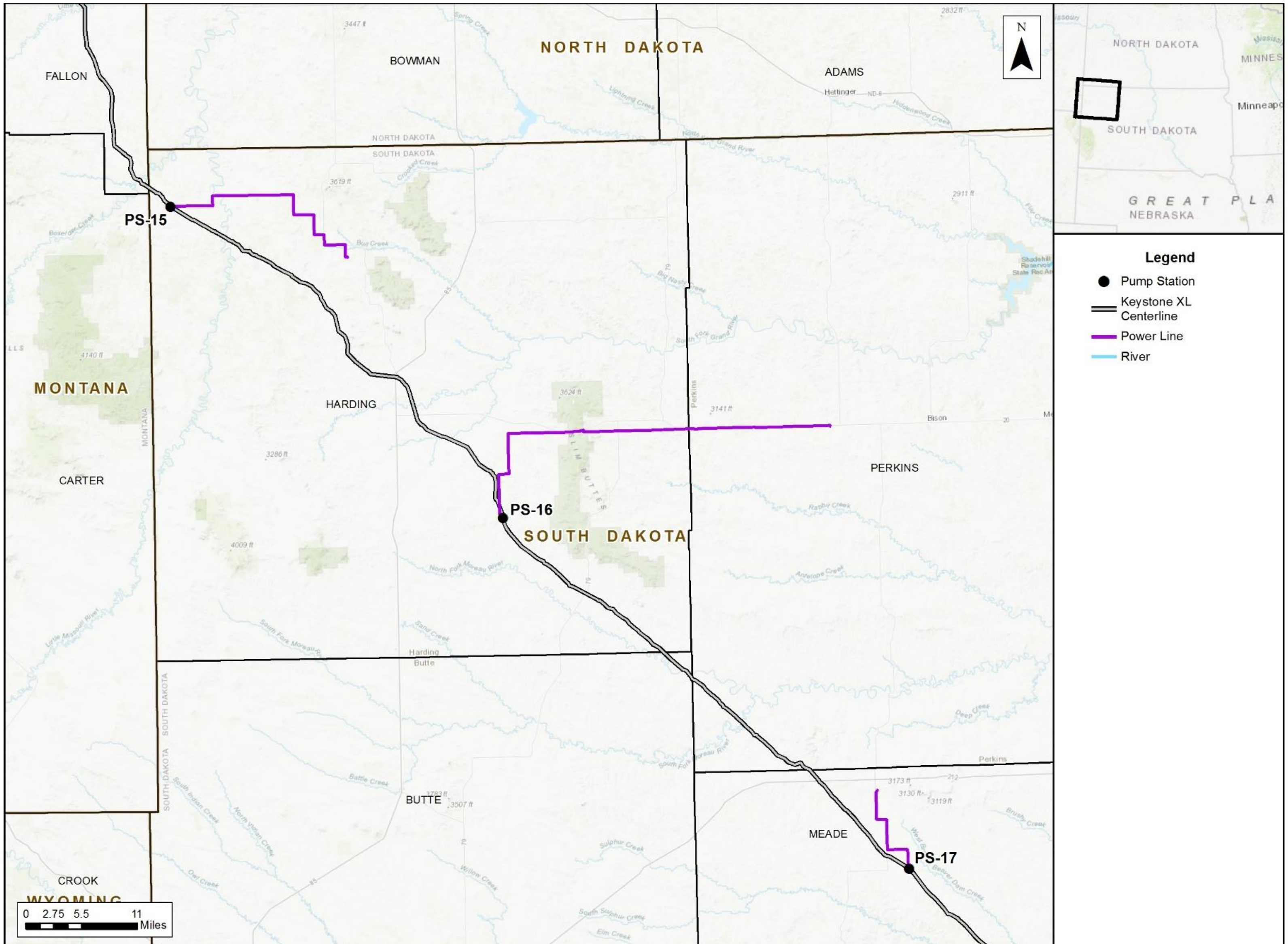
Source: Esri - World Topoographic Map; NAD 1983 UTM Zone 13N

Figure 6-1a. Project and Power Lines Overview (Montana, PS-09 – PS-11)



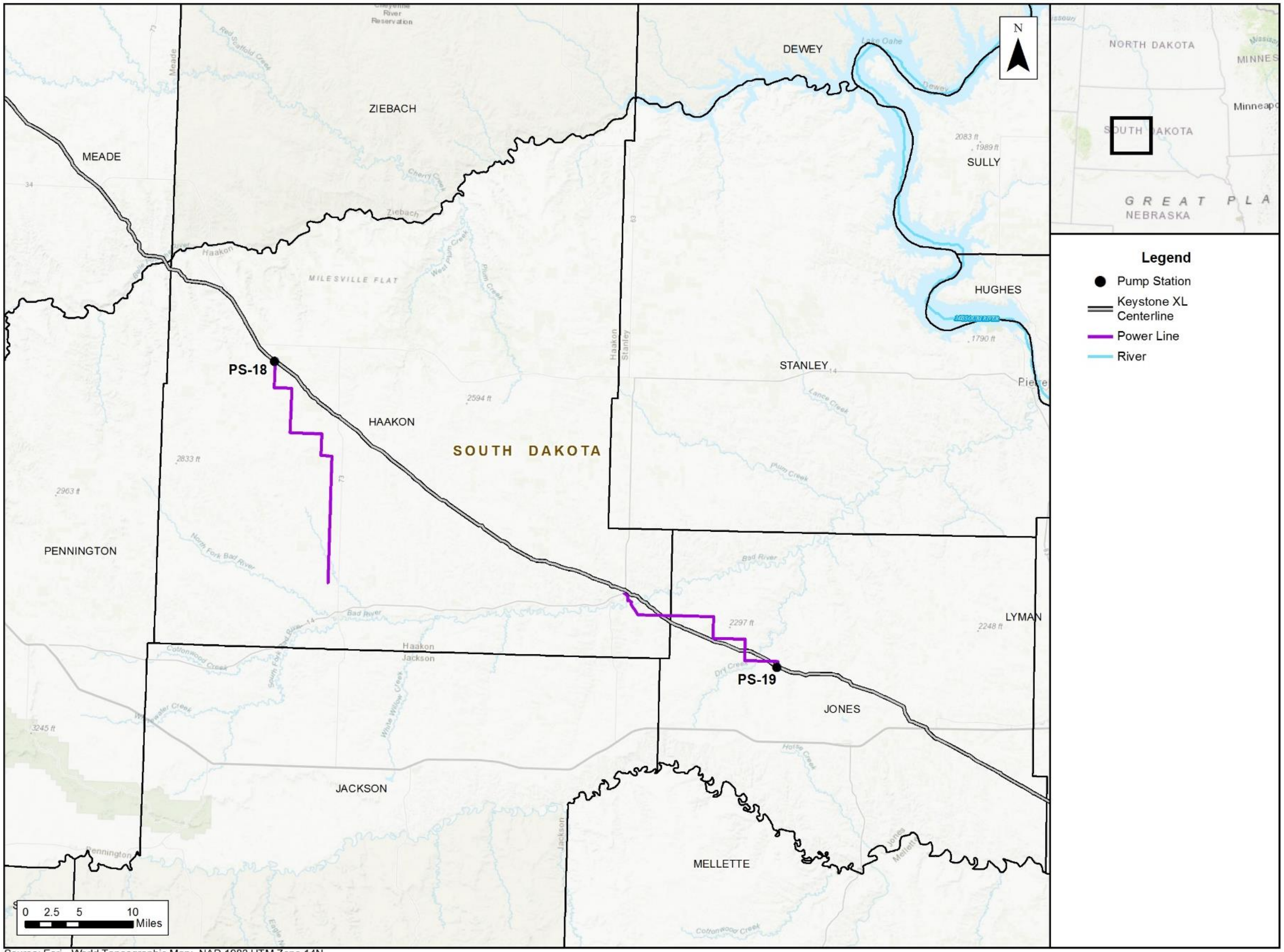
Source: Esri - World Topoographic Map; NAD 1983 UTM Zone 13N

Figure 6-1b. Project and Power Lines Overview (Montana, PS-12 – PS-14)



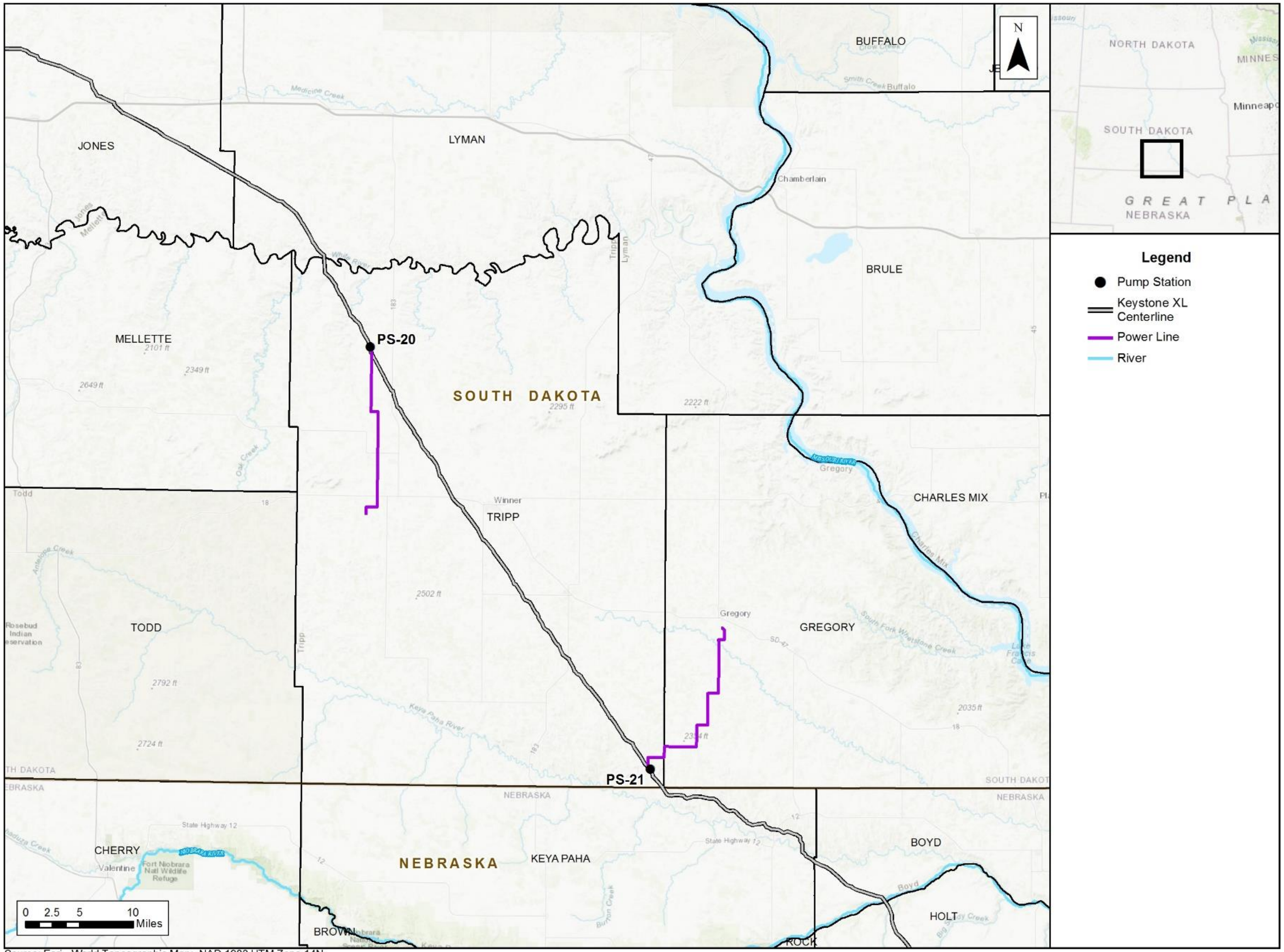
Source: Esri - World Topoographic Map; NAD 1983 UTM Zone 13N

Figure 6-2a. Project and Power Lines Overview (South Dakota, PS-15 – PS-17)



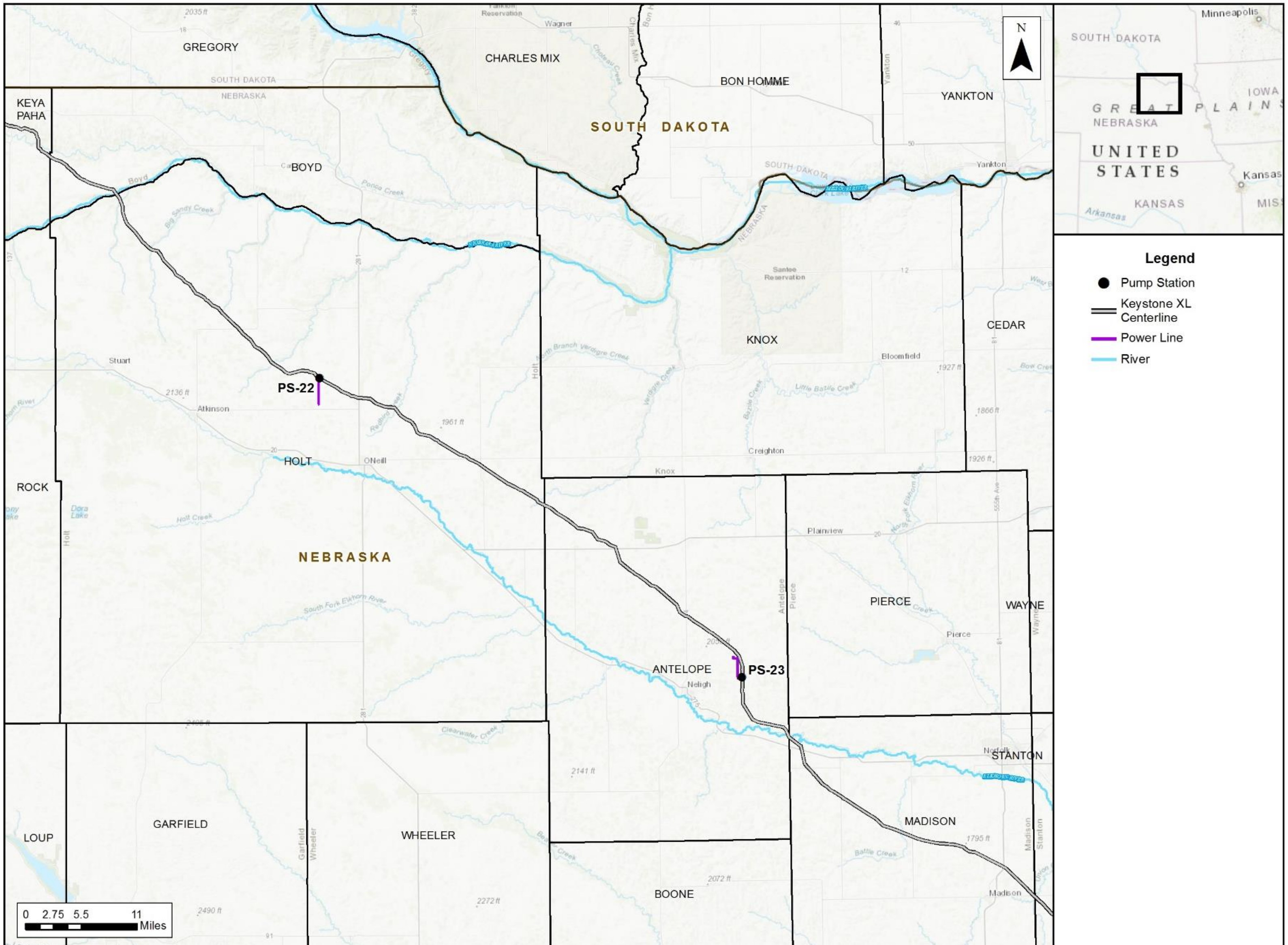
Source: Esri - World Topoographic Map; NAD 1983 UTM Zone 14N

Figure 6-2b. Project and Power Lines Overview (South Dakota, PS-18 – PS-19)



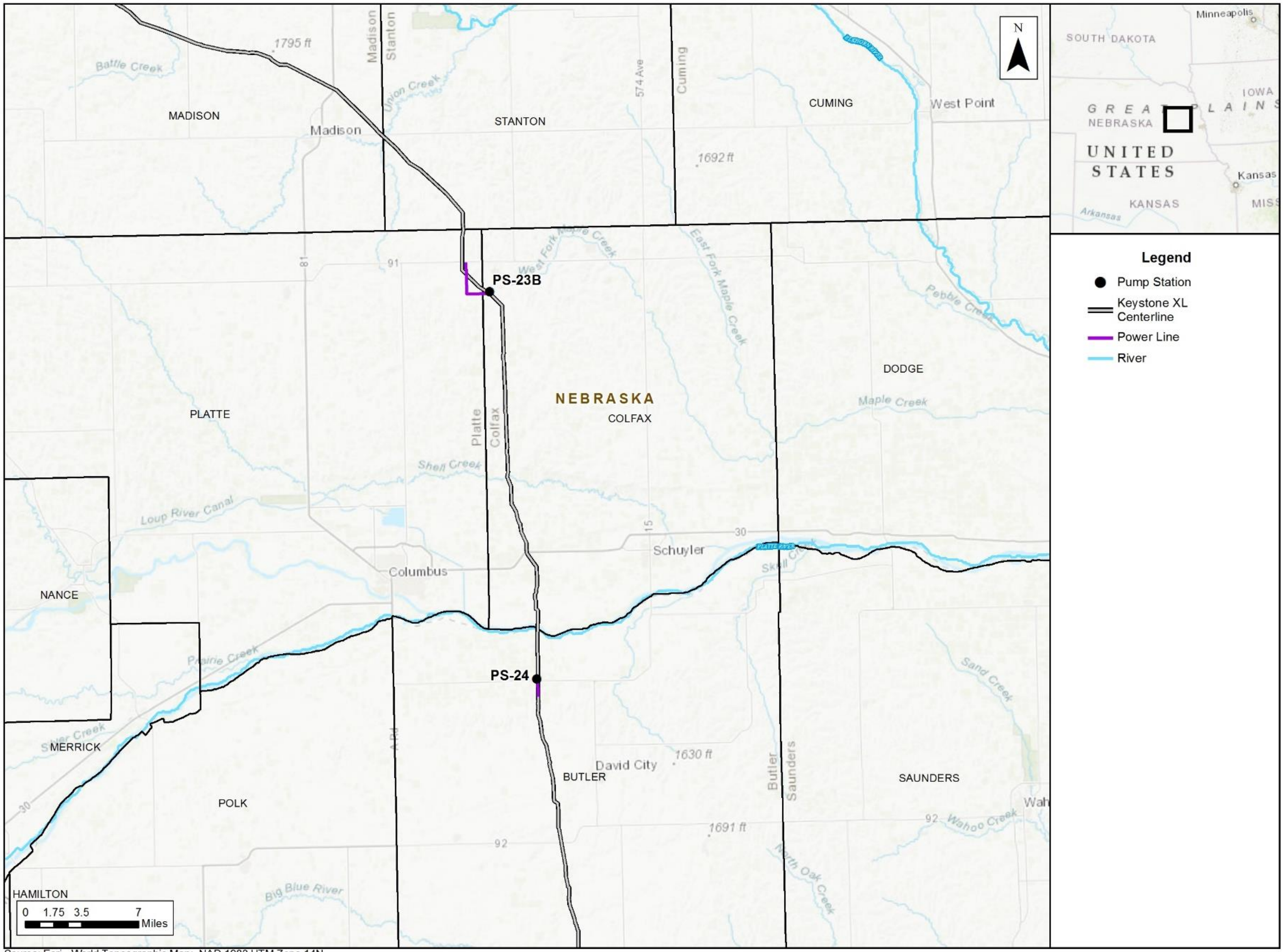
Source: Esri - World Topographic Map; NAD 1983 UTM Zone 14N

Figure 6-2c. Project and Power Lines Overview (South Dakota, PS-20 – PS-21)



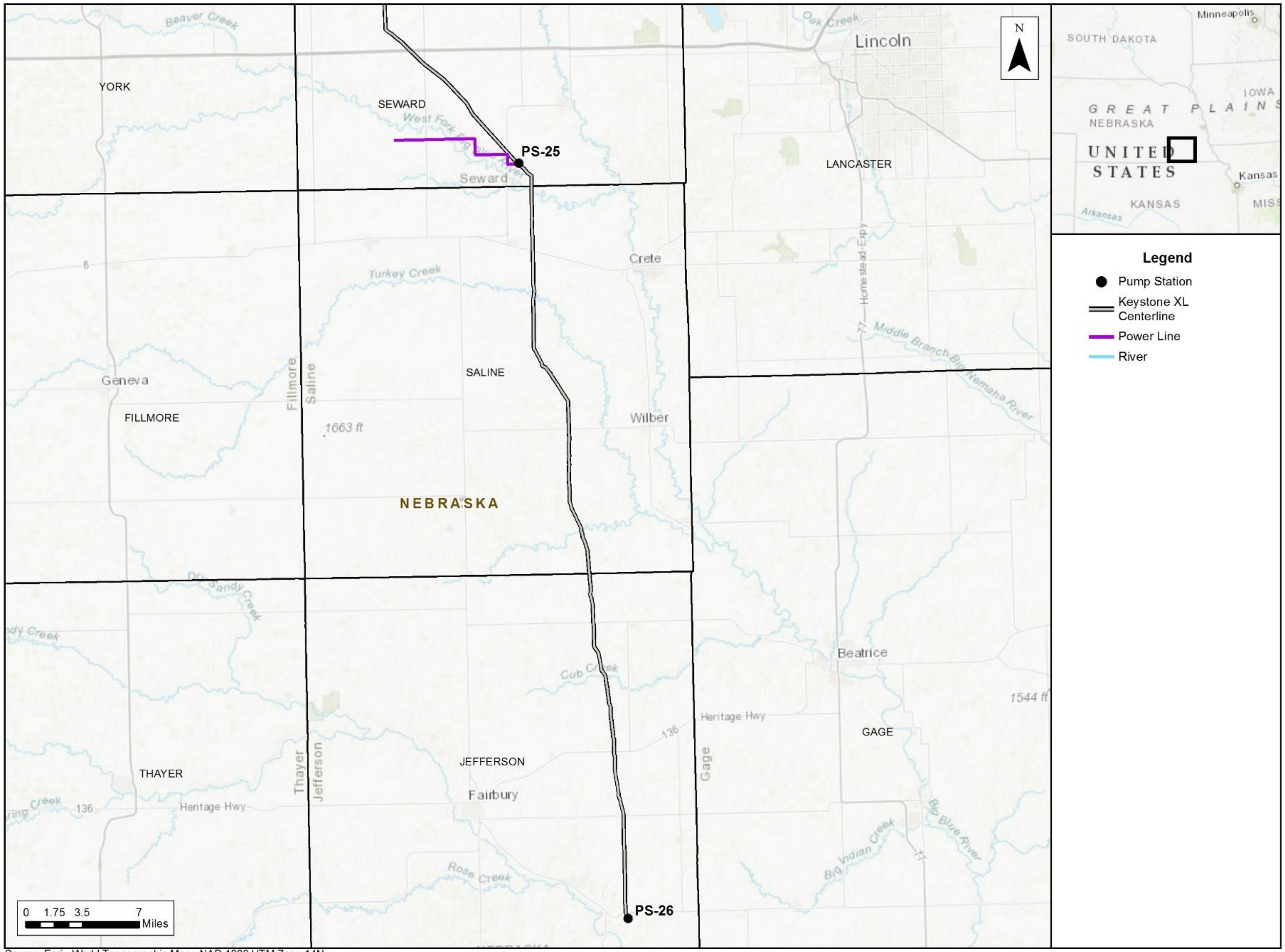
Source: Esri - World Topographic Map; NAD 1983 UTM Zone 14N

Figure 6-3a. Project and Power Lines Overview (Nebraska, PS-22 – PS-23)



Source: Esri - World Topoographic Map; NAD 1983 UTM Zone 14N

Figure 6-3b. Project and Power Lines Overview (Nebraska, PS-23B – PS-24)



Source: Esri - World Topoographic Map; NAD 1983 UTM Zone 14N

Figure 6-3c. Project and Power Lines Overview (Nebraska, PS-25 – PS-26)

6.3.1 Transmission and Distribution Line Design

The power providers specified in Table 6-1 have worked to site each transmission or distribution line to be the shortest, most efficient line that avoids environmentally sensitive areas and minimizes associated impacts. Section 6.3.7 provides a description of the transmission or distribution lines associated with each proposed pump station. Minor modifications to each power line may occur during final siting and structure (pole) placement to better avoid or minimize impacts on resources (e.g., sage-grouse leks, wetlands, floodplains). Transmission and distribution lines would be constructed consistent with national electric safety code standards and, as appropriate, the Avian Power Line Interaction Committee's (APLIC) guidance, such as that described in *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (APLIC 2006) and *Reducing Avian Collisions with Power Lines: The State of the Art in 2012* (APLIC 2012). Additional minor changes to design and routing may result through coordination with the appropriate local, state, and federal agencies pursuant to local zoning and other laws such as the NHPA of 1966 and the ESA of 1973. Changes to transmission or distribution line siting could require additional NEPA **and/or NHPA** analysis by permitting agencies. The subsequent environmental reviews could tier to this SEIS or incorporate its information as appropriate.

All power lines would be constructed and operated in accordance with National Electrical Safety Code standards with respect to worker safety, ground clearance, clearance to crossing utilities, clearance to buildings, material strength, and ROW width.

6.3.2 Right-of-Way Acquisition

Individual utilities would seek to acquire the necessary ROW to allow for the construction and operation of the proposed transmission or distribution lines necessary to power the pump station(s). They would negotiate with individual landowners and managers to acquire lands or easements for each line and substation, as necessary. ROW width may vary among power providers but would not exceed 100 feet in width, with some 100 feet, 80 feet, 50 feet and 30 feet wide, depending on adjacency to other ROWs, such as roads, and specific construction and reliability requirements. All of the ROW widths are permanent and necessary for operation and maintenance of the power line.

When a power line ROW abuts another ROW (e.g., road), the width would be smaller, such as 30 feet wide with the pole placement closer to the other ROW, thus reducing the total amount of land involved. However, it is not currently known where those adjacent ROWs, if any, would occur for each line; therefore, for impact assessment calculations, it is assumed that none of the ROWs would be adjacent to others. Using this assumption results in a more conservative assessment of impacts in comparison to using smaller ROW widths. As a result, impact calculations presented in this chapter are likely greater than they would actually be during construction and operation activities.

6.3.3 Substation Construction

Most proposed transmission and/or distribution lines would originate at existing substations (including switching yards), thereby minimizing the overall effects to the landscape. For some substations, additional transformers or other equipment may be necessary to meet required standards. However, for the majority of existing substations, any addition of equipment would occur within the current graveled and fenced substation footprint. Several substations may require small expansions to site the necessary equipment to support the new power lines. Expansion would include increasing the overall substation footprint, clearing and graveling the expansion area, extending fencing and installing water management measures to allow for the proper drainage of the site. For the purposes of analysis, it is assumed that the expansion of an existing substation would be approximately 4 acres in size**, unless more detailed information is available for a particular substation**.

New substations may be required for several power lines, as described below. This would potentially include purchasing land and clearing, grading and leveling, fencing, and graveling the site. For the purposes of this analysis, it is assumed that a new substation would require 8 acres of land, whereas a switching station would require 4 acres**, unless more detailed information is available for a particular substation**. Water management devices for proper drainage would also be installed. Section 6.3.9 provides additional site-specific detail for each pump station and associated line and any substation construction or modifications necessary. Table 6-2 provides a list of the specific tasks, equipment and level of effort likely required for new substation construction. All construction would occur during daylight hours. Although a single substation could be built in as little as 3 months, it is assumed that any substation construction could be concurrent with the construction of the associated power line, and would likely result in completion over a 9- to-12 month period. Seasonal restrictions could be observed for certain protected species**, as applicable, which may increase the time required for construction**.

In addition, each proposed Project pump station would contain a small substation entirely within the pump station footprint. Each of these substations (except PS-11) would be privately owned and operated and would affect less than 0.5 acre. Since the potential impacts of the pump stations are already considered in Chapters 2 and 4 of the 2014 Keystone XL Final SEIS, these small private substations are not considered further in this chapter. However, the substation at PS-11 is discussed below because it would be constructed and operated by WAPA.

Table 6-2. Summary of Equipment and Personnel for Substation Construction

Task	Approximate Number of Construction Personnel	Typical Equipment	Estimated Duration
	4 to 6	Graders, dump trucks, pickups, hand tools	2 weeks
Concrete Foundations	6 to 8	Excavators, concrete trucks, skid steer	3 weeks
	6 to 8	Cranes, boom trucks, pickups	3 weeks
Wiring and Buswork	4 to 6	Pickups	3 weeks
	4	Pickups	1 week
Cleanup	4	Pickups, dump trucks, flatbed trucks	Ongoing during construction

6.3.4 Transmission Line Construction Activities

Transmission line **(higher than 69 kV)** construction **by the power suppliers identified in Table 6-1 would proceed** in several steps, starting with engineering surveys and investigations and ending with reclamation and closeout. These engineering surveys, such as geotechnical borings, would provide detailed information for structure location and foundation design. Additional natural and cultural resource surveys may be necessary to site structures in a way that reduces impacts. See Table 6-3 for a list of the specific tasks, equipment and level of effort likely required. All construction would occur during daylight hours. Although a single line could be built in a little as 8 months, construction of multiple lines could be concurrent, and would likely result in completion of all lines over a 9- to-12 month period. However, seasonal restrictions could be observed for certain protected species**, as applicable, which may increase the time required for construction**. **For example, the transmission lines to PS-09 and PS-10 would be built over 2 years to avoid sage-grouse, leks, and big game migration periods. These timing restrictions would not preclude construction activities; and would not negatively impact overall construction of transmission lines.**

Clearing the ROW in preparation for construction would consist of mowing, crop removal and limited tree and shrub removal. Since the topography varies among the 19 proposed power lines, the amount of land clearing would be specific to each line, as described in Section 6.3.7. Construction crews would use mowers and other equipment, such as chainsaws and chippers, as necessary. Given the open nature of the landscape, it is expected that almost all clearing would be limited to the proposed structure (pole) location. Any other ROW clearing would be limited to the creation of temporary work areas, pulling sites and the removal of any tall-growing vegetation (typically greater than 10 feet high) that could potentially cause risks to the line's overall reliability. In some areas, localized grading could be required if there is a slope or uneven ground.

Table 6-3. Summary of Equipment and Personnel for Transmission Line Construction

Task[a]	Approximate Number of Construction Personnel	Typical Equipment	Estimated Duration[b]
Site Clearing	3	Pickups, ATVs, hand tools	2 weeks
Transmission Line Structure Assembly	6 to 8	Pickups, cranes, material trucks	2 months
Structure Hole Excavation	2 to 3	Rotary drill rigs, backhoes, pickups, ATVs, portable compressors	2 months
Concrete Foundations (if necessary)	5	Excavators, concrete trucks, skid steer	1 to 2 months
Transmission Structure Erection	6 to 8	Cranes, boom trucks, pickups	2 months
Ground Wire and Constructor Stringing	10 to 14	Pickups, lifts, boom trucks, tensioning machines, reel trailers	1 to 2 months

[a] This table is meant to describe general number of personnel, types of equipment and task duration for a generic project. The proposed power infrastructure would be constructed within a year**, with the exception of the power lines to PS-09 and PS-10**.
[b] Durations would vary based on miles of transmission line.
ATV = All-terrain vehicle

All the necessary material and hardware would be transported and stored at either developed areas, such as power provider equipment yards, or within the ROW prior to installation. No staging areas would be developed in undisturbed, non-ROW areas.

The utility pole structures that would permanently remain on the landscape would occupy only a small fraction of the ROW, typically on the order of 0.0001 percent to 0.01 percent of the ROW, depending on the number of structures and type of structures used. The types of structures **that would likely be used** to support the proposed power lines are typically buried only 8 to 12 feet deep and without foundations. Each single wood or steel pole structure would require excavating or augering a hole approximately 8 feet to 12 feet deep and 2 feet to 4 feet in diameter. Laminate (square) wood dead-end poles could also be used in places where round poles are inappropriate. Once the pole is set in the hole, the excavated soil would be used for backfill and tamped down. Any remaining soil would be banked against the pole to shed water and discourage pooling or would be used in site reclamation activities. The expected temporary construction area around each structure location (including equipment usage, excavation, soil storage, etc.) would be approximately 50 feet by 150 feet (0.2 acre). The use of wooden H-frame structures would require two holes per location. Once the hole is excavated, a crane or similar machine would lift the structure and position it into the hole. Figure 6-4 shows examples of wooden H-frame and monopole structures. Structures would typically reach approximately 60 to 110 feet high. Taller structures could be used as necessary for crossing wide ravines**,** rivers**, or other sensitive areas**.

Although the power providers would seek to avoid siting in wetlands and floodplains, there could be instances where siting in these areas is unavoidable. In these situations, steel caissons (hollow tubes) would be first driven into the ground, and the material inside the tube would be dredged and drained to create space for installing the transmission pole. This approach may require longer poles for those that are in wetland or shallow ground water areas. Fill material would be used to set the pole within the caisson. Access and the installation of poles would be conducted in compliance with any federal or state permit requirements. Access to wetlands could be across timber mats or similar products. Alternatively, access could be limited to frozen conditions. Silt fencing would be installed to reduce erosion or sediment transport in these areas. **The local power providers would be responsible for implementing the committed conservation measures outlined in this chapter and included in Table 8-5.**

The distance between each transmission structure would be approximately 350 feet to 450 feet. For estimating the number of structures per mile, a standard 400-foot separation was used to estimate a rate of 14 structures per mile for 115-kV lines, although this number was adjusted in some cases for specific power lines.

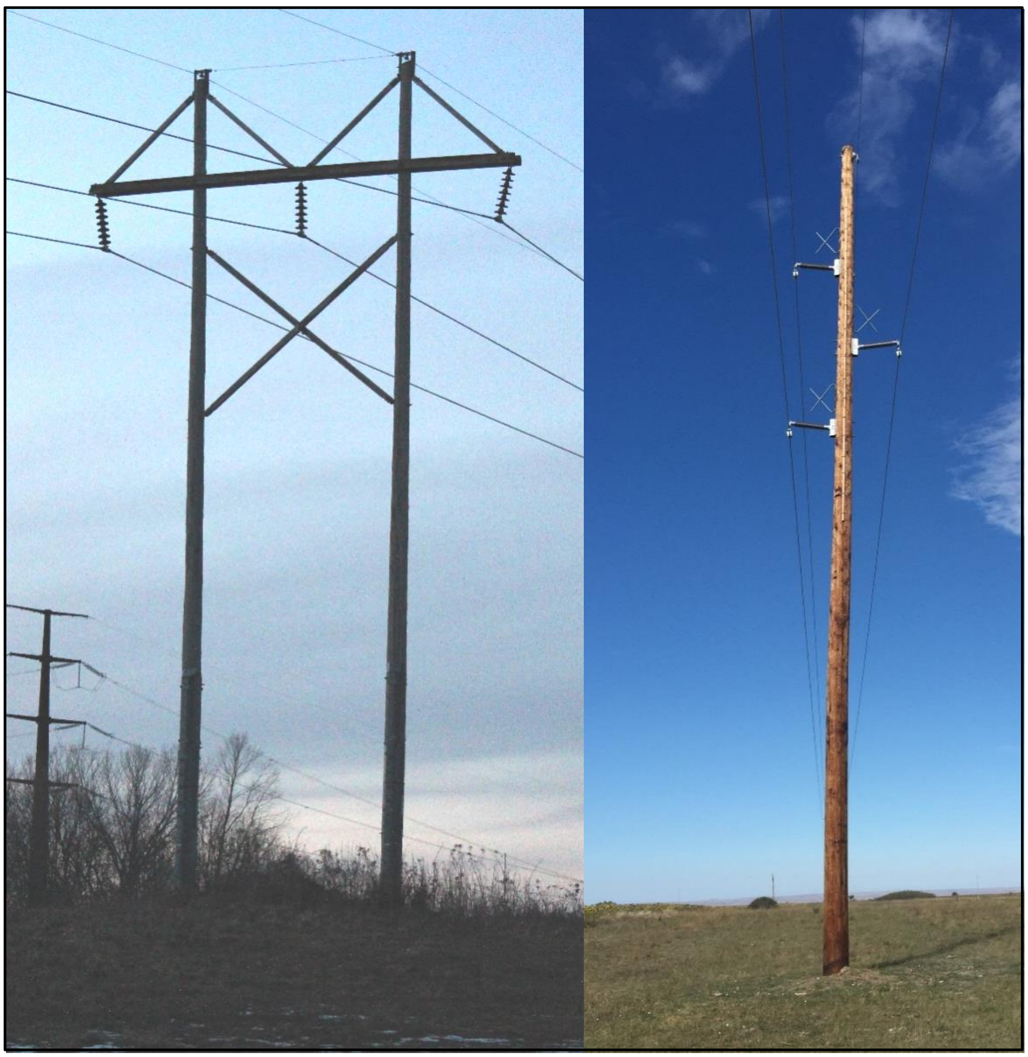


Figure 6-4. Examples of 115-kV H-frame Transmission Structures (left) and Monopoles (right)

6.3.5 Distribution Line Construction

Distribution line (69 kV and lower) construction **by the power suppliers identified in Table 6-1** would be conducted in a similar manner as the transmission line construction described in Section 6.3.4. The installation of a**n approximately 25**-foot to **4**5-foot-long wood pole would occur approximately every 250 feet, resulting in the need for approximately 2**1** wood poles per mile. Taller structures could be used as necessary when warranted by environmental conditions.

As described in Section 6.3.4, the construction of the distribution lines would include the need to clear the ROW, primarily where the poles would be installed, and to clear or limb any tall-growing vegetation in or near the ROW that poses a reliability risk. All construction would occur during daylight hours. Although a single line could be built in a little as 8 months **or less**, construction of multiple lines could be concurrent, and would likely result in completion of all lines over a 9**-** to 12-month period. **However, seasonal restrictions could be observed for certain protected species, as applicable. The local power providers would be responsible for implementing the committed conservation measures outlined in this chapter and included in Table 8-5.**

6.3.6 Transmission and Distribution Line Operation and Maintenance

Each of the transmission and distribution lines would be visually inspected by air, on foot, or by vehicle on a permanent road on an annual or semi-annual basis, depending on the policies of the individual power providers. Given the nature of the landscape, it is unlikely that vegetation management would be necessary beyond limited tree and shrub removal or limbing to maintain reliability. No herbicides would be sprayed along the ROW, although individual stump application may occur for certain tree species. **During the operational phase of the power infrastructure, small-scale isolated surface disturbance could occur from maintenance traffic and incidental repairs. Activities associated with maintenance or repair activities would be similar to those described for construction. Scheduled maintenance and repair activities would utilize best management practices and mitigation measures, as discussed below. Emergency repairs may be completed at any time and may use any equipment necessary to complete the repair. Any effects from emergency repairs would be temporary and the responsible party would restore areas if conditions require restoration efforts. The majority of effects from emergency repairs, if any, would result from the need to obtain access to structures.**

6.3.7 Access Roads, Temporary Work Areas, and Pulling Sites

Construction access along the different power lines would be primarily limited to existing access roads, local roads and the ROW. Existing roads may be modified as necessary to allow for the safe transport of equipment and workers. Any modifications would likely be limited to leveling and grading the existing roads and re-graveling them as necessary.

Temporary work areas would be primarily limited to either within the ROW or in pre-disturbed sites. No new, undisturbed sites would be affected by temporary work areas or staging areas.

Stringing methods are similar for transmission lines and distribution lines. Pulling and tensioning sites would be necessary to string the conductors from structure to structure and make sure each conductor is set to the correct tension. Pulling equipment would operate at one end of the conductors, while tensioning equipment would be used at the other end. All pulling and tension sites would be temporary, approximately 1 acre in size, and would occur primarily within the ROW. Some mowing, clearing and leveling may be necessary to create safe pulling sites. However, upon completion of stringing the conductor, all pulling and tensioning sites would be restored.

No off-ROW access roads have been identified for the power lines at this time **except for the power line to PS-13**. Power line access roads, laydown areas, and pulling and tensioning areas would be completed within the ROW to the extent practicable. Any additional areas disturbed **by the local power providers** outside of the ROW would be subject to additional environmental review. **At a minimum, construction of new permanent access roads and temporary work areas, including laydown areas and pulling and tensioning areas, would require completion of cultural resources and biological surveys, consultations and approvals of the appropriate SHPO and USFWS office. Keystone would comply with all federal, state, and local requirements prior to construction. In the future, newly created access road maintenance would be the responsibility of Keystone.**

6.3.8 Best Management Practices and Mitigation Measures

Keystone**, WAPA,** and **the** power providers would incorporate a number of best management practices and mitigation measures to limit the extent of any associated impacts of the construction and operation activities described above. A summary of these measures is provided in Chapter 8, Summary of Consequences. **Power providers have agreed to certain commitments through the ESA Section 7 consultation process as well (see Chapter 8, Summary of Consequences).** Additional measures could be included as a result of any necessary consultation or permitting with local, state or federal agencies. For example, WAPA follows a set of standard construction and mitigation practices (Appendix B, Western Area Power Administration Standard Construction and Mitigation Practices); these practices would be mandatory on portions of the power infrastructure involving WAPA, whereas similar practices for the proposed non-WAPA infrastructure would be finalized at a later date. Furthermore, BLM requires each project that crosses BLM-managed lands submit a BLM-Specific Construction, Mitigation, and Reclamation Plan. **Implementation of the proposed Project would comply with BLM Washington Office Instruction Memorandum 2018-093 on Compensatory Mitigation.**

6.3.9 Pump Station-Specific Power Infrastructure

As stated above, there are 19 new transmission and distribution lines proposed in Montana, South Dakota, and Nebraska to provide power to the pump stations required for the proposed Project. Some of these lines require expansion of existing substations or construction of new substations. Each proposed transmission or distribution line is described below according to its associated pump station (see Figures 6-1a–b, 6-2a–c, and 6-3a–c and Table 6-1). Note that pump station numbers begin at 09 because the first eight pump stations for this pipeline are located in Canada and are not part of this assessment.

6.3.9.1 PS-09

Big Flat Electric Cooperative propose**s** to construct and operate a**n approximately** 61-mile, 115-kV transmission line beginning at WAPA's proposed Bowdoin Substation and ending at PS-09. The proposed transmission line would be located in Philips County, Montana, **and** would cross 30.4 miles of BLM-managed lands. The cooperative would secure an 80- **to 100-**foot-wide permanent ROW**, depending on structure type**. On **all BLM-managed and** non-BLM**-managed** lands, all access and construction would occur on the 80**- to 100-**foot permanent ROW. For the purposes of this impact analysis, the Department uses a ROW width of 100 feet along the entire line, resulting in a construction ROW area of **approximately** 744 acres.

The total permanent ROW would be **approximately** 595.4 acres, with about 294.8 acres of that on BLM-managed lands. The temporary ROW on BLM-managed lands would add approximately 74 acres.

The proposed 5.8-acre Bowdoin Substation would be built on an 8-acre parcel of BLM-managed land along WAPA's existing Fort Peck to Malta 161-kV transmission line.

The transmission line would have three conductors and an overhead static wire. Based on the assumption of a transmission structure every 400 feet, the proposed line would require approximately 8**52 structures**. Approximately 4**25** structures would be installed on BLM-managed lands. The cooperative would use various pole types including treated wood monopoles and H-frames (approximately 60 feet to 80 feet tall). Each wood monopole or H-frame would be direct-buried and would not require a foundation.

Big Flat Electric Cooperative and the BLM are also discussing a route variant near the southern end of the proposed line. If built, this variant would result in a total length of approximately 64 miles from WAPA's proposed substation to PS-09 (approximately 33 miles on BLM-managed land), as well as an increase in ROW area. This variant would cross similar landscapes as the route analyzed below in Section 6.4, and differences in potential impacts between the two potential routes are expected to be nonexistent to negligible, depending on the resource. Additional environmental review may be necessary to fully evaluate this line after specific proposals are finalized. The BLM **may** identify **additional** mitigation **measures** at th**at** time.

6.3.9.2 PS-10

NorVal Electric Cooperative proposes to construct and operate a 48.**8**-mile-long, 115-kV transmission line originating at WAPA's Fort Peck Substation and ending at PS-10. The Fort Peck Substation would require an expansion to accommodate the **interconnection**. The expansion would occur on USACE lands **and would** requir**e its** authorization. **T**he expansion would be **no more than** approximately 3 acres in size. The area surrounding the existing substation has previously been highly disturbed. The proposed transmission line would be located in Valley County, Montana, and would cross 4.3 miles of BLM-managed lands. The cooperative would secure an 80-foot-wide permanent ROW. No additional temporary ROW would be necessary. All access and construction would occur on the permanent ROW. The total ROW would be 4**73.2** acres, with about 41.5 acres of ROW on BLM-managed lands.

The proposed transmission line would be installed on existing power line ROW across Fort Peck Dam and would then generally follow roads and trails to the pump station. The transmission line would have three conductors and an overhead static wire. Based on the assumption of a transmission structure every 250 feet, the proposed line would require approximately 1,036 poles. Approximately 101 structures would be installed on BLM-managed lands. The cooperative would use various pole types including treated wood monopoles and H-frames (approximately 60 feet to 80 feet tall). Each wood monopole or H-frame would be direct-buried and would not require a foundation. **Additional environmental review may be necessary to fully evaluate this line after specific proposals are finalized. The BLM may identify additional mitigation measures at that time.**

6.3.9.3 PS-11

NorVal Electric Cooperative proposes to construct and operate a 0.2-mile, **230**-kV distribution line to PS-11 from a proposed new WAPA substation and switching station (Coal Hill Substation) constructed **together** within **an approximately 3-acre site somewhere within an 8-acre parcel**, all located in McCone County, Montana. The cooperative has also proposed 2.6 acres of additional temporary work **area** adjacent to the proposed substation. The new substation would be constructed adjacent to WAPA's Fort Peck-Dawson County 230-kV transmission line. Construction of both the substation and switching station would require leveling and grading the site, adding appropriate measures for proper site drainage, graveling and fencing the area, and installing the necessary transformers and other equipment.

The 0.2-mile transmission line would be built within an 80-foot-wide ROW acquired by the cooperative. The area of the ROW would be approximately 1.9 acres. Based on the assumption of a transmission structure every 400 feet, the proposed line would require approximately three **structures**. The cooperative would likely use steel **lattice tower structures** (approximately 85 feet to 110 feet tall).

Other than the proposed additional temporary work area, the area potentially affected by construction and/or operation of this power infrastructure lies within the area potentially affected by the construction of PS-11, as discussed in Chapters 2 and 4 of the 2014 Keystone XL Final SEIS.

6.3.9.4 PS-12

McCone Electric Cooperative proposes to construct and operate a 4.6-mile, 115-kV transmission line from WAPA's Circle Substation to PS-12, all located in McCone County, Montana. WAPA would perform minimal commissioning work inside the existing Circle Substation to accommodate the interconnection.

The 4.6-mile transmission line would be built within an 80-foot-wide ROW acquired by the cooperative. The area of the ROW would be approximately 44.4 acres. Based on the assumption of a transmission structure every 400 feet, the proposed line would require approximately 66 poles. The cooperative would use various pole types including wood and steel monopoles (approximately 85 feet to 110 feet tall) and wood H-frames (approximately 65 feet to 105 feet tall). Each wood monopole or H-frame would be direct-buried and would not require a foundation.

6.3.9.5 PS-13

Tongue River Electric Cooperative proposes to construct and operate a 15.7-mile, 115-kV transmission line from WAPA's O'Fallon Substation in Prairie County, Montana, to PS-13 of the proposed Project. To accommodate the transmission line, WAPA would need to expand the O'Fallon Substation on lands currently owned by WAPA. The expansion would occupy **approximately 1.3** acres. The 15.7-mile transmission line would be built within an 80-foot-wide ROW acquired by the cooperative. The area of the ROW would be approximately 152.4 acres.

Based on the assumption of a transmission structure every 400 feet, the proposed line would require approximately 135 poles. The cooperative would use various pole types including wood monopoles (approximately 85 feet to 110 feet tall), wood H-frames (approximately 65 feet to 105 feet tall), and laminate dead-end structures (approximately 90 feet to 110 feet tall). Each wood monopole or H-frame would be **direct-buried and would not** require a foundation. The dead-end structures would be reinforced and anchored with guy wires.

6.3.9.6 PS-14

Montana-Dakotas Utility proposes to construct and operate a 6.9-mile, 115-kV transmission line **tapping** an existing **transmission line** and ending at PS-14, all located in Fallon County, Montana. The transmission line would be built within a 50-foot-wide ROW. The area of the ROW would be approximately 41.6 acres.

The utility would primarily use wood monopoles approximately 85 feet to 110 feet tall. Each wood monopole would be direct-buried and would not require a foundation. Based on the assumption of a transmission structure every 400 feet, the proposed line would require approximately 82 poles.

6.3.9.7 PS-15

Grand Electric Cooperative proposes to construct and operate a 24.7-mile, 115-kV transmission line extending from the Harding Substation to PS-15, all located in Harding County, South Dakota. The cooperative would seek financial assistance from RUS for the construction of the line. While no information regarding potential substation construction or expansion is currently available, it is assumed that a 4-acre expansion of the existing substation would be required.

The 24.7-mile transmission line would be built within a 50-foot-wide ROW acquired by the cooperative. The area of the ROW would be approximately 149.**6** acres. Based on the assumption of a transmission structure every 400 feet, the proposed line would require approximately 326 poles. The cooperative would use various pole types including wood and steel monopoles (approximately 85 feet to 110 feet tall) and wood H-frames (approximately 65 feet to 105 feet tall). Each wood monopole or H-frame would be **direct-buried and would not** require a foundation.

6.3.9.8 PS-16

Grand Electric Cooperative proposes to construct and operate a 41.9-mile, 115-kV transmission line extending from the Buffalo Substation in Perkins County, South Dakota, to PS-16 in Harding County, South Dakota. The cooperative would seek assistance from RUS for the construction of the line. While no information regarding potential substation construction or expansion is currently available, it is assumed that a 4-acre expansion of the existing substation would be required.

The 41.9-mile transmission line would be built within a 50-foot-wide ROW acquired by Grand Electric Cooperative. The area of the ROW would be approximately 253.**7** acres. Based on the assumption of a transmission structure every 400 feet, the proposed line would require approximately **553** poles. The cooperative would use various pole types including wood and steel monopoles (approximately 85 feet to 110 feet tall) and wood H-frames (approximately 65 feet to 105 feet tall). Each wood monopole or H-frame would be **direct-buried and would not** require a foundation. The proposed transmission line would cross 1.6 miles of the Custer Gallatin National Forest along highway 20. Grand Electric has already received a permit from the Forest Service for the crossing.

6.3.9.9 PS-17

Grand Electric Cooperative proposes to construct and operate a 10.9-mile, 115-kV transmission line in Meade County, South Dakota. The proposed line would extend from WAPA's Maurine Substation to a proposed new 8-acre substation adjacent to PS-17. The new substation would be constructed, owned and operated by Grand Electric Cooperative. WAPA would perform minimal commissioning work inside the existing Maurine Substation to accommodate the interconnection. The cooperative would seek assistance from RUS for the construction of the line.

The 10.9-mile transmission line would be built within a 50-foot-wide ROW acquired by the cooperative. The area of the ROW would be approximately 65.8 acres. The cooperative states that each 18-inch to 20-inch augured hole would be approximately 6 feet deep. Each pole would be installed 200 feet to 300 feet apart. Assuming an average of 250 feet between poles, 230 poles would be installed. The cooperative would use various pole types, but each pole would only extend 30 feet above ground level. Each wood monopole or H-frame would be **direct-buried and would not** require a foundation.

6.3.9.10 PS-18

West Central Electric Cooperative proposes to construct and operate a 26-mile, 115-kV transmission line extending from WAPA's Philip Substation to PS-18 of the proposed Project. WAPA would perform minimal commissioning work inside the existing Philip Substation to accommodate the interconnection. These facilities would be entirely within Haakon County, South Dakota. The cooperative would seek assistance from RUS for the construction of the line.

The 26-mile transmission line would be built within a 50-foot-wide ROW acquired by the cooperative. The area of the ROW would be approximately 157.**2** acres. Based on the assumption of a transmission structure every 400 feet, the proposed line would require approximately 3**2**0 poles. The cooperative would use various pole types including wood and steel monopoles and wood H-frames, each approximately 60 feet tall. Each wood monopole or H-frame would be **direct-buried and would not** require a foundation.

6.3.9.11 PS-19

West Central Electric Cooperative proposes to construct and operate a 20.5-mile, 115-kV transmission line extending from WAPA's Midland Substation in Jones County, South Dakota, to PS-19 in Haakon County, South Dakota. The Midland Substation would require a small yard expansion (estimated 1 acre), which would occur on property already owned by WAPA. This would require leveling and grading the site, adding appropriate measures for proper site drainage, graveling and fencing the expansion and siting additional equipment within the expansion. The cooperative would seek assistance from RUS for the construction of the line.

The 20.5-mile transmission line would be built within a 50-foot-wide ROW acquired by the cooperative. The area of the ROW would be approximately 124.**1** acres. Based on the assumption of a transmission structure every 400 feet, the proposed line would require approximately 2**19** poles. The cooperative would use various pole types including wood and steel monopoles and wood H-frames, each approximately 60 feet tall. Each wood monopole or H-frame would be **direct-buried and would not** require a foundation.

6.3.9.12 PS-20

Rosebud Electric Cooperative proposes to construct and operate a 17.2-mile, 115-kV transmission line extending from **its** Witten Substation and terminating at PS-20. The Witten Substation would likely need to be expanded to accommodate both the SVC and the new 115-kV delivery from PS-20. The expansion area has not been finalized but is assumed to total 4 acres. This would require leveling and grading the site, adding appropriate measures for proper site drainage, graveling and fencing the expansion and siting additional equipment within the expansion. These facilities would be entirely within Tripp County, South Dakota. The Cooperative would seek assistance from RUS for the construction of the line.

The 17.2-mile transmission line would be built within a 50-foot-wide ROW acquired by the cooperative. The area of the ROW would be approximately 104.5 acres. Based on the cooperative's assertion of a transmission structure every 250 feet to 300 feet, the proposed line would require approximately 36**4** poles. The cooperative would use various pole types including wood and steel monopoles and wood H-frames approximately 60 feet tall. Each wood monopole or H-frame would be **direct-buried and would not** require a foundation.

6.3.9.13 PS-21

Rosebud Electric Cooperative proposes to construct and operate a 20.5-mile, 115-kV transmission line extending from WAPA's Gregory Substation in Gregory County, South Dakota, to PS-21 in Tripp County, South Dakota. **The cooperative would seek assistance from RUS for the construction of the line.** WAPA has indicated that the substation would need to be rebuilt to accommodate the request. The Gregory Substation would be rebuilt on **an 8-acre parcel, potentially involving up to 6 acres of new ground disturbance**. The substation rebuild would require leveling and grading the site, adding appropriate measures for proper site drainage, graveling and fencing the area, and installing the necessary transformers and other equipment.

The 20.5-mile transmission line would be built within a 50-foot-wide ROW acquired by the cooperative. The area of the ROW would be approximately 124.5 acres. Based on the cooperative's assertion of a transmission structure every 250 feet to 300 feet, the proposed line would require approximately 43**4** poles. The cooperative would use various pole types including wood and steel monopoles and wood H-frames approximately 60 feet tall. Each wood monopole or H-frame would be **direct-buried and would not** require a foundation.

6.3.9.14 PS-22

NPPD and **Niobrara Valley Electric Membership Corporation** propose to construct a new 3.5-acre switching station, which would be named Eagle Creek, and a 2.5-mile-long, 115-kV transmission line. The switching station would interconnect with an existing 115-kV transmission line, and a new transmission line would extend from the new Eagle Creek facility to PS-22. These facilities would all be sited in Holt County, Nebraska.

The 2.5-mile-long transmission line would be built within a **5**0-foot ROW. The area of the 2.5-mile-long ROW would be **15.4** acres. Given the location of the ROW adjacent to a county road, the actual width of new ROW **may** be less than **5**0 feet, as it would overlap with a portion of an existing road ROW. The utilities would use wood monopoles approximately 65 feet to 75 feet tall. **Based on the assumption of a structure every 250 feet, the transmission line would require about 54 wood pole structures.** Each wood monopole would be **direct-buried and would not** require a foundation.

6.3.9.15 PS-23

Elkhorn Public Power District (PPD) proposes to construct and operate a new 3-mile-long, 69-kV distribution line. The distribution line would extend from the NPPD Antelope substation to PS-23. These facilities would all be sited in Antelope County, Nebraska. No new substation or expansion would be necessary.

The 3-mile-long distribution line would be built within a 100-foot ROW. Assuming **the need for 21** wood poles per mile for a distribution line, the PPD would need to install approximately **65** poles. The area of the ROW would be 3**7.0** acres. Given the location of the ROW adjacent to a county road, the actual width of new ROW would be less than 100 feet, as it would overlap with a portion of the existing road ROW. The PPD would use wood monopoles approximately 65 feet to 75 feet tall. Each wood monopole would be **direct-buried and would not** require a foundation.

6.3.9.16 PS-23B

For MAR PS-23B, Cornhusker PPD proposes a route that would be approximately 3.4 miles long, requiring 40.8 acres of ROW within Platte County, Nebraska.

This distribution line would be 34.5 kV and would originate at an existing 34.5-kV line. This line would be constructed using the same materials as described above**. Assuming the need for 21 wood poles per mile for a distribution line, this line** would require approximately **69** wood poles. No new substation or expansion would be necessary.

6.3.9.17 PS-24

Butler PPD proposes to construct and operate a new 1-mile-long, 69-kV distribution line. The distribution line would extend from an existing 69-kV line and end at PS-24. These facilities would all be sited in Butler County, Nebraska. No new substation or expansion would be necessary.

The 1-mile-long distribution line would be built within a 100-foot ROW. Assuming the need for 2**1** wood poles per mile for a distribution line, the PPD would need to install approximately 2**1 or 22** poles. The area of the ROW would be 12.4 acres. Given the location of the ROW adjacent to a county road, the actual width of new ROW would be less than 100 feet, as it would overlap with a portion of the existing road ROW. The PPD would use wood monopoles approximately 65 feet to 75 feet tall. Each wood monopole would be **direct-buried and would not** require a foundation.

6.3.9.18 PS-25

Norris PPD proposes to construct and operate a new 9.3-mile-long, 69-kV distribution line. The distribution line would extend from an existing 69-kV line to PS-25. These facilities would all be sited in Seward County, Nebraska. No new substation or expansion would be necessary.

The 9.3-mile-long distribution line would be built within a 100-foot ROW. Assuming the need for 2**1** wood poles per mile for a distribution line, the PPD would need to install approximately 1**97** poles. The area of the ROW would be 112.2 acres. Given the location of the ROW adjacent to a county road, the actual width of new ROW would be less than 100 feet, as it would overlap with a portion of the existing road ROW. The PPD would use wood monopoles approximately 65 feet to 75 feet tall. Each wood monopole would be **direct-buried and would not** require a foundation.

6.3.9.19 PS-26

NPPD and Norris PPD propose to construct and operate a new 0.1-mile-long, 115-kV transmission line. The transmission line would extend from an existing 115-kV transmission line to PS-26. These facilities would all be sited in Jefferson County, Nebraska. No new substation or expansion would be necessary.

The 0.1-mile-long transmission line would be built within a 100-foot ROW. The PPDs have proposed the need for three poles. The area of the ROW would be 1.3 acres. The PPD would use wood or steel monopoles and a laminate dead-end structure, each approximately 65 feet to 75 feet tall. Each **structure** would be **direct-buried and would not** require a foundation. One **structure** would be guyed.

6.4 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section describes the existing resources and the potential impacts that could result from the construction, operation and maintenance of the proposed power infrastructure required for the Proposed Action. Cumulative impacts are described in Chapter 7, Cumulative Impacts.

This section analyzes the following environmental resource areas and factors for potential impacts: soils, water resources, wetlands, terrestrial vegetation, wildlife, protected and special status species, land use and recreation, visual resources, socioeconomics and environmental justice, cultural resources, noise, and electric and magnetic fields (commonly referred to as EMF). Measures identified to avoid, minimize or mitigate adverse impacts are noted for each resource area **and are summarized in Table 8-5**.

The same classifications outlined in Section 4.1.1 are used in this chapter to rate potential impacts.

Impacts on the following resources as a result of the construction and operation of electrical power infrastructure would be negligible, and are not carried forward for detailed analysis in this section:

- Geology: The Proposed Action to install aboveground power infrastructure would have negligible impacts on geological resources; therefore, impacts on geological resources are not analyzed in detail in this section. Any impacts associated with geotechnical testing and foundation installation would be localized and limited to potential structure locations.
- Fisheries: Although the proposed transmission and distribution lines would cross a number of waterways, no instream activities are proposed. **R**efueling or servicing of all equipment with diesel fuel, gasoline, lubricating oils, grease and hydraulic and other fluids **would not occur** within 100 feet of perennial streams or wetlands. Impacts on water quality would be negligible because erosion and sedimentation controls would be installed during construction of the proposed power infrastructure. Therefore, it is unlikely that the proposed power infrastructure would affect fisheries.
- Air Quality: The Proposed Action would cause localized intermittent and temporary emissions of fugitive dust and other pollutants associated with land disturbance and fossil-fueled construction equipment during construction of the aboveground power infrastructure. Dust-related impacts on air quality would be less than those described for construction of the proposed pipeline in Section 4.12.3.1 of the 2014 Keystone XL Final SEIS, and would be negligible. Ozone associated with corona during operation of the power lines is discussed in Section 6.4.12.
- Potential Releases: Possible impacts from potential releases associated with power infrastructure are adequately covered in the 2014 Keystone XL Final SEIS; therefore, impacts associated with potential releases are not addressed in this section. Potential sources for releases of oil or refined oil products during construction and/or operational phases of the power infrastructure include fuel storage tanks, transformers, hydraulic and lubricating oil storage, and construction equipment and vehicles (Section 3.13.6.3 of the 2014 Keystone XL Final SEIS). The potential impact of a release from one of these sources would be much less than from the proposed pipeline construction and operation activities, and the response would generally be immediate because of the presence of staff during construction and operation activities involving potential releases (Section 4.13.7.2 of the 2014 Keystone XL Final SEIS).

6.4.1 Soils

The soil conditions in the general vicinity of the proposed Project area and the nature of potential impacts on this resource from the proposed Project are described in Sections 3.3 and 4.3 of this document as well as in Sections 3.2 and 4.2 of the 2014 Keystone XL Final SEIS. This section describes soil conditions of the proposed power line routes and assesses the environmental impacts from the construction and operation of the proposed power lines and associated infrastructure.

6.4.1.1 Affected Environment

The proposed power lines would cross a subset of the Major Land Resource Areas crossed by the proposed pipeline. The Pierre Shale Plains in western South Dakota and the Nebraska and Kansas Loess-Drift Hills in southeastern Nebraska would each be crossed by the pipeline but not by the power lines. The only Major Land Resource Area crossed by the proposed power lines but not by the pipeline is the Pierre Shale Plains, Northern Part, which lies within the Western Great Plains Range and Irrigated Region and which would be crossed by the line to PS-14. This portion of the landscape is heavily exploited for oil and gas extraction. In undeveloped areas, this landscape exhibits long smooth slopes, with moderately steep slopes along streams and drainages. Its dominant soil orders include Alfisols, Entisols and Vertisols.

6.4.1.2 Environmental Consequences

Overall, the impacts on soils resulting from construction of power lines and associated infrastructure would be negligible to minor and the impacts resulting from operations and maintenance would be negligible. In general, the power lines would be constructed in the vicinity of the proposed pipeline route or in similar landscapes; as such, the same soil conditions discussed in Sections 3.3 and 4.3 and in Sections 3.2 and 4.2 of the 2014 Keystone XL Final SEIS are expected to be encountered along the power line routes. In some areas along power line routes, soils may be sensitive to impacts. For example, soils rich in clay, as well as certain hydric soils, are vulnerable to rutting and compaction. Highly erodible soils and prime farmland soils are significant features in this region.

The main soil impacts associated with construction activities would be accelerated soil erosion and soil compaction. Operation of power lines and associated infrastructure would have no effect on soils except when inspections and maintenance activities occur outside of permanent roads and gravel pads; during such activities, potential impacts would be similar to those of construction, but of a lesser extent.

Temporary impacts from construction would occur at substation areas, pole excavations, pulling and tensioning areas, temporary workspaces and along access roads. The sizes and locations of these areas are not yet known, but**, with the exception of the access road for the power line to PS-13,** they would all be contained within the ROW and footprints of associated facilities. Therefore, for the purposes of this analysis, the extent of potential temporary impacts is conservatively assumed to be the entire ROW and footprints of associated facilities**, plus the access road for the PS-13 power line**, although the actual extent of disturbed soil areas would be less than this. The extent of permanent impacts would be much smaller, and would be limited to the land area occupied by poles and the areas used for permanent substations and similar facilities.

Considering that power pole placement by direct embedment would require only small (25 to 150 cubic feet) excavations and no foundations, the impact of pole installation on soils would be minimal. New substations and expansions of existing substations would disturb approximately **39** acres of soil, approximately **1** percent of the total ROW area. Furthermore, much of the proposed construction would occur in previously disturbed areas.

Portions of the proposed power line ROW would pass over prime farmland soil. The existing structure of prime farmland soil may be degraded by construction. Grading and equipment traffic could compact soil, reducing porosity and percolation rates, which can result in increased runoff potential.

Mitigation measures designed to minimize the impact of the proposed activities on soils and other resources are summarized in Chapter 8, Summary of Consequences. To minimize soil impacts, for example, work would be restricted during wet conditions to minimize rutting; compaction would be relieved by disking, chiseling or ripping; stones would be removed; topsoil or soil amendments may be added; and industry standard soil erosion and sedimentation controls would be used. Additional measures could also be included as a result of any necessary consultation or permitting with local, county or state agencies.

6.4.2 Water Resources

This section builds on the description and analyses provided in Sections 3.3 and 4.3 of the 2014 Keystone XL Final SEIS and Sections 3.6 and 4.6 of this document. Descriptions of the water resources that would be crossed by transmission and distribution lines are included below, and an assessment of the potential environmental impacts on water resources from the construction and operation of the power lines follows. Water resources described and assessed in this section include surface water, floodplains, groundwater and wild and scenic rivers. Wetlands are addressed in Section 6.4.3.

6.4.2.1 Affected Environment

Surface Water

The proposed electrical transmission and distribution lines would cross **waterbodies** 2**4**7 **times** in Montana, 3**07 times** in South Dakota**,** and 33 **times** in Nebraska. Table 6-4 provides a breakdown of the waterbody crossings using data from the National Hydrography Dataset (**USGS 2018b**, 2018c, 2018d). The transmission and distribution lines would cross a number of intermittent and perennial streams, canals and/or ditches, and other waterbody types.

Waterbody types that would be crossed by electrical transmission and distribution lines are described as follows according to USGS (2001, 2013):

- Perennial—waterbody that contains water in its channel at all times;
- Intermittent—waterbody that flows only when it receives water from rainfall, snow melt, or some other surface source;
- Artificial paths—used to complete a stream network where there is no obvious channel;
- Canal/ditch—artificial waters connecting two or more bodies or water or used for irrigation or water drainage; and
- Lake/pond—natural body of inland water.

Table 6-4. Summary of Waterbodies Crossed by Proposed Power Lines

	Number of Crossings[a]	Total Length Crossed in ROW (Miles)
Montana	**247**	**7.56**
PS-09	*155*	*5.09*
Artificial Path	9	0.19
Canal/Ditch	7	0.14
Lake/Pond: Intermittent	9	0.35
Lake/Pond: Perennial	4	0.06
Stream/River: Intermittent	126	4.35
PS-10	*47*	*1.26*
Artificial Path	2	0.06
Canal/Ditch	1	0.02
Lake/Pond: Intermittent	1	0.20
Lake/Pond: Perennial	0	0.00
Stream/River: Intermittent	42	0.96
Stream/River: Perennial	1	0.02
PS-12	*6*	*0.14*
Stream/River: Intermittent	6	0.14
PS-13	*29*	*0.93*
Canal/Ditch	6	0.35
Stream/River: Intermittent	23	0.58
PS-14	10	0.14
Stream/River: Intermittent	10	0.14
South Dakota	**307**	**5.37**
PS-15	*56*	*0.95*
Artificial Path	9	0.07
Lake/Pond: Intermittent	1	<0.01
Lake/Pond: Perennial	6	0.18
Stream/River: Intermittent	34	0.61
Stream/River: Perennial	6	0.09
PS-16	*67*	*1.24*
Artificial Path	9	0.11
Lake/Pond: Intermittent	7	0.22
Lake/Pond: Perennial	4	0.14
Stream/River: Intermittent	46	0.76
Stream/River: Perennial	1	0.01
PS-17	*13*	*0.15*
Stream/River: Intermittent	13	0.15
PS-18	*55*	*0.75*
Artificial Path	3	0.02
Lake/Pond: Perennial	2	0.02
Stream/River: Intermittent	49	0.67
Stream/River: Perennial	1	0.04
PS-19	*39*	*0.54*
Artificial Path	1	<0.01
Lake/Pond: Perennial	0	0.00
Stream/River: Intermittent	36	0.52
Stream/River: Perennial	2	0.02
PS-20	*13*	*0.29*
Artificial Path	1	<0.01
Lake/Pond: Perennial	0	0.00
Stream/River: Intermittent	12	0.29
PS-21	*64*	*1.44*
Stream/River: Intermittent	62	1.42
Stream/River: Perennial	2	0.02
Nebraska	**33**	**1.13**
PS-22	*2*	*0.04*
Stream/River: Intermittent	2	0.04
PS-23	*3*	*0.09*
Stream/River: Intermittent	3	0.09
PS-23B	*4*	*0.16*
Lake/Pond: Perennial	1	0.02
Stream/River: Intermittent	3	0.14
PS-25	*24*	*0.84*
Artificial Path	5	0.04
Lake/Pond: Perennial	0	0.00
Stream/River: Intermittent	19	0.80
Grand Total	**587**	**14.06**

[a] Lakes or ponds marked as "0" are within the ROW but would not be crossed directly by the line.
ROW = right-of-way

Floodplains

Floodplains in general, and specifically those near the proposed pipeline, are described in Section 3.3.4 of the 2014 Keystone XL Final SEIS and Section 3.6 of this document. This section describes floodplains that would be overlapped by proposed power lines and associated infrastructure.

As discussed in Section 3.3.4 of the 2014 Keystone XL Final SEIS, Executive Order 11988, Floodplain Management, states that actions by federal agencies are to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplain development wherever there is a practicable alternative. Since the 2014 Keystone XL Final SEIS was published, aspects of Executive Order 11988 have been updated with Executive Order 13690, which emphasizes ecosystem-based alternatives and long-term resilience and risk reduction when managing flood risks.

Floodplains mapped by FEMA as well as state-administered floodplains and unmapped floodplains are associated with many of streams and rivers addressed in the surface water section above. Many of the proposed power lines would be built in counties lacking FEMA floodplain maps; the exceptions are the lines to PS-11, PS-17, PS-23B, PS-24 and PS-26, and none of those would encounter FEMA-mapped floodplains. However, the existence of potential floodplains at certain other streams within the proposed power line routes was determined through inspection of satellite imagery.

Table 6-5 lists potential floodplains crossed by the proposed power lines. A discussion of the potential impacts on floodplains as a result of construction and operation of electrical power infrastructure is provided in Section 6.4.2.2.

Table 6-5. Potential Floodplains Crossed by the Proposed Power Lines

State	Pump Station	Waterbody Associated with Floodplain
Montana	PS-09	Beaver Creek
Montana	PS-09	Milk River
Montana	PS-09	Whitewater Creek
Montana	PS-10	Milk River
Montana	PS-10	Cherry Creek
Montana	PS-10	Buggy Creek
Montana	PS-12	Lone Tree Creek
Montana	PS-12	Buffalo Springs Creek
Montana	PS-13	Yellowstone River
Montana	PS-14	Pennel Creek
South Dakota	PS-15	Little Missouri River
South Dakota	PS-19	Bad River
Nebraska	PS-25	West Fork Big Blue River

Groundwater

Groundwater resources in the vicinity of the proposed Project and associated power infrastructure are described in Section 3.6 of this document and Section 3.3.2 of the 2014 Keystone XL Final SEIS. The proposed power infrastructure would also overlap three mapped aquifers that would not be encountered by the pipeline: PS-09 would overlap the Beaver Creek and Milk River Alluvium, PS-21 would overlap the Ponca Creek Alluvium and PS-25 would overlap the West Fork Big Blue River Alluvium. The depth to groundwater in these aquifers likely fluctuates seasonally, but is typically 7 to 26 feet, 6 to 35 feet and 6 to 15 feet, respectively (USGS 2019a, 2019b, 2019c). All of these are surficial aquifers in quaternary alluvial deposits of small rivers.

None of the proposed power lines would overlap a control zone for any wellhead protection area. However, the line to PS-13 would lie within the Fallon, Montana, wellhead protection area inventory zone and would approach as close as approximately 0.25 miles upgradient **of the control zone** (MDEQ 2004).

Wild and Scenic Rivers

There are no rivers designated as wild or scenic that would be crossed by the electrical power infrastructure that would serve the proposed Project; therefore, a corresponding section is not included in the environmental consequences section.

6.4.2.2 Environmental Consequences

This section describes the potential impacts on water resources from construction and operation of the electrical power infrastructure and substations described above. In general, construction impacts on water resources would be primarily short-term and/or negligible, as efforts would be made by power providers to span surface waters, and no poles or substations would be placed in surface waters. Although power providers would attempt to avoid wetlands and floodplains, some power poles could be sited in wetlands and floodplains, though substations would not. Efforts would be made to site the power lines parallel to existing ROWs. Potential impacts on groundwater would be avoided or minimized. During construction, power providers would follow mitigation measures outlined in Chapter 8, Summary of Consequences, to minimize impacts on water resources. After construction, power providers would restore affected lands in accordance with federal, state, and local standards as well as associated permits and private landowner requirements.

Surface Waters

Overall, the impacts on surface water resulting from construction and operation of power lines and associated infrastructure would be minor to negligible. As evaluated in Section 4.3.5.4 of the 2014 Keystone XL Final SEIS, potential impacts of crossings of surface water resources would be minimized by spanning them entirely. This could require taller transmission poles to span larger rivers. However, structures could be necessary in floodplains, especially floodplains that are wide. Transmission line construction would use a typical span length ranging from 250 to 450 feet, unless a taller structure is used to cross the waterbody. **Although no federal or state permits related to surface waters would be required,** county **and local** construction permitting agencies **may mandate** a buffer between the transmission line corridor and adjacent surface waters to minimize impacts on surface water features during initial construction and long-term operation, including maintenance activities.

Construction activities related to substations, pole excavations, and general use of heavy equipment could cause soil disturbance, which could contribute to increased soil erosion and subsequent sedimentation in nearby surface waters. However, power line designs would generally avoid impacts on surface water by placing poles away from rivers, streams, and riparian areas and thereby spanning surface waterbodies and sensitive riparian habitats. Operations and maintenance activities would be limited to the existing ROW and existing roads and are not anticipated to affect water resources. Mitigation measures designed to minimize the impact of the proposed Project **and associated power infrastructure** on water and other resources are summarized in Chapter 8, Summary of Consequences. To minimize impacts on surface water, industry standard soil erosion and sedimentation controls would be used during construction. Additional measures could also be included as a result of any necessary consultation or permitting with local, state, or federal agencies.

Floodplains

Overall impacts on floodplains would be minor and short term during construction and negligible in the long term from operations. The proposed power lines would not affect overall floodplain function. During construction, staging areas and the storage of equipment and construction vehicles would be located outside of the floodplain to the extent possible. Temporary access roads within the ROW and pulling and tensioning sites could result in short-term minor impacts through floodplain soil compaction, but the ROW would be restored when construction is completed. Pole placement could be required in some wide floodplains that are not able to be spanned. The installation of caissons and transmission poles would be done in a manner to limit impacts and area affected. Although the placement of transmission poles would result in long-term minor impacts, they would not alter floodplain function or flood risk.

Any poles in floodplains would be inspected to remove any accumulated debris following a flood event, as necessary. It is unlikely that the round poles would result in the accumulation of debris.

Routine maintenance activities would have no impact on the floodplain elevations or the floodplain functioning. The temporary placement of equipment, vehicles and materials could occur within the floodplain as part of routine maintenance and inspection activities, but disturbances would be negligible and temporary. Such activities would have no effect on floodplain contours or elevations. With revegetation and restoration, the power lines and associated infrastructure would not obstruct flows over floodplains and would have minimal impact on topography or flood elevation.

Groundwater

Overall effects to groundwater would be minor and short term during construction and negligible in the long term from operations. As evaluated in Section 4.3.5.3 of the 2014 Keystone XL Final SEIS, potential impacts on groundwater resources related to the construction and operation of electrical power infrastructure are expected to occur only as a result of small releases of refined petroleum products related to vehicle and equipment fueling and operations. It is also possible that damage to transformers within the electrical substations could result in a release of refined oil and other hazardous materials. Spills of fuel and other hazardous materials would be cleaned up immediately in accordance with applicable laws and regulations. Hydrogeologic conditions would be similar to those described for the proposed pipeline area adjacent to the planned power lines.

The potential effects of spills on groundwater resources would be similar to those described in Sections 4.6 and 5.5. Although the effects of spills related to heavy equipment and/or refueling would be practically identical whether a pipeline or power line is involved, the effects of spills of refined oils from power transformers and other electrical equipment would differ from potential spills of crude oil associated with the proposed pipeline. Power transformers and other electrical equipment contain much smaller volumes of oil and would thus present a much lower likely size of spill. Furthermore, the chemical compositions and physical properties of the refined oils are very different to those of crude oil and would lead to different behaviors in the environment. Impacts on groundwater resulting from a release could include water quality impacts potentially affecting sources of drinking water or irrigation. Prompt cleanup response would likely be capable of remediating the contaminated soils before the release would reach groundwater depth.

The type of structures necessary to support the proposed power lines are typically buried only 8 to 12 feet deep and without foundations. In some places, these burial depths could intersect the water table. However, power providers would likely use caissons in areas with shallow water tables. These caissons would be driven into the ground and the water and any sediment would be pumped out of the caisson, allowing for the installation of a transmission pole and fill material isolated from the surrounding groundwater. Given that these are typically non-rusting, galvanized caissons, they would not result in any impact on groundwater quality, nor would the wood pole come into contact with groundwater in these situations.

Chapter 8, Summary of Consequences, summarizes the avoidance, minimization and mitigation measures that would be used to minimize impacts of the proposed Project **and associated power infrastructure**.

6.4.3 Wetlands

This section builds upon the description and analyses provided in Sections 3.6 and 4.6 of this document and Sections 3.4 and 4.4 of the 2014 Keystone XL Final SEIS. Descriptions of the wetland resources that would be crossed by transmission and distribution lines are included below, followed by an assessment of the potential environmental impacts on wetlands from construction and operation of the power lines. **No new substations or expansions would overlap wetlands.**

6.4.3.1 Affected Environment

Wetland types that would be crossed by electrical transmission and distribution lines are described as follows (USFWS 1979):

- Emergent—wetlands with erect, rooted, herbaceous hydrophytic vegetation, excluding mosses and lichens. Vegetation is present for most of the growing season and is usually dominated by perennial plants.
- Forested—wetlands dominated by woody vegetation greater than 20 feet tall and have water present for brief periods during the growing season.
- Riverine—all wetlands and deepwater habitats contained within a channel that are not dominated by trees, shrubs or persistent emergent vegetation, including emergent mosses and lichens.
- Open Water—areas of standing water with less than 30 percent vegetative cover, including ponds and lakes.[2]

Table 6-6 includes a summary of the wetlands and acreages within each proposed power line ROW. The data presented in the table are based on National Wetland**s** Inventory data from the USFWS (**2018j**). The primary National Wetlands Inventory wetland type crossed is freshwater emergent wetlands, followed by riverine wetlands. At the time of preparation of this document, field surveys were not available to verify if these wetlands are present within the current environmental setting. Many of the wetlands along the ROWs have likely been extensively altered by historical and current agricultural practices. Additionally, it is unknown whether wetlands located within the ROW would be jurisdictional (regulated) or non-jurisdictional (unregulated) under USACE regulations.

[2] The National Wetlands Inventory dataset includes all types of wetlands and surface water features. Wetlands are considered an essential component of the surface water network, and are closely linked to and heavily reliant upon surface water hydrology. Freshwater open water features (ponds and lakes) of the National Wetlands Inventory and NHD are similar, but the National Wetlands Inventory dataset often considers the boundaries of open water features to be wetlands due to seasonal fluctuations in water levels that can occur. Therefore, the two datasets may vary in calculations of open water areas.

Table 6-6. Wetland Acres within the Proposed Power Line Rights-of-Way

Pump Station	Emergent	Forested	Riverine	Open Water	Total[a]
PS-09	16.8	–	12.0	2.7	31.5
PS-10	6.5	–	2.6	–	9.1
PS-11	–	–	–	–	0.0
PS-12	–	–	0.5	--	–
PS-13	0.1	–	2.1	–	2.2
PS-14	0.2	–	0.3	–	0.5
PS-15	0.4	–	0.9	0.**5**	1.**8**
PS-16	1.2	–	1.6	1.1	3.9
PS-17	0.2	–	0.2	< 0.1	0.4
PS-18	0.5	0.1	1.5	–	2.1
PS-19	0.8	< 0.1	1.1	< 0.1	1.9
PS-20	1.7	0.1	0.5	< 0.1	2.3
PS-21	0.8	–	1.1	**< 0.1**	1.9
PS-22	–	–	0.1	–	0.1
PS-23	–	–	0.2	–	0.2
PS-23B	0.3	–	0.1	–	0.4
PS-24	–	–	–	–	0.0
PS-25	0.2	0.1	2.0	0.1	2.**4**
PS-26	–	–	–	–	0.0
Total	**29.9**	**0.4**	**26.7**	**4.5**	**61.4**

Source: **National Wetlands Inventory** database (USFWS **2018j**)
[a.] **Totals may not match sums due to rounding**
NA = not applicable; ROW = right-of-way

6.4.3.2 Environmental Consequences

Overall impacts on wetlands are anticipated to be minor. Section 4.4.5.3 of the 2014 Keystone XL Final SEIS describes the nature of the primary impacts on wetlands from construction and operation of new power infrastructure.

Potential construction- and operations-related impacts on wetlands could include temporary and permanent impacts on wetland functions and values and permanent loss of wetlands due to fill for permanent power-related facilities (e.g., poles and access roads). The degree to which a given wetland and its functions are impaired depends on a number of factors including wetland type (e.g., emergent versus forested), landscape position (riverine versus wet meadow), level of impact and success of restoration efforts.

As shown in Table 6-6, proposed electrical power lines would cross 61.**4** acres of freshwater wetlands, including approximately 29.**9** acres of emergent wetlands, 0.**4** acre of forested wetlands, 26.**7** acres of riverine wetlands, and 4.**5** acres of open water based on National Wetlands Inventory data. Based on construction techniques described in Section 6.3, it is unlikely that all wetlands would be affected, and impacts are anticipated to be less than 61.**4** acres. Although the extent of wetland impacts is unknown at this time, potential impacts are discussed below.

Temporary impacts during construction could occur as a result of driving caissons into the ground, pole installations, pulling and tensioning areas, and temporary workspaces where timber matting would be installed prior to and removed after construction activities. The sizes and locations of these areas are not yet known. The extent of permanent impacts would be much smaller, and would be limited to the land area occupied by poles and the area of forested wetlands that would be converted to emergent wetlands.

Impacts on emergent wetlands affected within the proposed construction corridor, which would encompass the permanently-maintained operations ROW, would likely be short-term to long-term, with successful re-establishment within 3 to 5 years. All affected emergent wetlands would be restored to near pre-construction conditions following construction. Emergent wetlands would be allowed to persist outside of and within the permanent operations ROW for the life of the proposed power infrastructure. The only permanent loss of emergent wetlands would be associated with the installation of poles as discussed in the paragraph above.

In forested wetlands, the effects of proposed construction would be long-term due to the longer period needed to regenerate a mature forest community outside of the permanent ROW. Dependent on final design and construction techniques, forested wetland vegetation within the construction corridor would be cut to ground level, most likely with root systems left in place. If construction techniques at certain sites necessitate root system removal, then USACE Clean Water Act Section 404 permitting may be required, along with appropriate mitigation measures, such as restoration of original grade. Once construction activities are completed, **wetlands** outside of the permanently-maintained ROW would be restored to near pre-construction conditions and woody vegetation would be allowed to regrow. The permanent ROW would be kept free of tall-growing, woody vegetation. Therefore, forested wetlands within the permanent ROW could be converted to emergent wetlands, which represents a permanent impact on the **forested** wetland class, but does not necessarily represent a permanent loss of wetland **area**. National Wetlands Inventory data show **only 0.4** acre of forested wetlands within the proposed **power line ROWs (see Table 6-6)**; therefore, impacts on these wetlands are expected to be minor.

Keystone **and the local power providers have committed to implementing several measures** to **avoid and** minimize potential construction- and operations-related impacts at wetland crossings. **As much as practicable, power pole structures would be installed outside of wetlands. Construction in wetland areas would utilize protective matting or be restricted to frozen conditions to help minimize rutting. To minimize sedimentation, industry-standard soil erosion and sedimentation controls would be used during construction.**

Regulatory agencies may require additional wetland avoidance, minimization**,** and mitigation measures in the event that the current **measures** do not meet the requirements of local, state**,** and federal permitting agencies. Chapter 8, Summary of Consequences, provides additional mitigation measures for the proposed Project **and connected actions**.

The measures discussed above would aid in minimizing wetland impacts. Only a portion of the construction ROW would need to be cleared, and many wetland areas would be avoided or spanned, as feasible. Wetland areas disturbed during construction would be restored following construction and emergent wetlands would be allowed to persist within the permanent ROW outside of access roads and pole locations. Forested wetland impacts may be permanent, due to required maintenance of the permanent ROW.

6.4.4 Terrestrial Vegetation

This section builds upon the description and analyses provided in Sections 3.7 and 4.7 of this document and Sections 3.5 and 4.5 of the 2014 Keystone XL Final SEIS. Those sections generally describe the ecoregions and plant communities near the proposed Project and associated power infrastructure. This section describes the terrestrial vegetation near the specific proposed power infrastructure using the best available data; in most cases, this is limited to publicly available land cover data. This section then assesses the general environmental impacts from the construction and operation of the proposed power infrastructure, followed by line-specific impact analyses to the extent possible with the information available.

6.4.4.1 Affected Environment

The proposed Project and the proposed power infrastructure cross four USEPA Level III ecoregions: Northwestern Glaciated Plains, Northwestern Great Plains, Western Corn Belt Plains and Central Great Plains. For a description and maps, see Section 3.5.2 of the 2014 Keystone XL Final SEIS. Table 6-7 lists the major terrestrial ecosystems that would be crossed by the proposed power lines, according to the USGS GAP/LANDFIRE database.

Table 6-7. Major Ecosystems Crossed by the Proposed Power Lines

Ecosystem Designation	Description	Common Plants	Presence per State		
			MT	SD	NE
Cool Semi-Desert Scrub and Grassland					
Inter-Mountain Basins Big Sagebrush Shrubland	Broad basins between ranges, plains and foothills. Soils deep, well-drained and non-saline.	Wyoming big sagebrush (*Artemisia tridenta* spp. *wyomingensis*), greasewood (*Sarcobatus vermiculatus),* rubber rabbitbush (*Ericameria nauseosa*)		X	
Inter-Mountain Basins Big Sagebrush Steppe	Occurs on both glaciated and nonglaciated landscapes. Soils are typically deep and non-saline with a microphytic crust.	Wyoming big sagebrush (*Artemisia tridenta sp. wyomingensis*), western wheatgrass (*Pascopyrum smithii*), xeromorphic shrubs	X	X	
Developed and Urban					
Developed, High Intensity	Areas with 80% or more impervious surface.	NA		X	X
Developed, Medium Intensity	Areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50 to 79% of the total cover. Single-family housing units are commonly found in these areas.	NA	X		
Developed, Low Intensity	Areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20 to 49% of the total cover. Single-family housing units are commonly found in these areas.	NA	X	X	X
Developed, Open Space	Land that is not intensively developed for residential, commercial, industrial or institutional use.	NA	X	X	X

Table 6-7. Major Ecosystems Crossed by the Proposed Power Lines

Ecosystem Designation	Description	Common Plants	Presence per State		
			MT	SD	NE
Herbaceous Agricultural Vegetation					
Cultivated Cropland	Cultivated land, row crops.	Wheat, barley, oats, sorghum, corn, beans, and hay	X	X	X
Pasture/Hay	Hay fields.	Non-native grasses	X	X	
Introduced and Semi Natural Vegetation					
Introduced Upland Vegetation—Perennial Grassland and Forbland	Land cover is significantly altered/disturbed by introduced, non-native perennial grasses and forbs. Natural vegetation types are no longer recognizable.	Crested wheatgrass (*Agropyron cristatum*), smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), knapweed (*Centaurea* spp.), Canada thistle (*Cirsium arvense*), leafy spurge (*Euphorbia esula*), pepperweed (*Lepidium* spp.), and sweet clover (*Melilotus officinalis*)	X	X	
Open Water					
Open Water (Fresh)	Open water, sometimes associated with wetland habitat.	Emergent and submerged vegetation	X	X	
Recently Disturbed or Modified					
Disturbed, Non-specific	NA	NA		X	
Shrub and Herb Wetland					
Eastern Great Plains Wet Meadow, Prairie and Marsh	Herbaceous wetland communities that are found in drainages within loess-mantled hills.	Hydrophytic graminoids		X	
Great Plains Prairie Pothole	Occur in shallow depressions scraped out by glaciers.	Hardstem bulrush (*Schoenoplectus acutus*), softstem bulrush (*Schoenoplectus tabernaemontani*), common threesquare (*Schoenoplectus pungens*), cattails (*Typha* spp.), aquatic buttercups (*Ranunculus hydrocharoides*), aquatic smartweeds (*Polygonum* spp.), pondweeds (*Elodea* spp.), duckweeds (*Lemna* spp.), spikerush, (*Eleocharis* spp.) and foxtail barley (*Hordeum jubatum*)	X		
Inter-Mountain Basins Greasewood Flat	Found on nearly level, older alluvial terraces on broad or narrow floodplains and coalescing alluvial fans in valley. They typically have saline soil and a shallow water table.	Greasewood (*Sarcobatus vermiculatus*)	X	X	
North American Arid West Emergent Marsh	Occur in depressions in the landscape, as fringes around lakes, and along the mainstem and backwater channels of slow flowing streams and rivers.	Bulrushes (*Scirpus* spp.), cattails, rushes, pondweeds, smartweeds and pond lilies (Nymphaeaceae)	X		

Table 6-7. Major Ecosystems Crossed by the Proposed Power Lines

Ecosystem Designation	Description	Common Plants	Presence per State		
			MT	SD	NE
Western Great Plains Depressional Wetland Systems	Completely isolated from both the regional groundwater system and inter-wetland surface drainage basins. They occur in depressional basins found flat, enclosed upland areas or on level, shallow lake basins.	Western wheatgrass, foxtail barley, povertyweed (*Iva avillaris*), willow dock (*Rumex salicifolius*), spikerush and hardstem bulrush		X	
Western Great Plains Saline Depression Wetland	Discharge wetlands where highly saline water has moved into the depression. The water is prevented from percolating out due to impermeable dense clay.	Alkali bulrush (*Schoenoplectus martimus*), common threesquare, inland saltgrass (*Districhlis spicata*), Nuttall's alkali grass (*Puccinellia nuttalliana*), foxtail barley, red swampfire (*Salicornia rubra*) and freshwater cordgrass (*Spartina pectinata*)	X		
Temperate and Boreal Forest and Woodland					
North-Central Interior Dry-Mesic Oak Forest and Woodland	Found in gently rolling to flat landscapes. Characterized by a dry edaphic condition that is transitional between dry prairies, oak barrens, or savannas and dry-mesic oak-hickory forests and woodlands.	Eastern black oak (*Quercus velutina*), bur oak, scarlet oak (*Quercus coccinea*) and northern pin oak (*Quercus ellipsoidalis*)			X
Northwestern Great Plains—Black Hills Ponderosa Pine Woodland and Savanna	Typically found within the matrix of the Great Plains grassland systems where available soil moisture is higher or soils are more coarse and rocky.	Ponderosa pine, Douglas fir (*Pseudotsuga menziesii*), Rocky Mountain juniper, bearberry (*Arctostaphylos uvaursi*), big bluestem and pussy toes (*Anthennaria neglecta*)	X	X	
Northwestern Great Plains Floodplain	Meandering channels with alluvial bar formation. Vegetation occurs in bands or zones reflecting past deposition.	Black cottonwood, narrow leaf cottonwood, eastern cottonwood, Plains cottonwood, willow, red osier dogwood, common chokecherry (*Prunus virginiana*), boxelder and green ash	X		
Northwestern Great Plains Riparian	Associated with perennial to intermittent or ephemeral streams. Flooding is the key ecosystem process.	Black cottonwood, narrowleaf cottonwood (*Populus trichocarpa*), Plains cottonwood, willow, red osier dogwood (*Cornus sericea*), western wheatgrass, American licorice (*Glycyrrhiza lepidota*), big sagebrush and silver sagebrush (*Artemisia cana*)	X		
Ruderal Forest	Pioneer species of disturbed lands.	Maple, oak, ponderosa pine with crested wheatgrass, smooth brome and Kentucky bluegrass.		X	X
Southeastern Great Plains Floodplain Forest	Primarily along the floodplains or medium and large rivers. Soils are mainly alluvial and range from sand to dense clays.	Eastern cottonwood, willows and switchgrass big bluestem			X

Table 6-7. Major Ecosystems Crossed by the Proposed Power Lines

Ecosystem Designation	Description	Common Plants	Presence per State		
			MT	SD	NE
Western Great Plains Dry Bur Oak Forest and Woodland	Occurs in small-to-large patches on buttes, escarpments, and in foothill zones, usually on northerly facing slopes.	Bur oak, American basswood, quaking aspen and eastern red cedar			
Western Great Plains Floodplain Systems	Woody and herbaceous communities associated with larger rivers and streams that are subject to at least seasonal inundation.	Cottonwood, willows, switchgrass, snowberry and buffaloberry			
Western Great Plains Wooded Draw and Ravine	Associated with highly intermittent or ephemeral streams. May occur on steep northern slopes or within canyon bottoms where soil moisture and topography produce higher moisture levels.	Rocky Mountain juniper, aspen, paper birch and boxelder maple	X	X	
Temperate and Boreal Grassland and Shrubland					
Central Mixedgrass Prairie	Transition zone where tallgrass and shortgrass prairie merge, taking on the characteristics of both.	Tall and shortgrass prairie species, blue grama, buffalo grass, sideoats grama, western wheatgrass, sand dropseed, Indian grass and Canada wild rye (*Elymus canadensis*)		X	X
Central Tallgrass Prairie	Rich loess soils and receives 25 to 36 inches of annual precipitation.	Big bluestem, Indian grass, switchgrass, Canada wild rye, showy goldenrod (*Solidago speciosa*), prairie blazing star (*Liatris pycnostachya*), sky blue aster (*Aster oolentangiensis*) and purple coneflower			X
North Pacific Alpine and Subalpine Dry Grassland	Small grassy openings to large open ridges, typically imbedded in or above subalpine forests.	Idaho fescue (*Festuca idahoensis) SNF* greenleaf fescue (*F. viridula*)		X	
Northwestern Great Plains Mixedgrass Prairie	Occurs on both glaciated and nonglaciated landscapes. Soils are typically deep and non-saline with a microphytic crust	Western wheatgrass, thickspike wheatgrass (*Elymus lanceolatus*), green needlegrass, blue grama, and needle and thread (*Hesperostipa comata*)	X	X	
Northwestern Great Plains Shrubland	Found at elevations 1,220 to 1,524 meters. It is more commonly found at mesic sites with moderately shallow or deep, fine to sandy loam soils.	Serviceberry (*Amelanchier arborea*), skunkbush sumac (*Rhus trilobata*), snowberry (*Symphoricarpos albus*), silver buffalo berry (*Shepherdia argentea*), shrubby cinquefoil (*Potentilla fruticosa*), silverberry (*Elaeagnus ebbingei*) and horizontal rug juniper (*Juniperus horizontalis*)	X	X	
Western Great Plains Sand Prairie	Coarse textured soils.	Needle and thread, little bluestem (*Schizachyrium scoparium*), threadleaf sedge, prairie sandreed, sand bluestem (*Andropogon hallii*), and big bluestem (*Andropogon gerardii*)	X	X	X
Western Great Plains Tallgrass Prairie	Less than 5-11% tree cover.	Big bluestem, Indian grass (*Sorghastrum nutans*), switch grass (*Panicum virgatum*), little bluestem, and several grama grasses		X	

Table 6-7. Major Ecosystems Crossed by the Proposed Power Lines

Ecosystem Designation	Description	Common Plants	Presence per State		
			MT	SD	NE
Temperate and Boreal Open Rock Vegetation					
Western Great Plains Badland	Land lies below its local base level and is shaped by streams, erosion and erodible parent material. Noted for the relative absence of vegetative cover.	Dryland shrubs or herbaceous taxa	X	X	
Western Great Plains Cliff and Outcrop	Vegetation restricted to shelves, cracks and crevices in rock. Soil slightly developed.	Skunkbush (*Rhus trilobata*), longleaf wormwood (*Artemisia longifolia*) and grama	X		

Source: USGS 2011b. Descriptions and common plants obtained from metadata. Plant names follow NRCS 2012 PLANTS Database.
% = percent; MT = Montana; NA = Not applicable; NE = Nebraska; SD = South Dakota

Biologically unique landscapes and vegetation communities of conservation concern have been described in Section 3.7.

6.4.4.2 Environmental Consequences

Overall, impacts on terrestrial vegetation would be minor to moderate. Section 4.5 of the 2014 Keystone XL Final SEIS describes the nature of the primary impacts on vegetation from construction and operation of new power infrastructure. This section builds upon the previous assessment of impacts.

Temporary impacts on terrestrial vegetation from construction activities would occur at pole excavations, pulling and tensioning areas, and temporary workspaces. The sizes and locations of these areas are not yet known, but nearly all of the areas would be contained within the ROW and footprints of associated facilities. Therefore, for the purposes of this analysis, the extent of potential temporary impacts is assumed to be the entire ROW and temporary workspaces **plus the access road for the PS-13 power line**. The extent of permanent impacts would be much smaller and would be limited to the land area and air space occupied by poles and power lines and the areas used for permanent substations and similar facilities.

In general, construction impacts on vegetation would be minor, as much of the total power line route would run along existing roadways, fields, and other previously disturbed areas. The majority of impacts on terrestrial vegetation would be temporary in nature, only occurring during construction. These impacts would include removing crops, mowing areas, cutting or limbing tall growing vegetation, and crushing vegetation when laying down equipment or creating temporary access roads. Temporary impacts could occur across the entire proposed ROW where ground disturbance is required. Permanent impacts would result from the removal of vegetation for pole/structure installation and substation construction or expansion.

Vehicles or personnel traveling to or within sites during construction or operations could introduce or spread invasive species. During the construction phase of the proposed Project, all equipment and support vehicles would be power washed before entering or leaving the work area **if noxious weeds are present**. If noxious or invasive plant species were detected in the Project area at any time during the life of the proposed Project, the appropriate local weed and pest control agency would be contacted to ensure that proper methods are used for eradication of the noxious or invasive plants. Herbicides would not be applied broadly to the ROW, but could be applied to individual tree stumps to eliminate resprouting.

Total miles and acres of vegetation community potentially affected by the **proposed electrical** power **infrastructure** are presented in Table 6-8. Note that for all tables in this section, the crossing lengths shown represent length of centerline crossing the community, not necessarily the length of ROW crossing the community.

Table 6-8. Estimated Impacts of Vegetation Communities Crossed by the Proposed Power Lines and Substations

Vegetation Community Classification	Dominant Elements	Length Crossed (miles)[a]	ROW Area Affected (acres)[b]	Substation Area Affected (acres)	Additional Temporary Work Space Impacts (acres)
Barren Land	Rock, sand, clay	0.1	0.6	0.0	0.0
Cultivated Crops	Wheat, barley, oats, sorghum, corn, beans	51.2	430.3	7.4	0.0
Deciduous Forest	Ash, oak, elm, maple, aspen	0.2	2.6	0.0	0.0
Developed, High Intensity	Impervious surfaces	0.0[c]	0.2	0.0	0.0
Developed, Low Intensity	Private homes with vegetation	5.7	51.0	1.1	0.0
Developed, Medium Intensity	Private homes with pavement	0.0[c]	0.4	0.1	0.0
Developed, Open Space	Planted lawn	44.1	358.1	1.4	0.6
Emergent Herbaceous Wetlands	Rushes, sedges, bulrushes, cattails	1.6	14.4	0.0	0.0
Evergreen Forest	Ponderosa pine, western **red cedar**, juniper	0.3	1.9	0.0	0.0
Grassland/ Herbaceous	Big bluestem, little bluestem, blue grama, fescue	169.2	1,419.0	22.5	1.2
Open Water	Minimal floating or emergent vegetation	0.2	1.7	0.0	0.0
Pasture/Hay	Switchgrass, grama, wheatgrass, alfalfa	7.8	62.5	1.5	0.0
Scrub-Shrub	Serviceberry, snowberry, sumac, wolf-willow	36.9	318.7	4.9	0.7
Woody Wetlands	Cottonwood, willow, dogwood	1.3	10.3	0.0	0.0
Total[d]		**318.6**	**2,671.7**	**38.9**	**2.6**

Source: National Land Cover Data (**USGS 2019d**)

a. Length of centerline crossing the community, not necessarily the length of ROW crossing the community

b. Includes the entire power line ROW, not all of which would be disturbed

c. Less than 0.05 (rounded down)

d. Totals may differ from sums due to rounding and from Table 6-1 due to differences in granularity of the data sets.

ROW = right-of-way

Note: The anticipated impacts on waters and wetlands as indicated in the table are based entirely on National Land Cover Data information, which does not necessarily align with the National Hydrography Dataset and the National Wetlands Inventory. Furthermore, this does not include field-verified information. These acreages are estimates and do not reflect those acreages indicated in Section 6.4.3, Wetlands. For a more detailed technical description of **wetlands**, see Section 6.4.3.

Potential impacts on biologically unique landscapes or vegetation communities of conservation concern along proposed power infrastructure are quantified in Table 6-9.

Table 6-9. Estimated Potential Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern along the Proposed Power Infrastructure

Community Type	Length Crossed (miles)	ROW Area Affected (acres)	Substation Area Affected (acres)	Additional Temporary Work Space Impacts (acres)
Native Grasslands	163.**7**	1,**374.7**	**10.4**	0.**2**
Sagebrush	**17.9**	**174.5**	**9.5**	0.**8**
Riparian Habitats[a]	**4.2**[b]	**45.4**[b]	0.**5**[c]	0
Forest Communities	**2.7**[b]	**20.3**[b]	**0**	0
Rainwater Basin Landscape	9.3	112.2	0	0

Source: USGS 2011b

[a] Riparian Habitats include wooded floodplains, wooded draws and greasewood flats.

[b] Approximately **1.2** miles and **9.8** acres of vegetation qualify as both Riparian Habitats and Forest Communities in the ROW.

[c] Approximately 0.**5** acre of vegetation qualify as both Riparian Habitats and Forest Communities affected by substations.

ROW = right-of-way

Note: The U.S. Geological Survey Gap Analysis data set is different from the National Land Cover Data set presented in the previous table.

Impacts other than tree clearing would be temporary. Excavations would be minimal, and no trenching or grading would take place. As discussed in Section 3.7, native grassland communities are of management concern due to the unique habitat provided and due to losses from human activities. Although native grasslands would be reseeded with native seed where disturbed, impacts would be minor to moderate as construction effects on previously untilled native prairies could be long term. Typically, shortgrass prairie and mixed-grass prairie areas may take 5 to 8 or more years to re-establish if there are poor soil conditions and low moisture levels. In addition, destruction of the prairie sod during **substation** construction may require more than 100 years for complete recovery, although these areas would be limited in extent as no trenching or grading would occur. Disturbed native grassland areas would expose the fragile soils to erosion by wind and water. However, re-establishing cover of native grasses is expected to be successful based on the fertile soils that are present and adequate rainfall as evidenced by native grass establishment on the original Keystone pipeline. **Considering that construction of the proposed electrical power infrastructure would not involve soil disturbance outside of substation sites and the immediate area where power line support structures would be installed, impacts on native grasslands are likely to be localized to a small fraction of the ROW and substation areas.** Sagebrush communities typically take decades to recover from disturbance (Avirmed et al. 2015), so these effects would likely persist unless action is taken to restore sagebrush communities. Riparian habitats and other forest communities would suffer persistent impacts, as trees within the ROW would be cut and would not be allowed to regrow. Periodic ROW maintenance would ensure that trees are excluded, thus converting these previously wooded habitats into a grass- and forb-dominated community.

After construction, power providers would restore affected lands in accordance with federal, state and local standards and associated permits and private landowner requirements. Chapter 8, Summary of Consequences, summarizes the avoidance, minimization and mitigation measures that would be used to minimize impacts of the proposed Project **and connected actions**. Specific impacts associated with each transmission or distribution line are described below in the text and Tables 6-10 through 6-46, including impacts on each vegetative community type as well as impacts on biologically unique landscapes or vegetation communities of conservation concern. Most of the areas potentially affected would be temporarily affected, while substation impacts would be permanent.

PS-09

Big Flat Electric Cooperative proposes to construct and operate a 61.4-mile, 115-kV transmission line in Philips County, Montana, from WAPA's proposed Bowdoin Substation to PS-09.

Table 6-10. Estimated Impacts on Vegetation Communities Crossed by Proposed Transmission Line to PS-09

Vegetation Community Classification	Length Crossed (miles)	ROW Area Affected (acres)	Substation Area Affected (acres)
Cultivated Crops	**3.5**	**42.8**	0
Developed, Low Intensity	**0.1**	**1.0**	0
Developed, Open Space	**1.7**	**19.1**	0
Emergent Herbaceous Wetlands	**0.5**	**6.3**	
Grassland/Herbaceous	**40.7**	**491.9**	**5.8**
Open Water	**0.1**	**0.9**	
Pasture/Hay	**2.4**	**29.1**	0
Scrub-Shrub	**12.3**	**152.7**	**2.2**
Woody Wetlands	**0.0**[a]	**0.4**	0
Total[b]	**61.4**	**744.1**	**8.0**

Source: National Land Cover Data (**USGS 2019d**)

a. **Less than 0.05 (rounded down)**

b. **Totals may differ from sums due to rounding.**

ROW = right-of-way

Note: The anticipated impacts on waters and wetlands as indicated in the table are based entirely on National Land Cover Data information, which does not necessarily align with the National Hydrography Dataset and the National Wetlands Inventory. Furthermore, this does not include field verified information. These acreages are estimates and do not reflect those acreages indicated in Section 6.4.3, Wetlands. For a more detailed technical description of **wetlands**, see Section 6.4.3.

Table 6-11. Estimated Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern along the Proposed Transmission Line to PS-09

Community Type	Length Crossed (miles)	ROW Area Affected (acres)	Substation Area Affected (acres)
Native Grasslands	**39.9**	**480.0**	0
Sagebrush	7.**9**	**95.7**	**8.0**
Riparian Habitats[a]	2.**4**	**29.9**	0

Source: USGS 2011b

a. Riparian Habitats include wooded floodplains, wooded draws and greasewood flats.

ROW = right-of-way

Note: Differences between Table 6-10 and Table 6-11 stem from the level of data refinement and different vegetation classifications.

Impacts on terrestrial vegetation associated with the components required to supply power to PS-09 would be moderate, in light of the permanent forest clearing and disturbance to sagebrush communities.

PS-10

NorVal Electric Cooperative proposes to construct and operate a 48.**8**-mile-long, 115-kV transmission line in Valley County, Montana, from WAPA's Fort Peck Substation to PS-10. The small expansion of the Fort Peck Substation would occur in a highly disturbed area adjacent to the substation and dam.

Table 6-12. Estimated Impacts on Vegetation Communities Crossed by Proposed Power Infrastructure for PS-10

Vegetation Community Classification	Length Crossed (miles)	ROW Area Affected (acres)	Substation Area Affected (acres)
Cultivated Crops	**10.4**	**103.5**	0
Developed, High Intensity	**0.0[a]**	**0.1**	**0**
Developed, Low Intensity	**1.9**	**19.3**	0.**4**
Developed, Medium Intensity	**0.0[a]**	**0.3**	0
Developed, Open Space	**9.0**	**84.5**	0
Emergent Herbaceous Wetlands	**0.4**	**4.1**	0
Grassland/ Herbaceous	**22.7**	**218.3**	**0.4**
Open Water	**0[b]**	**0.0[a]**	**0**
Pasture/Hay	**0.3**	**0.0[a]**	0
Scrub-Shrub	**3.6**	**3.3**	**2.4**
Woody Wetlands	**0.5**	**34.6**	0
Total[c]	**48.8**	**473.2**	**3.0**

Source: National Land Cover Data (**USGS 2019d**)

a. Less than 0.05 (rounded down)

b Centerline does not cross this classification, but a portion of the ROW does.

c. Totals may differ from sums due to rounding.

ROW = right-of-way

Note: The anticipated impacts on waters and wetlands as indicated in the table are based entirely on National Land Cover Data information, which does not necessarily align with the National Hydrography Dataset and the National Wetlands Inventory. Furthermore, this does not include field verified information. These acreages are estimates and do not reflect those acreages indicated in Section 6.4.3, Wetlands. For a more detailed technical description of wetlands, see Section 6.4.3.

Table 6-13. Estimated Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern along the Proposed Power Infrastructure for PS-10

Community Type	Length Crossed (miles)	ROW Area Affected (acres)	Substation Area Affected (acres)
Native Grasslands	**14.3**	**175.7**	**1.0**
Sagebrush	4.1	**29.6**	0.**9**
Riparian Habitats[a]	**0.3**	**7**.9[b]	0.5
Forest Communities	0[c]	**7**.9[b, c]	0

Source: USGS 2011b

a. Riparian Habitats include wooded floodplains, wooded draws and greasewood flats.

b. Approximately 1 mile and **7**.9 acres of vegetation qualify as both Riparian Habitats and Forest Communities.

c. Centerline does not cross this classification, but a portion of the ROW does.

ROW = right-of-way

Note: Differences between Table 6-12 and Table 6-13 stem from the level of data refinement and different vegetation classifications.

Impacts on terrestrial vegetation associated with the components required to supply power to PS-10 would be moderate, in light of the permanent forest clearing and disturbance to sagebrush communities.

PS-11

NorVal Electric Cooperative proposes to construct and operate a 0.2-mile, **230**-kV distribution line from a proposed new WAPA substation named Coal Hill Substation adjacent to PS-11 in McCone County, Montana. The cooperative has also proposed 2.6 acres of additional temporary work space adjacent to the proposed substation.

Table 6-14. Estimated Impacts on Vegetation Communities at Proposed Power Infrastructure for PS-11

Classification Vegetation Community	Length Crossed (miles)	ROW Area Affected (acres)	Substation and Switching Station Area Affected (acres)	Additional Temporary Work Space Impacts (acres)
Grassland/ Herbaceous	0.**2**	**1.9**	**7.4**	1.2
Scrub-Shrub	0	**0**	**0.4**	0.7
Developed, Open Space	0	0	0.**3**	0.6
Total	**0.2**	**1.9**	**8.1**	**2.6**

Source: National Land Cover Data (**USGS 2019d**)
ROW = right-of-way
Note: The anticipated impacts on waters and wetlands as indicated in the table are based entirely on National Land Cover Data information, which does not necessarily align with the National Hydrography Dataset and the National Wetlands Inventory. Furthermore, this does not include field verified information. These acreages are estimates and do not reflect those acreages indicated in Section 6.4.3, Wetlands. For a more detailed technical description of **wetlands**, see Section 6.4.3.

Table 6-15. Estimated Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern at Proposed Power Infrastructure for PS-11

Community Type	Length Crossed (miles)	ROW Area Affected (acres)	Substation and Switching Station Area Affected (acres)	Additional Temporary Work Space Impacts (acres)
Native Grasslands	0.0[a]	0.**1**	0.9	0.2
Sagebrush	0.0[a]	**0.1**	0.**6**	0.**8**

Source: USGS 2011b
[a.] Less than 0.05 (rounded down)
ROW = right-of-way
Note: Differences between Table 6-14 and Table 6-15 stem from the level of data refinement and different vegetation classifications.

Impacts on terrestrial vegetation associated with the components required to supply power to PS-11 would be minor to moderate, in light of the small area affected but long recovery time of sagebrush communities (Avirmed et al. 2015).

PS-12

McCone Electric Cooperative proposes to construct and operate a 4.6-mile, 115-kV transmission line from WAPA's Circle Substation to PS-12, all located in McCone County, Montana. No substation expansion would be required.

Table 6-16. Estimated Impacts on Vegetation Communities Crossed by Proposed Transmission Line to PS-12

Vegetation Community Classification	Length Crossed (miles)	ROW Area Affected (acres)
Cultivated Crops	**0.9**	**9.7**
Developed, Low Intensity	**0.0**[a]	**0.2**
Developed, Open Space	**0.2**	**2.3**
Grassland/Herbaceous	**3.3**	**31.6**
Scrub-Shrub	**0.1**	**0.6**
Total[b]	**4.6**	**44.4**

Source: National Land Cover Data (**USGS 2019d**)
[a] **Less than 0.05 (rounded down)**
[b] **Totals may differ from sums due to rounding.**
ROW = right-of-way

Table 6-17. Estimated Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern along the Proposed Transmission Line to PS-12

Community Type	Length Crossed (miles)	ROW Area Affected (acres)
Native Grasslands	2.**2**	21.6

Source: USGS 2011b
ROW = right-of-way
Note: Differences between Table 6-16 and Table 6-17 stem from the level of data refinement and different vegetation classifications.

Impacts on terrestrial vegetation associated with the components required to supply power to PS-12 would be minor, as the native grassland would be restored after construction.

PS-13

Tongue River Electric Cooperative proposes to construct and operate a 15.7-mile, 115-kV transmission line from WAPA's O'Fallon Substation in Prairie County, Montana, to PS-13. This would require an expansion of the O'Fallon substation.

Table 6-18. Estimated Impacts on Vegetation Communities Crossed by Proposed Power Infrastructure for PS-13

Vegetation Community Classification	Length Crossed (miles)	ROW Area Affected (acres)	Substation Area Affected (acres)
Cultivated Crops	**1.3**	**12.5**	0.8
Deciduous Forest	**0.0[a]**	**0.2**	0
Developed, Low Intensity	**0.4**	**3.8**	0.**5**
Developed, Open Space	**1.5**	**12.9**	0.**0[a]**
Evergreen Forest	**0.1**	**0.7**	0
Grassland/Herbaceous	**11.3**	**110.8**	**0**
Pasture/Hay	**0.1**	**1.0**	0
Scrub-Shrub	**1.0**	**10.1**	**0**
Woody Wetlands	**0.1**	**0.5**	0
Total[b]	**15.7**	**152.4**	**1.3**

Source: National Land Cover Data (**USGS 2019d**)

[a] Less than 0.05 (rounded down)

[b] **Totals may differ from sums due to rounding.**

ROW = right-of-way

Note: The anticipated impacts on waters and wetlands as indicated in the table are based entirely on National Land Cover Data information, which does not necessarily align with the National Hydrography Dataset and the National Wetlands Inventory. Furthermore, this does not include field verified information. These acreages are estimates and do not reflect those acreages indicated in Section 6.4.3, Wetlands. For a more detailed technical description of wetlands, see Section 6.4.3.

Table 6-19. Estimated Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern along the Proposed Power Infrastructure for PS-13

Community Type	Length Crossed (miles)	ROW Area Affected (acres)	Substation Area Affected (acres)
Native Grasslands	9.4	91.2	**0**
Sagebrush	0.9	9.5	0
Riparian Habitats[a]	0.9[b]	8.6[b]	0
Forest Communities	1.**2**[b]	1**1**.5[b]	0

Source: USGS 2011b

[a] Riparian Habitats include wooded floodplains, wooded draws and greasewood flats.

[b] Approximately 0.**7** mile and **6**.6 acres of vegetation qualify as both Riparian Habitats and Forest Communities in the ROW.

ROW = right-of-way

Note: Differences between Table 6-18 and Table 6-19 stem from the level of data refinement and different vegetation classifications.

Impacts on terrestrial vegetation associated with the components required to supply power to PS-13 would be moderate in light of the permanent forest clearing and disturbance to sagebrush communities.

PS-14

Montana-Dakotas Utility proposes to construct and operate a 6.9-mile, 115-kV transmission line in Fallon County, Montana, **connecting** an existing **transmission line source and** PS-14.

Table 6-20. Estimated Impacts on Vegetation Communities Crossed by Proposed Transmission Line to PS-14

Vegetation Community Classification	Length Crossed (miles)	ROW Area Affected (acres)
Cultivated Crops	**0.1**	**0.5**
Grassland/Herbaceous	**4.2**	**25.4**
Scrub-Shrub	**2.6**	**15.7**
Total	**6.9**	**41.6**

Source: National Land Cover Data (**USGS 2019d**)
ROW = right-of-way

Table 6-21. Estimated Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern along the Proposed Transmission Line to PS-14

Community Type	Length Crossed (miles)	ROW Area Affected (acres)
Native Grasslands	3.5	21.7
Sagebrush	3.2	19.1
Riparian Habitats[a]	0.0[b]	0.1

Source: USGS 2011b
[a] Riparian Habitats include wooded floodplains, wooded draws and greasewood flats.
[b] Less than 0.05 (rounded down)
ROW = right-of-way
Note: Differences between Table 6-20 and Table 6-21 stem from the level of data refinement and different vegetation classifications.

Impacts on terrestrial vegetation associated with the components required to supply power to PS-14 would be moderate, in light of the permanent forest clearing and disturbance to sagebrush communities.

PS-15

Grand Electric Cooperative proposes to construct and operate a 24.7-mile, 115-kV transmission line in Harding County, South Dakota, from the Harding Substation to PS-15.

Table 6-22. Estimated Impacts on Vegetation Communities Crossed by Proposed Power Infrastructure for PS-15

Vegetation Community Classification	Length Crossed (miles)	ROW Area Affected (acres)	Substation Area Affected (acres)
Cultivated Crops	**0.7**	**4.3**	0
Developed, Low Intensity	**0.5**	**3.0**	0
Developed, Open Space	**1.3**	**8.2**	0
Grassland/Herbaceous	**18.8**	**113.4**	**3.9**
Scrub-Shrub	**3.4**	**20.7**	0.**1**
Total	**24.7**	**149.6**	**4.0**

Source: National Land Cover Data (**USGS 2019d**)
ROW = right-of-way
Note: The anticipated impacts on waters and wetlands as indicated in the table are based entirely on National Land Cover Data information, which does not necessarily align with the National Hydrography Dataset and the National Wetlands Inventory. Furthermore, this does not include field verified information. These acreages are estimates and do not reflect those acreages indicated in Section 6.4.3, Wetlands. For a more detailed technical description of wetlands, see Section 6.4.3.

Table 6-23. Estimated Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern along the Proposed Power Infrastructure for PS-15

Community Type	Length Crossed (miles)	ROW Area Affected (acres)	Substation Area Affected (acres)
Native Grasslands	18.3	110.9	4.0
Sagebrush	1.**8**	11.**2**	0
Riparian Habitats[a]	0.**1**[b]	**0**.8[b]	0
Forest Communities	0.**3**[b]	**1**.6[b]	0

Source: USGS 2011b
[a] Riparian Habitats include wooded floodplains, wooded draws and greasewood flats.
[b] Approximately 0.**1** mile and **0.5** acres of vegetation qualify as both Riparian Habitats and Forest Communities.
ROW = right-of-way
Note: Differences between Table 6-22 and Table 6-23 stem from the level of data refinement and different vegetation classifications.

Impacts on terrestrial vegetation associated with the components required to supply power to PS-15 would be moderate, in light of the permanent forest clearing and disturbance to sagebrush communities.

PS-16

Grand Electric Cooperative proposes to construct and operate a 41.9-mile, 115-kV transmission line extending from the Buffalo Substation in Perkins County, South Dakota, to PS-16 in Harding County, South Dakota. **The Buffalo Substation would likely require an expansion.**

Table 6-24. Estimated Impacts on Vegetation Communities Crossed by Proposed Power Infrastructure for PS-16

Vegetation Community Classification	Length Crossed (miles)	ROW Area Affected (acres)	Substation Area Affected (acres)
Cultivated Crops	**3.8**	**23.1**	0
Deciduous Forest	**0.1**	**0.6**	0
Developed, High Intensity	**0.0**[a]	**0.1**	0
Developed, Low Intensity	**1.1**	**7.8**	0
Developed, Medium Intensity	**0.0**[a]	**0.1**	
Developed, Open Space	**1.8**	**11.3**	0
Emergent Herbaceous Wetlands	**0.1**	**0.7**	0
Evergreen Forest	**0.2**	**1.1**	0
Grassland/Herbaceous	**17.4**	**105.0**	4.0
Open Water	**0.1**	**0.8**	0
Pasture/Hay	**3.4**	**19.9**	0
Scrub-Shrub	**13.8**	**83.2**	0
Total[b]	**41.9**	**253.7**	**4.0**

Source: National Land Cover Data (**USGS 2019d**)

a. Less than 0.05 (rounded down)

b. Totals may differ from sums due to rounding.

ROW = right-of-way

Note: The anticipated impacts on waters and wetlands as indicated in the table are based entirely on National Land Cover Data information, which does not necessarily align with the National Hydrography Dataset and the National Wetlands Inventory; furthermore, this does not include field verified information. These acreages are estimates and do not reflect those acreages indicated in Section 6.4.3, Wetlands. For a more detailed technical description of wetlands, see Section 6.4.3.

Table 6-25. Estimated Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern along the Proposed Power Infrastructure for PS-16

Community Type	Length Crossed (miles)	ROW Area Affected (acres)	Substation Area Affected (acres)
Native Grasslands	25.**3**	15**3.8**	**3.9**
Sagebrush	0.0[a]	0.2	0
Riparian Habitats[b]	0.**3**[c]	**1.8**[c]	0
Forest Communities	0.**5**[c]	**2.9**[c]	0

Source: USGS 2011b

a. Less than 0.05 (rounded down)

b. Riparian Habitats include wooded floodplains, wooded draws and greasewood flats.

c. Approximately 0.**3** mile and **1.8** acres of vegetation qualify as both Riparian Habitats and Forest Communities.

ROW = right-of-way

Note: Differences between Table 6-24 and Table 6-25 stem from the level of data refinement and different vegetation classifications.

Impacts on terrestrial vegetation associated with the components required to supply power to PS-16 would be moderate, in light of the permanent forest clearing and disturbance to sagebrush communities.

PS-17

Grand Electric Cooperative proposes to construct and operate a 10.9-mile 115-kV transmission line in Meade County, South Dakota, from WAPA's Maurine Substation to PS-17.

Table 6-26. Estimated Impacts on Vegetation Communities Crossed by Proposed Transmission Line to PS-17

Vegetation Community Classification	Length Crossed (miles)	ROW Area Affected (acres)
Barren Land	0.0[a]	**0.2**
Cultivated Crops	0.6	**3.2**
Developed, Low Intensity	**0.2**	**1.6**
Developed, Open Space	**0.8**	**5.7**
Grassland/Herbaceous	**9**.1	**54.3**
Pasture/Hay	0.1	**0.5**
Scrub-Shrub	0.0[a]	**0.2**
Total[b]	**10.9**	**65.8**

Source: National Land Cover Data (**USGS 2019d**)

a. Less than 0.05 (rounded down)

b. Totals may differ from sums due to rounding.

ROW = right-of-way

Note: The anticipated impacts on waters and wetlands as indicated in the table are based entirely on National Land Cover Data information, which does not necessarily align with the National Hydrography Dataset and the National Wetlands Inventory. Furthermore, this does not include field verified information. These acreages are estimates and do not reflect those acreages indicated in Section 6.4.3, Wetlands.

Table 6-27. Estimated Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern along the Proposed Transmission Line to PS-17

Community Type	Length Crossed (miles)	ROW Area Affected (acres)
Native Grasslands	9.8	59.**6**

Source: USGS 2011b

ROW = right-of-way

Note: Differences between Table 6-26 and Table 6-27 stem from the level of data refinement and different vegetation classifications.

Impacts on terrestrial vegetation associated with the components required to supply power to PS-17 would be minor, as the native grassland would be restored after construction.

PS-18

West Central Electric Cooperative proposes to construct and operate a 26-mile, 115-kV transmission line in Haakon County, South Dakota, from WAPA's Philip Substation to PS-18. The footprint of the Philip Substation is not expected to change.

Table 6-28. Estimated Impacts on Vegetation Communities Crossed by Proposed Transmission Line to PS-18

Vegetation Community Classification	Length Crossed (miles)	ROW Area Affected (acres)
Barren Land	**0.1**	**0.4**
Cultivated Crops	**6.1**	**37.4**
Developed, Low Intensity	**0.1**	**0.3**
Developed, Open Space	**4.0**	**23.7**
Emergent Herbaceous Wetlands	**0.1**	**0.3**
Grassland/Herbaceous	**15.6**	**94.4**
Open Water	0[a]	**0.0[b]**
Scrub-Shrub	**0.1**	**0.8**
Total[c]	**26.0**	**157.2**

Source: National Land Cover Data (**USGS 2019d**)

a. **Centerline does not cross this classification, but a portion of the ROW does.**

b. **Less than 0.05 (rounded down)**

c. **Totals may differ from sums due to rounding.**

ROW = right-of-way

Note: The anticipated impacts on waters and wetlands as indicated in the table are based entirely on National Land Cover Data information, which does not necessarily align with the National Hydrography Dataset and the National Wetlands Inventory. Furthermore, this does not include field verified information. These acreages are estimates and do not reflect those acreages indicated in Section 6.4.3, Wetlands.

Table 6-29. Estimated Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern along the Proposed Transmission Line to PS-18

Community Type	Length Crossed (miles)	ROW Area Affected (acres)
Native Grasslands	12.1	**73.3**
Riparian Habitats[a]	0.**0**[b, c]	0.**1**[b, c]
Forest Communities	0.**0**[b, c]	0.**1**[b, c]

Source: USGS 2011b

a. Riparian Habitats include wooded floodplains, wooded draws and greasewood flats.

b. **Less than 0.05 (rounded down)**

c. **Less than 0.05** mile and **approximately** 0.1 acre of vegetation qualify as both Riparian Habitats and Forest Communities.

ROW = right-of-way

Note: Differences between Table 6-28 and Table 6-29 stem from the level of data refinement and different vegetation classifications.

Impacts on terrestrial vegetation associated with the components required to supply power to PS-18 would be minor in light of the small amount of permanent forest clearing.

PS-19

West Central Electric Cooperative proposes to construct and operate a 20.5-mile, 115-kV transmission line extending from WAPA's Midland Substation in Jones County, South Dakota, to PS-19 in Haakon County, South Dakota, and to expand the Midland Substation.

Table 6-30. Estimated Impacts on Vegetation Communities Crossed by Proposed Power Infrastructure for PS-19

Vegetation Community Classification	Length Crossed (miles)	ROW Area Affected (acres)	Substation Area Affected (acres)
Cultivated Crops	**1.0**	**6.0**	0
Developed, Low Intensity	**0.2**	**1.8**	0
Developed, Open Space	**9.2**	**54.7**	0
Emergent Herbaceous Wetlands	**0.1**	**0.4**	0
Grassland/Herbaceous	**9.9**	**60.7**	1.0
Scrub-Shrub	0[a]	**0.1**	0
Woody Wetlands	0.**1**	**0.5**	0
Total[b]	**20.5**	**124.1**	**1.0**

Source: National Land Cover Data (**USGS 2019d**)

[a] **Centerline does not cross this classification, but a portion of the ROW does.**

[b] **Totals may differ from sums due to rounding.**

ROW = right-of-way

Note: The anticipated impacts on waters and wetlands as indicated in the table are based entirely on National Land Cover Data information, which does not necessarily align with the National Hydrography Dataset and the National Wetlands Inventory; furthermore, this does not include field verified information. These acreages are estimates and do not reflect those acreages indicated in Section 6.4.3, Wetlands. For a more detailed technical description of wetlands, see Section 6.4.3.

Table 6-31. Estimated Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern along the Proposed Power Infrastructure for PS-19

Community Type	Length Crossed (miles)	ROW Area Affected (acres)	Substation Area Affected (acres)
Native Grasslands	11.9	7**2.2**	**0.6**

Source: USGS 2011b

ROW = right-of-way

Note: Differences between Table 6-30 and Table 6-31 stem from the level of data refinement and different vegetation classifications.

Impacts on terrestrial vegetation associated with the components required to supply power to PS-19 would be minor to moderate, in light of the permanent forest clearing.

PS-20

Rosebud Electric Cooperative proposes to construct and operate a 17.2-mile, 115-kV transmission line in Tripp County, South Dakota, from **its** Witten Substation to PS-20.

Table 6-32. Estimated Impacts on Vegetation Communities Crossed by Proposed Transmission Line to PS-20

Vegetation Community Classification	Length Crossed (miles)	ROW Area Affected (acres)
Cultivated Crops	**11.6**	**70.6**
Developed, Low Intensity	**0.0**[a]	**0.2**
Developed, Open Space	**0.3**	**1.8**
Emergent Herbaceous Wetlands	**0.2**	**1.4**
Grassland/Herbaceous	**3.5**	**21.1**
Pasture/Hay	**1.0**	**6.3**
Woody Wetlands	**0.5**	**3.2**
Total[b]	**17.2**	**104.5**

Source: National Land Cover Data (**USGS 2019d**)

[a] **Less than 0.05 (rounded down)**

[b] **Totals may differ from sums due to rounding.**

ROW = right-of-way

Note: The anticipated impacts on waters and wetlands as indicated in the table are based entirely on National Land Cover Data information, which does not necessarily align with the National Hydrography Dataset and the National Wetlands Inventory. Furthermore, this does not include field verified information. These acreages are estimates and do not reflect those acreages indicated in Section 6.4.3, Wetlands. For a more detailed technical description of wetlands, see Section 6.4.3.

Table 6-33. Estimated Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern along the Proposed Transmission Line to PS-20

Community Type	Length Crossed (miles)	ROW Area Affected (acres)
Native Grasslands	3.9	23.6
Forest Communities	0.**4**	**2.4**

Source: USGS 2011b

ROW = right-of-way

Note: Differences between Table 6-32 and Table 6-33 stem from the level of data refinement and different vegetation classifications.

Impacts on terrestrial vegetation associated with the components required to supply power to PS-20 would be moderate, in light of the permanent forest clearing.

PS-21

Rosebud Electric Cooperative proposes to construct and operate a 20.5-mile, 115-kV transmission line extending from WAPA's Gregory Substation in Gregory County, South Dakota, to PS-21 in Tripp County, South Dakota. The substation would be rebuilt on existing WAPA property, but may not be in the exact footprint of the original substation**; the rebuild may involve up to 6 acres of new ground disturbance.**

Table 6-34. Estimated Impacts on Vegetation Communities Crossed by Proposed Power Infrastructure for PS-21

Vegetation Community Classification	Length Crossed (miles)	ROW Area Affected (acres)	Substation Area Affected (acres)
Cultivated Crops	**4.3**	**25.7**	**3.6**
Deciduous Forest	**0.0**[a]	**0.1**	0.0
Developed, Low Intensity	**0.1**	**0.7**	0.**2**
Developed, Medium Intensity	**0.0**[a]	**0.0**[a]	0.**1**
Developed, Open Space	**4.9**	**29.9**	0.**5**
Emergent Herbaceous Wetlands	**0.2**	**1.1**	0.0
Grassland/Herbaceous	**10.5**	**63.8**	**0.0**
Pasture/Hay	**0.4**	**2.4**	**1.5**
Woody Wetlands	**0.1**	**0.7**	0.0
Total[b]	**20.5**	**124.5**	**6.0**

Source: National Land Cover Data (**USGS 2019d**)

[a.] Less than 0.05 (rounded down)

[b.] **Totals may differ from sums due to rounding.**

ROW = right-of-way

Note: The anticipated impacts on waters and wetlands as indicated in the table are based entirely on National Land Cover Data information, which does not necessarily align with the National Hydrography Dataset and the National Wetlands Inventory. Furthermore, this does not include field verified information. These acreages are estimates and do not reflect those acreages indicated in Section 6.4.3, Wetlands. For a more detailed technical description of wetlands, see Section 6.4.3.

Table 6-35. Estimated Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern along the Proposed Power Infrastructure for PS-21

Community Type	Length Crossed (miles)	ROW Area Affected (acres)	Substation Area Affected (acres)
Native Grasslands	9.1	55.2	**0**
Forest Communities	0.**1**	**0.7**	0

Source: USGS 2011b

ROW = right-of-way

Note: Differences between Table 6-34 and Table 6-35 stem from the level of data refinement and different vegetation classifications.

Impacts on terrestrial vegetation associated with the components required to supply power to PS-21 would be moderate in light of the permanent forest clearing.

PS-22

NPPD and **Niobrara Valley Electric Membership Corporation** propose to construct a new 3.5-acre switching station and a 2.5-mile-long, 115-kV transmission line. The switching station would interconnect with an existing 115-kV transmission line, and the new transmission line would extend from the new switching station to PS-22.

Table 6-36. Estimated Impacts on Vegetation Communities Crossed by Proposed Power Infrastructure for PS-22

Vegetation Community Classification	Length Crossed (miles)	ROW Area Affected (acres)	Substation Area Affected (acres)
Cultivated Crops	0.**1**	**1.5**	3.**0**
Developed, Open Space	**1.9**	**21.8**	0.**5**
Grassland/Herbaceous	0.**6**	**7.6**	0.0[a]
Total[b]	**2.5**	**30.3**	**3.5**

Source: National Land Cover Data (**USGS 2019d**)

a. Less than 0.05 (rounded down)

b. Totals may differ from sums due to rounding.

ROW = right-of-way

Note: The anticipated impacts on waters and wetlands as indicated in the table are based entirely on National Land Cover Data information, which does not necessarily align with the National Hydrography Dataset and the National Wetlands Inventory. Furthermore, this does not include field verified information. These acreages are estimates and do not reflect those acreages indicated in Section 6.4.3, Wetlands. For a more detailed technical description of wetlands, see Section 6.4.3.

Table 6-37. Estimated Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern along the Proposed Power Infrastructure for PS-22

Community Type	Length Crossed (miles)	ROW Area Affected (acres)	Substation Area Affected (acres)
Native Grasslands	1.**3**	17.2	0

Source: USGS 2011b

ROW = right-of-way

Note: Differences between Table 6-36 and Table 6-37 stem from the level of data refinement and different vegetation classifications.

Impacts on terrestrial vegetation associated with the components required to supply power to PS-22 would be minor, as native grassland**, if present,** would be restored after construction.

PS-23

Elkhorn PPD proposes to construct and operate a new 3-mile-long, 69-kV distribution line in Antelope County, Nebraska, from the NPPD Antelope substation to PS-23.

Table 6-38. Estimated Impacts on Vegetation Communities Crossed by Proposed Distribution Line to PS-23

Vegetation Community Classification	Length Crossed (miles)	ROW Area Affected (acres)
Cultivated Crops	1.**6**	**18.5**
Deciduous Forest	0.0[a]	**0.3**
Developed, Low Intensity	0.**1**	**1.1**
Developed, Open Space	0.**8**	**9.4**
Grassland/Herbaceous	0.**6**	**7.7**
Total	**3.0**	**37.0**

Source: National Land Cover Data (**USGS 2019d**)
[a.] Less than 0.05 (rounded down)
ROW = right-of-way

Table 6-39. Estimated Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern along the Proposed Distribution Line to PS-23

Community Type	Length Crossed (miles)	ROW Area Affected (acres)
Native Grasslands	1.1	**12.6**
Riparian Habitats[a]	**0[b]**	**0.0[c]**
Forest Communities	**0[b]**	**0.0[c]**

Source: USGS 2011b
[a.] Riparian Habitats include wooded floodplains, wooded draws and greasewood flats.
[b.] Centerline does not cross this classification, but a portion of the ROW does.
[c.] Less than 0.05 (rounded down). This area qualifies as both Riparian Habitats and Forest Communities.
ROW = right-of-way
Note: Differences between Table 6-38 and Table 6-39 stem from the level of data refinement and different vegetation classifications.

Impacts on terrestrial vegetation associated with the components required to supply power to PS-23 would be minor, as the native grassland would be restored after construction.

PS-23B

Cornhusker PPD proposes to construct and operate a 3.4-mile-long 34.5-kV distribution line in Platte County, Nebraska, from an existing 34.5-kV line to PS-23B.

Table 6-40. Estimated Impacts on Vegetation Communities Crossed by Proposed Distribution Line to PS-23B

Vegetation Community Classification	Length Crossed (miles)	ROW Area Affected (acres)
Cultivated Crops	0.**2**	**8.6**
Developed, Low Intensity	0.3	**2.8**
Developed, Open Space	2.**9**	**28.5**
Grassland/Herbaceous	0[a]	**0.9**
Total[b]	**3.4**	**40.9**

Source: National Land Cover Data (**USGS 2019d**)
[a] **Centerline does not cross this classification, but a portion of the ROW does.**
[b] **Totals may differ from sums due to rounding.**
ROW = right-of-way

Table 6-41. Estimated Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern along the Proposed Distribution Line to PS-23B

Community Type	Length Crossed (miles)	ROW Area Affected (acres)
Native Grasslands	0.**3**	**3.8**
Riparian Habitats[a]	**0[b]**	**0.2[c]**
Forest Communities	0.**0[d]**	0.**3[c]**

Source: USGS 2011b
[a] **Riparian Habitats include wooded floodplains, wooded draws and greasewood flats.**
[b] **Centerline does not cross this classification, but a portion of the ROW does.**
[c] **Approximately 0.2 acre of vegetation qualify as both Riparian Habitats and Forest Communities.**
[d] **Less than 0.05 (rounded down)**
ROW = right-of-way
Note: Differences between Table 6-40 and Table 6-41 stem from the level of data refinement and different vegetation classifications.

Impacts on terrestrial vegetation associated with the components required to supply power to PS-23B would be minor, in light of the small amount of permanent forest clearing.

PS-24

Butler PPD proposes to construct and operate a new 1-mile-long, 69-kV distribution line in Butler County, Nebraska, from an existing 69-kV line to PS-24.

Table 6-42. Estimated Impacts on Vegetation Communities Crossed by Proposed Distribution Line to PS-24

Vegetation Community Classification	Length Crossed (miles)	ROW Area Affected (acres)
Cultivated Crops	1.0	**11.5**
Developed, Low Intensity	0.0[a]	**0.2**
Developed, Open Space	0.0[a]	**0.7**
Total	**1.0**	**12.4**

Source: National Land Cover Data (**USGS 2019d**)
[a] Less than 0.05 (rounded down)
ROW = right-of-way

The line to PS-24 would not cross biologically unique landscapes or vegetation communities of conservation concern.

Impacts on terrestrial vegetation associated with the components required to supply power to PS-24 would be minor, in light of the temporary disturbance to cultivated crops.

PS-25

Norris PPD proposes to construct and operate a new 9.3-mile-long, 69-kV distribution line in Seward County, Nebraska, from an existing 69-kV line to PS-25.

Table 6-43. Estimated Impacts on Vegetation Communities Crossed by Proposed Distribution Line to PS-25

Vegetation Community Classification	Length Crossed (miles)	ROW Area Affected (acres)
Cultivated Crops	**4.2**	**50.9**
Deciduous Forest	**0.0[a]**	**1.5**
Developed, Low Intensity	**0.6**	**7.3**
Developed, Open Space	**3.8**	**43.4**
Emergent Herbaceous Wetlands	**0[b]**	**0.2**
Grassland/Herbaceous	**0.6**	**8.9**
Total[c]	**9.3**	**112.2**

Source: National Land Cover Data (**USGS 2019d**)
[a] Less than 0.05 (rounded down)
[b] Centerline does not cross this classification, but a portion of the ROW does.
[c] Totals may differ from sums due to rounding.
ROW = right-of-way
Note: The anticipated impacts on waters and wetlands as indicated in the table are based entirely on National Land Cover Data information, which does not necessarily align with the National Hydrography Dataset and the National Wetlands Inventory. Furthermore, this does not include field verified information. These acreages are estimates and do not reflect those acreages indicated in Section 6.4.3, Wetlands. For a more detailed technical description of wetlands, see Section 6.4.3.

Table 6-44. Estimated Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern along the Proposed Distribution Line to PS-25

Community Type	Length Crossed (miles)	ROW Area Affected (acres)
Native Grasslands	**0.8**	1**3.1**
Riparian Habitats[a]	0[b]	0.6[b, c]
Forest Communities	0.1	0.**8**[c]
Rainwater Basin Landscape	9.3	112.2

Source: USGS 2011b

[a] Riparian Habitats include wooded floodplains, wooded draws and greasewood flats.

[b] Centerline does not cross this classification, but a portion of the ROW does.

[c] Approximately 0.1 mile and 0.6 acre of vegetation qualify as both Riparian Habitats and Forest Communities.

ROW = right-of-way

Note: Differences between Table 6-43 and Table 6-44 stem from the level of data refinement and different vegetation classifications.

Impacts on terrestrial vegetation associated with the components required to supply power to PS-25 would be minor to moderate, in light of the small amount of permanent forest clearing and the potential disturbance to Rainwater Basin Landscape.

PS-26

NPPD and Norris PPD propose to construct and operate a new 0.1-mile-long, 115-kV transmission line in Jefferson County, Nebraska, from an existing 115-kV transmission line to PS-26.

Table 6-45. Estimated Impacts on Vegetation Communities Crossed by Proposed Transmission Line to PS-26

Vegetation Community Classification	Length Crossed (miles)	ROW Area Affected (acres)
Developed, Open Space	0.0[a]	0.**2**
Grassland/Herbaceous	0.1	1.**1**
Total	**0.1**	**1.3**

Source: National Land Cover Data (**USGS 2019d**)

[a] Less than 0.05 (rounded down)

ROW = right-of-way

Table 6-46. Estimated Impacts on Biologically Unique Landscapes or Vegetation Communities of Conservation Concern along the Proposed Transmission Line to PS-26

Community Type	Length Crossed (miles)	ROW Area Affected (acres)
Native Grasslands	0.1	1.3

Source: USGS 2011b

ROW = right-of-way

Impacts on terrestrial vegetation associated with the components required to supply power to PS-26 would be minor, as the native grassland would be restored after construction.

6.4.5 Wildlife

This section builds upon the description and analyses provided in Sections 3.7 and 4.7 of this document, and Sections 3.6 and 4.6 of the 2014 Keystone XL Final SEIS. This section provides information related to potential impacts from electrical power infrastructure.

6.4.5.1 Affected Environment

The wildlife resources in the vicinity of the proposed Project and associated power infrastructure are described in Section 3.7 of this document and Section 3.6 of the 2014 Keystone XL Final SEIS. Wildlife of particular regional importance (other than protected species, which are discussed in Section 6.4.6) that could be affected by the proposed power lines and substations include big game animals, waterfowl and other game birds. Other wildlife, including small and medium game animals, non-game mammals, raptors and other non-game birds, reptiles, amphibians, and traditionally used wildlife are detailed in Section 3.6 of the 2014 Keystone XL Final SEIS.

Wildlife habitats potentially affected by construction and operation of power lines include approximately **177** miles of grassland/rangeland, 50 miles of cropland, 1 mile of upland forest, 3 miles of wetland and water, **37** miles of scrub-shrub**,** and 5**0** miles of developed land. The Audubon Society has labeled some of these lands and waters as Important Bird Areas.

Table 6-47 presents important wildlife habitats crossed by the proposed power lines. The lines to PS-09 and PS-10 would cross big game habitat priority areas, as defined by Montana Fish, Wildlife and Parks. **Some lines would also cross Important Bird Areas.** The Glaciated Prairie Important Bird Areas lies between Fort Peck Lake and the Milk River in northeastern Montana. This Important Bird Area encompasses an expanse of largely unbroken sagebrush shrub-steppe and prairie grassland supporting the greater sage-grouse (*Centrocercus urophasianus*), a species of global concern (Montana Audubon 2015a). The electrical power infrastructure for PS-09 would encounter this Important Bird Area. The North Valley Grasslands Important Bird Area covers much of Montana's Valley County north of the Milk River and is important for ground nesting grassland birds (U.S. Department of State 2014). The line to PS-10 would encounter this Important Bird Area. The Charles M. Russell National Wildlife Refuge Important Bird Area covers the area surrounding Fort Peck Lake and supports 15 bird species of global conservation concern (Audubon 2018a). The electrical power infrastructure for PS-10 would encounter this Important Bird Area as well. Crossed by PS-16, the Custer National Forest Important Bird Area in Harding County, South Dakota, rises out of the surrounding plains and provides ledges and small caves for nesting birds, supporting a community more similar to the Black Hills than to the nearby sagebrush- and grassland-dominated landscape (Audubon 2018b).

Table 6-47. Important Wildlife Habitats Crossed by Proposed Power Lines

Habitat Name	Miles Crossed	ROW Area Potentially Affected (acres)	Substation Area Affected (acres)
Big game habitat priority areas	85.**9**	**981.5**	**8**.0
Glaciated Prairie Important Bird Area	15.2	147.7	0.0
North Valley Grasslands Important Bird Area	16.4	158.7	0.0
Charles M. Russell National Wildlife Refuge and Important Bird Area	2.1	20.2	**3**.0
Custer National Forest Important Bird Area	1.9	11.7	0.0

Source**s**: Audubon 2016**;** Montana Audubon 2015b**;** Montana Fish, Wildlife and Parks 2019
BLM = Bureau of Land Management; ROW = right-of-way

6.4.5.2 Environmental Consequences

Overall impacts on wildlife would be minor from power line construction and minor to moderate from power line operations. The nature of potential impacts related to power lines and associated infrastructure is described in Section 4.7 of this document and in Section 4.6 of the 2014 Keystone XL Final SEIS. The consequences detailed in Section 6.4.6 for protected and special status species could also occur for other wildlife resources in the area. In brief, the proposed **activities** could result in temporary and permanent displacement, temporary loss of habitat during construction, permanent loss of habitat as a result of land use conversion (**i.e., tree removal along proposed power line alignments;** see Section 6.4.4), and an increased risk of birds colliding with**,** or being electrocuted by**,** operating power lines.

Temporary impacts on wildlife from construction activities would occur at substation areas, pole excavations, pulling and tensioning areas, and temporary workspaces. While the sizes and locations of these areas are not yet known, they would **nearly** all be contained within the ROW and footprints of associated facilities. Therefore, for the purposes of this analysis, the extent of potential temporary impacts is assumed to be the entire ROW and footprints of associated facilities**, plus the access road for the power line to PS-13**. The extent of permanent direct impacts would be much smaller, and would be limited to the land area and air space occupied by poles and power lines and the areas used for permanent substations and similar facilities. Indirect impacts, such as avoidance behaviors, could extend for some distance from the disturbed areas and could also occur outside of the ROW as a result of increased traffic along existing roads, especially in the case of skittish big game animals.

Much of the proposed construction would occur in previously disturbed areas, thus moderating potential impacts on wildlife. For example, much of the proposed work would be within 656 feet of an existing road centerline, a typical avoidance distance for several birds and big game animals (Hötker 2017, McCorquodale 2013). By siting power infrastructure in or near previously disturbed areas, direct impacts on wildlife during construction and indirect impacts (i.e., avoidance behavior) during operation, would be minimized.

Impacts on big game would be further minimized by avoiding construction within identified big game habitat priority areas from December 1 to May 15 of each year. This measure would be mandatory on all BLM-managed lands, and may be implemented on other portions of the proposed Project **and connected actions,** as well.

Power lines that cross rivers, streams, ponds and wetlands could present a collision hazard for waterfowl, game birds and other birds. As shown in Table**s** 8-2 **through 8-5**, collision risk would be mitigated by installing bird flight diverters (BFDs) on the power line at crossings of major habitat features and for 0.25 mile on either side of large rivers. In addition, perch deterrents could be installed under certain circumstances where the structure configuration allows and risk to wildlife from increased avian predation would be high. Power lines that cross Important Bird Areas also present a collision risk, although, on account of the large extent of Important Bird Areas, no mitigation measure has been proposed specifically for Important Bird Areas. However, the **avoidance, minimization, and** mitigation measures **summarized in** Table 8-**5**, as well as the microhabitat-based measures such as BFDs (see Table 8-3 and Table 8-4), and other measures listed in Section 6.4.6 for protected and special status species would also benefit the conservation of birds and other wildlife resources. **As shown by Barrientos et al. (2011), marking of power lines can reduce overall avian collision rates by 55 to 94 percent.**

The impacts resulting from **habitat modification and fragmentation have some potential to be major at the local level,** although the regional effect would likely be minor to moderate. Overall, the impacts on wildlife resulting from the proposed power lines and associated infrastructure would likely be minor to moderate.

6.4.6 Protected and Special Status Species

This section builds upon the description, analyses, and USFWS coordination summaries provided in Sections 3.8 and 4.8 of the 2014 Keystone XL Final SEIS and Sections 3.7 and 4.7 of this document. The following discussion is organized by species protected under the ESA, the MBTA, and the Bald and Golden Eagle Protection Act, as well as BLM and state-specific regulations, as appropriate. ESA-listed, migratory bird, and other sensitive species and/or their habitats are described that have the potential to be affected by the proposed electrical power infrastructure, as well as a description of specific potential effects, if any, to those species resulting from the construction and operation of the power infrastructure.

6.4.6.1 Endangered Species Act

Changes to the list of ESA-protected species potentially affected by the proposed Project **and connected actions** have occurred since the 2014 Keystone XL Final SEIS. Notably, the inclusion of the rufa red knot (*Calidris canutus rufa*) and the northern long-eared bat (*Myotis septentrionalis*), as well as the removal of Sprague's pipit (*Anthus spragueii*) and the greater sage-grouse (*Centrocercus urophasianus*), have occurred. A summary of these changes is provided in Table 3.7-4. In light of these changes, as well as the availability of new species-specific information, a Biological Assessment (BA) has been submitted to the USFWS for the proposed Project **and associated power infrastructure**. **The USFWS has finalized their Biological Opinion; findings of the Biological Opinion, including conservation measures, have been updated in the Final SEIS document.** In addition, Keystone has submitted a Habitat Conservation Plan to the USFWS under Section 10 of the ESA for an Incidental Take Permit of the American burying beetle. This includes further analysis of the potential impacts to endangered species. Thirteen ESA-listed species may occur in the vicinity of the proposed Project **and associated power infrastructure. Three species** would not be affected by the proposed **activities** because protected populations of those species are not likely to occur in the **affected a**rea, and 10 **species** are analyzed in detail (Table 6-49). Two of those 10 species are aquatic (i.e., pallid sturgeon and Topeka shiner) and would not be affected by the proposed power lines and associated infrastructure as any power line would span potential river**ine** habitat and no in**-channel** work would be required. The remaining eight species with the potential to be affected are described below along with a description of impacts, if any, to these species that could result from the construction and operation of the power infrastructure.

American Burying Beetle

Detailed natural history information, previous agency coordination, required conservation measures and an analysis of impacts on American burying beetles resulting from the construction and operation of the proposed Project are provided in the 2014 Keystone XL Final SEIS, Section 3.7. An updated analysis of impacts specifically resulting from the construction and operation of the power lines was provided in the BA submitted to USFWS in 2019 and is summarized below and in Table 6-49. The USFWS has recently completed a species status assessment for the American burying beetle (USFWS 2019k) and has proposed reclassifying this species from endangered to threatened (84 FR 19013).

The American burying beetle is the largest carrion-feeding insect in North America, reaching a length of about 1.6 inches and a weight of up to 0.1 ounce. Like other carrion beetles, American burying beetles search the environment for fresh carcasses, which they use for feeding and rearing of offspring (Milne and Milne 1976; USFWS 2012b). During the daytime, American burying beetles are believed to bury under the vegetation litter to avoid desiccation and predators. Unlike other burying beetles, no strong correlation with vegetation or soil type seems to exist, but it strongly prefers moist soils (Creighton et al. 1993; Hoback 2016; Jurzenski et al. 2011). There is a strong negative association between the presence of this species and cultivated croplands (Leasure and Hoback 2017). This species occurs in South Dakota and Nebraska, but does not occur in Montana.

Three proposed power lines, a substation rebuild, and a new switching station coincide with areas of potentially suitable habitat for the American burying beetle. This power infrastructure would serve PS-20, PS-21, and PS-22. No other power infrastructure required for the proposed Project would overlap the current range of this species. The power line to PS-20 would involve RUS's decision to help finance the construction of the power line. The power infrastructure to PS-21 would involve WAPA's rebuild of its Gregory substation, RUS's decision to help finance the construction of the power line, and WAPA's decision regarding interconnection; BLM and the USACE would not be involved. The power infrastructure for PS-22 would not involve any federal agency.

Construction of power infrastructure to these pump stations could affect the American burying beetle. Power lines would not negatively affect the American burying beetle except where pole structures would be installed. Data from Hoback (2016) suggest the risk to burying beetles buried at typical depths is very low even when a 33-ton NPPD truck vehicle passes directly over them. Therefore, the risk of disturbance, injury, or mortality of American burying beetles caused by pole structure installation is very low outside of the immediate area of ground disturbance where poles would be embedded. The level of permanent effect from poles occupying habitat area would be negligible, as each pole would affect only 3 square feet; e.g., for the power line to PS-21, all pole structures combined would permanently occupy a total of only 0.03 acre. Construction of the substation and the switching station would eliminate habitat and could harm individuals through direct contact during ground-disturbing activities. The elimination of habitat by the proposed infrastructure is not likely to have any additional effect on the American burying beetle, as there is other suitable habitat within the typical nightly movement range of this species (0.31 to 0.76 mile per night) (USFWS 2019k).

The proposed electrical power infrastructure would disturb up to approximately 9.5 acres of potentially suitable habitat, mostly at the substation and the switching station locations. After publication of the Draft SEIS, new data on the abundance of American burying beetles per acre became available. The BA used the new data to estimate that all of the disturbance related to construction of the proposed electrical power infrastructure combined would lead to effects on approximately one American burying beetle, including an allowance for potential lost reproductive output.

Conservation measures in the Biological Opinion would reduce the likelihood of impacts**. The NPPD has agreed to construct the** power **infrastructure for PS-22** during the winter months when the ground is frozen and the American burying beetle is inactive and hibernating below the frost line, thereby avoiding compaction and negative impacts on the species**.** WAPA and the power providers would endeavor to reduce the likelihood of American burying beetles occurring in the potentially affected area by mowing vegetation to less than 8 inches in height, removing grass clippings, and inspecting the work area daily to remove all carcasses; these measures would be in force from March 15 through October 31 or until construction in the vicinity is completed, whichever is earlier.

Continued operations of the proposed power infrastructure would be unlikely to affect the American burying beetle **because individuals would be buried during the daytime and likely would not be affected by activities that do not break the ground surface.**

Overall, the proposed electrical power infrastructure is likely to lead to negligible impacts on this species.

Black-Footed Ferret

Detailed natural history information, previous agency coordination, required conservation measures and an analysis of impacts on black-footed ferrets resulting from the construction and operation of the proposed Project are provided in the 2014 Keystone XL Final SEIS and Section 3.7. An updated analysis of impacts on black-footed ferrets resulting specifically from the construction and operation of the power lines is provided in the BA submitted to USFWS in 2019 and is summarized below and in Table 6-49.

Black-footed ferrets are solitary, primarily nocturnal carnivores that depend on prairie dogs. Historically, the range of the black-footed ferret coincided closely with that of the black-tailed prairie dog (*Cynomys ludovicianus*), Gunnison's prairie dog (*C. gunnisoni*), and white-tailed prairie dog (*C. leucurus*), which make up more than 90 percent of the black-footed ferret's diet**. Ferrets also use prairie dog burrows as their sole source of shelter** (USFWS 2008).

According to the USFWS Pierre Ecological Services Field Office, black-tailed prairie dog towns in all of South Dakota and Nebraska are block-cleared, meaning the towns no longer contain any wild free-ranging black-footed ferrets and activities within these areas that result in the removal of the black-tailed prairie dogs and/or their habitat would no longer be required to meet the USFWS survey guidelines for black-footed ferrets (C. Besken, Pers. Comm., June 11, 2008; SDGFP 2018; USFWS **2018k**). **Additionally, the USFWS no longer requires surveys for black-footed ferrets of any prairie dog town in Montana for actions outside of the reintroduction sites (Jeff Berglund, Pers. Comm., December 19, 2018). Further, in Montana, all prairie dog towns within the proposed ROW as of 2011 were unsuitable for the reintroduction of the black-footed ferret (Martha Tacha, Pers. Comm., January 6, 2011), and there are no currently existing black-footed ferret populations within the ROW (USFWS 2013b). Therefore, there appears to be little to no possibility of black-footed ferret presence near the proposed electrical power infrastructure.**

Power lines associated with the proposed Project are likely to attract raptors, which are known to be predators of the black-footed ferret and its primary prey, prairie dogs. However, **no effects on the black-footed ferret would be expected from the construction and operation of** power line**s** and associated infrastructure because none of the proposed power lines would approach a known population of black-footed ferrets. Further, the USFWS has determined that effects on prairie dogs in Montana, South Dakota, and Nebraska do not affect the black-footed ferret where it is not known to occur (Jeff Berglund, Pers. Comm., December 19, 2018). Even so, conservation measures would be implemented by electrical service providers to minimize raptor perching**, as appropriate,** in accordance with the APLIC, Suggested Practices for Avian Protection on Power Lines (APLIC 1996, 2012).

Overall, the proposed electrical power infrastructure is not likely to affect this species; therefore, impacts would likely be negligible.

Interior Least Tern

Detailed natural history information, previous agency coordination, required conservation measures and an analysis of impacts on interior least terns resulting from the construction and operation of the proposed Project are provided in the 2014 Keystone XL Final SEIS and in Section 3.7 of this document. An updated analysis of impacts specifically resulting from the construction and operation of the power lines is provided in the BA submitted to USFWS in 2019 and is summarized below and in Table 6-49.

The interior least tern is a migratory bird that winters along the Gulf Coast, the coasts of Caribbean islands, the eastern coast of Central America, and northern South America. The species breeds in the Rio Grande, Red, Missouri, Arkansas, Mississippi, and Ohio River systems from Texas to Montana and from eastern Colorado and New Mexico to southern Indiana. The interior

least tern continues to breed in most of the historical river systems, although its distribution generally is restricted to less altered river segments (USFWS 1990). Nesting areas of interior least terns include sparsely vegetated sand and gravel bars within a wide, unobstructed river channel or salt flats along lake shorelines (Nelson 1998; USFWS 1990). Nesting locations are usually well above the water's edge on dry, elevated sandbars and shorelines.

The USFWS initially identified six rivers that would be crossed by the proposed Project as potentia**lly suitable** nesting habitat for interior least terns: the Missouri and Yellowstone rivers in Montana; the Cheyenne River in South Dakota; and the Platte, Loup and Niobrara rivers in Nebraska. Since then, the proposed Project has been re-routed along the MAR in Nebraska and no longer crosses the Loup River. However, the effects of power line development are considered in crossings of the Missouri, Yellowstone, and Milk **rivers** in Montana; the Cheyenne, **River** in South Dakota; and the Niobrara, Elkhorn, **and** Platte, and **rivers** in Nebraska.

Construction of **proposed power infrastructure in potentially suitable habitat** during the nesting season would potentially disturb nesting and brood-rearing birds. **Of all the proposed electrical power infrastructure,** only **the** power line **that would serve PS-10 is** within 1 mile of **potentially** suitable **habitat. However, potentially suitable nesting habitat within 0.25 mile of the proposed power line to PS-10 is absent. Given the lack of nesting habitat suitability, there would be little to no risk of any effects to nesting least terns. While interior least terns typically forage near riverine nesting areas, effects to foraging habitat are possible as the species has been documented traveling up to 7 miles from non-riverine nesting areas to forage (USFWS 2013a). However, given that interior least terns utilize a variety of shallow-water habitats for foraging, typically in proximity to riverine nesting areas, effects to foraging individuals are not likely to occur.** Similarly, power line crossings of the Milk River would also occur in areas where suitable nesting habitat is lacking. Since none of the power lines cross suitable nesting habitat, nest predation by avian predators using the **power line** structures to perch would be avoided.

Operation of the proposed power lines has the potential to increase the collision hazards for feeding and nesting interior least terns, if present in the action area, potentially resulting in injury or mortality to individuals. The proposed power line in Montana to PS-10 would pass near, but not intersect, potentially suitable habitat. However, since the power line for PS-10 would be strung on existing structures or would replace existing structures with new structures, the increased risk would be insignificant, as birds are likely accustomed or habituated to the existing structures and power lines on the landscape. All other proposed power lines would be located more than 1 mile away from potentially suitable habitat. In addition, the marking of power lines designed to reduce effects to the whooping crane (see Table 8-3) would provide incidental benefits to least terns by further reducing the risk of collisions.

Some potential for increased predation on interior least terns exists due to the increased raptor perching opportunities provided by new power lines. While this could result in locally high levels of mortality to interior least tern colonies in the vicinity, if present, the exponential growth of the interior least tern population since the species was listed indicates that locally high levels of predation are not currently a threat to the species' continued survival (USFWS 2012b). As described above, only the power line to PS-10 is located within 1 mile of potentially suitable interior least tern nesting habitat. Further, nesting habitat is absent within 0.25 mile of the power line crossing, likely precluding successful predation of nesting terns, if present, by raptors perched on the new power line (Wuczyński 2005). Additionally, conservation measures would be implemented by electrical service providers to minimize raptor perching in accordance with the APLIC, Suggested Practices for Avian Protection on Power Lines (APLIC 1996, 2012).

The electrical power line providers are responsible for obtaining the necessary permits or authorizations from federal and state agencies and local governments to construct new power lines necessary to operate the proposed Project. As required by these processes, protection measures would be implemented by electrical service providers to minimize or prevent construction disturbance and collision risk to foraging interior least terns with the use of standard measures as outlined in APLIC guidance (APLIC 1994, 1996, 2006, 2012). Conservation measures applicable to power lines are provided in Chapter 8, Summary of Consequences (see Table 8-3).

Overall, the proposed electrical power infrastructure is not likely to affect this species; therefore, impacts would likely be negligible.

Northern Long-Eared Bat

Detailed natural history information, previous agency coordination, required conservation measures, and an analysis of impacts on northern long-eared bats resulting from the construction and operation of the proposed Project are provided in the 2014 Keystone XL Final SEIS and in Section 3.7 of this document. An updated analysis of impacts specifically resulting from the construction and operation of the power lines is provided in the BA submitted to USFWS in 2019 and is summarized below and in Table 6-49.

The northern long-eared bat prefers intact, closed-canopy forests for foraging, although individuals will forage along the forest edge (Patriquin and Barclay 2003; Jung et al. 1999; Barbour and Davis 1969). The northern long-eared bat rarely flies through non-forested areas, particularly large non-forested areas such as large agricultural fields (Henderson and Broders 2008; Hogberg et al. 2002). Roosting occurs primarily within intact, closed-canopy forests (Menzel et al. 2002; Owen et al. 2002; Foster and Kurta 1999). Roost tree species and diameter are highly variable (Lacki and Schwierjohann 2001; Foster and Kurta 1999), although snag density, tree density, and presence of cavities or loose bark appear to be important roosting features (Menzel et al. 2002; Owen et al. 2002, 2003; Foster and Kurta 1999). Proximity to water has also been identified as an important feature for roosting and foraging (Henderson and Broders 2008; Carter and Feldhamer 2005; Sasse and Perkins 1996).

There are no records of **known occupied northern long-eared bat maternity roost trees or hibernacula** within 1 mile of the proposed **power line infrastructure** in Montana, South Dakota or Nebraska. **Potentially suitable f**orested habitat **was quantified and mapped by Keystone** along the proposed power lines to PS**-13 through PS-21** (whereas proposed power lines to PS-09, PS-10, PS-11 and PS-12 **were** located in counties outside the northern long-eared bat range **at the time** [USFWS 2019**l;** MNHP 2018]). **Due to recent captures of the species in Montana, the power lines associated with PS-10 through PS-12 are now located within the current northern long-eared bat range (MNHP 2019). Similarly, potentially suitable habitat along the power lines to PS-22 through PS-26 in Nebraska was not evaluated by Keystone. As such, current aerial imagery of the power line routes to PS-10 through PS-12 and PS-22 through PS-26 was reviewed and any forested habitat identified was conservatively judged to be potentially suitable for use by roosting and/or foraging northern long-eared bats.** Based on **Keystone's** analysis **and aerial imagery review**, approximately **18** acres of potentially suitable forested habitat would overlap the proposed power line work that would serve **PS-10, PS-12,** PS-13, **PS-16, PS-18, PS-19, PS-20, PS-21, PS-22, PS-23, PS-23b, and PS-25.**

Given **the lack of known occurrences within 1 mile of the proposed power infrastructure and** the very small amount of **potentially suitable** habitat that could conservatively support the northern long-eared bat proximal to the proposed power **infrastructure**, the potential for northern long-eared bat occurrence near the action area is extremely low. **Further, tree removal activities will be conducted in accordance with required conservation measures provided in the final 4(d) Rule and summarized in Chapter 8, Summary of Consequences (see Table 8-3), and incidental take, if any, would not be**

prohibited. Therefore, the construction, operation and maintenance of the proposed power **infrastructure would have negligible effects on** the northern long-eared bat.

Piping Plover

Detailed natural history information, previous agency coordination, required conservation measures and an analysis of impacts on piping plovers resulting from the construction and operation of the proposed Project are provided in the 2014 Keystone XL Final SEIS **and** Section 3.7 of this document. An updated analysis of impacts specifically resulting from the construction and operation of the power lines was is provided in the BA **submitted to USFWS in 2019** and is summarized below **and in Table 6-49**.

Piping plovers are migratory birds that are thought to winter along the Gulf of Mexico, southern U.S. Atlantic coastal beaches from North Carolina to Florida, eastern Mexico, and scattered Caribbean islands and breed across three geographic regions: U.S. and Canadian Northern Great Plains from Alberta to Manitoba south to Nebraska, Great Lakes beaches, and Atlantic coastal beaches from Newfoundland to North Carolina (Haig 1986; USFWS 1988). Populations of piping plover potentially present within the action area are considered to belong to the threatened Northern Great Plains population and nest on the Missouri, Platte, Niobrara, and other rivers. Nesting habitat includes sparsely vegetated shorelines around small alkali lakes, large reservoir beaches, river islands and adjacent sandpits, beaches and dry barren sandbars in wide, open channel beds, and shorelines associated with industrial ponds (Haig and Plissner 1993; USFWS 2012b).

The USFWS initially identified six rivers that would be crossed by the proposed Project as potential nesting habitat for piping plover: the Missouri and Yellowstone rivers in Montana; the Cheyenne River in South Dakota, and the Platte, Loup and Niobrara **Rivers** in Nebraska. As mentioned above, since then, the proposed Project has been re-routed along the MAR in Nebraska and no longer crosses the Loup River. However, the effects of power line development are considered in crossings of the Missouri, Yellowstone, and Milk **rivers** in Montana; the Cheyenne **River** in South Dakota; and the Niobrara, Elkhorn, **and** Platte **Rivers** in Nebraska.

Construction of proposed power infrastructure in potentially suitable habitat during the nesting season would potentially disturb nesting and brood-rearing birds. Of all the proposed electrical power infrastructure, only the power line that would serve PS-10 is within 1 mile of potentially suitable habitat. However, potentially suitable nesting habitat within 0.25 mile of the proposed power line to PS-10 is absent. Given the lack of nesting habitat suitability, there would be little to no risk of any effects to nesting piping plover.

Operation of the proposed power lines has the potential to increase the collision hazards for nesting piping plover, if present in the action area, potentially resulting in injury or mortality to individuals. The proposed power line in Montana to PS-10 would pass near, but not intersect, potentially suitable habitat. However, since the power line for PS-10 would be strung on existing structures or would replace existing structures with new structures, the increased risk would be insignificant, as birds are likely accustomed or habituated to the existing structures and power lines on the landscape. All other proposed power lines would be located more than 1 mile away from potentially suitable habitat. In addition, the marking of power lines designed to reduce effects to the whooping crane (see Tables 8-3 and 8-4) would provide incidental benefits to piping plover by further reducing the risk of collisions.

Some potential for increased predation on piping plover exists due to the increased raptor perching opportunities provided by new Project power lines. As described above, only the power line to PS-10 is located within 1 mile of potentially suitable nesting habitat. Further, nesting habitat is absent within 0.25 mile of the power line crossing, likely precluding successful predation of nesting plovers, if present, by raptors perched on the new power line (Wuczyński 2005).

The electrical power line providers are responsible for obtaining the necessary permits or authorizations from federal and state agencies and local governments to construct new power lines necessary to operate the proposed Project. As required by these processes, protection measures would be implemented by electrical service providers to minimize or prevent construction disturbance, collision risk and predation risk to piping plovers with the use of standard measures as outlined in APLIC guidance (APLIC 1994, 1996, 2006, 2012). Conservation measures applicable to power lines are provided in Chapter 8, Summary of Consequences (see Table 8-3).

Overall, the proposed electrical power infrastructure is not likely to affect this species; therefore, impacts would likely be negligible.

Rufa Red Knot

Previous agency coordination, required conservation measures, and an analysis of impacts on rufa red knots resulting from the construction and operation of the proposed Project are provided in Section 3.7 of this document. An analysis of impacts specifically resulting from the construction and operation of the power lines is provided in the BA submitted to USFWS in 2019 and is summarized below and in Table 6-49.

The rufa red knot was federally listed as a threatened species on December 11, 2014. The species is generally restricted to ocean coasts during winter and occurs primarily along the coast during migration; however, a small number of migrants are reported across the interior of the United State during spring and fall migration (eBird 2019; Jorgensen 2014). With the exception of a few, primarily saline, lakes in the northern Great Plains, there is no evidence that rufa red knots use non-coastal habitats as stopover sites proximal to the proposed Project or electrical power infrastructure (Central Flyway Council 2013).

Most rufa red knots migrate along the eastern coastline, feeding on mollusks and softer invertebrate prey (Piersma and van Gils 2011; Harrington 2001). The primary locations for these types of food sources are coastal marine and estuarine habitats with exposed intertidal sediment, sand, gravel, or cobble beaches, tidal mudflats, salt marshes, shallow coastal impoundments and lagoons (Cohen et al. 2010; Cohen et al. 2009; Niles et al. 2008; Harrington 2001; Truitt et al. 2001). Although small numbers of rufa red knots are reported annually across the interior United States during spring and fall migrations, there is no evidence that this species uses non-coastal sites proximal to the proposed Project as traditional stopover locations. Non-coastal traditional stopover locations exist around Lake Erie, Lake Michigan, and Lake Ontario in the Midwest, and potentially on a much less frequent basis at smaller sites such as Cheyenne Bottoms National Wildlife Refuge in Kansas (eBird 2019). The USFWS notes that some information "suggests that some rufa red knots likely use inland saline lakes as stopover habitat in the Northern Great Plains. We have no information to indicate whether rufa red knots may also use inland freshwater habitats during migration" (79 FR 73705). Those inland saline lakes are quite far from the proposed electrical power infrastructure, primarily in southern Saskatchewan (Gratto-Trevor et al. 2001; Nature Saskatchewan 2014; 79 FR 73705). Rufa red knot use of other stopover habitat in the Northern Great Plains is less consistent and may vary between years depending on water level and prey availability (79 FR 73705); only small numbers of migrant rufa red knot have been observed through the Great Plains within the United States (78 FR 60023). In general, the 500- to 600-mile-

wide central flyway that includes the proposed Project and electrical power infrastructure is consistently used by some rufa red knots, but stopover locations may vary depending on conditions such as water levels and prey sources (79 FR 73705). Some geolocator data also indicate that rufa red knots fly directly from Canada to Texas without stopping (Fitzsimmons 2011).

Given that rufa red knots typically make non-stop, direct migratory flights and that very little potentially suitable habitat exists within the potentially affected area, rufa red knots would not be expected to encounter the proposed power infrastructure. If stopovers occur due to **poor** weather conditions during migration, potential injury or mortality could occur due to power line collisions; however, red knot stopover habitat proximal to the proposed power infrastructure is very limited, with only 2.7 acres within the power line ROW. There is one potential stopover site at Austin Lake proximal to the transmission line to PS-09, one ephemeral lake along the transmission line to PS-16, and two ephemeral lakes along the transmission line to PS-18. There is no potential stopover habitat proximal to the proposed power lines in Nebraska.

In the unlikely event that a migrating rufa red knot does approach a power line associated with the proposed Project, the installed BFDs and other conservation measures detailed in Table 8-3 (see Chapter 8, Summary of Consequences) would reduce the risk of effects on the rufa red knot. **Overall, the proposed electrical power infrastructure is not likely to affect this species; therefore, impacts would likely be negligible.**

Whooping Crane

Detailed natural history information, previous agency coordination, required conservation measures, and an analysis of impacts on whooping cranes resulting from the construction and operation of the proposed Project are provided in the 2014 Keystone XL Final SEIS and Section 3.7 of this document. An updated analysis of impacts specifically resulting from the construction and operation of the power lines is provided in the BA submitted to USFWS in 2019 and is summarized below and in Table 6-49.

Whooping cranes are migratory birds that occur only in North America. In 2018, the total wild population was estimated to be 849 birds (ICF 2018). This estimate includes 504 birds in the self-sustaining Aransas-Wood Buffalo Population (AWBP) that winters in coastal marshes in Texas and migrates to Canada to nest in Wood Buffalo National Park and adjacent areas. During spring and fall migrations, the AWBP population moves through the central Great Plains including portions of Montana, North Dakota, South Dakota, and Nebraska, using shallow, seasonally or semi-permanently flooded palustrine wetlands, broad river channels, stock ponds, and shallow portions of reservoirs for roosting, and various croplands and emergent wetlands for feeding (Austin and Richert 2001; Johns et al. 1997). Birds from the AWBP population depart from their wintering grounds in Texas from March through May. Fall migration typically begins in September with most birds arriving on wintering grounds in October and November (CWS and USFWS 2005).

Historically, the sole source of data used to define the migration corridor of the whooping crane has been historical observations of migrating whooping cranes. Recently, Pearse et al. (2018) updated the presumed migration corridor using opportunistic confirmed sightings from 1946 to 2016, as well as location data collected between 2010 and 2016 from 58 cranes outfitted with radio transmitters (Figure 6-5).[3,4] Generally speaking, the migration corridor includes areas of the Great Plains similar to those identified in past efforts using historical observations (Kuyt 1992; Pearse et al. 2018; Stehn and Wassenich 2008; Tacha et al. 2010). Similar to the historical 198.8-mile-wide corridor, the Pearse et al. (2018) migration corridor has an average width of 182.7 miles. USFWS flyway historical sighting data (USFWS 2018e**) and USGS telemetry data (Pearse et al. 2018) were reviewed for recorded ground sightings of whooping cranes in proximity to the action area (see Figures 6-6a, 6-6b, and 6-6c). Unlike telemetry data, historical USFWS data have the major limitation that the data are dependent on human observation and likely result in false negative information in remote locations.**

Power lines associated with the proposed Project **that are located** in the **95 percent whooping crane** migration corridor **(a polygon that encompasses 95 percent of the verified historical and recent telemetry records**) could pose collision hazards to migrant whooping cranes. **Power lines associated with PS-16 through PS-23 are located within the 95 percent whooping crane migration corridor.** Collisions with power lines are a major source of mortality for fledged whooping cranes of the migratory AWBP **(**Fjetland 1987; Lewis et al. 1992; Lingle 1987; Stehn and Wassenich 2008). The risk to migrating cranes is greatest when cranes make short, low-altitude flights between roosting and foraging sites, which often occur during low-light conditions (Stehn and Wassenich 2008). Cranes flying over power lines from adjacent roosting or foraging habitats have less time to react to wires (Thompson 1978; Brown et al. 1987; Scott et al. 1972; Stehn and Haralson-Strobel 2014).

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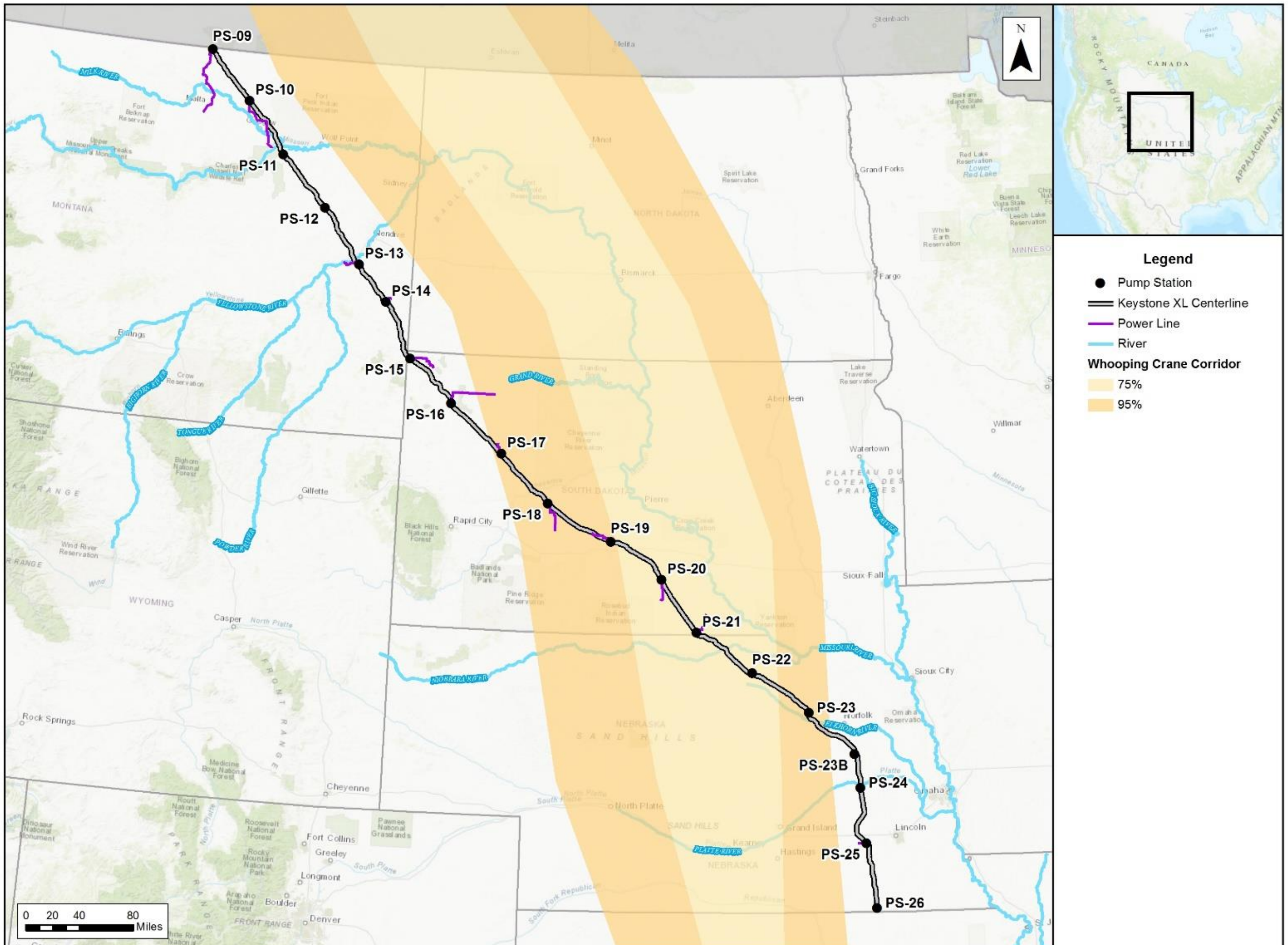
[3]This document sourced the Provisional Whooping Crane Telemetry Database from the Central Flyway stretching from North Dakota to Texas. The data is managed and owned by the USFWS. The Telemetry Database was provided to Environmental Resources Management (ERM). The USFWS has not directed, reviewed, or endorsed any aspect of the use of the Telemetry Database. Any and all data analyses, interpretations, and conclusions drawn from these data are solely those of ERM.

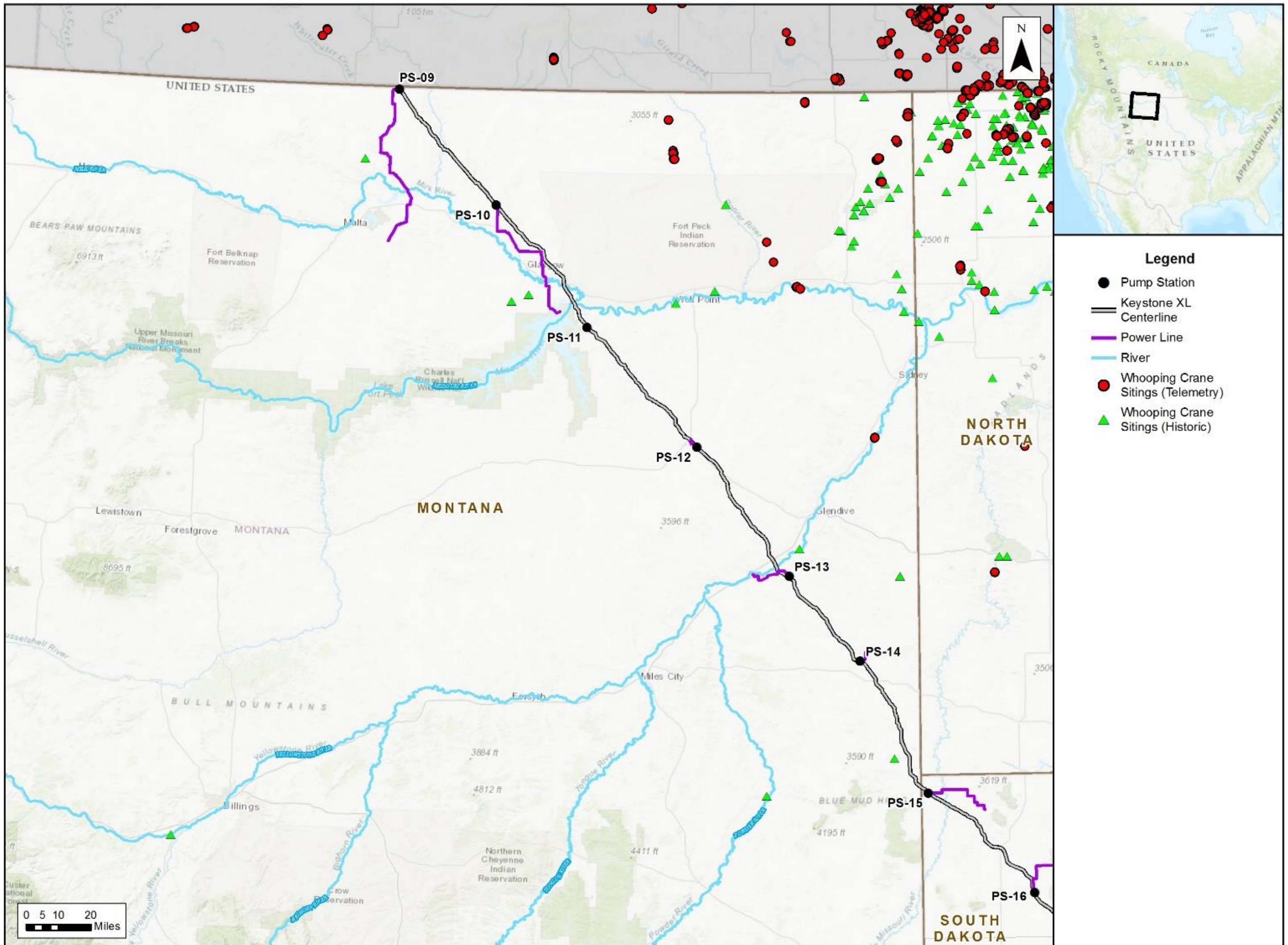
[4] This document includes whooping crane migration use data from the Central Flyway stretching from Canada to Texas, collected, managed, and owned by the USFWS. Data were provided to ERM as a courtesy for their use. The USFWS has not directed, reviewed, or endorsed any aspect of the use of these data. Any and all data analyses, interpretations, and conclusions drawn from these data are solely those of ERM.



Source: Esri - World Topographic Map; NAD 1983 UTM Zone 14N

Source: USFWS 2018m

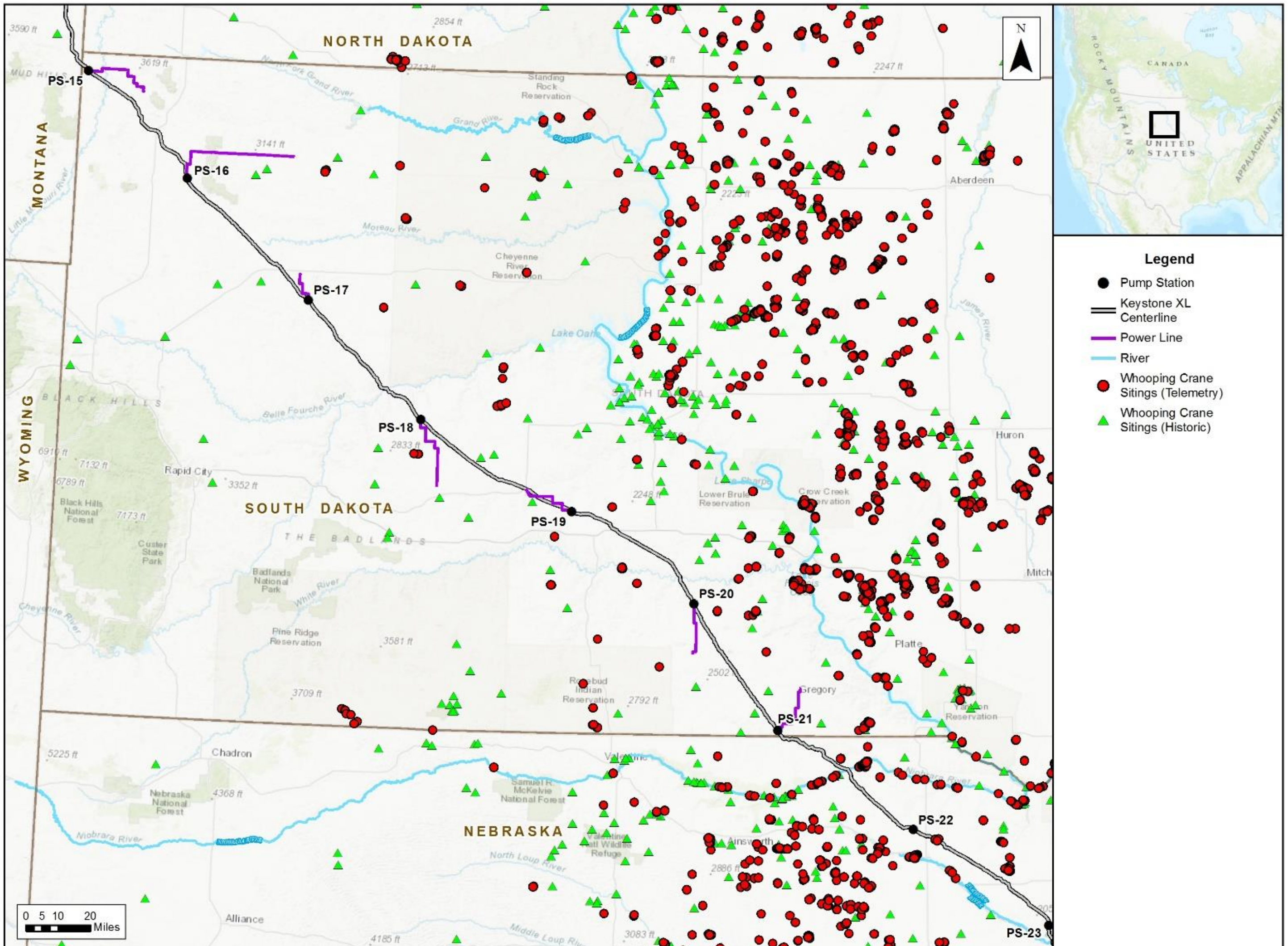
Figure 6-5. Central Flyway Whooping Crane Migration Corridor for the Aransas-Wood Buffalo Population



Source: Esri - World Topoographic Map; NAD 1983 UTM Zone 13N

Source: USFWS 2018m

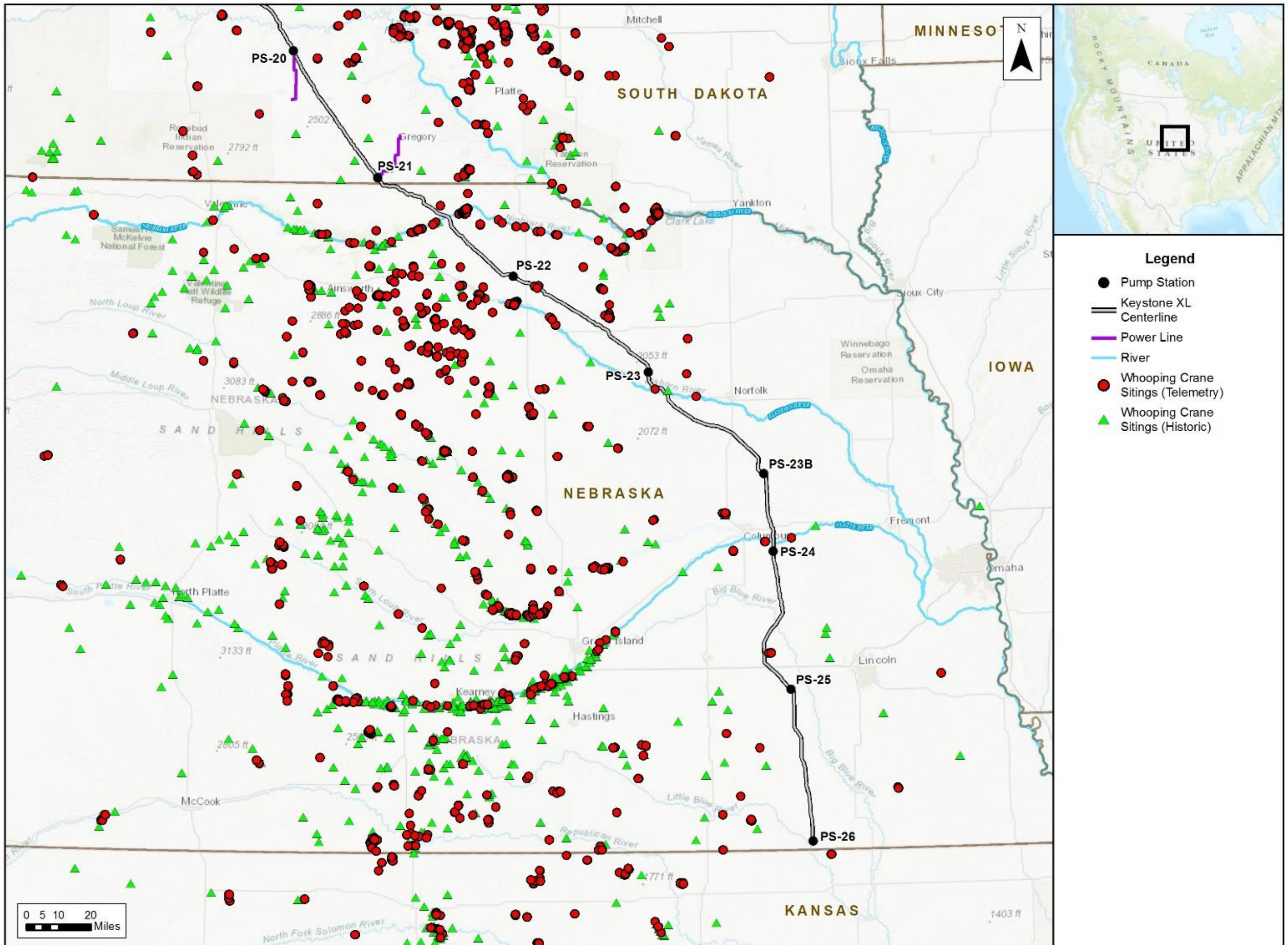
Figure 6-6a. Whooping Crane Flyway Sightings and Telemetry Data in Montana



Source: Esri - World Topoographic Map; NAD 1983 UTM Zone 14N

Source: USFWS 2018m

Figure 6-6b. Whooping Crane Sightings and Telemetry Data in South Dakota



Source: Esri - World Topoogographic Map; NAD 1983 UTM Zone 14N

Source: USFWS 2018m

Figure 6-6c. Whooping Crane Sightings and Telemetry Data in Nebraska

Observations of sandhill crane (*G. canadensis*, a closely related species that is often used as a surrogate to study whooping cranes) flight behaviors indicated that crane flocks reacted more to power lines when flying less than 820 feet before crossing a power line. Cranes flying less than 820 feet before crossing a power line rapidly gained altitude to fly 3 to 16 feet over the power lines, whereas cranes flying more than 820 feet before crossing power lines tended to fly greater than 20 feet above the power lines (Morkill and Anderson 1991; Stehn and Wassenich 2008). Further, according to studies at San Luis Valley in Colorado, no crane collisions were observed when habitat use areas were located greater than 0.99 mile from installed overhead power lines (Brown et al. 1987; Stehn and Wassenich 2008).

In an effort to alert birds to the presence of power lines, especially smaller diameter ground wires, a variety of bird flight diverters (BFDs) have been installed on power lines, with reductions in bird collisions ranging from 0 to 81 percent (Jenkins et al. 2010). Observed variability in collision reduction is a result of many factors such as time of year, time of day, weather conditions, power line span distance, wire diameter, power line orientation in relation to occupied habitat and species-specific biology (Barientos et al. 2011; Jenkins et al. 2010). While the efficacy of BFD devices can vary widely, overall, a review of 21 power line-marking studies concluded that BFDs reduce avian collisions by 55 to 94 percent (Bernardino et al. 2011). However, larger birds that are less maneuverable in flight (i.e., cranes, storks, geese, etc.) generally are more likely to collide with marked or unmarked power lines than smaller birds are.

In Nebraska, significant sandhill crane mortality resulting from collision with two existing 69-kV power lines crossing the Platte River has been observed (Murphy et al. 2009; USFWS 2009A; Wright et al. 2009). One study conducted during the spring whooping crane migration in 2007 estimated that between 165 and 210 sandhill cranes did not survive collisions with the two power lines (Wright et al. 2009). No evidence of whooping crane mortality was observed during that study. From March 4 to April 8, 2009, Murphy et al. (2016) observed the power lines and recorded crane reactions. A total of 448 flocks of sandhill cranes were observed during the 2009 spring migration. Sandhill cranes reacted to the power lines at greater distances during daylight hours than during low-light conditions. **Earlier reaction time would likely allow birds more time to avoid a power line.** Use of power line markers with reflective, glow-in-the-dark stickers to increase both daytime and nighttime visibility resulted in increased reaction distances and more gradual avoidance behaviors in sandhill cranes (Murphy et al. 2016). Generally, sandhill cranes are more likely to react to marked spans than unmarked spans, often gaining altitude further than 16 feet from the wire, providing some indication that the marker balls were observed by cranes and avoided (Morkill and Anderson 1991; Stehn and Wassenich 2008). **A recent study conducted by Dwyer et al. (2019) investigated the use of a pole-mounted near-ultraviolet light Avian Collision Avoidance System (ACAS) to illuminate the entire span crossing the Platte River in an effort to further reduce sandhill crane collisions at the above described power line crossing, where a substantial number of collisions were occurring annually despite the fact that the line is marked with Fireflys (P&R Tech, Beaverton, Oregon, USA) and yellow spiral BFD (Preformed Line Products, Cleveland, Ohio, USA) line markers. While the ACAS system was designed for use on non-marked lines, the span where the ACAS was tested is marked with Fireflys and BFDs installed at an average spacing of 9.5 feet (Dwyer et al. 2019). This is much denser that the current APLIC recommendation of 16- to 98-foot spacing (APLIC 2012). A 98 percent reduction in collisions was observed during the study. At this time it is unclear to what extent the illumination of previously installed Fireflys and BFDs influenced the resulting reduction in collisions, or if the ACAS system would have been as effective in the absence of the previously installed Fireflys and BFDs.** In Nebraska, Murphy et al. (2016) documented studies of sandhill cranes, demonstrating that marking power lines can be an effective way to reduce sandhill crane collisions and would be expected to reduce collision risk for migrating whooping cranes (Morkill 1990; Morkill and Anderson 1991). **New novel approaches such as the use of the ACAS, either alone or with other forms of line marking, may even further the reduce collision risk for avian species, as demonstrated by Dwyer et al. (2019).**

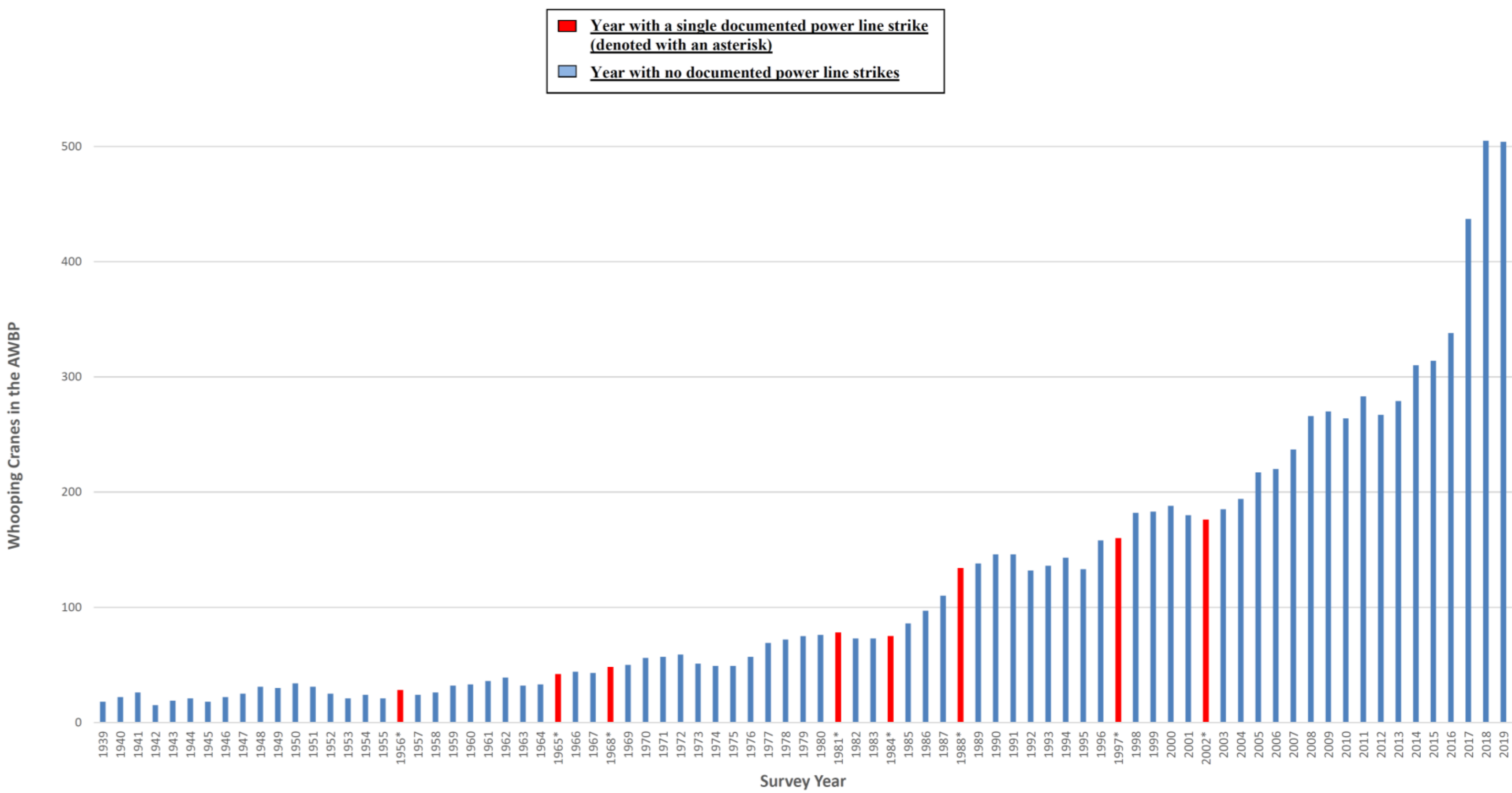
However, while reductions in collision risk have been documented, some collision risk to whooping cranes may still exist (USFWS 2009). **Therefore, a more detailed collision risk assessment was conducted.**

Collision Risk Assessment

As described above, the potential exists for whooping crane mortality to occur as a result of collisions with the proposed **electrical** power lines. Further, substantial uncertainty exists around critical parameters (i.e., the proportion of total mortality that occurs during migration, the proportion of the total mortality that results from power line collisions, and proportion of the power line strikes that can be attributed to transmission lines) used to assess impacts on whooping cranes (USFWS 2017a). However, as explained below, (1) more power lines do not appear to equate to more risk to whooping cranes, (2) projected **increased** risk to migrating whooping cranes, based upon historical whooping crane mortality data, is extremely small, and (3) **power line**-specific conservation measures to avoid and minimize bird collision risk would be applied**. T**herefore, impacts on migrating whooping cranes, if any, would be **negligible**.

There is no indication that there is a causal link between the number of power line miles and potential collision risk to migrating whooping cranes (Bainbridge 2017). Using data obtained from the WAPA, as well as inquiries to state rural electric associations, Bainbridge (2017) identified a total of approximately 34,000 and 291,000 miles of transmission and distribution lines, respectively, within the AWBP migration corridor in 2016, many of which were built after the Rural Electrification Act of 1936. In addition, from 1939 to the most current AWBP census, the population of whooping cranes has grown to **504** individuals (**Butler and Harrell 2019; Figure 6-7)**). Despite both the proliferation of power lines in the migration corridor and the increase in the AWBP numbers, increased mortality resulting from power **line collisions has not been observed in the historical records or by current radio telemetry efforts (Stehn and Haralson-**Strobel 2014; USFWS 2016b). **In fact, the last known power line mortality was documented in 2002 (Stehn and Haralson-Strobel 2014).**

Given the small size of the AWBP, it has been extensively monitored over the years and much information regarding population dynamics, individual mortality, and other life history characteristics has been collected. From 1959 to 2010, a total of 49 whooping crane mortalities resulting from power-line collisions have been documented across all populations, with a majority (39, or 80 percent) of collision mortalities occurring in the experimental, introduced flocks (Stehn and Haralson-Strobel 2014). However, these experimental flocks would not be exposed to the proposed power lines, and there are significant behavioral, biological, environmental, and management differences between the experimental flocks and the AWBP. These differences include (1) experimental flocks have much higher exposure rates to power lines, (2) the experimental flocks are exposed to greater levels of human incursion into stopover habitat along the migration route, and (3) the AWBP is the only flock where young learn from the experiences of their parents. Given these differences, power line mortality associated with the experimental flocks are not considered further in this assessment, and only AWBP mortality data were used.



Source: **Butler and Harrell 2019; Butler et al. 2013; CWS and USFWS 2007; Stehn and Haralson-Strobel 2014.**

Figure 6-7. Whooping Crane Abundance on the Wintering Grounds on or near the Aransas National Wildlife Refuge, Texas

Much of the undocumented mortality was once thought to occur during seasonal migrations between summer and wintering grounds (Lewis et al. 1992; Stehn and Haralson-Strobel 2014; USFWS 2016b). However, recent telemetry studies have shown that crane mortality occurs across all seasons and observed mortality occurred generally in proportion to the time spent at each life history stage. A recent study deployed radio transmitters on 68 individual cranes between 2009 and 2014. A total of 17 whooping crane mortalities were documented from 2011 to 2015. Most of these mortalities occurred outside of migration periods, near primary nesting areas in Wood Buffalo National Park and at wintering sites on and near the Aransas National Wildlife Refuge. Less than 15 percent occurred during spring or fall migration periods, which occurs for 2 months of the year, or 17 percent of the time (USFWS 2016b).

The risk to migrating whooping cranes as a result of the proposed power lines can be assessed using the null hypothesis and reasonably certain knowledge method proposed by USFWS (USFWS 2018l).[5]

Null Hypothesis: The power lines associated with the proposed Project will be no more or less hazardous than the average level of hazard from existing power lines within the 95 percent whooping crane migration corridor.

Reasonably Certain Knowledge:

1. Approximately 7,790 miles of transmission lines and 82,415 miles of distribution lines (or 90,205 total miles of power lines) exist in the migration corridor in Nebraska and South Dakota (NPPD 2019).
2. The power lines associated with the proposed Project would add approximately 115.4 miles of new power lines in the 95 percent whooping crane migration corridor, an increase of 0.13 percent.
3. Total annual post-fledging AWBP mortality averages 10.9 percent **(USFWS 2018l)**.
4. According to telemetry studies, 17.4 percent (4 of 23) of post-fledging mortality occurs during migration (Kyut 1992; Pearse et al. 2019).
5. Daily mortality rates are approximately constant across the annual cycle **(Fronczak et al 2015; Pearse et al. 2018; USFWS 2018l)**.
6. Approximately 55 percent of whooping crane migration days occur in the United States (Howe **1989**).
7. From reasonably certain items 3) through 6), the proportion of the post-fledging AWBP that dies during migration across the United States is (0.109)(0.174)(0.55)=0.0104, or about 1 percent. At the current population level of 504 individuals (Butler and Harrell 2019), the current total mortality from all causes occurring during migration in the United States is about 5 individuals per year.

Other best available information that is not reasonably certain:

1. Power line strikes plus "physical trauma" mortality (highly suggestive of power line strikes, see Brown and Drewien 1995; Gil de Weir 2006) account for about 56 percent (14 of 25) of known-cause recovered mortality during migration (Stehn and Haralson-Strobel 2014). This estimate represents the best available information but is not reasonably certain because of potential biases in recovered mortality versus unrecovered mortality.
2. 25 percent (2 of 8) of known power line strikes in the United States occurred in Nebraska (n = 2) and South Dakota (n=0) combined (Stehn and Haralson-Strobel 2014). This estimate represents the best available information, but is not reasonably certain because of potential biases in recovered mortality versus unrecovered mortality.

[5] At construction camps, electricity for the required camps would be provided by local utilities via an interconnection to existing adjacent low-voltage power lines. At most, a new low-voltage power line would be built from the existing power line across a roadway and into the campsite. As such, no impacts on migrating whooping cranes or their habitats would be expected to occur, and the new power lines associated with construction camps, if necessary, are not included in the analysis below.

Using reasonably certain item 6 and the other best available information items 1 and 2 above, the number of expected power line strikes per year in Nebraska and South Dakota at the current population size of the AWBP is (5)(0.60)(0.25)=0.75 strikes per year. Based on the null hypothesis, the rate of strikes due to power lines associated with the proposed Project would be 0.13 percent of this total, or 0.000975 strikes per year. Using a population growth scenario based on a 4.5 percent exponential growth rate, a reasonably certain estimate would be 0.149 fatal whooping crane collisions over the 50-year life of the Project. This estimated result would be reasonably certain for unmarked power lines. However, portions of the proposed power lines will be marked with approved BFDs, further reducing the chances for fatal power line strikes associated with the proposed Project.

In addition to the overall **high**-level risk assessment above, a more detailed assessment of the proximity of whooping crane habitat and occurrences relative to individual power lines **associated with** the proposed Project is described below.

For power lines to pump stations, potentially suitable migration habitat (e.g., large waterbodies, wetlands, and other roosting habitat, as well as associated agricultural fields or other foraging habitat) was identified at 8 pump station locations where new transmission lines fall within the 75 percent or 95 percent whooping crane migration corridors (Pearse et al. 2018). These include:

- PS-16 Harding and Perkins counties, South Dakota (95 percent)
- PS-17 Meade County, South Dakota (95 percent)
- PS-18 Haakon County, South Dakota (95 percent)
- PS-19 Haakon and Jones counties, South Dakota (95 percent)
- PS-20 Tripp County, South Dakota (75 percent)
- PS-21 Tripp and Gregory counties, South Dakota (75 percent)
- PS-22 Holt County, Nebraska (75 percent)
- PS-23 Antelope County, Nebraska (95 percent)

For the purposes of this analysis, a distance of 5 miles was used as a conservative measure of the potential for cranes to use habitats in the vicinity of the proposed power lines, pursuant to USFWS guidelines to avoid construction of new power lines within 5 miles of documented high-use areas and designated critical habitat (USFWS 2010). No high-use areas are located within 5 miles of the proposed power infrastructure associated with the proposed Project. All of the historical occurrence records and recent telemetry locations within 5 miles represent a single stopover event, with no apparent pattern of use over multiple migration seasons. Additionally, while some records of whooping cranes exist within 5 miles of the proposed Project and associated power infrastructure, it is noted that no mortality has been observed when habitat use areas are greater than 0.99 mile from existing power lines (Brown et al. 1987; Stehn and Wassenich 2008). Sites that are greater than 1 mile from power lines allow for individuals to cross the power lines at sufficient altitude to avoid a strike (Brown et al. 1987). None of the proposed power lines are located within 1 mile of a historical record or a recent telemetry location.

The proposed power infrastructure includes the construction and operation of 115.4 miles of new power lines within the 95 percent whooping crane migration corridor. These power lines would be sited an average of 7.2 miles (range = 1.8 to 11.8 miles) from confirmed historical observations and an average of 9.7 miles (range = 4.6 to 23.4 miles) from recent telemetry locations (Table 6-48). A total of three historical and 10 telemetry records are located within 5 miles of proposed power lines, but none are located within 1 mile of proposed power lines (Table 6-48). The 10 telemetry records **within 5 miles** represent a single stopover event in 2014. One historical record and no telemetry records are located within 3.5 miles of the proposed power infrastructure, a distance typically traveled by whooping cranes from roost sites to foraging sites during spring and fall migration stopovers **(Pearse et al. 2017)**. While previous occurrences are not an accurate predictor of whooping crane use in the future, these data, which represent the best available science, indicate a very low rate of previous habitat use in proximity to the proposed power lines. Therefore, the proposed power lines present a significantly lower risk of collision than power lines placed in high-use areas documented within the migration corridor. Further, this lack of previous use may reflect either an abundance of potentially suitable habitat on the landscape (i.e., potentially suitable habitat is readily available to migrating whopping cranes) or the absence of habitat features that would attract migrating whooping cranes (e.g., the designated critical habitat along the Platte River in Nebraska, which is used by many individuals every year).

Table 6-48. Whooping Crane Occurrence Relative to Proposed New Power Lines

Pump Station	Migration Corridor [a]	Power Line Length (miles) [b]	Distance to Historical Occurrence (miles) [c]	Distance to Telemetry Occurrence (miles) [d]
PS-09	—	61.4	5.1	27.3
PS-10	—	48.4	6.0	48.7
PS-11	—	0.2	20.7	58.4
PS-12	—	4.6	41.7	55.0
PS-13	—	15.7	8.2	49.5
PS-14	—	6.9	24.6	44.6
PS-15	—	24.7	14.9	61.1
PS-16	95%	41.9[e]	4.3	10.5
PS-17	95%	10.9	11.8	23.4
PS-18	95%	26.0	3.6	4.6
PS-19	95%	20.5	1.8	8.5
PS-20	75%	17.2	10.1	7.2
PS-21	75%	20.5	8.1	12.5
PS-22	75%	2.5	10.1	5.3
PS-23	95%	3.0	8.2	5.6
PS-23b	—	3.4	16.4	15.8
PS-24	—	1.0	15.3	4.0
PS-25	—	9.3	14.1	9.8
PS-26	—	0.1	17.7	6.9

a. 95 and 75 percent migration corridors represent a polygon that encompasses 95 and 75 percent, respectively**,** of confirmed whooping crane migration observations (Pearse et al. 2018). A dash (-) indicates the pump station is located outside the **whooping crane migration** corridors.

b. Power line lengths for PS-16 through PS-21 were provided by the applicant; lengths for PS-22 through PS-26 are estimated by the NPPD.

c. Shortest straight-line distance from the nearest historical record location to the nearest point of the power line.

d. Shortest straight line distance from the nearest telemetry record to the nearest point of the power line.

e. Of the 41.9 miles of power line, only approximately 14.8 miles are located within the 95 percent whooping crane migration corridor.

As described above, the projected chance of a whooping crane colliding with a power line associated with the proposed Project is very small, though significant uncertainty exists around this projection. The above estimated 0.149 whooping crane collisions over the life of the proposed Project would be further reduced to **negligible** levels through application of conservation measures, including, among others, siting power lines more than 5 miles away from designated critical habitat or documented high use areas, and marking new power lines within 1 mile of potentially suitable habitat within the 95 percent **whooping crane migration** corridor.

While there is some debate as to the efficacy of BFDs for the whooping crane, the literature clearly shows that BFDs can be an effective means to reduce collision risk by 40 to 60 percent for some species (Barrientos et al. 2011; Brown and Drewien 1995; Morkill and Anderson 1991; Murphy et al. 2016; and Yee 2008). The USFWS (2010) *Region 6 Guidance for minimizing effects from power line projects within the whooping crane migration corridor* states that BFDs reduce collision risk, and that marking new lines and an equal length of existing lines within the migration corridor maintains the baseline condition from the threat of power line collisions (USFWS 2010). To reduce potential impact to the whooping crane, BFDs would be installed, consistent with APLIC guidelines, in appropriate areas as identified in pre-construction field reviews. Keystone would develop a compliance monitoring plan that requires written confirmation that the power lines have been marked and that the markers are maintained in working condition.

Given that (1) new power lines do not equate to increased collision risk to migrating whooping cranes, (2) calculated collision risk based upon historical and recent telemetry location data is very low, and (3) application of USFWS approved conservation measures would be used to avoid and minimize take, effects, if any, to migrating whooping cranes resulting from the construction and operation of the **power lines associated with the** proposed Project would be **unlikely. Therefore, impacts to whooping cranes would be negligible**.

Western Prairie Fringed Orchid

Detailed natural history information, previous agency coordination, required conservation measures, and an analysis of impacts on western prairie fringed orchids (*Platanthera praeclara*) resulting from the construction and operation of the proposed Project are provided in the 2014 Keystone XL Final SEIS and Section 3.7 of this document. An updated analysis of impacts specifically resulting from the construction and operation of the proposed electrical power infrastructure was provided in the BA submitted to USFWS in 2019 and is summarized below and in Table 6-49.

The western prairie fringed orchid is an erect, stout, herbaceous perennial that historically occurred throughout the tallgrass prairies of southern Canada and the central United States west of the Mississippi River (USFWS 1996; Sieg and King 1995). The species is most commonly found in moist, undisturbed mesic to wet calcareous prairies, sedge meadows, and mesic swales (Phillips 2003; Sieg 1997; USFWS 1996). Populations of western prairie fringed orchids vary dramatically between wet and dry years, with increases in wet years, and decreases in dry years (Sieg and Wolken 1999). Soil moisture appears to be the most significant factor in the survival of individual orchids and the number of orchids flowering in a given year (USFWS 2007; Phillips 2003; Sieg 1997; Sieg and King 1995).

The western prairie fringed orchid is known to occur in Nebraska and Kansas (NatureServe 2009) and is likely to occur in South Dakota, given the availability of suitable habitat, especially south of Highway 18 in Tripp County, South Dakota (USFWS 2012**b**). In Nebraska, populations are known to occur in Boone, Cherry, Dodge, Garfield, Grant, Greeley, Hall, Holt, Lancaster, Loup, Madison, Otoe, Pierce, Rock, Saline, Sarpy, Seward, and Wheeler counties and may occur at other sites in Nebraska (AECOM 2008a). In addition, the NNHP also has records of the orchid documented in Keya Paha and Stanton counties (NNHP 2019). Populations in South Dakota are possibly extirpated (NatureServe 2009), but factors that indicate the species could still be present include incomplete surveys in areas of suitable habitat crossed by the proposed route on private lands and erratic flowering patterns with long dormancies that make detection difficult (Phillips 2003).

There is no potential for this species to occur on BLM-managed lands, USACE-managed lands, or WAPA-owned lands associated with the proposed Project and electrical power infrastructure. There is the potential for this species to occur along the proposed power line to PS-21, which involve**s** decisions by WAPA and RUS. In addition, there is also the potential for occurrence along the proposed power lines to PS-22 through PS-25.

A preferred route for the transmission line to PS-21 has been designed from near Gregory, South Dakota, to PS-21. The South Dakota Natural Heritage Program data do not record western prairie fringed orchid within 1 mile of the PS-21 route (SDNHP 2018). Based on a review of recent aerial imagery, land cover data, and soil survey data, the majority of the habitat along the transmission line is cultivated hayland or rolling pasture on droughty soils that do not support suitable hydrology for western prairie fringed orchid. **The route does cross approximately 0.4 acre of small drainages and wetlands that may provide potentially suitable habitat for the species. However,** these features would likely not be disturbed by construction; rather, they would be spanned and transmission poles placed outside the wetland boundary. Regardless, based on pedestrian survey in the proposed pipeline route near this transmission line, wetlands along small drainages and surrounding ponds are typically dominated by reed canarygrass (*Phalaris arundinacea*) with the surrounding banks typically dominated by smooth brome (*Bromus inermis*) or Kentucky bluegrass (*Poa pratensis*). The likelihood of western prairie fringed orchid along the proposed transmission line route to PS-21 is low.

Proposed power line routes to PS-22 through PS-25 have not been surveyed for the western prairie fringed orchid. For the power line routes to these pump stations, the **local power providers** would complete pre-construction field surveys for the western prairie fringed orchid during the appropriate bloom periods in areas of potentially suitable habitat **within the Nebraska Natural Heritage Program-identified range of the species**. The NPPD would delineate and mark areas where western prairie fringed orchid habitat is present as "avoidance areas" where placement of structures and construction traffic would not occur. Although the routes have not yet been surveyed, all of the power line corridors fall within townships that were queried by the Nebraska Natural Heritage Program for western prairie fringed orchid presence. Western prairie fringed orchid was not documented in any township that contains a proposed power line corridor.

Similar to habitat along the PS-21 route, habitat within the **power line route to** PS-22 near O'Neill, Nebraska, is composed of cultivated land, primarily center-pivot agriculture and dry, rolling, upland pasture interspersed with small, non-wetland drainages. Based on pedestrian surveys on the proximal pipeline route, some of these pastures contain native species such as porcupine grass (*Hesperostipa spartea*) or little bluestem (*Schizachyrium scoparium*), neither of which is particularly indicative of western prairie fringed orchid habitat, as they typically grow in sites that are too dry for the orchid. Further, many of the pastures are invaded by smooth brome. The likelihood of western prairie fringed orchid within the proposed power line corridor for PS-22 is low.

Based on aerial imagery, land along the proposed power line route to PS-23 near Neligh, Nebraska, is highly disturbed. The majority of the habitat within the corridor is cultivated, although roadside ditches and small grassland or forested patches occur. Wetlands are not likely to occur in this corridor. It is unlikely that the western prairie fringed orchid would occur in the proposed power line corridor to PS-23.

Habitat within the power line corridors for PS-23B near Leigh, Nebraska and PS-24 near Bellwood, Nebraska, is highly disturbed. The majority of the habitat within the PS-23B corridor is cultivated, although small pastures, farm ponds, and wetlands do exist. However, based on pedestrian survey of the nearby pipeline route within this power line corridor, those pastures, ponds, and wetlands are likely dominated by smooth brome or reed canarygrass similar to those on or near the pipeline. All of the habitat within the PS-24 corridor is either cultivated or residential, with the exception of Deer Creek which is a channelized, highly altered canal. In addition, the proposed power lines to PS-23B and PS-24 would occur outside of the Nebraska Natural Heritage Program-identified range of the western prairie fringed orchid. It is highly unlikely that western prairie fringed orchid is present in the corridors for either PS-23B or PS-24.

The potential power line route to PS-25 near Milford, Nebraska, is almost entirely composed of cultivated land. Sections of wooded habitat occur within the corridor along the West Fork Big Blue River. However, these are outside of the Nebraska Natural Heritage Program-identified range of the western prairie fringed orchid. Desktop surveys suggest that the areas traversed by this line would probably be unsuitable for this species. Furthermore, pedestrian survey at creeks on the nearby proposed pipeline route found that herbaceous habitat in wetter areas was often dominated by smooth brome, reed canarygrass, and stinging nettle (*Urtica dioica*). Finally, the power line is expected to follow existing disturbed areas along the sides of public roads. It is highly unlikely that western prairie fringed orchid is present in the corridor that would provide power to PS-25.

The construction and operation of new electrical power infrastructure could affect the western prairie fringed orchid if activities were to disturb potential habitat for this species. However, as described above, it is highly unlikely that western prairie fringed orchid is present in any of the corridors that would provide power to pump stations, and it is unlikely that those corridors would contain appreciable areas of high-quality habitat. Protection measures provided in Chapter 8, Summary of Consequences, such as pre-construction surveys of potentially suitable habitat within the range of the species, would be implemented. Any individuals identified within the planned route would either be avoided by route micro-alignments or **by reducing the width of the construction ROW**. **Considering that the proposed electrical power infrastructure is not likely to affect this species, impacts would likely be negligible.**

Table 6-49. Summary of Impact Analyses Conducted on the Endangered Species Act-listed Species Potentially Occurring near the Proposed Electrical Power Infrastructure

Common Name (Scientific name)	Federal Status	Impact Description
American burying beetle (*Nicrophorus americanus*)	E	**A**ny effects would result in less than significant impacts. Construction and maintenance of power **infrastructure for** PS-2**0, PS-2**1**,** and PS-22 could affect the American burying beetle. Power lines would not negatively affect **this species** except where pole structures and electrical substation**s** would be installed. The level of impact from poles is estimated to be negligible. **Construction of substations would eliminate habitat and could harm individuals through direct contact during ground-disturbing activities.** **According to the Biological Assessment, c**onstruction of this power **infrastructure is estimated to** affect **approximately one** American burying beetle. However, the conservation measures in the Biological Opinion **would reduce the likelihood of impacts**.
Black-footed ferret (*Mustela nigripes*)	E/Exp.	**Overall, the proposed electrical power infrastructure is not likely to affect this species; therefore, impacts would likely be negligible.** Power line**s** associated with the proposed Project are likely to attract raptors, known to be predators of the black-footed ferret and their primary prey, prairie dogs. However, **there appears to be little to no possibility of black-footed ferret presence near the proposed electrical power infrastructure. Even so,** measures would be implemented by electrical service providers to minimize raptor perching**, as appropriate,** in accordance with the APLIC Suggested Practices for Avian Protection on Power Lines (APLIC 1996, 2012).
Interior least tern (*Stenula antillarum*)	E	**A**ny effects would result in less than significant impacts. Although new electric power lines **have the potential to** increase the collision and predation **risks** for interior least terns, none of the proposed power lines would overlap **potentially** suitable nesting or foraging habitat, and only one power line would approach within 1 mile of **potentially** suitable habitat. The installation of BFDs in high-priority areas is likely to reduce the risk of collision with power lines. **Overall, the proposed electrical power infrastructure is not likely to affect this species; therefore, impacts would likely be negligible.**
Northern long-eared bat (*Myotis septentrionalis*)	T	**Any effects would result in less than significant impacts.** The construction and operations of proposed power lines **would remove potentially suitable habitat, but** would **avoid impacts to the species because known** roost trees **would not be affected,** as **required** under the 4(d) rule.
Pallid sturgeon (*Scaphirhynchus albus*)	E	**T**he power lines servicing PS-10 would cross the Milk River at three places within a meandering 0.85-mile stretch of river. This construction would involve no disturbance to the river and therefore would not affect the **pallid** sturgeon.
Piping plover (*Charadrius melodus*)	E	**A**ny effects would result in less than significant impacts. **Although new electric power lines have the potential to increase the collision and predation risks** for piping plover, none of the proposed power lines would overlap suitable nesting or foraging habitat. The proposed power lines would not cross any areas suitable for piping plover nesting**, and only one power line would approach within 1 mile of potentially suitable habitat. The installation of BFDs in high-priority areas is likely to reduce the risk of collision with power lines. Overall, the proposed electrical power infrastructure is not likely to affect this species; therefore, impacts would likely be negligible.**

Table 6-49. Summary of Impact Analyses Conducted on the Endangered Species Act-listed Species Potentially Occurring near the Proposed Electrical Power Infrastructure

Common Name (Scientific name)	Federal Status	Impact Description
Rufa red knot (*Caladris canutus rufa*)	T	**A**ny effects would result in less than significant impacts. Given that (1) the proposed **electrical power infrastructure** would not affect stopover habitat**,** (2) there is very little stopover habitat proximal to the proposed transmission lines**, and** (3) red knot are extremely uncommon in the Central Flyway, there would be no measurable impact on the red knot from the proposed **electrical power infrastructure.**
Topeka shiner (*Notropis topeka*)	E	**The proposed electrical power infrastructure would not overlap** the range of the Topeka shiner. Therefore, no impacts on Topeka shiner would occur as a result of the construction and operation of **the proposed electrical** power **infrastructure**.
Whooping crane (*Grus americana*)	E	**A**ny effects would result in less than significant impacts. Given that (1) new power lines do not equate to increased collision risk to migrating whooping cranes, (2) calculated collision risk based upon historical and recent telemetry location data is very low, and (3) application of USFWS approved conservation measures would be used to avoid and minimize take, effects, if any, to migrating whooping cranes resulting from the construction and operation of the proposed **electrical power infrastructure** would be **unlikely**.
Western prairie fringed orchid (*Platanthera praeclara*)	T	**A**ny effects would result in less than significant impacts. The construction and operations of new electrical power line segments could affect the western prairie fringed orchid if power line **installation** were to disturb potential habitat for this species. However, it is highly unlikely that western prairie fringed orchid is present in any of the corridors that would provide power to pump stations, and it is unlikely that those corridors would contain appreciable areas of high-quality habitat. Protection measures that would be implemented by electrical service providers to prevent impacts on this species **are summarized** in Chapter 8 (see Table**s** 8-**4 and 8-5**). **Overall, the proposed electrical power infrastructure is not likely to affect this species; therefore, impacts would likely be negligible.**

Source: Bessken 2008, SDGFP 2018, Shriner 2007 in litt. as cited in USFWS 2009b; USFWS **2018k**, 2016a

APLIC = Avian Power Line Interaction Committee; E=endangered; ESA = Endangered Species Act; Exp. = experimental population; HDD = horizontal directional drill; MA = may affect; MAR = Mainline Alternative Route; NA = not applicable; NPPD = Nebraska Public Power District; SEIS = Supplemental Environmental Impact Statement; T = threatened; USFWS = U.S. Fish and Wildlife Service

6.4.6.2 Migratory Bird Treaty Act

Migratory bird species not covered under any federal or state protections are afforded protections under the MBTA. The federal MBTA (16 USC 703, Supp. I, 1989) prohibits killing, possessing, or trading in migratory birds, except in accordance with regulations prescribed by the Secretary of the Interior. This act encompasses whole birds, parts of birds, and bird nests and eggs. The U.S. Department of the Interior's Office of the Solicitor issued Memorandum M-37050 on December 22, 2017, which adopts the position that the MBTA prohibition on the "taking" or "killing" of migratory birds applies only to deliberate acts intended to take a migratory bird (U.S. Department of Interior 2017). The legal opinion reverses the position of prior administrations that the MBTA prohibits not only the intentional take of migratory birds but also the take of migratory birds that is incidental to otherwise lawful activity (i.e., unintentional). Unintentional take includes disturbance to species and nests during ground-clearing activities, such as ROW clearing, where unobserved nests of migratory birds could be located.

As described above, the construction and operation of the proposed power lines have some potential to present an ongoing collision hazard to individual migratory birds, if present within the power line ROW, which could result in effects on these individuals (Table 6-50). However, such effects, if they occur, would not be likely to result in population-level impacts to migratory bird species. **In some cases, species-specific conservation measures (as outlined in Chapter 8, Summary of Consequences [see Tables 8-3 and 8-5]) would have incidental benefits to non-target migratory bird species.** Loss of potentially suitable habitat would be minimal.

6.4.6.3 Bald and Golden Eagle Protection Act

The federal Bald and Golden Eagle Protection Act, enacted in 1940, (16 USC 668-668d) prohibits the take of bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) except as otherwise permitted in the Bald and Golden Eagle Protection Act. From 1967 to 2007, the bald eagle was federally protected under the ESA as an endangered species and state-protected as either threatened or endangered (depending on the state). While the bald eagle is no longer listed under the ESA, it remains protected under the Bald and Golden Eagle Protection Act and some state endangered species regulations. In addition, both the bald eagle and golden eagle are protected under the MBTA (16 USC 703-712).

Minor to moderate temporary impacts on bald and golden eagles, if present within the power line ROW, could occur as a result of disturbance during construction of the proposed power lines. As discussed above for other bird species, the proposed power lines have the potential to pose an ongoing collision hazard to individual bald and golden eagles, which could result **in** effects on these individuals (Table 6-50). However, such effects, if they occur, would not be likely to result in population-level impacts to these species.

6.4.6.4 BLM Sensitive Species, State Protected Species, and Animals and Plants of Conservation Concern

The BLM maintains its own list of sensitive animals and plants, to properly manage these species to promote their conservation and reduce the likelihood and need for future listing under the ESA (Table 6--49). The proposed electrical power infrastructure would overlap approximately 4**0** miles of federal lands managed by the BLM in Montana.

The **impacts of** construction and operation of the proposed power lines would be expected to vary by species and range from no impact to moderate impact (Table 6-50). Species-specific **avoidance, minimization and mitigation** measures for some of these species (as described in Chapter 8, Summary of Consequences [see Table 8-4]) have been provided by resources agencies and would be incorporated into the proposed **activities**. Additionally, some of the species-specific measures would be expected to have some incidental benefits to **other** species.

Greater Sage-Grouse

While ESA protections for the sage-grouse no longer apply since it was removed from the federal Candidate species list, the species is listed as a BLM sensitive species, a Montana species of concern, and a South Dakota species of greatest conservation need. No critical habitat for the species has been designated under the ESA, but both the BLM and State of Montana have designated sage-grouse habitat. The BLM designated priority habitat management areas (PHMA), general habitat management areas (GHMA) and restoration habitat management areas (RHMA). The State of Montana has designated Priority and General habitat, as well as a designated Connectivity Area. The boundaries of Priority habitat generally align with PHMA, and General habitat with GHMA.

As discussed in Section 3.8 of the 2014 Keystone XL Final SEIS, surveys of greater sage-grouse along the proposed Project pipeline route have been conducted annually since 2010, and the Montana Department of Fish, Wildlife**,** and Parks and South Dakota Department of Game, Fish**,** and Parks consider 28 leks along the proposed Project pipeline route to be active in any given year.

The proposed electrical power infrastructure **may** affect the greater sage-grouse. The proposed **power** lines to **PS-**09, **PS-**10, and **PS-**13 would intersect designated sage-grouse habitat. **Some d**irect and indirect impacts to sage-grouse and its habitat are expected to result from power infrastructure construction and operation. Construction activities are likely to disturb and/or displace sage-grouse individuals and to **effect** potentially suitable habitat. Operation of the proposed lines could increase predation by raptors and could result in periodic disturbance to individuals and/or habitat during maintenance and repair activities. **T**hese impacts are expected to be minor after application of the following **avoidance, minimization, and** mitigation measures: the Greater Sage-Grouse Conservation Plan for the Keystone XL Project (**Westech** 2017); local power providers' implementation of avoidance and conservation measures developed in coordination with the USFWS regarding ways to minimize or mitigate impacts on the greater sage-grouse and threatened and endangered species for new power lines to the pump stations; and Keystone's commitment to implement several measures described in Chapter 8, Summary of Consequences (see Table 8-4), including providing compensation for impacts on greater sage-grouse habitat in Montana and South Dakota.

Table 6-50. BLM Sensitive Species, State-protected Species and Animals and Plants of Conservation Concern Potentially Occurring on or near the Proposed Electrical Power Infrastructure

	Status					
Species	**BLM**	**MT**	**SD**	**NE**	**Occurrence and Habitat**	**Power Line Impacts**
Birds						
American bittern (*Botaurus lentiginosus*)	SS				This species occurs throughout the region surrounding the proposed power infrastructure in Montana, South Dakota, and Nebraska. The species inhabits large, freshwater wetlands with tall, emergent vegetation.	Minor to moderate impacts on American bittern, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species. Additionally, BMPs and conservation measures relative to wetland impacts would provide incidental benefits to the species (Table 8-5).
Baird's sparrow (*Ammodramus bairdii*)	SS				This species may occur throughout the region surrounding the proposed power infrastructure in Montana and portions of northwestern South Dakota. They inhabit mixed-grass prairies, alfalfa fields, and fallow cropland. The species breeds in early June to late July and nests on the ground.	Minor to moderate impacts on Baird's sparrow, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.
Bald eagle (*Haliaeetus leucocephalus*)	SS				This species may occur throughout the region surrounding the proposed power infrastructure in Montana, South Dakota, and Nebraska. They nest and roost in large trees that are near water with abundant fish and waterfowl prey.	Minor to moderate impacts on bald eagles, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.
Black tern (*Chlidonias niger*)	SS				This species may occur throughout the region surrounding the proposed power infrastructure in Montana and South Dakota during the breeding season and may also be present throughout Nebraska during migration. They inhabit perennial wetlands, marshes, prairie potholes, and ponds.	Minor to moderate impacts on black terns, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species. Additionally, BMPs and conservation measures relative to wetland impacts would provide incidental benefits to the species (Table 8-5).

Table 6-50. BLM Sensitive Species, State-protected Species and Animals and Plants of Conservation Concern Potentially Occurring on or near the Proposed Electrical Power Infrastructure

	Status					
Species	BLM	MT	SD	NE	Occurrence and Habitat	Power Line Impacts
Brewer's sparrow (*Spizella breweri*)	SS				This species nests throughout Montana and portions of western South Dakota in sagebrush steppe habitat with high shrub cover and large patch size. They nest in big sagebrush from May through July.	Minor to moderate impacts on Brewer's sparrows, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.
Burrowing owl (*Athene cunicularia*)	SS				This species nests throughout the region surrounding the proposed power infrastructure in Montana, South Dakota, and Nebraska. They nest from March to October in open grasslands with abandoned prairie dog, ground squirrel, or badger burrows.	Minor to moderate impacts on burrowing owls, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.
Caspian tern (*Hydroprogne caspia*)	SS				This species breeds in and around the Fort Peck Reservoir in northwestern Montana and may occur as an uncommon seasonal migrant throughout the region surrounding the proposed power infrastructure in Montana, South Dakota, and Nebraska. They nest on sandy or stony beaches on islands in large reservoirs.	Minor to moderate impacts on Caspian terns, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.
Chestnut-collared longspur (*Calcarius ornatus*)	SS				This species breeds throughout the region surrounding the proposed power infrastructure in and eastern Montana and northern South Dakota. The species may also be present as a migrant in central and southern South Dakota and all of Nebraska. They nest from May through August in native mixed-grass prairie, and in short to medium grasses that have been recently grazed or mowed.	Minor to moderate impacts on chestnut-collard longspurs, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.
Common tern (*Sterna hirundo*)	SS				This species may occur as a breeding resident in northeastern Montana and as a migrant throughout the region surrounding the proposed power infrastructure in southeastern Montana and all of South Dakota and Nebraska. The species nests on shorelines or sparsely vegetated islands of larger bodies of water.	Minor to moderate impacts on common terns, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.

Table 6-50. BLM Sensitive Species, State-protected Species and Animals and Plants of Conservation Concern Potentially Occurring on or near the Proposed Electrical Power Infrastructure

	Status					
Species	**BLM**	**MT**	**SD**	**NE**	**Occurrence and Habitat**	**Power Line Impacts**
Ferruginous hawk (*Buteo regalis*)	**SS**				**This species may occur as a breeding resident throughout the region surrounding the proposed power infrastructure in Montana, South Dakota, and portions of western and central Nebraska. They nest in mixed grass prairie with greasewood and big sagebrush, on the ground, in shrubs, on rock outcrops, and in trees. Nesting typically may occur from February through October.**	**Minor to moderate impacts on ferruginous hawks, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.**
Forster's tern (*Sterna forsteri*)	**SS**				**This species may occur as a breeding resident in northwestern Montana and may be present throughout the region surrounding the proposed power infrastructure in Montana, South Dakota, and Nebraska. They typically nest colonially in large marshes with extensive reed beds or muskrat houses and occasionally along marshy borders of lakes and reservoirs.**	**Minor to moderate impacts on Forster's tern, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species. Additionally, BMPs and conservation measures relative to wetland impacts would provide incidental benefits to the species (Table 8-5).**
Franklin's gull (*Leucophaeus pipixcan*)	**SS**				**This species may occur as a migrant throughout the region surrounding the proposed power infrastructure in Montana, South Dakota, and Nebraska. They nests colonially on large prairie marsh complexes over water in emergent cattails and bulrushes.**	**Minor to moderate impacts on Franklin's gulls, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species. Additionally, BMPs and conservation measures relative to wetland impacts would provide incidental benefits to the species (Table 8-5).**
Golden eagle (*Aquila chrysaetos*)	**SS**				**This species is a breeding resident throughout the region surrounding the proposed power infrastructure in Montana and western South Dakota. The species is also a non-breeding resident throughout central and eastern South Dakota and Nebraska. They nest from March to August on rock outcrops, cliff ledges and trees. They forage in prairie and sagebrush habitats, and in open woodlands.**	**Minor to moderate impacts on golden eagles, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.**

Table 6-50. BLM Sensitive Species, State-protected Species and Animals and Plants of Conservation Concern Potentially Occurring on or near the Proposed Electrical Power Infrastructure

Species	Status BLM	MT	SD	NE	Occurrence and Habitat	Power Line Impacts
Greater sage-grouse (*Centrocercus urophasianus*)	SS				This species may occur year-round throughout the region surrounding the proposed power infrastructure in Montana and western South Dakota. They inhabit sagebrush habitat at elevations ranging from 4,000 to over 9,000 feet. See Section 3.8-3.2 of the 2014 Keystone XL Final SEIS, Federally Protected and Candidate Birds, for a more complete description of this species habitat requirements and occurrences in the proposed Project ROW.	Minor to moderate impacts on greater sage-grouse, if present within the footprint of the proposed power infrastructure, would be expected. To reduce impacts, conservation measures related to sage-grouse and its habitats along the proposed power infrastructure would be implemented. Species-specific conservation measures provided in Chapter 8 (see Table 8-4) would be applied to the proposed power infrastructure where impacts to greater sage grouse habitat would occur. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.
Interior least tern (*Sternula antillarum*)	E		E	E	See Section 6.4.6.1.	See Table 6-49.
Loggerhead shrike (*Lanius ludovicianus*)	SS				This species may occur as a breeding resident throughout the region surrounding the proposed power infrastructure in Montana, South Dakota, and Nebraska. The species breeds from mid-June to mid-July, in open habitats with short vegetation areas with scattered shrubs and trees.	Minor to moderate impacts on loggerhead shrikes, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.
Long-billed curlew (*Numenius americanus*)	SS				This species may occur as a breeding resident throughout the region surrounding the proposed power infrastructure in Montana, South Dakota, and northwestern Nebraska. They nest and forage in well-drained native grasslands, shrublands and agricultural fields.	Minor to moderate impacts on long-billed curlews, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.
McCown's longspur (*Calcarius mccownii*)	SS				This species may occur as a breeding resident throughout the region surrounding the proposed power infrastructure in Montana and as a migrant in western South Dakota. They nest and forage in short-grass prairie or heavily grazed mixed-grass prairie.	Minor to moderate impacts on McCowan's longspurs, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.

Table 6-50. BLM Sensitive Species, State-protected Species and Animals and Plants of Conservation Concern Potentially Occurring on or near the Proposed Electrical Power Infrastructure

	Status					
Species	BLM	MT	SD	NE	Occurrence and Habitat	Power Line Impacts
Mountain plover (*Charadrius montanus*)	SS			T	This species breeds throughout central and eastern Montana, in short-grass prairies and prairie dog colonies. Most mountain plover nesting in Montana is concentrated south of the proposed Project area in southern Phillips and Valley counties, but this species may nest in prairie dog towns in the region surrounding the proposed power infrastructure.	Minor to moderate impacts on mountain plovers, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.
Osprey (*Pandion haliaetus*)			T		This species may occur as a breeding resident throughout the region surrounding the proposed power infrastructure in Montana, and as a migrant throughout South Dakota and Nebraska. They nest near large lakes, reservoirs and rivers.	Minor to moderate impacts on ospreys, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.
Peregrine falcon (*Falco peregrinus*)	SS		E		This species may occur year-round in Montana and as a migrant throughout the region surrounding the proposed power infrastructure in South Dakota and Nebraska. They nest on ledges and cliffs, often near open habitats where they can hunt for prey.	Minor to moderate impacts on peregrine falcons, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.
Piping plover (*Charadrius melodus*)	T		T	T	See Section 6.4.6.1.	See Table 6-49.
Red-headed woodpecker (*Melanerpes erythrocephalus*)	SS				This species may occur as a breeding resident throughout the region surrounding the proposed power infrastructure in Montana, South Dakota, and Nebraska. They inhabit open woodlands (especially with beech and oak) and other open areas with scattered trees.	Minor to moderate impacts on red-headed woodpeckers, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.
Rufa red knot (*Calidris canutus* rufa)	T			T	See Section 6.4.6.1.	See Table 6-49.

Table 6-50. BLM Sensitive Species, State-protected Species and Animals and Plants of Conservation Concern Potentially Occurring on or near the Proposed Electrical Power Infrastructure

	Status					
Species	**BLM**	**MT**	**SD**	**NE**	**Occurrence and Habitat**	**Power Line Impacts**
Sage thrasher (*Oreoscoptes montanus*)	SS				This species may occur as a breeding resident throughout the region surrounding the proposed power infrastructure in Montana. They nests from April through July on the ground in habitats dominated by big sagebrush, and use sagebrush and shrubs during migration.	Minor to moderate impacts on sage thrashers, if present within the footprint of the proposed power infrastructure, would be expected. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.
Sprague's pipit (*Anthus spragueii*)	SS				This species may occur as a breeding resident throughout the region surrounding the proposed power infrastructure in Montana and northern South Dakota and as a migrant in central and southern South Dakota and all of Nebraska. They nest on the ground in short-grass and mixed-grass prairie, wet meadows, and alkaline wetlands.	Minor to moderate impacts on Sprague's pipits, if present within the footprint of the proposed power infrastructure, would be expected to occur. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.
Trumpeter Swan (*Cygus buccinator*)	SS				This species may occur as a migrant throughout the region surrounding the proposed power infrastructure in Montana and may occur as a breeding resident in western South Dakota and northwestern Nebraska. They typically breed on the margins of large inland waters with emergent marsh vegetation.	Minor to moderate impacts on trumpeter swans, if present within the footprint of the proposed power infrastructure, would be expected to occur. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species.
Veery (*Catharus fuscescens*)	SS				This species may occur as a breeding resident throughout the region surrounding the proposed power infrastructure Montana and as a migrant in South Dakota and Nebraska. They breed in swampy forested habitats with an open, shrubby understory. In Montana the species is associated with riparian willow thickets and cottonwood stands.	Minor to moderate impacts on veerys, if present within the footprint of the proposed power infrastructure, would be expected to occur. Species-specific conservation measures provided in Chapter 8 (see Table 8-4) would be applied to the proposed Project, including the proposed power lines.

Table 6-50. BLM Sensitive Species, State-protected Species and Animals and Plants of Conservation Concern Potentially Occurring on or near the Proposed Electrical Power Infrastructure

	Status					
Species	**BLM**	**MT**	**SD**	**NE**	**Occurrence and Habitat**	**Power Line Impacts**
White-faced ibis (*Plegadis chihi*)	SS				This species may occur as a breeding resident throughout the region surrounding the proposed power infrastructure in northeast Montana and may occur as a migrant in southeast Montana, South Dakota, and Nebraska. They nest in freshwater ponds, swamps, and marshes with pockets of emergent vegetation.	Minor to moderate impacts on trumpeter swans, if present within the footprint of the proposed power infrastructure, would be expected to occur. In some cases, species-specific conservation measures provided in Chapter 8 (Tables 8-3 and 8-5) would have incidental benefits to non-target migratory bird species. Additionally, BMPs and conservation measures relative to wetland impacts would provide incidental benefits to the species (Table 8-5).
Whooping Crane	E		E	E	See Section 6.4.6.1.	See Table 6-49.
Fish						
Blacknose shiner (*Notropis heterolepis*)			E	E	Northern United States; Keya Paha and Niobrara rivers and tributaries, Spring Creek, South Dakota, Nebraska; weedy lakes streams; eats insects.	No impacts on blacknose shiners, if present within the footprint of the proposed power infrastructure, would be expected. No in-stream impacts would be expected. Standard soil and erosion control BMPs would be applied in adjacent habitat (see Table 8-5).
Finescale dace (*Chrosomus neogaeus*)			E	T	Northern United States; Keya Paha, Niobrara, Main Stem Elkhorn rivers, Spring Creek, South Dakota, Nebraska; bogs, creeks, rivers, eats invertebrates.	No impacts on finescale dace, if present within the footprint of the proposed power infrastructure, would be expected. No in-stream impacts would be expected. Standard soil and erosion control BMPs would be applied in adjacent habitat (see Table 8-5).
Northern redbelly dace (*Chrosomus eos*)			T	T	Northern United States; Upper Missouri River and tributaries, Frenchman Creek, Yellowstone River and tributaries east of the Powder River, Montana; Keya Paha, Niobrara rivers and tributaries, Spring Creek, South Dakota, Nebraska; boggy lakes, streams; forage on diatoms, algae, zooplankton and insects.	No impacts on northern redbelly dace, if present within the footprint of the proposed power infrastructure, would be expected. No in-stream impacts would be expected. Standard soil and erosion control BMPs would be applied in adjacent habitat (see Table 8-5).
Northern redbelly dace x finescale dace hybrid (*Chrosomus eos* x *Chrosomus neogaeus* hybrid)	SS				This hybrid may occur wherever northern redbelly dace and finescale dace occur. They are known from the upper Missouri River and tributaries north of the Missouri River in Montana. They have similar life history characteristics and habitat requirements to the northern redbelly dace.	No impacts on Northern redbelly dace x finescale dace hybrid, if present within the footprint of the proposed power infrastructure, would be expected. No in-stream impacts would be expected. Standard soil and erosion control BMPs would be applied in adjacent habitat (see Table 8-5).

Table 6-50. BLM Sensitive Species, State-protected Species and Animals and Plants of Conservation Concern Potentially Occurring on or near the Proposed Electrical Power Infrastructure

	Status					
Species	BLM	MT	SD	NE	Occurrence and Habitat	Power Line Impacts
Paddlefish (*Polyodon spathula*)	SS				This species may occur in the Missouri and Yellowstone rivers in Montana, in quiet waters of large rivers or impoundments. They spawn on the gravel bars of large rivers during late spring and early summer high water.	No impacts on paddlefish, if present within the footprint of the proposed power infrastructure, would be expected. No in-stream impacts would be expected. Standard soil and erosion control BMPs would be applied in adjacent habitat (see Table 8-5).
Northern Pearl dace (*Margariscus nachtriebi*)	SS		T		This species may occur in cool tributaries of the Missouri, Milk, Niobrara, and Platte rivers; they spawn in spring over gravel or sand.	No impacts on northern pearl dace, if present within the footprint of the proposed power infrastructure, would be expected. No in-stream impacts would be expected. Standard soil and erosion control BMPs would be applied in adjacent habitat (see Table 8-5).
Sauger (*Sander canadensis*)	SS				Within Montana, this species is known to occur in the Missouri, Milk, and Yellowstone rivers, Frenchman Creek, and Boxelder Creek. They also occur in the muddy shallows of lakes and reservoirs. They spawn in the main stem of large tributaries with pools and rocky substrates.	No impacts on sauger, if present within the footprint of the proposed power infrastructure, would be expected. No in-stream impacts would be expected. Standard soil and erosion control BMPs would be applied in adjacent habitat (see Table 8-5).
Sicklefin chub (*Macrhybopsis meeki*)			T		This species is known to occur in the Missouri, Milk, Yellowstone, Niobrara, Platte rivers, and Fort Peck Reservoir. They prefer large warm rivers with gravel and sand. Presumably a bottom feeder.	No impacts on sicklefin chub, if present within the footprint of the proposed power infrastructure, would be expected. No in-stream impacts would be expected. Standard soil and erosion control BMPs would be applied in adjacent habitat (see Table 8-5).
Sturgeon chub (*Macrhybopsis gelida*)	SS		T	E	This species is known to occur in the Missouri, Powder, Yellowstone, Cheyenne, Little Missouri, White, Keya Paha, Elkhorn, and Platte rivers, and in Fort Peck Reservoir, in turbid water with moderate to strong currents over bottoms ranging from rocks and gravel to coarse sand. They spawn from June through July.	No impacts on sturgeon chub, if present within the footprint of the proposed power infrastructure, would be expected. No in-stream impacts would be expected. Standard soil and erosion control BMPs would be applied in adjacent habitat (see Table 8-5).
Topeka shiner (*Notropis topeka*)	E			E	This species may occur in portions of South Dakota, Minnesota, Kansas, Iowa, Missouri, and Nebraska, primarily in small prairie (or former prairie) streams in pools containing clear, clean water and clean gravel, rock or sand bottoms.	No impacts on Topeka Shiner, if present within the footprint of the proposed power infrastructure, would be expected. No in-stream impacts would be expected. Standard soil and erosion control BMPs would be applied in adjacent habitat (see Table 8-5).

Table 6-50. BLM Sensitive Species, State-protected Species and Animals and Plants of Conservation Concern Potentially Occurring on or near the Proposed Electrical Power Infrastructure

Species	Status BLM	Status MT	Status SD	Status NE	Occurrence and Habitat	Power Line Impacts
Invertebrates						
A mayfly (*Raptoheptagenia cruentata*)	SS				This species may occur throughout the region surrounding the proposed power infrastructure in Montana. It inhabits larger, perennial prairie streams with sand and gravel bottoms and cobble riffles.	No impacts on *Raptoheptagenia cruentata*, if present within the footprint of the proposed power infrastructure, would be expected. No in-stream impacts would be expected. Standard soil and erosion control BMPs would be applied in adjacent habitat (see Table 8-5).
American burying beetle (*Nicrophorus americanus*)	E			E	See Section 6.4.6.1.	See Table 6-49.
Mammals						
Black-footed ferret (*Mustela nigripes*)	E		E	E	See Section 6.4.6.1.	See Table 6-49.
Black-tailed prairie dog (*Cynomys ludovicianus*)	SS				This species may occur throughout the region surrounding the proposed power infrastructure in Montana, South Dakota, and Nebraska. They inhabit all major grassland habitats in relatively level sites with silty clay loam, sandy clay loam or clay loam soils and low, relatively sparse vegetation.	Minor to moderate temporary impacts on black-tailed prairie dogs, if present within the footprint of the proposed power infrastructure, would be expected. Impacts on the species would be limited to construction. Loss of potentially suitable habitat would be minimal.
Fringed Myotis (*Myotis thysanodes*)	SS				This species may occur in the region surrounding the proposed power infrastructure in southeastern Montana The species occurs in a variety of habitats, from low- to mid-elevation grassland, woodland and desert habitats, up to and including spruce-fir forests.	Minor temporary impacts on fringed Myotis, if present within the footprint of the proposed power infrastructure, would be expected. Impacts on the species would be limited to construction. Loss of potentially suitable habitat would be minimal.
Northern Myotis (*Myotis septentrionalis*)				T	See Section 6.4.6.1.	See Table 6-49.

Table 6-50. BLM Sensitive Species, State-protected Species and Animals and Plants of Conservation Concern Potentially Occurring on or near the Proposed Electrical Power Infrastructure

Species	Status BLM	Status MT	Status SD	Status NE	Occurrence and Habitat	Power Line Impacts
Northern river otter (*Lontra canadensis*)			T	T	This species may occur throughout the region surrounding the proposed power infrastructure in South Dakota and Nebraska. They inhabit rivers, streams, lakes, ponds, marshes, and swamps. They feed on a variety of prey items, dominated by fish and crayfish.	Minor temporary impacts on river otters, if present within the footprint of the proposed power infrastructure, are expected to occur. Standard soil and erosion control BMPs would be applied in adjacent habitat (see Table 8-5). Impacts on the species would be limited to construction. Loss of potentially suitable habitat would be minimal.
Spotted bat (*Euderma maculatum*)	SS				This species may occur throughout the region surrounding the proposed power infrastructure in southeastern Montana. The species roosts in caves, rock crevices, and cliff habitats and are often encountered foraging in open, arid habitats dominated by juniper and sagebrush.	Minor temporary impacts on spotted bats, if present within the footprint of the proposed power infrastructure, are expected to occur. Impacts on the species would be limited to construction. Loss of potentially suitable habitat would be minimal.
Swift fox (*Vulpes velox*)	SS		T	E	This species may occur throughout the region surrounding the proposed power infrastructure in Montana, South Dakota, and Nebraska. They inhabit prairie habitats with a high density of small mammals (ground squirrels or prairie dogs), and burrows in sandy soil on high ground in open prairies and along fencerows.	Minor temporary impacts on swift foxes, if present within the footprint of the proposed power infrastructure, are expected to occur. Impacts on the species would be limited to construction. Loss of potentially suitable habitat would be minimal.
Townsend's big-eared bat (*Corynorhinus townsendii*)	SS				This species may occur throughout the region surrounding the proposed power infrastructure in Montana and western South Dakota. They roost and hibernate in caves and mines during all seasons. There are no known roosts for this species in the potentially affected area, although this species likely forages in and travels through the potentially affected area.	Minor temporary impacts on Townsend's big-eared bat, if present within the footprint of the proposed power infrastructure, would be expected. Impacts on the species would be limited to construction. Loss of potentially suitable habitat would be minimal.
Plants						
Small white lady's slipper (*Cypripedium candidum*)				T	This species is may occur in Keya Paha, Holt, Colfax, and Butler counties, Nebraska. It typically inhabits relatively undisturbed grasslands and prairie habitats, though it has been documented in moderately disturbed sites such as road side ditches.	Minor to moderate impacts on small white lady's slipper, if present within the footprint of the proposed power infrastructure, would be expected.

Table 6-50. BLM Sensitive Species, State-protected Species and Animals and Plants of Conservation Concern Potentially Occurring on or near the Proposed Electrical Power Infrastructure

	Status					
Species	BLM	MT	SD	NE	Occurrence and Habitat	Power Line Impacts
Visher's buckwheat (*Erigonum visheri*)	SS				This species is known to occur in Harding, Meade, and Perkins counties, South Dakota. It inhabits barren outcrops in badlands formations and sparely vegetated grasslands.	Minor to moderate impacts on Visher's buckwheat, if present within the footprint of the proposed power infrastructure, would be expected.
Western prairie fringed orchid (*Platathera praeclara*)				T	See Section 6.4.6.1.	See Table 6-49.
Reptiles and Amphibians						
False map turtle (*Graptemys pseudogeographica*)			T		This species may occur in the region surrounding the proposed power infrastructure in central South Dakota and eastern Nebraska. They inhabit freshwater habitats with abundant aquatic vegetation, including lakes, ponds, reservoirs, sloughs, and large and medium rivers and their backwaters.	Minor impacts on false map turtles, if present within the footprint of the proposed power infrastructure, would be expected. No impacts would be expected to occur within streams, lakes or ponds. Standard soil and erosion control BMPs would be applied in adjacent habitat (see Table 8-5).
Great plains toad (*Anaxyrus cognatus*)	SS				This species may occur in the region surrounding the proposed power infrastructure in Montana, South Dakota, and Nebraska and inhabits agricultural areas, deserts, open floodplains, grasslands, and shrublands. They breed in small reservoirs and backwater sites along streams, as well as flooded areas, rain pools, and stock ponds.	Minor to moderate impacts on great plains toads, if present within the footprint of the proposed power infrastructure, would be expected.
Greater short-horned lizard (*Phrynosoma hernandesi*)	SS				This species may occur throughout central and eastern Montana as well as western South Dakota and Nebraska. They inhabit dry open forests, grasslands, and sagebrush with sparse vegetation at ground level, sunbaked soil, ridges between coulees, and limestone outcrops.	Minor to moderate impacts on greater short-horned lizards, if present within the footprint of the proposed power infrastructure, would be expected.

Table 6-50. BLM Sensitive Species, State-protected Species and Animals and Plants of Conservation Concern Potentially Occurring on or near the Proposed Electrical Power Infrastructure

	Status					
Species	BLM	MT	SD	NE	Occurrence and Habitat	Power Line Impacts
Western Milksnake (*Lampropeltis gentillis*)	SS				This species may occur in the region surrounding the proposed power infrastructure in southeastern Montana, as well as western South Dakota and all of Nebraska. They inhabit sandstone bluffs, rock outcrops, grasslands, and open ponderosa pine savanna.	Minor to moderate impacts on western milksnakes, if present within the footprint of the proposed power infrastructure, would be expected.
Northern leopard frog (*Rana pipiens*)	SS				This species may occur throughout the region surrounding the proposed power infrastructure in Montana, South Dakota, and Nebraska. They inhabit low elevation beaver ponds, creeks, lakes, pools in intermittent streams, stock ponds, reservoirs, and wetlands.	Minor to moderate impacts on northern leopard frogs, if present within the footprint of the proposed power infrastructure, would be expected. No impacts would be expected to occur within streams, lakes or ponds. Standard soil and erosion control BMPs would be applied in adjacent habitat (see Table 8-5).
Plains hognose snake (*Heterodon nasicus*)	SS				This species may occur throughout the region surrounding the proposed power infrastructure in Montana, South Dakota, and Nebraska. They inhabit habitats with sandy or gravelly soil, including sagebrush grasslands as well as floodplains, prairies, sandhills, and semi-agricultural lands.	Minor to moderate impacts on plains hognose snakes, if present within the proposed power infrastructure, would be expected to occur.
Plains spadefoot (*Spea bombifrons*)	SS				This species may occur throughout the region surrounding the proposed power infrastructure in Montana, South Dakota, and Nebraska. They inhabit shrublands, grasslands, and semi-arid desert habitats with soft sandy/gravelly soils near permanent or temporary water.	Minor to moderate impacts on plains spadefoot toads, if present within the footprint of the proposed power infrastructure, would be expected.
Snapping turtle (*Chelydra serpentina*)	SS				This species may occur throughout the region surrounding the proposed power infrastructure in Montana, South Dakota, and Nebraska. They inhabit all types of shallow freshwater habitats with abundant aquatic vegetation and submerged logs, including major rivers, smaller reservoirs, and smaller streams and creeks with permanent water flow and sand or muddy substrates.	Minor impacts on snapping turtles, if present within the footprint of the proposed power infrastructure, would be expected. No impacts would be expected to occur within streams, lakes or ponds. Standard soil and erosion control BMPs would be applied in adjacent habitat (see Table 8-5).

Table 6-50. BLM Sensitive Species, State-protected Species and Animals and Plants of Conservation Concern Potentially Occurring on or near the Proposed Electrical Power Infrastructure

	Status					
Species	**BLM**	**MT**	**SD**	**NE**	**Occurrence and Habitat**	**Power Line Impacts**
Spiny-softshell (*Apalone spinifera*)	**SS**				**This species may occur throughout the region surrounding the proposed power infrastructure in Montana, South Dakota, and Nebraska. They inhabit larger rivers and tributaries, but may also be found in pools along intermittent streams, irrigation canals, and oxbows.**	**Minor impacts on spiny-softshell turtles, if present within the foot print of the proposed power infrastructure, would be expected. No impacts would be expected to occur within streams, lakes, or ponds. Standard soil and erosion control BMPs would be applied in adjacent habitat (see Table 8-5).**
Western massasauga (*Sisturus tergeminus*)				**T**	**This species may occur in southeastern Nebraska. They inhabit a variety of moist tallgrass prairie or grassy fields or floodplains.**	**Minor to moderate impacts on massasauga rattlesnakes, if present within the footprint of the proposed power infrastructure, would be expected.**

Sources: Andres and Stone 2009, U.S. Department of State 2014, USFWS 2012**b**, **Westech** 2017

BLM = Bureau of Land Management; E = endangered; KS = Kansas; MT = Montana; NE = Nebraska; ROW = right-of-way; SC = species of concern; SD = South Dakota; SEIS = Supplemental Environmental Impact Statement; SGCN = species of greatest conservation need; SS = sensitive species; T = threatened

6.4.7 Land Use and Recreation

This section describes the affected environment and potential impacts on land use and recreation associated with the construction and operation of the proposed electrical power infrastructure. This section builds upon the description and analyses provided in Sections 3.2 and 4.2 of this document, and Sections 3.9 and 4.9 of the 2014 Keystone XL Final SEIS.

6.4.7.1 Affected Environment

The power infrastructure would cross primarily privately owned land (**81.5** percent) with portions crossing through state (approximately **6.0** percent), **and** federal (approximately **12.5** percent) jurisdictions. Similar proportions of federal, state, and private lands would be located within the proposed ROW for the transmission and distribution lines (Table 6-51 and Table 6-52). No locally owned public lands (such as parks) were identified within the ROW.

Proposed substations or substation expansion areas would be mostly located on private lands. **The proposed WAPA** substation associated with PS-09 would be located on **BLM-managed** land **and the proposed WAPA substation expansion associated with PS-10 would be located on land** managed by the USACE. Potential substation expansion areas associated with PS-15 and PS-16 would be located on state lands.

Table 6-51. Total Distance Crossed by the Power Line Centerline (miles)[a]

Pump Station	Federal	State	Private	Total
PS-09	31.2	3.4	26.8	61.4
PS-10	7.1	4.8	36.9	48.8
PS-11	0	0	0.2	0.2
PS-12	0	0.8	3.8	4.6
PS-13	0	0	15.7	15.7
PS-14	0	0.2	6.7	6.9
PS-15	0	4.6	20.1	24.7
PS-16	1.6	5.3	35	41.9
PS-17	0	0	10.9	10.9
PS-18	0	0	26	26
PS-19	0.0	0	20.5	20.5
PS-20	0	0	17.2	17.2
PS-21	0	0	20.5	20.5
PS-22	0	0	2.5	2.5
PS-23	0	0	3	3
PS-23B	0	0	3.4	3.4
PS-24	0	0	1	1
PS-25	0	0	9.3	9.3
PS-26	0	0	0.1	0.1
Totals[b]	39.9	19.1	259.6	318.6
Percent of Total	12.5%	6.0%	81.5%	100%

Source: **USGS 2018b**

[a] Distances presented represent miles crossed by the power line's centerline, not the right-of-way.

[b] Totals may not match due to rounding.

Table 6-52. Total Land Area Crossed by Power Line ROW (acres)

Pump Station	Federal	State	Private	Total
	379.5	40.1	324.5	744.1
PS-10	69.5	46.6	357.1	473.2
	0.0	0.0	1.9	1.9
PS-12	0.0	7.1	37.3	44.4
	0.0	0.0	152.4	152.4
PS-14	0.0	1.9	39.7	41.6
	0.4	28.2	121.0	149.6
PS-16	9.4	33.5	210.8	253.7
	0.0	0.0	65.8	65.8
PS-18	0.0	0.0	157.2	157.2
	0.0	0.0	124.1	124.1
PS-20	0.0	0.0	104.5	104.5
	0.0	0.0	124.5	124.5
PS-22	0.0	0.0	15.4	15.4
	0.0	0.0	37.0	37.0
PS-23B	0.0	0.0	40.8	40.8
	0.0	0.0	12.4	12.4
PS-25	0.0	0.0	112.2	112.2
	0.0	0.0	1.3	1.3
Total[a]	458.8	157.4	2039.9	2656.1
	17.3%	5.9%	76.8%	100%

Source: **USGS 2018b**

[a] Totals may not match due to rounding.

% = percent; ROW = right-of-way

The proposed power lines and substations would be located in primarily rural areas characterized by sparse residential and commercial development, undeveloped lands, and agricultural land uses including farming and ranching. Land use categories that would be crossed by the each of the power line centerlines, power line ROWs, and substations are provided in Section 6.4.4. According to National Land Cover Database data, lands within the area potentially affected would mostly consist of grasslands (**53** percent), followed by agricultural lands (cultivated crops and pasture/hay) (1**8** percent) developed/open space (1**3** percent)**, and shrubland (12 percent)**. The **remaining 3 percent of the** ROW would consist of developed/low intensity**,** developed/high intensity, developed medium intensity, **woody wetlands, barren land,** forest lands**,** and open water. Section 3.9 of the 2014 Keystone XL Final SEIS provides a detailed description of commonly harvested principal crops in Montana, North Dakota, South Dakota, and Nebraska reported by the **2012** Census of Agriculture. Resource extraction, specifically oil and gas extraction, commonly occurs in proximity to the proposed power line ROWs.

The proposed power lines would cross special interest areas managed for recreation and other uses. The Protected Areas Database was used to identify special interest areas managed for conservation or recreation that are crossed by the power lines or ROW. Table 6-53 identifies crossings of special interest areas by the proposed power lines or ROWs, and Table 6-54 identifies substation or substation expansion areas that would be located within special interest areas.

Table 6-53. Special Interest Areas Crossed by Power Lines

Pump Station	Name/Ownership	Miles Crossed	Acres in ROW
PS-09	BLM: Malta Field Office	31.2	379.5
	Montana State Department of Natural Resources and Conservation: Montana State Trust Lands	3.4	4**1.0**
PS-10	The Nature Conservancy: Bitter Creek Easement	**0**.5	14.**5**
	BLM: Glasgow Field Office	4.3	4**2.1**
	USACE: Fort Peck Recreation Area (Downstream Recreation Area)	2.8	**27.3**
	USFWS: Charles M. Russell National Wildlife Refuge	**2.1**	**20.1**
	Montana State Department of Natural Resources: Montana State Trust Lands	4.8	46.6
PS-12	Montana State Department of Natural Resources: Montana State Trust Lands	0.8	7.1
PS-14	Montana State Department of Natural Resources: Montana State Trust Lands	0.2	**1.9**
PS-15	**South Dakota School and Public Lands**	**4.6**	**28.1**
PS-16	USFS: The Castles Natural Area	1.1	6.7
	USFS: Custer Gallatin National Forest	1.6	9.**4**
	South Dakota School and Public Lands	5.3	33.5

Source: **USGS 2018b**

BLM = Bureau of Land Management; ROW = right-of-way; USACE = U.S. Army Corps of engineers; USFS = U.S. Forest Service; USFWS = U.S. Fish and Wildlife Service

Table 6-54. Potential New Substation or Substation Expansions Located in Special Interest Areas

Pump Station/Facility	Name/Ownership	Acres in Substation Area
PS-09/Possible Substation (Bowdoin)	BLM Malta Field Office	**8.0**
PS-10/Possible Substation	BLM Glasgow Field Office, U.S. Army Corps of Engineers; United States Fish and Wildlife	**3.0**
PS-15/Possible Expansion of Harding Substation	South Dakota School and Public Lands	4.0
PS-16/Possible Expansion of Buffalo Substation	South Dakota School and Public Lands	4.0

Source: **USGS 2018b**

BLM = Bureau of Land Management

Federal lands in the study area managed by the BLM are governed by Approved Resource Management Plans (ARMPs) **including HiLine District ARMP and the Miles City Field Office ARMP, as amended,** which identify the spectrum of activities allowed on BLM lands and under what conditions they are allowed. With respect to power line ROW, the **HiLine District ARMP and the Miles City Field Office ARMP, as amended,** identify lands where new ROW is allowed, restricted or prohibited. Other land uses managed by the **HiLine District ARMP and the Miles City Field Office ARMP, as amended,** include mining, oil and gas extraction, energy development, conservation, and various types of recreation.

The U.S. Forest Service (USFS) manages land in the study area associated with the Custer Gallatin National Forest and the Castles Natural Area, under the Custer National Forest Management Plan, completed in 1986. The Custer Gallatin National Forest is in the process of revising their forest plan, and published a Proposed Action for public scoping in January 2018, although the Forest Plan is not complete. Forest Plans are similar to the BLM ARMPs **(HiLine District ARMP and the Miles City Field Office ARMP, as amended)**, and identify lands where resource use and recreational activities are allowed, restricted or prohibited.

The Fort Peck Recreation Area is managed by the USACE, and the Charles M. Russell National Wildlife Refuge is managed by USFWS. These recreation areas support hunting, fishing, camping and other types of recreation, and are located adjacent to each other near the Fort Peck Dam. The PS-10 transmission line and associated ROW would cross these jurisdictions adjacent to a roadway and an established transmission corridor leading to the Fort Peck Substation, which would require a three-acre expansion.

State lands would be crossed by the power lines in Montana and South Dakota, but not in Nebraska. Montana State Trust Lands are managed by the Department of Natural Resources and Conservation and the State Land Board. Leasing programs are available for state trust lands for agriculture, grazing, timber, mineral extraction and other surface uses including issuance of ROW agreements. Dispersed recreation (hunting, fishing, camping) is allowed with a permit (Montana Interagency Access Council 2018). South Dakota School and Public Lands State Lands are available to members of the public for hunting and fishing as long as rules and regulations are followed. Mineral leasing is also conducted on state lands (South Dakota School and Public Lands 2019).

6.4.7.2 Environmental Consequences

Impacts on land use or recreation would occur if existing activities were interrupted or precluded because of construction or operation of the power lines or substations. Power infrastructure can generally be sited to be compatible with most rural, agricultural and developed land uses. Transmission and distribution line routes follow road ROW, existing transmission ROW, and parcel boundaries where practicable to minimize impacts on land use. Power lines were routed specifically to avoid impacts on developed areas, agricultural fields, irrigation pivots, residential structures, and developed oil and gas extraction sites wherever possible. New substations or substation expansions would be located on undeveloped lands, typically adjacent to existing electrical infrastructure.

During construction, land uses within the ROW such as recreation and agricultural activities would be temporarily restricted. After construction, recreation, agricultural, and other land management activities may resume within the ROW, and underneath the power lines around the structures as long as safe practices are followed. For example, resource extraction activities such as oil extraction and mining may continue around the power lines as long as safe practices are followed, but tall structures would be prohibited within a certain distance from the ROW to maximize safety. No residential structures would be located within the permanent ROW of the power lines, and non-residential structures within the construction ROW would be avoided by construction activities. If construction is planned for agricultural areas, measures would be taken to avoid or minimize crop damage, restore the disturbed land to its prior condition, and to compensate landowners for any damages. Substation sites are located on undeveloped land. Construction of the substations would change agricultural or undeveloped land designations to "developed" and prior uses such as agriculture would be precluded.

Approximately 0.5 mile of the transmission line associated with PS-10 would be located along the boundar**y** of **a** parcel that ha**s a** conservation easement managed by The Nature Conservancy. Because the transmission line would be located along the parcel boundar**y**, impacts on land use within the easement are expected to be minor and temporary during construction, limited to the construction ROW, and minor during operations, limited to the structure locations. Additional coordination with The Nature Conservancy would be required to determine how the transmission line may impact conservation uses of the land. According to the National Conservation Easement Database, no other conservation easements were identified within the proposed ROW (National Conservation Easement Database 2019).

The following describes recreation areas that would be crossed by each power line, and potential impacts on recreation and other land uses:

- The transmission line and potential substation associated with PS-09 would be located on lands managed by the BLM's Malta District Office **and** State Trust Lands managed by the Department of Natural Resources and Conservation. No developed recreation sites would be crossed or located within the ROW. BLM lands crossed are categorized as "roaded-modified" indicating that the landscape is heavily modified by roads for activities such as oil and gas or off-highway vehicle use (BLM 2015a). The lands crossed by the transmission line are open to new ROW provided that mitigation measures identified in Appendix H and Appendix I in the HiLine ARMP are followed. ROW within state lands may be temporarily closed to dispersed recreation during construction, but may resume after construction is completed. Hunting opportunities on state lands crossed by the ROW may also be temporarily impacted if game species avoid the area due to construction activity.
- The transmission line and potential substation associated with PS-10 would cross lands managed by the BLM's Glasgow Field Office and the USACE. The transmission line would also cross the Fort Peck Recreation Area (managed by the USACE), the Charles M. Russell National Wildlife Refuge (managed by the USFWS), Montana State Trust Lands and a Nature Conservancy easement. BLM lands crossed by the transmission line are open to new ROW provided that mitigation measures identified in Appendix H and Appendix I in the HiLine ARMP are followed. BLM lands crossed are categorized as "roaded-natural**,**" indicating that **the landscape is generally natural with moderate modifications and the concentration of users is** low to moderate (BLM 2015a). Where the ROW crosses land managed by the USACE as part of the Fort Peck Recreation Area/Charles M. Russell National Wildlife Refuge complex and the Lewis and Clark NHT, the transmission line would be collocated with roads and existing transmission lines to minimize potential impacts on land use and recreation. ROW within state lands may be temporarily closed to dispersed recreation during construction, but may resume after construction is completed. Hunting opportunities on state lands crossed by the ROW may also be temporarily impacted if game species avoid the area due to construction activity.
- The transmission line associated with PS-12 would cross Montana State Trust Lands managed by the Department of Natural Resources and Conservation, and the proposed substation expansion would also be located on Montana State Trust Lands. No developed recreation sites would be crossed or located within the ROW. ROW within state lands may be temporarily closed to dispersed recreation during construction, but may resume after construction is completed. Hunting opportunities on state lands crossed by the ROW may also be temporarily impacted if game species avoid the area due to construction activity.

- Montana State Trust lands managed by the Department of Natural Resources and Conservation would be crossed by the ROW associated with the proposed line to PS-14. No developed recreation sites would be crossed or located within the ROW. ROW within state lands may be temporarily closed to dispersed recreation during construction, but may resume after construction is completed. Hunting opportunities on state lands crossed by the ROW may also be temporarily impacted if game species avoid the area due to construction activity.
- The ROW associated with PS-15 would cross lands managed by South Dakota School and Public Lands, and the proposed Harding substation expansion would be also located on state trust lands. No developed recreation sites would be crossed or located within the ROW. ROW within state lands may be temporarily closed to dispersed recreation during construction, but may resume after construction is completed. Hunting opportunities on state lands crossed by the ROW may also be temporarily impacted if game species avoid the area due to construction activity.
- The transmission line and ROW associated with PS-16 would cross lands managed by the USFS Custer Gallatin National Forest and South Dakota School and Public Lands. The potential expansion of the Buffalo Substation would also be located on state trust lands. No developed recreation sites would be crossed or located within the ROW. The areas crossed within the Custer Gallatin National Forest/Castles Natural Area are located adjacent to State Route 20 approximately 0.5 mile north of the Reva Gap Campground and trailheads associated with the Castles. According to the 1986 Forest Plan, utility corridors are allowed at this location because there is an existing utility line (USFS 1986). The entrance to the campground and trailheads may be temporarily closed during transmission line stringing, but no other impacts on recreational uses are anticipated. ROW within state lands may be temporarily closed to dispersed recreation during construction, but may resume after construction is completed. Hunting opportunities on state lands crossed by the ROW may also be temporarily impacted if game species avoid the area due to construction activity.

Chapter 8, Summary of Consequences, summarizes the avoidance, minimization and mitigation measures that would be used to minimize impacts of the proposed Project **and associated power infrastructure**. Overall, impacts on land use and recreation are expected to be minor. While certain land uses may be temporarily prohibited during the construction timeframe, many activities including certain agricultural practices and dispersed recreation activities may resume when construction is complete. No developed recreation sites were identified within the ROW or substation areas. Although some activities such as oil and gas extraction or mining would be prohibited within or near the ROW, the ROW area is generally very small compared to other lands available for such activities in proximity to the sites. Substation construction would remove lands from agricultural or resource extraction activities, but would be done so with the permission of the landowner, and other lands nearby would likely be available for such activities.

6.4.8 Visual Resources

The following sections describe the affected visual environment and potential impacts on visual resources associated with constructing and operating the proposed electrical power infrastructure. This section builds upon the description and analyses provided in Sections 3.2 and 4.2 of this document, and Sections 3.9 and 4.9 of the 2014 Keystone XL Final SEIS.

6.4.8.1 Affected Environment

Section 3.9.2.4 of the 2014 Keystone XL Final SEIS provides a detailed definition of visual resources and the regulatory framework for managing visual resources on federal lands. The proposed power lines and substations would cross a variety of landscapes as indicated in Tables 6-51 and 6-52 with varying natural features and cultural modifications that create the visual environment. The landscape is rural in character with widely scattered residences and infrastructure. Wide-open vistas and long-range views are common throughout the study area, and topography is locally varied. In general, power lines and substations are existing visual features in the landscape, and other common visible infrastructure includes oil and gas developments, rural towns, fences, agricultural infrastructure, farms, communication towers, and roadways. Wherever practicable, the proposed power lines have been located adjacent to roadways, other power lines, and parcel boundaries or fence lines to consolidate infrastructure and minimize the creation of multiple visual linear corridors across the landscape.

The number of potentially sensitive viewers near the proposed power lines and substations is generally low due to low population densities. Potentially sensitive viewers may include residents, recreational users, motorists and users of public lands. Residences are often concentrated near roadways, and may have vegetation planted around the house or property that would limit views of the power lines. Recreational users are typically sensitive to changes in scenic quality, and may view the proposed infrastructure travelling along roadways or participating in site-specific recreational activities such as hunting, hiking, or camping. The proposed power lines and substations would not be visible from any Wild and Scenic Rivers (National Wild and Scenic River System 2019) or National Scenic Byways (Federal Highway Administration 2019). The proposed power lines and substations would be located on federal lands and special interest areas as identified in Tables 6-53 and 6-54.

6.4.8.2 Environmental Consequences

During construction, visual impacts would result from construction activities, including the presence of workers, equipment and vehicles in the area of active construction. Visual impacts would also result from exposure of bare soils and removal of existing vegetation at power line structure or substation locations, which would occur within the ROW and create visual contrast with adjacent vegetated areas until revegetation is complete. During operations, visual impacts would include the presence of new linear structures that create contrast with the existing visual environment in terms of forms, line, colors and textures. For example, transmission lines and conductors create visible linear corridors on the landscape; transmission poles create a repeating pattern of tall vertical forms; conductors create long, thin horizontal lines; and substations create contrast in colors and forms against a natural backdrop. Where similar forms, lines, colors, and textures occur within the landscape, such as where existing power lines occur, visual contrast from a new similar facility can be somewhat reduced. The presence of maintenance crews and activities during periodic maintenance would also create visual impacts. Overall, impacts on visual resources are anticipated to be minor. Construction and operation of power lines and substations would introduce new visual elements into the landscape, but would not change the overall visual character of the rural areas where they are constructed.

Specific descriptions of potential impacts on visual resources are discussed below for each pump station power line/substation.

PS-09

Visual impacts associated with the PS-09 infrastructure are anticipated to be minor. The transmission line would cross sparsely populated, undeveloped lands characterized by some agricultural fields and oil and gas development. The transmission line would cross approximately 31.2 miles of undeveloped Visual Resource Management Class III BLM lands managed by the Malta District **and** 3.4 miles of Montana State Trust Lands. The potential Bowdoin substation would also be located on BLM lands classified as Visual Resource Management Class III. Visual Resource Management Class III lands allow for a moderate level of change to the visual environment such that activities may attract attention but not dominate the view of the casual observer (BLM 2015a). The lands crossed are categorized as “roaded-modified” in the **HiLine District ARMP and the Miles City Field Office ARMP, as amended**, indicating that the landscape is heavily modified by roads for activities such as oil and gas or off-highway vehicle use (BLM 2015a). Because existing visible cultural modifications exist in the landscape, the transmission line and substation are anticipated to comply with the Visual Resource Management Class III standard. No recreation sites were identified in proximity to the ROW and the number of sensitive recreational viewers would be very low. No residences were identified within a mile of the proposed Bowdoin substation, which is located on undeveloped land adjacent to a road and an existing high-voltage transmission line.

PS-10

Visual impacts associated with the PS-10 infrastructure are anticipated to be minor to moderate. The transmission line would cross mostly undeveloped lands and would also be located adjacent to roadways for a significant portion of its length. The transmission line would cross BLM lands for 4.3 miles, the Fort Peck Recreation Area (managed by the USACE) for 2.8 miles, the Charles M. Russell National Wildlife Refuge for **2.1** miles, and Montana State Trust Lands for 4.8 miles. The potential substation would also be located on BLM lands. The BLM land is designated Visual Resource Management Class IV, which represents areas that have least visual value, allowing for a high level of change to the characteristic landscape with and major modification of the existing landscape character (BLM 2015a).

The transmission line would cross U.S. Route 2 three times, and be located parallel to U.S. Route 2 for approximately five miles. U.S. Route 2 is a driving route for the Lewis and Clark NHT. The transmission line would cross the Lewis and Clark NHT centerline where it crosses the Fort Peck Recreation Area (managed by the USACE) and the Charles M. Russell National Wildlife Refuge. Although the transmission line would be visible from visitors to the Fort Peck Recreation Area and wildlife refuge, the Fort Peck Interpretive Center and campgrounds, the transmission line would be collocated with roads and multiple existing power lines that connect to the Fort Peck Substation.

Potentially sensitive viewers would include residents, motorists driving the Lewis and Clark NHT, and recreational users. Overall visual impacts would be minor for most of the route and near Fort Peck because of the existing electrical infrastructure near the Fort Peck Dam. Potential visual impacts would be moderate where the proposed transmission line adjacent to a driving route associated with the Lewis and Clark NHT, because potentially sensitive viewers likely travel this route, and no electrical infrastructure currently exists along this stretch of the roadway.

PS-11

The 0.2-mile transmission line associated with PS-11 and the proposed Coal Hill Substation would produce minor visual impacts when considered with the proposed Keystone XL infrastructure. Only three transmission structures would be required, and an existing high-voltage 230-kV transmission line constructed with lattice structures crosses the proposed power line ROW and proposed Coal Hill Substation site. No residences were identified within one mile of the proposed infrastructure and no special interest lands would be crossed; therefore, potentially sensitive viewers are very limited. The proposed infrastructure would be visible from Highway 528 but is not likely to be visible from State Route 24 due to intervening topography. Overall visual impacts would be minor.

PS-12

Visual impacts associated with the PS-12 infrastructure are anticipated to be minor. The 4.6-mile transmission line associated with PS-12 would cross Montana State Trust Lands for approximately 0.8 mile in a rural area near County Road 13. PS-12 would also cross Montana State Route 200, a driving route of the Lewis and Clark NHT and a section of the Big Sky Backcountry Byway, along an existing H-frame transmission line. No residences were observed within one mile of the substation expansion area, which would be located on Montana State Trust Lands. Potentially sensitive viewers would be limited to motorists and residents near the transmission alignment. The transmission line route would follow existing power line ROW for a portion of its length. Visual impacts are anticipated to be minor due to low numbers of potentially sensitive viewers, and because transmission infrastructure is an existing visual element in the viewing area at the Lewis and Clark NHT crossing.

PS-13

Visual impacts associated with the PS-13 infrastructure are anticipated to be minor. The 15.7-mile transmission line associated with PS-13 would not cross any special interest lands or federal lands. The transmission alignment would be located near the community of Fallon at its western endpoint. Potentially sensitive viewers include residents of Fallon and other residences along the transmission alignment or near the new proposed substation at PS-13. Visual impacts associated with the proposed PS-13 infrastructure near Fallon would be minor because electrical and other infrastructure is common in the landscape near Fallon. Where the transmission line would cross undeveloped lands between Fallon and PS-13, including at the new proposed substation at PS-13, visual impacts would be minor due to a low number of potentially sensitive viewers.

PS-14

Visual impacts associated with the PS-14 infrastructure are anticipated to be minor. The proposed transmission line would cross mainly undeveloped lands with some oil and gas infrastructure. Potentially sensitive viewers are very limited due to low residential development in this area.

PS-15

Visual impacts associated with the PS-15 infrastructure are anticipated to be minor. The proposed 24.7-mile transmission line would cross lands managed by South Dakota School and Public Lands for 4.6 miles. The expansion of the Harding substation would also be located on state trust lands. Sensitive viewers would be limited to area residents. The transmission line would cross undeveloped land characterized by very low residential density and some oil and gas infrastructure. Overall visual impacts are anticipated to be minor due to a lack of potentially sensitive viewers.

PS-16

Visual impacts associated with the PS-16 infrastructure are anticipated to be minor. The proposed 41.9-mile transmission line would cross lands managed by the USFS associated with the Custer National Forest (1.6 miles) and the Castles Natural Area (1.1 mile), as well as the South Dakota State Land Board (5.3 miles). According to the current USFS Custer National Forest Plan (Management Area O), the management objective of this area is to "protect the unique geological and scenic features of the National Natural Landmarks and provide a recreation opportunity." The area has a Visual Quality Objective of Retention (human activities are not evident to the casual Forest visitor) and states that the landscape may be modified to facilitate public use and enjoyment of the area (USFS 1986). However, the USFS is currently revising the Forest Plan for the Custer Gallatin National Forest. The Proposed Action was published in January 2018 for a scoping comment period, and assigns a Scenic Integrity Objective of Moderate along State Route 20 where the transmission line is proposed, meaning "management activities are noticeable but not visually dominant" (USFS 2018).

At this location, the transmission line would be located adjacent to State Route 20 and collocated with an existing power line on the south side of the road. An existing power line also roughly parallels the north side of the road. From the interior of the Castles area and the Reva Gap Campground, the proposed transmission line is not likely to be visible due to screening by vegetation and topography. Where visible from State Route 20, it would not dominate views due to distance and because other more visually dominant landforms occur in the landscape.

The project proponent would work with the USFS design the transmission line to reduce contrast between the transmission line and the visual backdrop in this area. It is anticipated that the transmission line would be designed such that it meets the intended Moderate Scenic Quality Objective proposed for the revised forest plan, and overall visual impacts would be minor in this area. It is important to note that the revised Custer Gallatin National Forest Plan Revision is not complete, and the January 2018 Proposed Action does not constitute a management directive. Discussions with the USFS would be necessary to ensure the project complies with current management directives.

For the remainder of the route, the proposed transmission line would be mostly located on undeveloped land or located adjacent to roadways. The proposed transmission line would be located adjacent to State Route 20 through the small community of Prairie City for approximately 0.25 mile. The remainder of the route is characterized by sparsely populated agricultural lands. The proposed Buffalo substation is located on land managed by the South Dakota State Land Board, but no established recreation sites were observed.

PS-17

Visual impacts associated with the PS-17 infrastructure are anticipated to be minor. The approximately 10.9-mile transmission line would not cross any special interest lands, and its ROW would be located on undeveloped private land. The transmission line would be located adjacent to local roads for approximately 6.8 miles. The area is sparsely developed, although at least two farms are located within a mile of the transmission line. One farm is located within one mile of the proposed substation, which is proposed to be located on undeveloped private land.

PS-18

Visual impacts associated with the PS-18 infrastructure are anticipated to be minor. The approximately 26.0-mile transmission line associated with PS-18 would be located adjacent to existing power lines and local roads for the majority of the route, which traverses a very sparsely populated area. The route would not cross any special interest lands. The Phillips Substation is located approximately one mile west of Waggoner Lake, and two residences are located approximately 0.5 mile south of the substation site. Several power lines enter and exit the substation. Potentially sensitive viewers would be limited to area residents.

PS-19

Visual impacts associated with the PS-19 infrastructure are anticipated to be minor. The approximately 20.5-mile transmission line would be located adjacent to local roads for the majority of the route, located mostly on undeveloped and agricultural lands in a very sparsely populated area. No developed recreation sites were identified along the ROW. Existing power lines are located along mostly local roads followed by the proposed route. The existing Midland substation is located approximately one mile northeast of the community of Midland, and the closest residence identified is approximately 0.4 mile to the west across from State Route 63. Several transmission lines and a communications tower are also located within 0.5 mile of the substation expansion area. Potentially sensitive viewers would be limited to area residents.

PS-20

Visual impacts associated with the PS-20 infrastructure are anticipated to be minor. The approximately 17.2-mile transmission line would be located on undeveloped and agricultural lands, and adjacent to local roads for a portion of the route. Existing power lines are located along most local roads along the proposed route. Potentially sensitive viewers would be limited to area residents, and overall, visual impacts from the transmission line would be minor.

PS-21

Visual impacts associated with the PS-21 infrastructure are anticipated to be minor. The approximately 20.5-mile transmission line would be located adjacent to local roads for the majority of the route, and would not cross any special interest lands. Existing power lines are located along most local roads along the proposed route. Potentially sensitive viewers would be limited to area residents. Because the Gregory Substation would be rebuilt in the same location, construction and operation of the substation is anticipated to have minor visual impacts.

PS-22

Visual impacts associated with the PS-21 infrastructure are anticipated to be minor. The approximately 2.5-mile transmission line would not cross any special interest lands, and its ROW would be located on private undeveloped or agricultural land. The transmission line would be located adjacent to 488th Avenue for its entire length. Potentially sensitive viewers are limited to the few residents located along the route. The proposed Eagle Creek switching station would be located between agricultural pivots along an existing high-voltage transmission line.

PS-23

Visual impacts associated with the PS-23 infrastructure are anticipated to be minor. The distribution line route would not cross any special interest lands, and its ROW would be located on private undeveloped or agricultural land. The distribution line that would supply PS-23 would be located adjacent to local roads for its entire length. The area is sparsely developed, with one residence located adjacent to the route along 529th Avenue.

PS-23B

Visual impacts associated with the PS-23B infrastructure are anticipated to be minor. The 3.4-mile transmission line would not cross any special interest lands, and its ROW would be located on private undeveloped or agricultural land. The transmission line that would supply PS-23B would be located adjacent to local roads for its entire length. The area is sparsely developed, although several residences are located along the route adjacent to the ROW.

PS-24

Visual impacts associated with the PS-24 infrastructure are anticipated to be minor. The 1.0-mile distribution line route would be located on private agricultural land and collocated with the pipeline ROW. The distribution line would be located in proximity to sections of the California NHT and the Mormon Pioneer NHT as described in Section 4.9.3.4 of the 2014 Keystone XL Final SEIS, but distribution lines are common sight in the area.

PS-25

Visual impacts associated with the PS-25 infrastructure are anticipated to be minor. The proposed 9.3-mile distribution line would be located adjacent to local roadways with existing parallel distribution lines for the majority of its length and would not cross any special interest lands. Potentially sensitive viewers are limited to residents along the local roadways.

PS-26

The 0.1-mile transmission line associated with PS-26 would have negligible visual impacts. Only three transmission structures would be required in an area characterized by two substations and an existing power line. The transmission structures would be located in proximity to sections of the California, Oregon and Pony Express NHTs as described in Section 4.9.3.4 of the 2014 Keystone XL Final SEIS, but the additional structures would not be noticeable from the trails. The structures are not likely to be noticed by the casual observer.

Chapter 8, Summary of Consequences, summarizes the avoidance, minimization and mitigation measures that would be used to minimize impacts of the proposed Project **and associated power infrastructure**.

6.4.9 Socioeconomics and Environmental Justice

The following section describes the affected socioeconomic environment and potential socioeconomic impacts (including impacts on environmental justice) of constructing and operating the proposed electrical power infrastructure. This section builds upon the description and analyses provided in Sections 3.8 and 4.8 of this document, and Sections 3.10 and 4.10 of the 2014 Keystone XL Final SEIS.

6.4.9.1 Affected Environment

Socioeconomics

Tables 6-55 and 6-56 summarize demographic, socioeconomic, public services, and transportation information for the counties containing the proposed substations and transmission and distribution lines. Key findings from these data are summarized below.

Population

As shown in Table 6-55, most of the affected counties in Montana and South Dakota have very low population density—often less than one person per square mile. Counties in Nebraska have somewhat higher population densities, due to the presence of small to moderate sized cities and towns, especially in the southern portion of the state. Ten of the 18 affected counties experienced population declines between 2010 and 2017, and nearly all counties experienced lower population growth rates than their corresponding state.

Table 6-55. Population Characteristics

County or State	Pump Station Number(s)	Population 2010	2016	Percent Change (2010-2016)	2016 Density (per square mile)
Montana		**989,415**	**1,023,391**	**3.4%**	**7.0**
Phillips, MT	PS-09	4,253	4,150	-2.4%	0.8
Valley, MT	PS-10	7,369	7,576	2.8%	1.5
McCone, MT	PS-10, PS-11, PS-12	1,734	1,678	-3.2%	0.6
Prairie, MT	PS-13	1,179	1,414	19.9%	0.8
Fallon, MT	PS-14	2,890	2,913	0.8%	1.8
South Dakota		**814,191**	**851,058**	**4.5%**	**11.0**
Harding, SD	PS-15, PS-16	1,255	1,277	1.8%	0.5
Perkins, SD	PS-16	2,982	3,019	1.2%	1.0
Meade, SD	PS-17	25,456	26,840	5.4%	7.7
Haakon, SD	PS-18, PS-19	1,937	2,073	7.0%	1.1
Jones, SD	PS-19	1,006	767	-23.8%	0.8
Tripp, SD	PS-20, PS-21	5,644	5,475	-3.0%	3.4
Gregory, SD	PS-21	4,271	4,217	-1.3%	4.0
Nebraska		**1,826,341**	**1,881,259**	**3.0%**	**24.3**
Holt, NE	PS-22	10,435	10,360	-0.7%	4.3
Antelope, NE	PS-23	6,685	6,421	-3.9%	7.5
Platte, NE	PS-23B	32,237	32,703	1.4%	47.7
Butler, NE	PS-24	8,395	8,205	-2.3%	13.9
Seward, NE	PS-25	16,750	17,113	2.2%	29.7
Jefferson, NE	PS-26	7,547	7,354	-2.6%	12.8

Source: U.S. Census Bureau 2017d, 2010b; see also Section 3.8, Socioeconomics and Environmental Justice
MT = Montana; NE = Nebraska; SD = South Dakota

Housing

As shown in Table 6-56, nearly all of the affected counties had vacant rental housing, although vacancy rates (and the number of vacant units) varied. Affected counties in Montana generally had higher vacancy rates than the statewide average, whereas those in South Dakota and Nebraska generally had lower rental vacancy rates than the statewide average.

Table 6-56. Housing Characteristics

County	Pump Station Number(s)	Housing Units		Rental Vacancy Rate
		Total	Vacant	
		491,439	**78,786**	**6.0**
Phillips, MT	PS-09	2,310	509	6.3
	PS-10	4,833	1,483	3.9
McCone, MT	PS-10, PS-11, PS-12	1,022	295	12.1
	PS-13	664	112	20.3
Fallon, MT	PS-14	1,483	289	4.0
		375,866	**42,330**	**5.2**
Harding, SD	PS-15, PS-16	676	181	2.5
	PS-16	1,786	492	2.5
Meade, SD	PS-17	11,489	836	4.3
	PS-18, PS-19	1040	171	10.6
Jones, SD	PS-19	519	100	0.0
	PS-20, PS-21	3,067	508	7.9
Gregory, SD	PS-21	2,499	582	3.2
		815,006	**73,425**	**5.4**
Holt, NE	PS-22	5,217	648	4.5
	PS-23	3,284	537	6.5
Platte, NE	PS-23B	13,606	869	3.4
	PS-24	4,059	580	1.1
Seward, NE	PS-25	6,993	645	4.9
	PS-26	3,903	600	7.9

Source: U.S. Census Bureau 2017d
MT = Montana; NE = Nebraska; SD = South Dakota

Economy

Table 6-57 shows income and labor force data, while Table 6-58 shows property tax information for affected counties. Unemployment in the affected counties was generally lower, although not always, than the corresponding statewide averages. Median household incomes in affected South Dakota counties were below the statewide average, while incomes in affected Montana and Nebraska counties varied relative to the statewide average. Countywide property tax revenues tended to be higher in Nebraska than in Montana or South Dakota, reflecting both higher population and housing unit counts, as well as different statewide approaches to taxation.

Table 6-57. Economic Characteristics

County	Pump Station Number(s)	Income (2016)		Civilian Labor Force (Persons)	Unemployment Rate (Percent)
		Per Capita	Median Household		
Montana		**$27,309**	**$48,380**	**520,124**	**5.6**
Phillips, MT	PS-09	$22,772	$38,692	1,869	7.3
Valley, MT	PS-10	$27,820	$49,977	3,974	4.6
McCone, MT	PS-10, PS-11, PS-12	$28,736	$42,330	848	0.9
Prairie, MT	PS-13	$24,441	$44,643	610	6.9
Fallon, MT	PS-14	$31,902	$50,114	1,591	2.9
South Dakota		**$28,596**	**$52,078**	**453,329**	**4.1**
Harding, SD	PS-15, PS-16	$27,239	$51,458	665	1.4
Perkins, SD	PS-16	$28,576	$45,855	1,544	4.0
Meade, SD	PS-17	$25,884	$53,069	13,647	1.5
Haakon, SD	PS-18, PS-19	$22,643	$39,554	982	2.7
Jones, SD	PS-19	$25,229	$39,276	480	2.3
Tripp, SD	PS-20, PS-21	$26,270	$41,210	2,912	0.6
Gregory, SD	PS-21	$28,491	$40,045	2,071	1.5
Nebraska		**$28,596**	**$54,384**	**1,019,897**	**4.2**
Holt, NE	PS-22	$26,267	$49,607	5,654	1.3
Antelope, NE	PS-23	$27,048	$46,381	3,232	1.8
Platte, NE	PS-23B	$27,052	$58,473	18,314	4.6
Butler, NE	PS-24	$28,045	$51,166	4,397	4.5
Seward, NE	PS-25	$28,491	$61,563	8,936	3.5
Jefferson, NE	PS-26	$26,305	$44,616	3,824	3.2

Source: U.S. Census Bureau 2017d
MT = Montana; NE = Nebraska; SD = South Dakota

Table 6-58. Property Tax Revenues

County	Pump Station Number(s)	Property Tax Revenue
Phillips, MT	PS-09	$11,193,991
Valley, MT	PS-10	$20,981,787
McCone, MT	PS-10, PS-11, PS-12	$4,931,397
Prairie, MT	PS-13	$3,891,165
Fallon, MT	PS-14	$13,295,965
Harding, SD	PS-15, PS-16	$3,734,382
Perkins, SD	PS-16	$6,526,565
Meade, SD	PS-17	$32,128,832
Haakon, SD	PS-18, PS-19	$4,122,400
Jones, SD	PS-19	$2,197,027
Tripp, SD	PS-20, PS-21	$9,359,289
Gregory, SD	PS-21	$6,860,908
Holt, NE	PS-22	$39,412,045
Antelope, NE	PS-23	$26,159,146
Platte, NE	PS-23B	$68,863,997
Butler, NE	PS-24	$30,055,100
Seward, NE	PS-25	$41,739,172
Jefferson, NE	PS-26	$26,951,526

Source: Montana Department of Revenue 2018 (2017 data); Nebraska Department of Revenue 2018b (2017 data); South Dakota Department of Revenue 2017 (2016 data)

MT = Montana; NE = Nebraska; SD = South Dakota

Public Services and Roads

Table 6-59 summarizes public safety and health resources in affected counties. Consistent with low population totals and population density, the affected counties generally have a limited number of police and fire departments. Several affected counties do not have a continuously staffed hospital—i.e., equivalent to a Level IV or higher rating, as defined by the American College of Surgeons (ACS 2018).

Table 6-59. Public Services

County	Pump Station Number(s)	Police/Sheriff Departments	Fire Departments	Nearest Hospital (Designated Trauma Level)
Phillips, MT	PS-09	1	2	Phillips County Medical Center
Valley, MT	PS-10	3	3	Frances Mahon Deaconess Hospital
McCone, MT	PS-10, PS-11, PS-12	2	1	Trinity Hospital[a, b]
Prairie, MT	PS-13	1	1	Prairie Community Hospital[b]
Fallon, MT	PS-14	2	1	Fallon Medical Complex
Harding, SD	PS-15, PS-16	1	3	West River Health Services[a]
Perkins, SD	PS-16	2	4	West River Health Services[a]
Meade, SD	PS-17	2	9	Regional Health Sturgis Hospital[b]
Haakon, SD	PS-18, PS-19	2	3	Hans P. Peterson Memorial Hospital[b]
Jones, SD	PS-19	1	2	Avera St. Mary's Hospital[a, c]
Tripp, SD	PS-20, PS-21	2	3	Winner Regional Healthcare Center[c]
Gregory, SD	PS-21	3	4	Community Memorial Hospital[b] Avera Gregory Healthcare Center [b]
Holt, NE	PS-22	3	4	West Holt Memorial Hospital[b] Avera St. Anthony's Hospital[b]
Antelope, NE	PS-23	4	5	Antelope Memorial Hospital
Platte, NE	PS-23B	3	6	Columbus Community Hospital[c]
Butler, NE	PS-24	2	8	Columbus Community Hospital[a, c]
Seward, NE	PS-25	3	5	Memorial Hospital
Jefferson, NE	PS-26	3	5	Jefferson Community Health Center

Source: Community Network 2018; Montana Department of Public Health and Human Services 2018; Nebraska Department of Health and Human Services 2018; South Dakota Department of Health 2018; USACops 2018

[a] Indicates that the listed medical facility is not within the subject county.

[b] Designated as a Trauma Receiving Hospital (American College of Surgeons Level IV, ACS 2018)

[c] Designated as a Community Trauma Hospital (American College of Surgeons Level III, ACS 2018)

MT = Montana; NE = Nebraska; SD = South Dakota

Table 6-60 lists the major roads crossed by the proposed transmission and distribution lines. Major roadways include Category III roads, primary U.S. and state highways and Category IV roads, Primary Limited Access roads or interstates. Six of the power lines would cross major roads for a total of 15 times.

Table 6-60. Major Roads

County	Pump Station Number(s)	Major Roads Crossed
Phillips, MT	PS-09	U.S. Route 2
Valley, MT	PS-10	U.S. Route 2 (3 crossings); U.S. Route 117; State Highway 24
McCone, MT	PS-12	State Highway 200
Harding, SD	PS-16	State Highway 20 (4 crossings);State Highway 79
Tripp, SD	PS-20	U.S. Route 18; State Highway 44
Seward, NE	PS-25	U.S. Route 6

MT = Montana; NE = Nebraska; SD = South Dakota

Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs federal agencies to identify and address, as appropriate, disproportionately high and adverse health or environmental effects of their programs, policies and activities on minority populations and low-income populations. Environmental justice refers to the "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies" (USEPA 2019). Guidance from the CEQ (CEQ 1997b) states that an environmental justice community may exist where either:

- The minority (defined here as individuals who identified themselves as a race other than "white") or low-income population in the affected area exceeds 50 percent; or
- The minority or low-income population (calculated as individuals whose household income was less than 200 percent of the federally defined poverty rate) of the affected area is "meaningfully greater" than the minority or low-income composition of the population in the appropriate reference area.

This section evaluates the population characteristics of individual census block groups within two miles of the substations and transmission and distribution lines, and defines the "reference area" as the home state for each block group. Population data were gathered from the USEPA's EJSCREEN environmental justice screening and mapping tool (USEPA 2018g), which reflects data from the U.S. Census Bureau's 2011-2015 American Community Survey. For this analysis, "meaningfully greater" indicates a minority or low-income population in the 80th or higher percentile (compared to the statewide population).

The substations and transmission and distribution lines are within two miles of 34 block groups. None of the block groups met the 50 percent criterion described above for minority or low-income population. Two block groups met the "meaningfully greater" criterion for minority population, while three additional block groups met the criterion for low-income population. These block groups are described below. Appendix C, Transmission Line Population Data provides census data for all block groups crossed by or within two miles of the transmission and distribution lines, as well as similar information for Montana, South Dakota and Nebraska.

- PS-09, Phillips County, Montana: The substation and a portion of the transmission and distribution lines for PS-09 are within block groups 0602003 and 0602004, which are in the 86th and 87th percentile, respectively, for minority population. The minority population in these block groups was 22 and 24 percent, respectively, compared to Montana's 11 percent statewide minority population.

- PS-17, Meade County, South Dakota: The substation and transmission and distribution lines for PS-17 are entirely within block group 0205002, which is in the 81st percentile for low-income population. Low-income residents comprised 49 percent of this block group's population, compared to the statewide low-income percentage of 32.7 percent.
- PS-18, Haakon County, South Dakota: The substation and transmission and distribution lines for PS-18 are within block group 9601002, which is in the 83rd percentile for low-income population. Low-income residents comprised 49 percent of this block group's population, compared to the statewide low-income percentage of 32.7 percent.
- PS-21, Gregory County, South Dakota: The substation and a portion of the transmission and distribution lines for PS-21 are within block group 9711001, which is in the 83rd percentile for low-income population. Low-income residents comprised 51 percent of this block group's population, compared to the statewide low-income percentage of 32.7 percent.

This analysis also included a desktop review, using Google Earth aerial views, of the proposed substations and transmission and distribution lines to determine whether the improvements would cross or impact communities too small to be distinguishable in the block group. The lines would not pass through any town or village centers, but would be within approximately two miles of the towns of Midland and Gregory, South Dakota and Leigh and Bellwood, Nebraska. The census data for these towns indicate that they do not meet the criteria for environmental justice populations. The proportions of low income and minority populations in each of these communities are well below 50 percent and less than the respective statewide average (U.S. Census 2015).[6]

The U.S. Department of Health and Human Services, Health Resources and Services Administration, maintains designations of health professional shortage areas in an effort to identify areas that have shortages of medical services. The agency categorizes health professional shortage areas by shortages of primary medical care, dental care or mental health providers. Table 6-61 lists the health professional shortage area designations for primary care within the impacted counties. The four counties identified above as containing Census Blocks with environmental justice populations also are designated as having a shortage of primary care health professionals, either county-wide or for low income or high needs population. In addition, multi-county catchment areas that include portions of the study area are designated as health professional shortage areas for mental health professionals.

The proposed electrical power infrastructure would also cross portions of ceded and unceded lands, as described in Section 3.8.2.4, that members of certain Indian tribes may use for hunting and fishing. The power infrastructure would not cross any Tribal lands or any other lands currently owned by Indian tribes. Coordination with Indian tribes regarding power infrastructure is described in Section 6.4.10.

[6] The proportions of low income and minority populations in each of these communities were reviewed using the United States Census American Community Survey from 2015, to be comparable to the USEPA Environmental Justice Screening and Mapping Tool.

Table 6-61. Health Professional Shortage Areas for Primary Care

County	HPSA Status
Phillips, MT	County-wide geographic HPSA
Valley, MT	HPSA for low income population
McCone, MT	County-wide geographic HPSA
Prairie, MT	County-wide geographic HPSA
Fallon, MT	County-wide geographic HPSA
Harding, SD	High Needs Geographic Area HPSA
Perkins, SD	County-wide geographic HPSA
Meade, SD	County-wide geographic HPSA
Haakon, SD	HPSA for low income population; one rural health clinic has HPSA designation
Jones, SD	County-wide geographic HPSA
Tripp, SD	HPSA for Low Income Population
Gregory, SD	Fairfax Service Area is a High Needs Service Area HPSA
Holt, NE	Four rural health clinics with HPSA designations
Antelope, NE	No primary care HPSA designation
Platte, NE	East Central District Health Department has HPSA designation
Butler, NE	No primary care HPSA designation
Seward, NE	No primary care HPSA designation
Jefferson, NE	No primary care HPSA designation

Source: U.S. Department of Health and Human Services 2019
HPSA = Health Professional Shortage Areas; MT = Montana; NE = Nebraska; SD = South Dakota

6.4.9.2 Environmental Consequences

Socioeconomics

The entities identified in Section 6.3 and their contractors would construct the substations and transmission and distribution lines. As described in Section 6.3, construction would involve a small number of workers. Due to the limited nature of the work (i.e., comparable to transmission and distribution lines constructed for other uses not associated with the proposed Keystone XL pipeline), this analysis assumes that most of these workers would live in the counties where construction would occur. As a result, construction of the transmission and distribution lines would not cause changes in population, housing or demand for public services.

Construction of the substations and transmission and distribution lines would marginally improve economic conditions by supporting existing employment and wages. Due to the limited nature of construction and the limited construction period, continued employment and wages would have negligible impact on per capita or median household income, unemployment or property tax revenue.

Construction of substations and transmission and distribution lines across major roads would involve the movement of construction vehicles and materials along public roads, as well as brief road closures while electrical cables are strung across the road. With implementation of the traffic and transportation mitigation measures in Chapter 8, Summary of Consequences, traffic delays associated with construction of the power infrastructure are expected to be sporadic and brief in nature. Therefore, road crossings would have negligible impacts on traffic and transportation safety.

Operation of the electrical power infrastructure could benefit the members of the local electrical cooperatives by increasing their revenues by selling large amounts of power to Keystone. Operation could also, in combination with the greater Project, increase tax revenues that could help pay for public services. Operation of the **electrical power infrastructure** would involve periodic inspections and scheduled maintenance activities, which would be similar to construction activities. **Overall,** operation **of the electrical power infrastructure** would **likely** have negligible **to beneficial** impacts on socioeconomic resources.

Environmental Justice

As stated above, the substations and electric transmission lines would cross or be within one mile of 34 block groups; five of these 34 block groups met criteria as environmental justice communities. These findings must be considered in the context of the extremely low and sparse populations of these areas. None of the block groups with environmental justice communities had more than 1,250 residents, and all were in counties with population densities less than 8 persons per square mile.

Minority and low-income populations would not experience disproportionately high and adverse impacts from construction, operation and maintenance of the proposed substations, transmission and distribution lines, and associated improvements.

Areas impacted by the proposed power lines have been identified as having shortages of primary care health services. While construction workers in these areas could marginally increase the competition for medical or health services, impacts would be temporary and scattered throughout the entire area, and not be concentrated in any specific area. The number of workers required is not anticipated to measurably increase demand for such services through an influx of workers to the area. Based on the description of construction activities in Section 6.3, construction of the substations and electric transmission lines would not involve unusual or uncommon construction techniques or equipment, and thus would not pose unusual safety risks for workers or unusual demands on medical services.

Construction of the substations and transmission and distribution lines would result in temporary increases in noise and possible road delays, typical of construction activity. With implementation of the traffic and transportation mitigation measures in Chapter 8, Summary of Consequences, traffic delays are expected to be sporadic and brief in nature. Once built and operational, the lines would impact the visual environment and require periodic maintenance and repair activities. The construction activity, changes to the visual environment, periodic maintenance or repairs, and impacts described in other sections of Section 6.4 would not have disproportionately high and adverse impacts on environmental justice populations within the analysis area.

The impacts of power infrastructure operations on other resources are described throughout Section 6.4. These impacts would not disproportionately affect the environmental justice communities described in this section; therefore, construction and operation of the substations and transmission and distribution lines would have no environmental justice impacts.

6.4.10 Cultural Resources

This section builds upon the description and analyses provided in Section 3.9 and 4.9 of this document, and Sections 3.11 and 4.11 of the 2014 Keystone XL Final SEIS. This section provides information related to impacts from the proposed electrical power infrastructure.

In 2011, the Department and other relevant state and federal agencies, the Advisory Council on Historic Preservation, Indian tribes, Keystone, and the public executed a Programmatic Agreement to facilitate federal compliance with the NHPA and to preserve cultural and historic resources. This Programmatic Agreement was amended in 2013. The Programmatic Agreement provides a streamlined process for assessing potential impacts to historic **properties** including those lands that have not yet been surveyed. The Programmatic Agreement includes a stipulation that requires identification and evaluation of historic properties within the Project APE. Any future surveys could result in the identification of additional **historic properties** that would require the adjustment of pole and other infrastructure siting to avoid damaging the resource or site.

Per the Programmatic Agreement, the Department has coordinated with Indian tribes, federal agencies, and permitting agencies**, as described in Section 3.9. Ongoing consultation** will **continue to** be coordinated. The authorization and permit applications for these proposed power lines may be reviewed and acted on by the Department, BLM, WAPA, RUS, and other federal and state agencies, as appropriate per the conditions outlined in the Programmatic Agreement and Record of Consultation (see Appendix E of the 2014 Keystone XL Final SEIS). BLM has completed **its** NHPA Section 106 consultation **requirements** for **its involvement in the proposed electrical power infrastructure for** PS-09 and PS-10. **NHPA Section 106 consultation has been completed for the proposed electrical power infrastructure associated with PS-09, PS-17, and PS-18. For all other pump stations, consultation is ongoing for at least a portion of the proposed electrical power infrastructure.**

6.4.10.1 Affected Environment

The types of **historic properties** likely found with the **potentially affected** areas for each power line are described in Section 3.9. Most of the power line ROWs have had cultural resource surveys completed at least in part, including literature research and field surveys. However, to fully comply with the stipulations of the Programmatic Agreement, the entire ROWs would be surveyed prior to making determinations about whether the construction or operation of the power lines and substation would have adverse effects on **historic properties**. **Historic properties identified during surveys of the proposed electrical power infrastructure** are described below with any associated impacts that could occur.

6.4.10.2 Environmental Consequences

Construction of the proposed transmission lines could involve various **effects to historic properties**, including the following:

- Possible damage or destruction of **historic properties** within the construction ROW through vibrations caused by earthmoving, heavy equipment, blasting, drilling, boring, etc.;
- Temporary loss of community access to **historic properties**, **including** TCPs, during construction;
- Potential temporary visual impacts on **historic properties** during construction while heavy equipment and personnel are present or permanent visual impacts associated with the power lines;
- Increased dust and noise, potentially impacting **NRHP-eligible** historic structures or TCPs near the construction area; and
- Unanticipated discovery of previously unknown **historic properties** within the construction footprint.

Transmission line construction-related impacts could be either direct or indirect. Direct impacts, such as an unanticipated discovery of previously unknown **historic properties** during transmission line construction, could have a permanent impact on that **property**. A Programmatic Agreement has been prepared to provide a process for consulting parties to implement the avoidance, if possible, or mitigation of adverse effects on historic properties. If impacts on **historic** properties could not be avoided, mitigation plans would be developed and reviewed to evaluate the submitted information following the protocols outlined in the amended Programmatic Agreement developed for the proposed Project.

Potential impacts related to the integrity of **historic properties** during proposed construction from increases in noise, dust, vibrations, presence of heavy equipment traffic, and changes in viewshed would be temporary, expected to last only for the duration of construction in specific areas (typically within the construction period of a year). Given the temporary nature of construction and use of the ancillary facilities such as contractor yards, no permanent adverse impacts **to historic properties** are anticipated, with the exception of the presence of the new power line on the landscape (see also impacts on visual resources in Section 6.4.8). The low profile of materials and vehicle equipment would have negligible effects on the viewshed and the integrity of **NRHP** historic structures, landscapes or TCPs, if present. Noise associated with construction would be intermittent and limited to daytime hours when higher noise thresholds are permitted by federal agencies; therefore, intermittent noise would not be expected to have a significant impact on the integrity of any **historic properties** present. Similarly, any increase in traffic or dust associated with truck traffic would be intermittent and temporary, and would be limited in duration.

During operation of the proposed transmission lines, only previously disturbed areas would be expected to require periodic disturbance; therefore, the potential for additional impacts on cultural resources would be unlikely. Indirect impacts would consist of a permanent change in viewshed to historic structures, TCPs or cultural landscapes, if present. These types of impacts have been evaluated by the Department in consultation with state and federal agencies as well as consulting Indian tribes as part of the NHPA Section 106 process. Given the nature, location, setting and type of structures, these low-profile facilities are unlikely to significantly impact the setting and feeling of historic structures due to their distance from permanent ancillary facilities, the low-lying nature of historic structures and the various vegetative and topographic elements of the landscape in such areas.

The proposed transmission line routes were designed to avoid disturbing historic properties to the maximum extent possible. Because significance for **historic properties** is determined by a **property's** eligibility for inclusion in the NRHP, cultural resources **identified in field surveys and** that have been determined not eligible, and thereby not historic properties, are not evaluated for proposed Project impacts. Additionally, the NRHP status of some cultural resources remains undetermined, and surveying in some of the proposed Project area is ongoing. For all **historic properties** listed in the NRHP, considered to be eligible for the listing in the NRHP, or those that are unevaluated, avoidance would continue to be the preferred mitigation strategy. To mitigate potential impacts, actions would be taken whenever feasible, to avoid known **historic properties**, minimize **effects** when avoidance is not possible, and mitigate **effects** when minimization is not sufficient. In addition, the proposed Project plans to implement Unanticipated Discovery Plans to ensure minimization of **effects** on unknown **historic properties** that may be inadvertently encountered during construction or operation of the proposed Project. The specific actions proposed for individual known **historic properties** are described in the following state-specific sections and tables.

Cultural resources surveys for all electrical power infrastructure have not been fully completed. The types of potential impacts associated with the proposed electrical power infrastructure are likely to be similar to those for the proposed Project pump station and pipeline construction ROW near these areas. The authorization and permit applications for these proposed connected actions would be reviewed and acted on by other federal and state agencies. Those agencies may conduct more detailed cultural resources **surveys** of the proposed electrical power infrastructure. Potential impacts on **historic properties** from the proposed electrical power infrastructure would be evaluated and avoided, if possible, minimized, or mitigated, in accordance with applicable regulations during the environmental review for these proposed connected actions.

If during the construction of the proposed power lines, ground disturbances result in the inadvertent discovery of any bones, artifacts, foundations, or other signs of past human occupation of the area, the construction would be stopped and a qualified archaeologist, federal agency representative and/or the appropriate state SHPO would be contacted immediately for consultation before construction at that site could continue and the stipulations of the Programmatic Agreement would be implemented.

The lead agency under the Programmatic Agreement will seek concurrence of effects from the SHPO and comments from Indian Tribes and other interested parties. Per the Programmatic Agreement, WAPA is only obligated to seek concurrence of effects on modification and construction of substations and transmission lines that WAPA will own. WAPA will not own any transmission lines and will not seek SHPO concurrence for those activities. WAPA will own and would seek SHPO concurrence on:

- Fort Peck Substation expansion (PS-10),
- Coal Hill Substation (PS-11)**,**
- **Midland Substation expansion (PS-19), and**
- **Gregory Substation rebuild (PS-21)**.

WAPA has already received SHPO concurrence on:

- Bowdoin Substation (PS-09), and
- O'Fallon Substation (PS-13).

PS-09

Big Flat Electric Cooperative proposes to construct and operate a 61.4-mile, 115-kV transmission line beginning at WAPA's proposed Bowdoin Substation and ending at PS-09. The proposed transmission line would be located in Philips County, Montana, and would cross 30.35 miles of BLM-managed lands. **(Potential route variations could increase these distances, as described in Section 6.3.9.1.)** The Department, BLM, and WAPA are all signatories to a Programmatic Agreement with the Montana SHPO and the federal Advisory Council on Historic Preservation; as such, the potential effects of the proposed power **infrastructure** to **historic properties** were initially reviewed by BLM, and consequently the Montana SHPO, in coordination with affected Indian tribes and other interested parties in March of 2015.

As part of adherence to the Programmatic Agreement, an initial file/records search was conducted to identify previously recorded cultural resources and previously completed resource investigations within the vicinity of the proposed transmission line. The results of this effort identified 21 previously recorded prehistoric sites and seven previously recorded historic sites within the area that was reviewed (GANDA 2013). Subsequently, a Class III cultural resources survey was completed for the proposed transmission line APE identifying 45 sites in total (GANDA 2014). **Additional surveys were conducted along several potential route variants, bringing the total number of finds to 49.** Potential impacts on all sites within the APE were assessed at that time. **All eligible** sites w**ere recommended for** avoidance, **either by re-routing or** spanning **the site, except f**or **one site that would be avoided by observing a 100-foot buffer within which no work would be allowed**. Additional mitigation measures regarding flagging of restricted areas, vehicle travel limitations, staging locations, and construction procedures have also been proposed to minimize potential impacts. SHPO provided BLM with concurrence for site eligibility determinations, avoidance and mitigation strategies as well as a "No Adverse Effect Determination" for the original alignment on August 4, 2015.

The Unanticipated Discovery Plan **attached to the Programmatic Agreement will** be implemented to minimize impacts on unknown **historic properties** that may be inadvertently encountered during construction or operation of the proposed transmission line. As such, it is expected that there would be negligible impacts ("No Adverse Effect") on **historic properties** from the construction and operation of this transmission line.

Since 2015, an alignment shift has been proposed for a portion of the transmission line, due to sage grouse nesting areas and habitat. Additional Class III inventory was undertaken in 2018 and 2019. SHPO has provided BLM with concurrence for site eligibility determinations, avoidance and mitigation strategies as well as a "No Adverse Effect Determination" related to these alignment shifts on September 26, 2019. WAPA has also fulfilled its historic preservation requirements for the PS-**0**9 project, including tribal coordination and SHPO concurrence**, the latter of which was received on June 15, 2011**.

PS-10

NorVal Electric Cooperative proposes to construct and operate a 48.4-mile-long, 115-kV transmission line originating at WAPA's Fort Peck Substation and ending at PS-10. The proposed transmission line would be located in Valley County, Montana, but would cross 4.3 miles of BLM-managed lands. The Department, BLM, and WAPA are signatories to the Programmatic Agreement with the Montana SHPO and the federal Advisory Council on Historic Preservation; as such, the potential adverse effects of the proposed power line project to **historic properties** were initially reviewed by Montana SHPO, in coordination with affected Indian tribes and other interested parties, in July of 2014. In adherence to the Programmatic Agreement, an initial file/records search was conducted to identify previously recorded cultural resources and previously completed resource investigations within a 2-mile-wide corridor centered on the proposed transmission line. The results of this effort identified 41 previous investigations and seven archaeological sites within the area that was reviewed (Tinti 2013). Subsequently, a Class III cultural resources field inventory was completed for the proposed 115-kV transmission line route identifying **33** sites in total**, of which 7 are either listed or eligible for listing on the NRHP, 19 were determined ineligible, 4 were not evaluated, and 3 were determined by later surveys to no longer exist** (Tinti 2013; Baer et al. 2010**a**). Potential project impacts on all sites within the APE were **addressed**, as recommended by the BLM, primarily through avoidance**, particularly** through spanning and/or fencing where appropriate. Additional **precautionary** measures regarding flagging of restricted areas, vehicle travel limitations, staging locations, and construction procedures have also been proposed to **avoid** potential impacts. SHPO provided BLM with concurrence for site eligibility determinations, avoidance and mitigation strategies as well as a "No Adverse Effect Determination" for the original alignment on September 16, 2014. **For WAPA's proposed expansion of the existing Fort Peck substation, WAPA has not yet identified the configuration of the expansion and has therefore not yet surveyed the area for cultural resources. This would be completed before the expansion begins.**

The Unanticipated Discovery Plan **attached to the Programmatic Agreement will** be implemented to minimize impacts on unknown **historic properties** that may be inadvertently encountered during construction or operation of the proposed transmission line. As such, it is expected that there would be negligible impacts ("No Adverse Effect") on **historic properties** from the construction and operation of the transmission line.

PS-11

NorVal Electric Cooperative proposes to construct and operate a 0.2-mile, 69-kV distribution line from a proposed new 5-acre WAPA substation named Coal Hill Substation to PS-11 in McCone County, Montana. The Department and WAPA are signatories to the Programmatic Agreement with the Montana

SHPO and the federal Advisory Council on Historic Preservation; as such, the proposed power line and substation project would need to be reviewed by Montana SHPO, and consulting Indian tribes and other interested parties.

Field surveys for this proposed transmission line and substation were completed in fall 2018**. No cultural resources were recorded. WAPA prepared a cultural resources survey report and submitted the report to the Department, and the Department has consulted with the Montana SHPO and the tribes. The SHPO has not yet announced concurrence on the findings and determinations. The** Unanticipated Discovery Plan **attached to the Programmatic Agreement will** be implemented to ensure minimization of impacts on unknown **historic properties** that may be inadvertently encountered during construction or operation of the proposed transmission line. As such, it is expected that there would be negligible impacts on **historic properties** from the construction and operation of this **line and substation**.

PS-12

McCone Electric Cooperative proposes to construct and operate a 4.6-mile, 115-kV transmission line from WAPA's Circle Substation to PS-12, all located in McCone County, Montana. The Department and WAPA are signatories to the Programmatic Agreement with the Montana SHPO and the federal Advisory Council on Historic Preservation; as such, any potential adverse effect of the proposed power line project would need to be reviewed by Montana SHPO, and consulting Indian tribes and other interested parties.

As part of adherence to the Programmatic Agreement, a Level I file search was conducted to identify previously recorded cultural resources and previously completed resource investigations within the vicinity of the proposed transmission line. The results of this effort identified four previously recorded historic sites within the area that was reviewed (GANDA 2011). Subsequently, a **Class I**II cultural resources field survey was completed for the proposed 115-kV transmission line route identifying four archaeological sites and one isolated find within close proximity (GANDA 2011; Baer et al. 2010**a**). However, not all areas of the proposed route have been surveyed. All identified features are recommended as ineligible for the National Register. **In addition,** WAPA completed a Class III cultural resources inventory of the substation area in June 2011 and received SHPO concurrence on the findings and determinations on June 5, 2011. Prior to transmission line construction, consultation with Montana SHPO, field surveys of all remaining areas, and the development of measures to avoid any adverse effects to potentially eligible archaeological sites would take place. **The** Unanticipated Discovery Plan **attached to the Programmatic Agreement will** be implemented to ensure minimization of impacts on unknown **historic properties** that may be inadvertently encountered during construction or operation of the proposed transmission line. Based on this process, it is expected that there would be negligible, if any, impacts on **historic properties** from the construction and operation of this transmission line **and substation**.

PS-13

Tongue River Electric Cooperative proposes to construct and operate a 15.7-mile, 115-kV transmission line from WAPA's O'Fallon Substation to PS-13, all located in Prairie County, Montana. The Department and WAPA are signatories to the Programmatic Agreement with the Montana SHPO and the federal Advisory Council on Historic Preservation; as such, the proposed power line project would need to be reviewed by Montana SHPO, and consulting Indian tribes and other interested parties.

As part of adherence to the Programmatic Agreement, a **Class I** file search was conducted to identify previously recorded cultural resources and previously completed resource investigations within a 2-mile-wide corridor centered on the proposed transmission line. The results of this effort identified three previously recorded archaeological sites within the area that was reviewed (Baer et al. 2010**a**). Subsequently, a **Class I**II cultural resources field survey was completed for the proposed 115-kV transmission line route identifying six archaeological sites including four historic sites and two sites that have both prehistoric and historic components (Baer et al. 2010**a**). However, not all areas of the proposed route have been surveyed, and portions of the route have been rerouted meaning that some originally identified sites may not be located within the current corridor. Identified archaeological sites include isolated finds and a homestead/farmstead. Five of the identified features were recommended not eligible for listing by the National Register, and one feature was unevaluated. Avoidance is recommended regarding the unevaluated archaeological site to avoid impacts. **WAPA has also completed a Class III cultural resources inventory of the substation area circa January 2011 and received SHPO concurrence on the findings and determinations on January 28, 2011.**

Prior to transmission line construction, field surveys would be completed for all unsurveyed areas. Upon completion of consultation, **historic properties** would be avoided **prior to** construction. **The** Unanticipated Discovery Plan **attached to the Programmatic Agreement will** be implemented to ensure minimization of impacts on unknown **historic properties** that may be inadvertently encountered during construction or operation of the proposed transmission line. As such, it is expected that there would be negligible, if any, impacts on **historic properties** from the construction and operation of this transmission line **and substation**.

PS-14

Montana-Dakotas Utility proposes to construct and operate a 6.9-mile, 115-kV transmission line starting at an unnamed substation and ending at PS-14, all located in Fallon County, Montana. **T**he **Department would need to review the** proposed power line project **with the** Montana SHPO and consulting Indian tribes and other interested parties.

In adherence to the Programmatic Agreement, a **Class** I file search was conducted to identify previously recorded cultural resources and previously completed resource investigations within a 2-mile-wide corridor centered on the proposed transmission line. The results of this effort identified 21 previously recorded archaeological sites within the area that was reviewed (Baer et al. 2010**a**). Subsequently, a **Class** III cultural resources field survey was completed for the proposed 115-kV transmission line route identifying three **prehistoric isolated finds, which are not eligible for listing in the NRHP, and for which avoidance measures are not recommended** (Baer et al. 2010**a**). However, not all areas of the proposed route have been surveyed, and portions of the route have **changed; therefore, these resources may no longer** be located within the current corridor. **A revised route was surveyed in 2012, and two historic properties were recorded (Exp 2013).**

Prior to transmission line construction, field surveys of all remaining areas would be completed and consultation with Montana SHPO would occur. Prior to construction, any known **historic properties** would be **recommended for avoidance**. **The** Unanticipated Discovery Plan **attached to the Programmatic Agreement will** be implemented to ensure minimization of impacts on unknown **historic properties** that may be inadvertently encountered during construction or operation of the proposed transmission line. As such, it is expected that there would be negligible impacts on **historic properties** from the construction and operation of this transmission line.

PS-15

Grand Electric Cooperative proposes to construct and operate a 24.7-mile, 115-kV transmission line extending from the Harding Substation to PS-15, all located in Harding County, South Dakota. Grand Electric Cooperative is seeking financial assistance from RUS, a signatory to a Programmatic Agreement with the Department, the South Dakota SHPO and the federal Advisory Council on Historic Preservation;

as such, the proposed power line project would need to be reviewed by South Dakota SHPO, and any consulting Indian tribes or other interested parties.

As part of adherence to the Programmatic Agreement, a **Class I** file search was conducted to identify previously recorded cultural resources and previously completed resource investigations within a 2-mile-wide corridor centered on the proposed transmission line. The results of this effort identified 10 previously recorded prehistoric sites within the area that was reviewed (Salisbury et al. 2010). Subsequently, a **Class I**II cultural resources field survey was completed of the proposed 115-kV transmission line route identifying **two** archaeological sites **and one isolated find** (Salisbury et al. 2010). **A shift in alignment prompted a re-survey of the transmission lines in September 2018. The three previously recorded features were not encountered. Ten isolated occurrences were reported and a previously recorded site could not be re-located. None of the isolated occurrences were determined NRHP-eligible by the Department in consultation with the South Dakota SHPO and the tribes.**

The provisions for unanticipated **discoveries on RUS-funded projects in Stipulation VI.B of the Programmatic Agreement will be** implemented to ensure minimization of impacts on unknown **historic properties** that may be inadvertently encountered during construction or operation of the proposed transmission line. Based on implementation of the Programmatic Agreement and associated avoidance measures, it is expected that there would be negligible impacts on **historic properties** from the construction and operation of this transmission line.

PS-16

Grand Electric Cooperative proposes to construct and operate a 41.9-mile, 115-kV transmission line extending from the Buffalo Substation to PS-16, located in Harding and Perkins Counties, South Dakota. Grand Electric Cooperative is seeking financial assistance from RUS, a signatory to the Programmatic Agreement with the Department, South Dakota SHPO and the federal Advisory Council on Historic Preservation; as such, the proposed power line project would need to be reviewed by South Dakota SHPO, and any consulting Indian tribes or other interested parties.

In adherence to the Programmatic Agreement, a **Class I** file search was conducted to identify previously recorded cultural resources and previously completed resource investigations within a 2-mile-wide corridor centered on the proposed transmission line. The results of this effort identified nine previously recorded prehistoric sites and 15 previously recorded historic sites within the area that was reviewed (Salisbury et al. 2010). Subsequently, a **Class I**II cultural resources field survey was completed of the proposed 115-kV transmission line route identifying seven archaeological sites in total, including **two prehistoric isolated finds, one previously recorded artifact scatter,** three historic **homesteads**, and one **stone cairn** of unknown cultural affiliation (Salisbury et al. 2010). However, not all areas of the proposed route have been surveyed, and portions of the route have been **changed,** meaning that some originally identified sites may not be located within the current corridor. **The two isolated finds and one of the historic homesteads were determined not eligible for listing in the NRHP. The prehistoric artifact scatter and one historic homestead are unevaluated. The remaining historic homestead was determined eligible and the cairn is potentially eligible. Avoidance was recommended for the eligible, potentially eligible, and unevaluated resources.**

Prior to transmission line construction, field surveys of all remaining areas would be conducted and additional consultation with the South Dakota SHPO would occur. **Prior to construction, any known historic properties would be recommended for avoidance**. **The provisions for unanticipated discoveries on RUS-funded projects in Stipulation VI.B of the Programmatic Agreement will be implemented** to ensure minimization of impacts on unknown **historic properties** that may be inadvertently encountered during construction or operation of the proposed transmission line. Based on site avoidance and the implementation of the Plan, it is expected that there would be negligible impacts on **historic properties** from the construction and operation of this transmission line.

PS-17

Grand Electric Cooperative proposes to construct a 10.9-mile, 115-kV transmission line to provide power to PS-17. The proposed line would extend from WAPA's Maurine Substation to PS-17. Grand Electric Cooperative is seeking financial assistance from RUS. The Department and RUS are signatories to the Programmatic Agreement with the South Dakota SHPO and the federal Advisory Council on Historic Preservation; as such, the proposed power line project would need to be reviewed by South Dakota SHPO and any consulting Indian tribes or other interested parties.

In adherence to the Programmatic Agreement, a **Class I** file search was conducted to identify previously recorded cultural resources and previously completed resource investigations within a 2-mile-wide corridor centered on the proposed transmission line. The results of this effort did not identify any previously recorded prehistoric or historic sites within the area that was reviewed (Salisbury et al. 2010). Subsequently, a **Class I**II cultural resources field survey was completed for the proposed 115-kV transmission line route. **In consultation with the South Dakota SHPO, Grand Electric performed additional field efforts in 2018, resulting in the detection of a new isolated find.** South Dakota SHPO subsequently reviewed the feature and confirmed its ineligibility for listing by the National Register and concurred with the No Historic Properties Affected determination for construction of the PS-17 transmission line **(SD SHPO 2018)**.

The provisions for unanticipated discoveries on RUS-funded projects in Stipulation VI.B of the Programmatic Agreement will be implemented to ensure minimization of impacts on unknown **historic properties** that may be inadvertently encountered during construction or operation of the proposed transmission line. As such, it is expected that impacts on **historic properties** from the construction and operation of this transmission line would be negligible.

PS-18

West Central Electric Cooperative proposes to construct and operate a 26.0-mile, 115-kV transmission line to provide power to PS-18. West Central Electric Cooperative is seeking financial assistance from RUS, a signatory to the Programmatic Agreement with the Department, South Dakota SHPO and the federal Advisory Council on Historic Preservation; as such, the proposed power line project would need to be reviewed by South Dakota SHPO and any consulting Indian tribes or other interested parties.

As part of adherence to the Programmatic Agreement, a **Class I** file search was first conducted to identify previously recorded cultural resources and previously completed resource investigations within a 2-mile-wide corridor centered on the proposed transmission line. The results of this effort identified five previous investigations, one archaeological site, and four historic structures within the area that was reviewed (Baer **et al.** 2010**b**). Subsequently, a **Class I**II cultural resources field inventory was completed for the proposed 115-kV transmission line route identifying three historic archaeological sites and one isolated find. **The isolated find consists of farm equipment. The sites include a farmstead, a water well, and a trash dump. The isolated find and the water well are recommended as not eligible for listing in the NRHP. The farmstead and the trash dump remain unevaluated with regard to NRHP eligibility.**

Avoidance **of the unevaluated sites was recommended** by spanning the transmission lines over the **resources**. In addition, no ground disturbance was recommended to occur within 100 feet of the site boundaries. South Dakota SHPO subsequently reviewed the features and confirmed that two of the sites are not eligible for the National Register, and that the other two sites should remain unevaluated (SD SHPO 2010a). Furthermore, South Dakota SHPO concurred with the determination of No Historic Properties Affected for the construction of the PS-18 transmission line provided that the recommended avoidance measures are implemented. **The provisions for unanticipated discoveries on RUS-funded projects in Stipulation VI.B of the Programmatic Agreement will be implemented** to ensure minimization of impacts on unknown **historic properties** that may be inadvertently encountered during construction or operation of the proposed transmission line. Based on the concurrence with the South Dakota SHPO, it is expected **that there** would be no **to negligible** impacts on **historic properties** from the construction and operation of this transmission line.

PS-19

West Central Electric Cooperative proposes to construct and operate a 20.5-mile, 115-kV transmission line to provide power to PS-19. West Central Electric Cooperative is seeking financial assistance from RUS, a signatory to the Programmatic Agreement with the Department, the South Dakota SHPO and the federal Advisory Council on Historic Preservation; as such, the proposed power line project would need to be reviewed by South Dakota SHPO and any consulting Indian tribes or other interested parties.

As part of adherence to the Programmatic Agreement, a **Class I** file search was first conducted to identify previously recorded cultural resources and previously completed resource investigations within a 2-mile-wide corridor centered on the proposed transmission line. The results of this effort identified seven previous investigations, seven archaeological sites, and six historic structures within the area that was reviewed (Baer **et al.** 2010**c**). Subsequently, a **Class I**II cultural resources field inventory was completed for the proposed 115-kV transmission line route identifying two archaeological sites and four isolated finds. The isolated finds and one archaeological site were recommended as not eligible for listing by the National Register. The remaining site was unevaluated in regard to National Register eligibility.

Avoidance of known cultural resources by spanning the transmission lines over the unevaluated site within the survey corridor was recommended in consultation with the South Dakota SHPO. In addition, no ground disturbance was recommended to occur within 100 feet of the site boundary. South Dakota SHPO subsequently reviewed the sites and confirmed the one unevaluated site should remain unevaluated (SD SHPO 2010b). Furthermore, the South Dakota SHPO concurred with the determination of No Historic Properties Affected for the construction of the PS-19 transmission line provided that the recommended avoidance measures are implemented. **The provisions for unanticipated discoveries on RUS-funded projects in Stipulation VI.B of the Programmatic Agreement will be implemented** to ensure minimization of impacts on unknown **historic properties** that may be inadvertently encountered during construction or operation of the proposed transmission line. Based on South Dakota SHPO concurrence, it is expected that there would be no impacts on **historic properties** from the construction and operation of this transmission line. **WAPA has not planned any surveys at the site of the proposed expansion of the existing Midland substation.**

PS-20

Rosebud Electric Cooperative proposes to construct and operate a 17.2-mile, 115-kV transmission line to provide power to PS-20. The cooperative is seeking financial assistance from RUS, a signatory to the Programmatic Agreement with the Department, the South Dakota SHPO and the federal Advisory Council on Historic Preservation; as such, the proposed power line project would need to be reviewed by the South Dakota SHPO and any consulting Indian tribes or other interested parties.

A Class III cultural resources field inventory was completed for the proposed route identifying three archaeological **resources** including two isolated finds**, one of which is prehistoric and the other historic,** and a **historic** artifact scatter (Salisbury et al. 2010). All three sites were recommended as not eligible for listing **in** the National Register. **However, not all areas of the proposed route have been surveyed, and portions of the route have been rerouted meaning that some originally identified sites may not be located within the current corridor.** The remaining portion**s** of the ROW would need to be surveyed prior to completing consultation with the South Dakota SHPO and initiating construction. **In adherence to the Programmatic Agreement, the cooperative conducted a database record search of any known cultural**

or historic resources (SD SHPO 2011a). The record search found no recorded historic structures within 100 feet of the proposed transmission line in Tripp County. Only one archeological site had been recorded within 100 feet of the proposed line. This site was documented as an isolated Euro-American find, and its eligibility for listing in the National Register is undetermined. In addition, one miscellaneous archeological site, a grave, had been recorded near the project area but not within 100 feet. The record search also found that four archeological surveys have been recorded within 100 feet of the project area, two occurring in 1987, one in 1989 and one in 2008.

The cooperative proposes to mark the boundary of each identified site, regardless of whether it is eligible for listing. These sites would be avoided during construction. **The provisions for unanticipated discoveries on RUS-funded projects in Stipulation VI.B of the Programmatic Agreement will be implemented** to ensure minimization of impacts on unknown **historic properties** that may be inadvertently encountered during construction or operation of the proposed transmission line. Given the protective and avoidance measures, it is expected that there would be negligible impacts, if any, to **historic properties** from the construction and operation of this transmission line.

PS-21

Rosebud Electric Cooperative proposes to construct and operate the 20.5-mile-long, 115-kV transmission line to provide power to PS-21. The cooperative is seeking financial assistance from RUS, a signatory to the Programmatic Agreement, with the Department, the South Dakota SHPO and the federal Advisory Council on Historic Preservation; as such, the proposed power line project would need to be reviewed by the South Dakota SHPO and any consulting Indian tribes or other interested parties.

A Class III cultural resources field inventory **along a** proposed route identif**ied ten** archaeological sites **and six isolated finds** (Salisbury et al. 2010). However, not all areas of the proposed route have been field surveyed, and portions of the route have been rerouted meaning that some originally identified sites may not be located within the current corridor. **The six isolated finds were determined not eligible for listing in the NRHP.** Of the **remaining ten** sites, **three are not eligible, four remain unevaluated, and three are eligible**. Avoidance by spanning the transmission lines over the unevaluated and eligible sites within the survey corridor was recommended. In addition, no ground disturbance was recommended to occur within 100 feet of the site boundaries. **In adherence to the Programmatic Agreement the cooperative conducted a database record search of any known cultural or historic resources (SD SHPO 2011b). The record search found that there were no historic structures recorded within 100 feet of the proposed transmission line project area. However, the record search identified 14 archaeological sites within 100 feet of the project area located in Gregory County, South Dakota. Of the 14 sites identified, 8 were not eligible of listing in the National Register, three were unevaluated and the remaining 3 were found eligible for listing. All three eligible sites were classified as Farmstead/Artifact Scatter-Euro-American. The record search also found that two archaeological surveys were completed within 100 feet of the project area in 1992, 1995, and 2004. A similar record search was conducted for the portion of the transmission line project area in Tripp County, South Dakota (SD SHPO 2011b). The search found that there were no archeological sites or historic structures within 100 feet of the project area. The search also identified one archeological survey within 100 feet of the proposed Project area conducted in 2008.**

The cooperative proposes to mark the boundary of each identified site, regardless of whether it is eligible for listing. These sites would be avoided during construction. Prior to construction, all remaining unsurveyed areas would be surveyed and consultation with the South Dakota SHPO would be completed. **The provisions for unanticipated discoveries on RUS-funded projects in Stipulation VI.B of the Programmatic Agreement will be implemented** to ensure minimization of impacts on unknown **historic properties** that may be inadvertently encountered during construction or operation of the proposed transmission line. As such, it is expected that there would be n**egligible** impacts on **historic**

properties from the construction and operation of this transmission line. **For WAPA's proposed rebuild of the existing Gregory substation, field surveys found no sites of potential interest.**

Nebraska Power Lines

All proposed power **infrastructure** in Nebraska (those associated with Pump Stations 22, 23, 23B, 24, 25, and 26) would be constructed by PPDs. **T**he Department, a signatory to the Programmatic Agreement, would consult with the Nebraska SHPO on compliance with Section 106 of the NHPA. The Department, working with the PPDs, would ensure that a literature search would be conducted of any previously identified cultural resources or completed surveys near the proposed ROW. Since power line routes have not been surveyed for cultural resources, an exhaustive analysis is not possible in this section. However, once a route is confirmed, the Department would ensure cultural resource surveys were completed if it is determined there is a likelihood that cultural resources could be present. If **historic properties** are identified, the districts would minimize impacts on the sites to the extent possible by marking the **historic properties** with flagging so that they can be avoided during construction activities. The Department would also ensure that an Unanticipated Discovery Plan was implemented to minimize impacts on unknown **historic properties** that may be inadvertently encountered during construction or operation of **each** proposed power line. Given the proposed power line rout**es** are within agricultural fields and previously disturbed ROWs, the expectation is that the likelihood of cultural resources in the power line ROWs would be low and through adherence to the Programmatic Agreement and consultation with the Nebraska SHPO, any impacts would be avoided or mitigated to the extent possible. Therefore, any impacts on **historic properties** would likely be negligible.

6.4.11 Noise

Construction and operation of electrical transmission and distribution lines and substations would result in noise, which is defined as unwanted sound. The following sections describe the existing environment in terms of noise, and potential environmental impacts associated with noise from construction and operation of the proposed electrical power infrastructure.

6.4.11.1 Affected Environment

Section 3.5 provides a detailed explanation of how noise is measured, identifies common sound levels in and typical sound ranges for residential and rural communities (see Section 3.5, Tables 3.5-1 and 3.5-2) and provides a discussion of noise regulation. Potential sensitive receptors would include residents and business owners, and recreational users at special interest areas crossed by the proposed power lines and associated ROW (see Tables 6-53). These areas include federal lands managed by the BLM, USFS, USFWS, and USACE; and state lands including Montana State Trust Lands and South Dakota School and Public Lands. While dispersed recreation may be permitted on federal and state lands, no developed recreation sites such as campgrounds and trailheads would be crossed by the ROW. Because the proposed power lines and substations are located in rural areas, no residences occur within the ROW, and developed recreation sites within special interest areas would not be crossed, the number of potentially sensitive receptors is generally low.

6.4.11.2 Environmental Consequences

Sections 3.12.4.3 and 4.12.5.3 of the 2014 Keystone XL Final SEIS describe the general nature of the potential impacts anticipated from noise derived from construction and operation of new transmission and distribution lines and substations. Temporary noise impacts would occur during construction of the power lines and substations. Noise from construction would not be constant, but would vary with the type of activity and equipment used. For power lines, noise would be more temporary in nature and limited to the area around the portion of the power line being constructed. For substations, periodic noises would occur throughout the construction period at the substation location. Noise levels during construction are anticipated to be generally equal to or less than those anticipated for pipeline construction (as described in the 2014 Keystone XL Final SEIS), and durations at any one location would be shorter. To reduce noise impacts, construction would occur mostly during daytime hours and would comply with any local noise regulations. Construction equipment would be properly equipped with mufflers to lessen noise impacts. Overall, impacts from noise during construction activities would be minor.

Temporary sources of noise during operation of the power lines and substations would include maintenance or repair activities that would occur only intermittently. Noise impacts associated with maintenance or repair activities would be similar to those described for construction. A “crackling” or “buzzing” noise that is sometimes audible near energized electrical equipment (referred to as corona) could be another source of noise during operation. Audible noise from corona varies with voltage, the condition of the conductor and weather conditions. In foggy or wet weather, audible “crackling” or “buzzing” sounds may occur, caused by ionization of the moist air around the conductors. Noise is generally highest at the conductors, and decreases as the distance from the conductor increases. During rain, noise from corona is unlikely to be perceptible because the sound of the rain itself would be louder than noise produced by corona. Audible sounds are more likely to occur during light rain, fog, snow or otherwise humid conditions, but may not be perceptible outside the ROW over background sounds of wind, vehicles, farm equipment and other sources of noise. Because maintenance and repair activities would rarely occur, and because audible noise from corona is generally not anticipated to be noticeable, impacts from noise are anticipated to be minor during operation of the power lines and substations.

6.4.12 Electric and Magnetic Fields

Power lines and electrical equipment produce EMFs when energized. Potential impacts associated with EMFs) discussed in this section include induced voltage, EMF fields, stray voltage, and air quality impacts associated with corona.

6.4.12.1 Affected Environment

EMFs around electrical equipment are generally larger at higher voltages, and are strongest directly under the power line but decrease rapidly with increasing distance from the conductor. For a 115 kV transmission line, typical mean magnetic field under the line is 29.7 milligauss, and 6.5 milligauss at 50 feet. For comparison, the typical mean magnetic field for a 230 kV transmission line is 57.5 milligauss directly under the line, and 19.5 milligauss at 50 feet away, and the median magnetic field level for a copy machine is 90 milligauss six inches away from the source, and 40 milligauss at one foot away from the source (NIEHS 2002). EMFs are typically at background levels at approximately 100 feet away from a substation fence. There are no federal guidelines for EMF.

6.4.12.2 Environmental Consequences

EMF from power lines can induce a voltage on objects in close proximity, such as a vehicle, farm equipment, or fence. If the conducive objects are insulated or partially insulated from the ground and are touched by a person, the person may receive minor shocks similar to what is experienced by walking across a carpet and touching a grounded object or another person. Induced voltage may be avoided by not parking equipment under the power lines or by grounding the equipment. As this is generally considered unnecessary to ensure safety, impacts from induced voltage are anticipated to be negligible.

Exposure to EMF from transmission lines has been extensively studied for several decades. The National Institute of Environmental Health Sciences has concluded that there is little scientific evidence to correlate extra low frequency EMF exposure to health risks (NIEHS 1999, 2002). Strong EMFs may affect the function of implantable medical devices such as pacemakers, but such effects are usually temporary and the devices resume normal functions once removed from the source of the EMF. The proposed power lines are located in rural areas, and there are no residential structures within the operational ROW of the proposed power lines. Therefore, interference with medical devices is not anticipated, and no impacts from EMFs to human health and safety are expected.

Distribution lines may produce stray voltage where they connect to service entrances of buildings. Transmission lines may produce stray voltage on underbuilt or parallel distribution lines. Appropriate measures would be taken to prevent stray voltage problems in these circumstances according to National Electrical Safety Code standards, and impacts from stray voltage are not anticipated.

As described above, corona is the breakdown or ionization of air within a few centimeters of electrical equipment, and is caused by imperfections such as sharp edges, scratches on the conductor, or water. Corona can produce ozone and nitrogen oxides in the air surrounding the conductor. While wet and humid conditions increase corona, ozone is a very reactive compound that is relatively short-lived, particularly in wet conditions. For these reasons, ozone produced by transmission lines at the proposed voltages is anticipated to be far below any state or federal air quality standards, and impacts on air quality from corona are not anticipated.

7 CUMULATIVE IMPACTS

7.1 INTRODUCTION

This chapter describes the potential cumulative impacts that could occur from implementation of the proposed Project in combination with other past, present and reasonably foreseeable future actions. Reasonably foreseeable actions are those that are likely to be constructed or take place in the foreseeable future (based on permit applications or similar indication of significant intent). Potential long-term and/or permanent effects from these projects and activities may contribute to overall cumulative impacts within the area. As defined in 40 CFR 1508.7, cumulative impacts are the incremental impacts on the environment resulting from the Proposed Action. The analysis of cumulative impacts follows the processes recommended by the CEQ and the regulations in 40 CFR Chapter V (CEQ 2005, 1997b).

This analysis provides updates to projects considered in the cumulative effects assessment in the 2014 Keystone XL Final SEIS, focusing on the WCSB crude oil pipeline projects within the United States and their contribution to greenhouse gas emissions in combination with the updated greenhouse gas and climate change analysis in Sections 3.10 and 4.10. This includes consideration of potential climate change impacts on the global, national and regional environment. This analysis also considers specific direct, indirect and cumulative impacts related to the MAR, and whether those impacts are consistent with those described in the 2014 Keystone XL Final SEIS.

Changes Since the 2014 Keystone XL Final SEIS

The Department addressed direct, indirect and cumulative effects of the proposed Keystone XL Project in the previous 2011 Keystone XL Final EIS and in the 2014 Keystone XL Final SEIS. The Department considered the following tables from the 2014 Keystone XL Final SEIS:

- Table 4.15-1, Representative Past Projects Considered in the Cumulative Effects Assessment. Projects within this table are reflective of the current built (baseline) environment assessed in the 2014 Keystone XL Final SEIS.
- Table 4.15-2, Representative Present Projects Considered in the Cumulative Effects Assessment. Projects within this table were approved and under construction during the 2014 Keystone XL Final SEIS.
- Table 4.15-3, Representative Future Projects Considered in the Cumulative Effects Assessment. Projects within this table were reasonably likely to be constructed or take place in the foreseeable future (based on permit applications or similar indication of significant intent).

Table 7-1 provides changes to project status since the 2014 Keystone XL Final SEIS and identifies any new projects that were not previously under consideration.

Table 7-1. Updates to the Projects Considered within the 2014 Keystone XL Final SEIS Cumulative Effects Assessment and New Projects that have Arisen Since 2014

Project Name	Description	Localities Impacted	Geographic Relationship to the Proposed Project	Identified in 2014 Analysis (Y/N)
PAST PROJECTS				
TransCanada Gulf Coast Pipeline and Oil Storage Facility	Operational since 2014, the Gulf Coast Pipeline consists of 485 miles of new crude-oil pipeline from Cushing, Oklahoma to Nederland, Texas and a new tank farm on an approximately 74-acre site at Cushing, Oklahoma. The carrying capacity is 830,000 bpd.	Oklahoma, Texas	Approximately 395 miles (81 percent) is within approximately 300 feet of existing pipelines, utilities, or road ROWs. The remaining 90 miles (19 percent) of the route created new ROWs. A tank farm was constructed on an approximately 74-acre site at Cushing, Oklahoma, adjacent to the existing Cushing Oil Terminal.	Y (present project)
BakkenLink Pipeline	Approximately 132-mile long, 12-inch-diameter oil gathering system to move Bakken crude within North Dakota to a crude oil rail loading facility near Fryburg, about 30 miles west of Dickinson in southwestern North Dakota. The carrying capacity is 65,000 bpd.	Western North Dakota and southeastern Montana	The BakkenLink Pipeline is near Baker, Fallon County, Montana.	Y (future project)
Dakota Access Pipeline	**Approximately 1,172-milelong, 30-inch pipeline transporting light sweet crude oil from the Bakken/Three Forks production area in North Dakota to Patoka, Illinois. The carrying capacity is 65,000 bpd.**	**North Dakota, South Dakota, Iowa, Illinois**	**Regional oil pipeline project.**	**N**
Enbridge Line 67 Expansion (also referred to as the "Alberta Clipper")	Pipeline capacity increase of the existing Enbridge Line 67 pipeline in North Dakota, Minnesota and Wisconsin. Included the addition of new pump stations and modifications to existing pump stations to increase the flow rate up to 890,000 bpd (crude oil).	North Dakota, Minnesota and Wisconsin	Regional oil pipeline project.	N
NuStar Energy—East Refined Product Pipeline System	Carries refined products through eastern and southern Nebraska.	Eastern and southern Nebraska	Within several counties in Nebraska.	N
Magellan Pipeline System	Carries refined petroleum products through Seward County, Nebraska, and ammonia through Jefferson County, Nebraska.	Southeastern Nebraska	Within Seward and Jefferson counties, Nebraska.	N
Tallgrass Interstate Gas Transmission Line	Carries natural gas through Madison, Stanton, and Platte counties, Nebraska.	Northeastern Nebraska	Within Madison, Stanton, and Platte counties, Nebraska.	N
Bakken NGL Pipeline	An approximately 600-mile long NGL pipeline running from northeastern Montana, south to Colorado.	Montana, Wyoming, Colorado	Within Fallon County, Montana.	N

Table 7-1. Updates to the Projects Considered within the 2014 Keystone XL Final SEIS Cumulative Effects Assessment and New Projects that have Arisen Since 2014

Project Name	Description	Localities Impacted	Geographic Relationship to the Proposed Project	Identified in 2014 Analysis (Y/N)
Mni Wiconi Rural Water Supply System	4,400 miles of pipeline through southwest and south-central South Dakota; 12- to 24-inch polyvinyl chloride water pipeline, which provides water to Pine Ridge, Rosebud, and Lower Brule Indian Reservations, along with other communities.	Haakon, Stanley, Jones, Lyman, Mellette, Todd, Jackson, Bennett, and Shannon counties, South Dakota. Portions of Pennington and Tripp counties, South Dakota.	Within Haakon, Jones, Lyman, and Tripp counties, South Dakota.	N
Dry Prairie Rural Water System	System to provide drinking water to approximately 27,434 people in eastern Montana. 12- to 15-inch diameter polyvinyl chloride water delivery pipelines throughout the service area.	Montana: Daniels, Sheridan, and Roosevelt counties and portions of Valley County	Portions of the water system west of the Fort Peck Indian Reservation within northeastern Montana, specifically in Valley County.	N
Diamond Willow Wind	**30 MW capacity using 20 wind turbines in Fallon County, Montana**	**Eastern Fallon County, Montana**	**Within Fallon County, Montana**	**N**
Steele Flats	74.8 MW capacity using 44 wind turbines in Jefferson County, Nebraska.	Central Jefferson County, Nebraska	Within Jefferson County, Nebraska.	N
Prairie Breeze	206.5 MW capacity using 118 wind turbines in Antelope County, Nebraska.	Southeastern Antelope County, Nebraska	Within Antelope County, Nebraska.	N
Prairie Breeze II	73.4 MW capacity using 41 wind turbines in Antelope and Madison counties, Nebraska.	Southeastern Antelope County and western Madison County, Nebraska	Within Antelope and Madison counties, Nebraska.	N
Prairie Breeze III	35.8 MW capacity using 20 wind turbines in Antelope County, Nebraska.	Southeastern Antelope County, Nebraska	Within Antelope County, Nebraska.	N
Creston Ridge	6.8 MW capacity using 4 wind turbines at Creston, Nebraska, in Platte County.	Northeastern Platte County, Nebraska	Within Platte County, Nebraska. Near PS-23B.	N
Seward Wind Farm	1.7 MW capacity using 1 wind turbine. On the west side of Seward, Nebraska, in Seward County.	Central Seward County, Nebraska	Within Seward County, Nebraska.	N
Upstream Energy Center	Up to 350 MW capacity using 168 wind turbines.	Antelope County, Nebraska	Within Antelope County, Nebraska.	N
PRESENT PROJECTS				
Minnesota Pipe Line Company Line 4	Expansion of existing Line 4 to its original capacity of 350,000 bpd (crude oil). The project would involve the addition of six pump stations and other upgrades at existing stations.	Minnesota	Regional oil pipeline project.	N
Milligan 1	Construction start**ed** in **2019 and planned to be operational in 2020**; 300 MW capacity using 150 wind turbines.	Saline County, Nebraska	Within Saline County, Nebraska.	N

Table 7-1. Updates to the Projects Considered within the 2014 Keystone XL Final SEIS Cumulative Effects Assessment and New Projects that have Arisen Since 2014

Project Name	Description	Localities Impacted	Geographic Relationship to the Proposed Project	Identified in 2014 Analysis (Y/N)
FUTURE PROJECTS				
Enbridge Line 3	Enbridge plans to replace the existing Line 3 (originally constructed in 1968) between Neche, North Dakota and Superior, Wisconsin. The project would have a future distance of approximately 340 miles and include 18 new pump stations. The new Line 3 would be designed as "mixed service," allowing it to carry a variety of different types of crude oil from heavy to light with an increase to historic capacity of approximately 760,000 bpd (light crude oil). Enbridge's Certificate of Need Application with the Minnesota Public Utilities Commission was granted in June 2018 contingent on certain modifications. An official Commission Order is expected.	North Dakota, Minnesota and Wisconsin	Regional oil pipeline project.	N
Enbridge Line 61 Expansion	Enbridge plans to expand the capacity of the existing Line 61. The project includes constructing and modifying pump stations in Wisconsin and Illinois. The total combined design compacity of Line 61 will exceed 1.2 million bpd (crude oil). The project is pending state legal approvals.	Wisconsin and Illinois	Regional oil pipeline project.	N
Milligan 3	Planned start date 2020; 73 MW capacity using 40 wind turbines.	Saline County, Nebraska	Within Saline County, Nebraska.	N
R-Project	Construction to begin in late 2019.345-kV transmission line to extend from Sutherland to Thedford and onward to a new substation in Holt County, Nebraska.	Central Nebraska	Within the range of protected species discussed in this document.	N
Highway 12 Resurfacing	8 miles of milling and resurfacing in Keya Paha County, Nebraska.	Keya Paha County, Nebraska	Within Keya Paha County, Nebraska.	N
Highway 20 Resurfacing	8.75 miles of resurfacing in Antelope County, Nebraska.	Antelope County, Nebraska	Within Antelope County, Nebraska.	N
Highway 15 Resurfacing	15.2 miles in Colfax County, Nebraska.	Colfax County, Nebraska	Within Colfax County, Nebraska.	N
Highway 92 Resurfacing	11.1 miles of milling and resurfacing in Butler County, Nebraska.	Butler County, Nebraska	Within Butler County, Nebraska.	N
US-34 Resurfacing	13.65 miles of milling and resurfacing in Seward County, Nebraska.	Seward County, Nebraska	Within Seward County, Nebraska.	N
US-136 Resurfacing	9.76 miles of resurfacing in Jefferson County, Nebraska.	Jefferson County, Nebraska	Within Jefferson County, Nebraska.	N
Highway 15 Repairs	11 miles in of milling, resurfacing, and bridge repairs in Butler County, Nebraska.	Butler County, Nebraska	Within Butler County, Nebraska.	N
Highway 6 Repairs	3.6 miles of milling, resurfacing, and bridge repairs in Seward County, Nebraska.	Seward County, Nebraska	Within Seward County, Nebraska.	N

Table 7-1. Updates to the Projects Considered within the 2014 Keystone XL Final SEIS Cumulative Effects Assessment and New Projects that have Arisen Since 2014

Project Name	Description	Localities Impacted	Geographic Relationship to the Proposed Project	Identified in 2014 Analysis (Y/N)
I-80 Repairs	16.5 miles of milling, resurfacing, and bridge repairs in Seward County, Nebraska.	Seward County, Nebraska	Within Seward County, Nebraska.	N
Highway 33 and US-6 Resurfacing	11 miles in Saline County, Nebraska.	Saline County, Nebraska	Within Saline County, Nebraska.	N
Highway 15 Resurfacing	11.8 miles in Jefferson County, Nebraska.	Jefferson County, Nebraska	Within Jefferson County, Nebraska.	N
US-212 Resurfacing	47.86 miles of milling and resurfacing in Meade County, South Dakota.	Meade County, South Dakota	Within Meade County, South Dakota.	N
US-14 Resurfacing	22.27 miles of milling and resurfacing in Haakon County, South Dakota.	Haakon County, South Dakota	Within Haakon County, South Dakota.	N
US-183 Resurfacing	35.82 miles of full-depth reclamation and resurfacing in Tripp County, South Dakota.	Tripp County, South Dakota	Within Tripp County, South Dakota.	N

Source: Andeavor Logistics 2017; Hydrocarbons Technology 2018; Minnesota Pipe Line Company 2018; Minnesota Public Utilities Commission 2018; Wisconsin Public Radio 2018

bpd = barrels per day; MW = megawatts; N = no; NGL = natural gas liquids; ROW = right-of-way; SEIS = Supplemental Environmental Impact Statement; Y = yes

The Department also considered changes along the proposed pipeline ROW from preconstruction activities conducted by Keystone. This includes site preparation of future construction camps and pipe yards along the Preferred Route. Keystone is in the process of performing mowing and tree removal activities for site preparation of future construction camps, contractor yards and pipe yards along the Preferred Route. Keystone has restricted these activities to the Fall of 2019, outside of the migratory bird nesting season and 4(d) rule for the northern long-eared bat.

7.2 METHODOLOGY

The scope of the cumulative impact analysis focuses on the geographic boundaries and timeframes that relate to the resources affected by the proposed Keystone XL Project and how the impacts interact with other actions across resource areas, regardless of Department jurisdiction. Similarly, the ROI for the cumulative impacts analysis was determined based on the potential for the Project to contribute to cumulative environmental effects when considered with past, present or reasonably foreseeable projects. Table 7-2 describes the cumulative impact ROI for each resource. The analysis also considers whether changes to the projects identified in Table 7-1 are consistent with cumulative impact analysis findings described in the 2014 Keystone XL Final SEIS.

Table 7-2. Region of Influence for Cumulative Impacts Analysis by Resource Area

Resource Area	Region of Influence
Land Use, Recreation and Visual Resources	Areas adjacent to and within the ROW
Geology and Soils	Areas adjacent to and within the ROW
Air Quality	Regional, defined by counties crossed by the pipeline
Noise and Vibration	Areas adjacent to and within the ROW
Water Resources	Watersheds, floodplains and state-designated stream segments crossed by the ROW
Biological Resources	Biological resources within the counties crossed by the ROW
Socioeconomics and Environmental Justice	Census tracts/block groups and transportation infrastructure within the counties crossed by the ROW
Cultural Resources	Areas adjacent to and within the ROW
Greenhouse Gases and Climate Change	Global, national and regional scale
Reliability and Safety	Area within the potential reach of released product, as described in Chapter 5, Environmental Consequences from Accidental Releases

ROW = right-of-way

The cumulative impacts analysis considers the direct effects of the Project in the context of effects from past, present or reasonably foreseeable projects updated from the 2014 Keystone XL Final SEIS and uses similar impact assessment methodologies as described in Chapter 4, Environmental Consequences from Construction and Normal Operations.

7.3 PAST, PRESENT AND REASONABLY FORESEEABLE PROJECTS

In this analysis, the Department considered projects or actions that have the potential to result in cumulative impacts to the resource as it relates to the ROI. This analysis builds on the Department's cumulative impact analysis in the 2014 Keystone XL Final SEIS. Specific to the MAR, the Department considered current and future projects within the counties crossed by the proposed MAR by searching publicly available regulatory and planning databases – specifically related to energy development (e.g., wind farms, oil and gas pipelines, mining and mineral extraction activities, transportation projects and county-specific economic development offices). The Department also considered changes to WCSB crude-oil projects considered in the 2014 Keystone XL Final SEIS (see Table 7-1).

Historical and ongoing activities in the Project area, including agricultural development, ranching, livestock grazing, energy infrastructure and urban and suburban development have substantially altered localized areas along the pipeline ROW.

Section 28(p) of the Mineral Leasing Act of 1920 provides that "in order to minimize adverse environmental impacts and the proliferation of separate rights-of-way across Federal lands, the utilization of rights-of-way in common shall be required to the extent practical." To the extent practicable, the Keystone XL pipeline route parallels the Northern Border pipeline ROW at the northern border crossing in Montana on federal lands (see 2014 Keystone XL Final SEIS, Section 2.2.5, Major Pipeline Route Alternatives). The Keystone XL pipeline and Northern Border pipeline routes parallel each other for approximately 25 miles, with width distances varying from 845 feet to overlapping, depending on localized site conditions, topography and other factors. Consideration of co-location and parallel routes in part influenced the route for the Project. No other practicable opportunities for co-location of the project pipeline route on federal lands have been identified. All of these activities have contributed to a change to the once dominant grassland and rainwater basin landscape and degradation of natural habitat for wildlife and plant species. Refer to Chapter 3, Affected Environment, for a further description of the affected environment.

Current and reasonably foreseeable future projects within and near the ROI are identified below. Overall, the area remains predominantly rural and agricultural in nature with little activity having the potential for contributing to significant cumulative effects. Pipeline projects, associated facilities and new road construction are the primary activities identified that have the potential for cumulative effects, as these projects are large-scale and/or linear in nature.

The 2014 Keystone XL Final SEIS also evaluated connected actions. As defined by CEQ regulations, connected actions are closely related and therefore should be discussed in the same impact analysis. Actions are connected if they meet the following requirements:

- Automatically trigger other actions that may require environmental impact statements;
- Cannot or will not proceed unless other actions are taken previously or simultaneously; and
- Are interdependent parts of a larger action and depend on the larger action for their justification.

The connected action analysis in the 2014 Keystone XL Final SEIS considered the requirements for electrical distribution lines and substations for the operation of pipeline facilities (e.g., pump stations and MLVs). Chapter 6, Electrical Power Infrastructure, provides updates to information regarding electrical power lines since the 2014 Keystone XL Final SEIS and analyzes potential adverse effects of construction and operations of these utilities.

7.3.1 Existing Keystone Mainline

This analysis identified the existing Keystone Mainline for cumulative impact consideration as it would share a ROW with the MAR portion of the Keystone XL pipeline and it has the potential to cumulatively affect similar resources. As depicted in Figure 2-1, the MAR parallels a significant portion of the existing Keystone Mainline in Nebraska (excluding Antelope and Madison counties), ending in Steele City, Nebraska. The Keystone Mainline has been in operation since 2010 and carrying crude oil from the Western Canadian Sedimentary Basin in Canada to Steele City, Nebraska. From Steele City, the Mainline splits in two, with one leg running east through Missouri for deliveries into Wood River and Patoka, Illinois; and the second leg running south to Cushing, Oklahoma, and then on to refineries along the Gulf of Mexico via the Keystone Pipeline System’s Gulf Coast extension.

A review of Keystone assets and projects identified no other assets, projects or plans to expand existing facilities in the Project area other than the proposed Keystone XL pipeline, including the proposed MAR that is the subject of this SEIS (TransCanada 2018b).

7.3.2 Other Pipeline Infrastructure Projects near the MAR (oil, gas, products and terminals)

This analysis identified other pipeline infrastructure projects for cumulative impact consideration as they share similar characteristics (linear in nature), traverse similar landscapes as the MAR and have the potential to cumulatively affect similar resources affected by the MAR. The primary source for all the pipeline infrastructure locations was the U.S. Energy Information Administration (EIA) and the Nebraska Pipeline Association (Nebraska Pipeline Association 2018; U.S. Energy Information Administration 2018); additional sources that supplement specific infrastructure details are called out separately below. The following existing oil and natural gas pipelines run near (within the same county(ies)) as the MAR:

- Platte (carries crude oil through western Nebraska and terminates in Steele City, Jefferson County) (Enbridge 2018)
- NuStar Energy (East Refined Products Pipeline System), carries petroleum refined products and anhydrous ammonia pipeline through Nebraska (Platte and Madison counties) with a termination in Norfolk, Madison County) (NuStar Energy 2018)
- NuStar Energy’s East System Pipeline (carries hydrocarbon gas liquid [HGL] through northeastern Madison County, north-south through the town of Norfolk) (NuStar Energy 2018)
- NuStar Energy’s East Refined Products Pipeline System pipelines (carries refined products through Seward and Colfax Counties) (NuStar Energy 2018)
- Magellan (carries a refined product pipeline through Nebraska across Seward County and an ammonia pipeline across Jefferson County) (Magellan Midstream Partners 2018)
- Rockies Express West, Trailblazer and Natural Gas Pipeline Company of America (operates natural gas transmission lines in Jefferson County (TallGrass Energy 2018a; USFWS 2018h)
- Tallgrass Interstate Gas Transmission Line (operates natural gas transmission line in Madison, Stanton and Platte counties) (TallGrass Energy 2018b)
- Northern Natural Gas Pipeline (operates numerous natural gas through every county crossed by the proposed MAR) (Northern Natural Gas 2018)
- Petroleum product pipelines in Saline, Butler and Colfax Counties with petroleum product terminal in Colfax County (NuStar Energy LP terminal is called the Columbus Terminal but is located just across the Platte County line in Richland, Colfax County) and Madison County (NuStar Energy in Norfolk)

A review of oil, gas and product expansion projects identified no new projects or expansion in the ROI.

7.3.3 Wind Farms / Wind Energy Projects

This analysis identified wind farms and wind energy projects within the ROI for cumulative impact consideration as they often occupy large footprints and are dominant features in the landscape. These types of projects have the potential to cumulatively affect similar resources affected by the MAR. **The only wind farms in Montana counties crossed by the Project are the existing Diamond Willow Wind Farm (Fallon County, expanded in 2010, 20 turbines, 30 megawatts [MW]) and a 10-MW test facility in Valley County (Bugh and Larson 2018, Phadke no date).** Existing wind farms that became operational between 2013 and 2016 include: Steele Flats Wind Farm (Jefferson County, 2013; 44 turbines, 74.8 megawatts [MW]), Prairie Breeze Wind (Antelope County, 2014; 118 turbines, 206.5 MW), Prairie Breeze II Wind Energy Center (Antelope and Madison counties, 2015; 41 turbines, 73.4 MW), Prairie Breeze III Energy Center (Antelope County, 2016; 20 turbines, 35.8 MW); Creston Ridge Wind Farm in Platte County (4 turbines, 6.8 MW); **Grande Prairie wind farm (400 MW; 200 turbines);** and the Seward Wind Farm (1.7 MW in Seward County) (U.S. Energy Information Administration 2018; Kansas Energy Information Network 2014; Nebraska Office of Energy Statistics 2018; Nebraska Public Power District 2018). The Upstream Energy Center (Antelope County; maximum capacity 350 MW, 168 turbines) became operational in early 2019. **In addition, the Milligan I Wind Farm (300 MW, 150 turbines) is currently under construction (Nebraska Office of Energy Statistics 2019)**.

The only wind farm currently proposed include **that is reasonably foreseeable is the** Milligan 3 Project (Saline County, planned start date 2020; maximum capacity 73 MW, 40 turbines)**. In addition, the following wind farms were included in the Draft SEIS, but are no longer considered to be reasonably foreseeable because they are no longer listed as in development by the South Dakota Public Utilities Commission:** New Underwood North and South (10 to 50 MW each, Haakon County, South Dakota); Basin Electric SD-2 (125 to 200 MW in Tripp County, South Dakota); **and** Basin Electric SD-3 (125 to 200 MW in Jones County, South Dakota) **(SDPUC 2019)**.

7.3.4 Transmission Lines

This analysis identified transmission lines for cumulative impact consideration as they share similar characteristics (linear in nature), traverse similar landscapes as the MAR and have the potential to cumulatively affect similar resources affected by the MAR. One existing in-state network of transmission lines extends through every county along the proposed MAR Route (U.S. Energy Information Administration 2018). The NPPD has also proposed a new transmission line and substations (known as the R-Project) across central Nebraska (USFWS 2017b). A review of the NPPD website identified no additional planned transmission projects near the MAR (Nebraska Public Power District 2018; Nebraska Office of Energy Statistics 2018).

The proposed MAR would require local power providers to construct, operate and maintain power lines and substations to service pump stations for MAR pipeline and single power line connections to MLVs. These activities are considered connected actions and potential impacts are analyzed by each resource area within Chapter 6, Electrical Power Infrastructure.

7.3.5 Energy Production Facilities

This analysis identified energy production facilities within the ROI (U.S. Energy Information Administration 2018; Nebraska Office of Energy Statistics 2018; Nebraska Public Power District 2018) for cumulative impact consideration as they often occupy large footprints and are dominant features in the landscape. These types of projects have the potential to cumulatively affect similar resources affected by the MAR. The area includes many existing energy production facilities, in addition to wind, including:

- Coal Plant (Columbus, Platte County)

- Natural Gas Plants (Crete in northeastern Saline County and Fairbury in Jefferson County)
- Petroleum Plants (David City in Butler County, Madison Utilities in Madison County, Wilbur in Saline County)
- Other – Elkhorn Valley Ethanol Plant (Norfolk in northeastern Madison County – 40 million gallons per year); Loup River Hydroelectric Plant (Platte County)

A review of energy production/power plant projects identified no new projects or issues in the project areas (US Energy Information Administration 2018; Nebraska Public Power District 2018).

7.3.6 Highway Construction

This analysis identified highway construction projects for cumulative impact consideration as they share similar characteristics (linear in nature), traverse similar landscapes as the MAR and have the potential to cumulatively affect similar resources affected by the MAR. The highway projects below, broken out by county, are identified as current and future projects in the Nebraska Surface Transportation Program Book for Fiscal Years 2018-2023 (Six Year Plan) (Nebraska Department of Transportation 2017) or the South Dakota Department of Transportation 2019 – 2022 Statewide Transportation Improvement Program (South Dakota Department of Transportation 2018). Unless otherwise noted, all are future projects. Also, no relevant projects were identified in Stanton or Madison counties in Nebraska.

The following projects were identified in Nebraska:

- Antelope: Resurfacing of Highway 20 (8.75 miles).
- Colfax: Resurfacing of Highway 15 (N-91) (15.2 miles).
- Butler: Milling and resurfacing of Highway 92 (Rising City East) (11.1 miles); milling, resurfacing and bridge repair of Highway 15 (N-92 South) (11 miles).
- Jefferson: Resurfacing of US-136 (9.76 miles); resurfacing of Highway 15 (11.8 miles).
- Keya Paha: Milling and resurfacing of Highway 12 (8 miles).
- Seward: Milling, resurfacing and bridge repair of Highway 6 (in Milford and north) (3.6 miles); milling, resurfacing and bridge repair of I-80 Goehner to Milford, milling, resurfacing and bridge repair (9 miles) and from York/Seward County line to Goehner (7.5 miles); resurfacing and bridge repair of Highway 6 (Emerald west) (3.9 miles); milling and resurfacing of US-34 (13.65 miles).
- Saline: Resurfacing of Highway 33 (Crete) and US 6/N-15 (11 miles).
- Jefferson: Resurfacing of Highway 15 (Fairbury North) (11.8 miles).

The following projects were identified in South Dakota:

- Haakon: Milling and resurfacing of US-14 (22.27 miles).
- Meade: Milling and resurfacing of US-212 (47.86 miles).
- Tripp: Full-depth reclamation and resurfacing (35.82 miles).

7.3.7 Rail

Major rail lines intersect the MAR, including BNSF (Seward, Saline and Jefferson counties), Union Pacific (Colfax, Platte and Butler counties) and a regional railroad (Nebraska Central) that runs through Stanton, Madison, Platte and Butler counties. A review of rail projects identified plans for major investments in rail infrastructure in Nebraska by BNSF and Union Pacific (Aberdeen, Carolina and Western Railway Company 2018; Area Development News Desk 2012; BNSF 2017, 2018; Union Pacific 2018; Rio Pacific Grande 2016). This cumulative impact analysis considers existing rail lines, but does not include planned rail projects since locations have not been identified.

7.4 CUMULATIVE IMPACT ANALYSIS DETERMINATIONS

Table 7-3 provides a comparison of findings by resource between the 2014 Keystone XL Final SEIS and the cumulative impacts analysis and conclusions detailed within this chapter. The analysis considers regulatory controls, mitigations and standard industry best management practices that are in place to reduce long-term adverse impacts. As indicated by the table, impact determinations are consistent with findings in the 2014 Keystone XL Final SEIS.

Table 7-3. Comparison of Cumulative Impact Findings

Resource Area	2014 Keystone XL Final SEIS	Current Analysis
Land Use, Recreation and Visual Resources	Less than significant	Less than significant
Geology and Soils	Less than significant	Less than significant
Air Quality	Less than significant	Less than significant
Noise and Vibration	Less than significant	Less than significant
Water Resources	Less than significant	Less than significant
Biological Resources	Less than significant	Less than significant
Socioeconomics and Environmental Justice	Less than significant	Less than significant
Cultural Resources	Less than significant	Less than significant
Greenhouse Gases and Climate Change[a]	Increased greenhouse gas emissions associated with WCSB crude oil lifecycle	Increased greenhouse gas emissions from WCSB crude oil lifecycle and other global sources
Reliability and Safety	Increased risk for accidental release	Increased risk for accidental release[b] (see Chapter 5, Environmental Consequences from Accidental Releases)

a. Greenhouse gas emissions from the proposed Project would add to all other global sources that cumulatively lead to climate change. Other sources of greenhouse gases include other proposed crude oil pipelines that would transport WCSB crude oil to markets in the United States, as discussed in Section 7.4.9.

b. Operation of the proposed Project in combination with operations of current and planned crude oil pipelines within the cumulative impact ROI increases the probability of an accidental release. Chapter 5, Environmental Consequences from Accidental Releases, discusses the potential impacts from an accidental release of crude oil on the natural, cultural and human environment.

SEIS = Supplemental Environmental Impact Statement; WCSB = Western Canadian Sedimentary Basin

7.4.1 Land Use, Recreation and Visual Resources

The 2014 Keystone XL Final SEIS concluded cumulative impacts to land use, recreation and visual resources would be less than significant. Overall cumulative impacts to land use would be negligible for the MAR and ancillary facilities. The MAR lies in a predominantly agricultural area. A large portion of the MAR lies within an existing utility corridor which helps minimize the permanent changes in land use, as well as potential impacts on recreation and visual resources resulting from MAR construction and operation. Construction and operation of various projects affect existing land use covers, typically converting one land use type to another. In agricultural areas, construction impacts are mostly temporary along ROWs, and agricultural activities can mostly resume after construction is completed. However, some construction impacts, including soil compaction and mixing, as well as impacts to prime farmland can be long lasting. In forested areas, construction of linear projects results in the removal of trees and shrubs and requires clearing of vegetation in ROW. While an extensive portion of the route crosses prime farmland (see Section 7.4.2), the MAR ROW would cross only a small area of forested land (36 acres), 12.9 acres of which would be required for operation and result in a permanent change in land use. Similarly, the power lines necessary to service pump stations would primarily cross farmland plus an additional approximately 26 acres of forested land, which would result in permanent conversion of this area to non-forest.

Long-term concerns for cumulative impacts relate to permanent changes in land use, a declining trend in the availability of recreational or special interest areas, and adverse impacts to visual resources. Most impacts to land use, recreation and visual resources occur on a local level. To the extent they occur in the same corridor, the cumulative projects contribute to overlapping regional impacts and would add to the cumulative changes in land use. The MAR would cross one Nebraska Scenic Byway and two NHTs (located on private land), as well as several perennial waterbodies that include a designated recreational use. There would be no long-term impacts on either of these resources, and any adverse effects during construction would be temporary and minor with the implementation of best management practices and special construction procedures for waterbody crossings. The power lines necessary to service pump stations would also cross several special interest areas and would cause permanent impacts to visual resources (see Sections 6.4.7 and 6.4.8). The majority of cumulative projects are existing projects and would have no additional impact on current or potential future land use along the MAR. However, past and current actions generally have caused minor cumulative impacts on land use. Due to its central location between northern oil and gas fields and southern refineries, numerous natural gas, crude oil and refined product pipelines have been constructed and now crisscross the state of Nebraska, including the area that would be crossed by the MAR. A more recent development in the area is wind power and portions of the route (e.g., southeastern Antelope County) include groupings of one or more wind farms with potentially hundreds of individual turbines in a given area. There are also plans to develop additional wind farms in some of the counties along the MAR. While wind turbine installations may cover a large area, they are compatible with many land uses, such as farming and grazing found in the Project area. They require only limited land for turbine foundations and infrastructure and would not be expected to result in a cumulative impact on land use. However, potential aesthetic impacts of wind turbines and the resulting changes in the visual landscape can be large, depending on the individual viewer's perspective or the proximity of other important scenic or heritage protected landscapes. Regulatory controls in place include local land use plans, zoning and easement agreements. Such controls promote project-siting efforts that avoid protected lands, ensure land use compatibility and employ visual screening of infrastructure.

During construction of the MAR and ancillary facilities, impacts may include noise and dust from equipment, temporary traffic delays when equipment is being moved and the visual effects from removing vegetation and excavating soils. Of the past, present and planned projects within the ROI, none would contribute to long-term cumulative impacts on land use. Projects that have already been constructed and are in operation would not contribute to cumulative impacts because routine maintenance and management of the operating facilities do not require land clearing or ground disturbance.

7.4.2 Geology and Soils

The 2014 Keystone XL Final SEIS concluded cumulative impacts to geology and soils would be less than significant. Past, present and planned actions generally have caused, and may cause, minor cumulative impacts primarily to geology (fossil fuels, mineral resources and paleontological resources) and soils (including prime farmland) in the ROI for the MAR. No fossil fuel resources or significant mineral resources or mining operations have been identified within the ROI for the MAR, although there may be sand and gravel resources in the general area. Nationally "critical" mineral resources have been identified in nearby Elk Creek, Nebraska (over 50 miles east of the MAR in Jefferson County), where NioCorp Metals plans to develop North America's only niobium, scandium and titanium project. However, the project is at a sufficient distance from the MAR that the contribution to these impacts by the MAR would be negligible. Construction activities could potentially harm paleontological resources. Keystone would adhere to Paleontological Monitoring and Mitigation Plans developed for federal as well as certain state and local government lands. No cumulative effects on paleontological resources are expected.

Long-term impacts on soils relate to potential productivity concerns (reduction in the soil's ability to support plant growth) and the permanent conversion of prime farmland soil. Projects generally cause impacts that are confined and specific to the areas they disturb. This part of central Nebraska has been crossed extensively with numerous natural gas, crude oil and refined product pipelines coming from the northern oil and gas fields and heading to southern refineries. This has resulted in the conversion of land uses, including the loss of prime farmland soils, which is additive and cumulative over a wide area. A significant portion of the ROI includes prime farmland. Past projects have also contributed to soil disturbance and the potential for a cumulative decline of productivity in temporarily disturbed areas, although disturbance from transmission line and wind turbine projects in the area are limited to small, isolated features associated with tower footings, substation sites and turbine foundations. In addition, industry standard best management practices, such as stockpiling and restoring topsoil, can reduce long-term effects. Regulatory controls (Farmland Protection Policy Act) are also in place to protect prime farmland soils and productivity.

7.4.3 Air Quality

The 2014 Keystone XL Final SEIS concluded cumulative impacts to air quality would be less than significant. Overall cumulative impacts to air quality with the ROI of the MAR would be minor. Past, present and planned actions generally have caused, and may cause, minor permanent changes in air quality, assuming that effective regulatory oversight and mitigation efforts occur. The majority of cumulative projects are existing projects, and the area is generally rural and meets national and state air quality standards. Agriculture is the dominant industry. Construction-related emissions, such as from ongoing or planned highway projects, or future wind farm projects, are, or would be, limited to fugitive dust and mobile-source combustion emissions, including criteria pollutants. Given the temporary and localized nature of these dust emissions for projects occurring within the ROI, including those from farm equipment and farming activities, these activities are not expected to significantly affect air quality. In addition, fugitive dust control plans would be implemented not only for the MAR and ancillary facilities but also for other projects in order to comply with federal, state and local requirements. Therefore, cumulative impacts to air quality would be minor and short-term for construction phases.

7.4.4 Noise and Vibration

The 2014 Keystone XL Final SEIS concluded cumulative impacts to noise and vibration would be less than significant. Past, present and planned actions generally have caused, and may cause, minor to moderate cumulative impacts from noise within the ROI of the MAR. The cumulative impacts analysis of noise considers the long-term perceptible increases in ambient noise levels and increases of excessive ground-borne vibration to persons or property. Most of the potential impacts from noise are short-term and associated with the construction phase of a project, including construction equipment and vehicles and directional drilling. Examples of construction noise levels are provided in Section 4.5 and at 50 feet include 84 dBA because of ground clearing, 89 dBA from excavation and grading and 85 dBA from

HDD. Additionally, each pump station would operate using electrical power supplied by power lines and a substation operated by the regional power provider, NPPD. The NPPD would be responsible for managing the power lines and substations in accordance with all applicable federal, state and local regulations to maintain compliance with all noise requirements. Although construction noise could be moderately loud from activities resulting, the temporary and intermittent nature of the construction activities would not result in long-term cumulative impacts. Additionally, construction activities are generally limited to daylight hours in conformance with federal, state and local codes and ordinances, and manufacturer-prescribed safety procedures and industry practices.

For some projects, operations may also cause noise impacts. Potential impacts from noise could include direct impacts to nearby residences, wildlife and recreation areas. Because noise from other existing and planned projects generally would occur at separate locations, they would not contribute to cumulative noise effects in combination with the MAR. Current and planned actions, such as the multiple wind farms existing and planned in the area, have caused, and may cause, negligible to minor cumulative impacts to noise and vibration, such as in southeastern Antelope County where a large number of wind farms are located. Turbines generate noise and continuous noise can create stressors for humans and wildlife. However, turbine noise levels should not be a concern if the turbines are properly placed and located sufficient distances from residences and other sensitive noise receptors. However, the MAR is located miles away from the large grouping of wind farms in southeastern Antelope County such that they should not pose a cumulative concern.

During operation, long-term concerns include perceptible increases in ambient noise levels that exceed regulatory thresholds at sensitive receptors. As noted in Section 7.3.4, electrical power infrastructure also crisscross the entire project area, and additional lines would have to be extended to, and substations constructed for, the three pump stations located along the MAR (Stanton/Platte, Butler and Seaward counties) and single line connections are required to the MLVs. Both the pump stations and the transformers used in electrical generation and distribution systems generate noise during operation, and their co-location along the MAR introduces the potential for minor to moderate cumulative impacts on sensitive noise receptors that live or work nearby. Regulatory controls in place include the Noise Control Act and local ordinances that all projects must follow to avoid potential noise impacts. Typically, mitigation measures for noise include avoidance during the site selection process for a project – locating it away from sensitive receptors – and the use of noise barriers and enclosures for noise emitting equipment (e.g., pump stations or generators).

7.4.5 Water Resources

The 2014 Keystone XL Final SEIS concluded cumulative impacts to water resources would be less than significant.

7.4.5.1 Groundwater and Surface Water

Past, present and planned actions generally have caused, and may cause, minor cumulative impacts on surface water and groundwater resources within the ROI of the MAR, assuming projects implement appropriate and effective mitigation and restoration efforts. However, the contribution to these impacts by the MAR would be negligible. Groundwater provides drinking water and water for industrial and irrigational uses from aquifers in unconsolidated materials and bedrock units throughout the ROI. The list of projects in Section 7.3 would not likely affect the availability or quality of groundwater, and the MAR would contribute negligibly to adverse cumulative groundwater impacts. Most of the projects are already existing and would not contribute to cumulative impacts on water resources because routine maintenance and management of the operating facilities do not require any groundwater or surface water disturbing construction activities. No mining operations, which have the potential to affect groundwater, have been identified nearby. In addition, the planned highway construction projects involve remodeling and construction of existing roads, and the planned windfarms do not require water. Therefore, cumulative impacts to water resources are not expected. Regulatory controls (Clean Water Act and Safe Drinking Water Act) and industry standard best management practices (e.g., establishment of unusually sensitive drinking water areas/drinking water supply management areas) are also in place and would minimize adverse cumulative impacts on groundwater.

The ROI includes three watersheds and major surface waters (rivers and streams). The pipeline, rail and transmission line projects identified in Section 7.3, in particular, have the potential to cross multiple waterbodies along their planned routes. Permanent and long-term cumulative impacts from construction could include the placement of fill in surface waters or wetlands, which may reduce the quality of these water resources. In conformance with regulatory oversight, project proponents typically select and modify proposed routes for linear projects to minimize the potential for impacts on surface water resources, as well as on other sensitive environments. Projects avoid these resources whenever possible or include mitigation methods, such as HDD, to avoid impacts. Regulatory oversight under the Clean Water Act and Rivers and Harbors Act, and required best management practices for sediment and erosion control, would result in minor cumulative adverse impacts on surface waters.

7.4.5.2 Wetlands and Floodplains

Past actions, including agriculture, have drastically changed the landscape in many parts of Nebraska. In relation to the MAR and the ROI this would include the transformation of the once dominant complex of shallow lakes, marshes and other wetlands located within the Rainwater Basin Ecoregion. Farming and placement of drainage tiles have removed many of these features from today’s landscape. Present and planned actions generally have caused, and may cause, minor to moderate cumulative impacts on wetlands and floodplains within the ROI, assuming that projects implement appropriate and effective mitigation and restoration efforts. With respect to floodplains, the MAR would make a negligible contribution to adverse cumulative impacts. Regulatory oversight and development restrictions under the National Flood Insurance Program (NFIP) and Executive Order 11988 (Floodplain Management) would limit cumulative adverse impacts on floodplains to minor.

The majority of the ROI includes agricultural land, and only a small area of predominantly emergent wetlands remains. The MAR would cross through the Rainwater Basin Region (Butler, Seward and Saline counties), named for the once abundant natural wetlands that formed where clay-bottomed playa depressions occur. Impacts to wetland resources, however, from the pipeline would be avoided or temporary in nature during construction. There are approximately 34,103 acres of wetlands remaining in the Rainwater Basin, which is only about 10 percent of what historically existed; the largest threat to these wetlands has been and continues to be habitat loss due to cropland conversion (NGPC 2005). Other projects in the ROI would have minor adverse impacts to wetland resources. Development projects would be required to comply with Section 404 of the Clean Water Act to avoid or mitigate impacts to wetlands. However, non-federally protected isolated wetlands may experience a cumulative loss if these resources are not avoided.

7.4.6 Biological Resources

The 2014 Keystone XL Final SEIS concluded cumulative impacts to biological resources would be less than significant. Past actions, including agriculture, have drastically changed the biological communities and habitats in many parts of Nebraska. In relation to the MAR and the ROI this would include the transformation of the once dominant grasslands into agricultural crops and rangeland and loss of riparian forest. Overall cumulative impacts to biological resources would be minor to moderate for the MAR pipeline, power lines and ancillary facilities. Construction of the pipeline within the MAR, and the associated power lines and ancillary facilities would require the clearing of deciduous forest and woody wetland vegetation within the temporary ROW and would result in moderate long-term impacts on these communities given the length of time needed for the community to mature to pre-construction conditions. Once forested areas within the permanent ROW would not be allowed to re-establish due to periodic mowing and brush clearing during pipeline operation. Routine maintenance vegetation clearing would occur no more than every 1 to 3 years.

Based on historic and proposed projects, the primary impact concern with respect to terrestrial vegetation and potential cumulative impacts is the conversion of forested uplands to herbaceous habitats, which reduces forest cover and increases the amount of forest fragmentation. Much of the ROI includes agricultural lands. Agriculture has changed the landscape and reduced natural habitat by the planting of crops and ranging of cattle, which does not provide suitable habitat for most protected species, increasing the importance of those areas that do remain.

Past, present and planned actions identified in Section 7.3 relating to pipelines and electrical power infrastructure have contributed to cumulative impacts from continuing habitat (forested and prairie) decline and fragmentation. The recent growth in wind power and wind energy farms, many of which are located within the ROI**,** has placed additional pressure on biological resources. While wind farms require expansive areas of land to operate, they require only small areas of land to be cleared for turbine foundations and infrastructure. While habitat fragmentation may not be a significant concern, the movement and noise of the turbines could have adverse effects on wildlife, including migratory birds and some federally protected species. This combined with regional transmission lines and power connections to pipeline facilities could cause cumulative adverse effects on avian species and bats from potential for collision. Impacts would be **expected to be** negligible to minor for smaller and more agile species but could be **minor to** moderate for larger**, less maneuverable** bird species such as **sandhill** cranes, herons and raptors. Mortality resulting from collision for bird species is most likely to occur during spring and fall migrations when concentrations of these species are at their peak. **Further discussion on collision risk specific to the endangered whooping crane is presented below.**

Effects to other wildlife populations due to accidental injury or mortality of less mobile species are anticipated to be mostly minor and highly localized. Past, present and planned projects would minimize impacts on wildlife to the extent practicable by implementing best management practices, adhering to regulatory controls and avoiding habitat areas of concern when practicable.

Because trends in surface water quality are not evidencing declines in the region (see Section 7.4.5) and regulatory controls are in place to protect water quality and aquatic habitat (under the Clean Water Act), proposed projects would contribute minimally to cumulative declines in aquatic habitat and fisheries.

With respect to threatened and endangered species, project impacts to species would be less than significant, and the proposed Project is not likely to adversely affect protected species **other than the American burying beetle,** based on adherence to conservation measures included in the 2014 Keystone XL Final SEIS and summarized in Chapter 8. The American burying beetle is likely to be adversely affected by the Project and is discussed in the 2019 BA **and in Section 6.4.6.1**. Overall impacts to the American burying beetle from the proposed Project are anticipated to be less than significant with the implementation of conservation measures. Construction of new pipelines or other ground-disturbing projects through southern South Dakota and north-central Nebraska could contribute to cumulative mortality and loss of American burying beetle habitat. Any additional potential losses within this species would likely require conservation measures, thus reducing overall cumulative impacts on this species.

Each pump station required for the proposed Project would operate using electrical power supplied by power lines operated by local power providers. A total of 19 new electrical power lines that range in length from 0.1 mile to approximately 64 miles would be needed to provide electricity to each of the proposed Project pump stations. A complete summary of these proposed electrical power lines is provided in Table 6-1 in the Final SEIS. As previously discussed, the cumulative

increase of these power lines coupled with other electrical transmission lines, such as the R-Project that is included in Table 7-1 above, as well as those electrical power lines associated with future wind energy projects, has the potential to result in increased collisions for bird species, including the federally endangered whooping crane. Electrical power lines have the potential to pose a collision hazard to migrating whooping cranes during seasonal migrations. However, the collision risk assessment provided in Section 6.4.6.1 shows that the Project-specific calculated collision risk, based upon historical whooping crane observations and recent telemetry locations, is very low. Similarly, the collision risk assessment that the USFWS relied upon for the R-Project, a 225-mile high-voltage transmission line located in central Nebraska, concluded that a fatal collision with that project was not reasonably certain to occur. While these two projects, individually, are not expected to result in whooping crane mortality, cumulative effects may be possible, especially when additional electrical power lines associated with future wind projects within the ROI are considered. However, literature does not show a clear causal link between the cumulative miles of power lines and potential collision risk to migrating whooping cranes (Bainbridge 2017). As shown in the collision risk assessment provided in Section 6.4.6.1, despite the proliferation of power lines in the migration corridor over the past 80 years and the increase in the numbers of whooping cranes in the Aransas-Wood Buffalo Population (AWBP), increased mortality resulting from power line collisions has not been observed in historical records or by current radio-telemetry efforts (Stehn and Haralson-Strobel 2014; USFWS 2016b). In fact, the last known power line mortality was documented in 2002 (Stehn and Haralson-Strobel 2014). For the proposed Project, local power providers would be responsible for managing the proposed power lines and substations in accordance with all applicable federal, state and local regulations. The BLM, WAPA, RUS, and/or the USACE will make adherence to the conservation measures in this SEIS (see Table 8-3) conditions of any approvals, as applicable within the authority of each agency, to minimize adverse impacts to wildlife, including whooping cranes. Similar conservation measures related to the whooping crane could also be applied to future electrical power line projects within the range of the whooping crane.

In addition to the potential for collision with electrical power lines associated with future wind energy projects, some potential exists for whooping cranes to collide with operating wind turbines. Much of the highest wind energy potential in the country occurs in the Great Plains, which includes the U.S. portion of the whooping crane migration corridor. Ongoing and anticipated development in wind resources in the migration corridor could place thousands more wind turbines, associated transmission lines and other appurtenances in the Central Flyway path of the species in coming years (USFWS 2009a). As of 2014, there were nearly 10,000 operating wind turbines in the in the central and southern Great Plains (Pearse et al. 2016; Diffendorfer et al. 2014). The region is also used extensively by the midcontinental population of sandhill cranes, a close relative of the whooping crane that is often used as a surrogate given the species' similar life history characteristics. Similar to the whooping crane, sandhill cranes are susceptible to mortality as a result of collisions with power lines. However, only a few sandhill crane mortalities resulting from collisions with wind turbines have been documented to date, despite the fact that nearly 80 percent of the estimated > 1,000,000-member mid-continent sandhill crane population resides in a region with thousands of operating wind turbines for up to half of each year (Pearse et al. 2016; Navarrete and Griffis-Kyle 2014; Dubovsky 2018). Given the similarities between sandhill and whooping crane behavior and habitat use, the much larger population size of sandhill cranes, and the rarity of documented fatal interactions with operating wind turbines, it is assumed that the potential for whooping crane mortality as a result of collision with an operating wind turbine is also very low.

A majority of the migration corridor is located outside of the ROI. Readily available public information suggests that there are currently 396 operating wind turbines in the ROI (Table 7-1). At the time this document was prepared, only the Milligan 1 and Milligan 3 wind farms are

considered reasonably foreseeable, which would add an additional 190 wind turbines in the vicinity of the proposed Project (Table 7-1). Mortality of whooping cranes caused by wind farms in the ROI is expected to be low to nonexistent, given the limited number of individuals in the AWBP and the relatively few operating and proposed wind farms in the ROI (Table 7-1; USFWS 2009a). Further, the USFWS believes that whooping cranes will avoid potentially suitable habitat within 0.5 miles of a wind turbine, further reducing the potential for fatal interactions with operating wind turbines in the ROI within the migration corridor (USFWS 2009a). Given the above, combined with the dispersed nature of potentially suitable whooping crane habitat in the ROI and the whooping crane's natural history, the likelihood of fatal interactions with operating wind turbines in the ROI is very low.

As described in Chapter 8 (see Tables 8-3 and 8-5) a series of conservation measures will be applied to the proposed Project to avoid and minimize adverse impacts to whooping cranes. As such, the overall cumulative effects to whooping crane populations from the proposed Project would likely be negligible.

7.4.7 Socioeconomics and Environmental Justice

The 2014 Keystone XL Final SEIS concluded cumulative impacts to socioeconomics and environmental justice would be less than significant. **The Department has determined that o**verall cumulative impacts to socioeconomics and environmental justice **of the Preferred Route (including the MAR)** would be **minor to moderate**. **Members of tribes claim that the increase of pipelines are a significant cumulative impact to tribal resources and tribal rights, including the increased risk of a spill occurring on lands they claim treaty rights to and resources they claim use rights for, including water, fisheries, plants and animals. This claim extends beyond the proposed Keystone XL pipeline as other crude oil projects including the Dakota Access Pipeline, Line 67 (Alberta Clipper) Pipeline, and Line 3 Pipeline have generated attention by and opposition from these communities.**

Past, present and planned actions generally have caused, and may cause, negligible to minor cumulative impacts on socioeconomics within the ROI, and the MAR pipeline would make a negligible to minor contribution to the cumulative impacts. Construction activities from the MAR and other planned projects in the area would result in temporary beneficial impacts on the economy, employment and income. Minor to moderate cumulative impacts could occur if there are concurrent and/or successive construction schedules of other geographically overlapping projects that would have competing demands on local construction workforce, public services and facilities (including schools and hospitals) and transportation infrastructure. Overlapping schedules could occur for the MAR and one or more of the planned windfarms but the impacts are expected to be minor. The impact of the 106 MAR construction workers that might relocate from another area is expected to be small and have a negligible impact on the existing housing market and public services. Similarly, wind farm construction is not labor intensive (estimated maximum 220 workforce for an 80-turbine facility) and can typically be completed within 6 months (Wyoming Industrial Siting Council 2010). Therefore, the increases in demand for housing and public services from the combined construction workforces of the MAR, and the planned windfarms that fall within the ROI would have negligible cumulative effect. The construction workforce associated with the MAR and other planned windfarm projects would also result in temporary beneficial impacts, generating increased spending at local businesses.

During construction activities, nearby residents may experience short-term increases in fugitive dust and noise, disruption to local traffic patterns and temporary competition for services. This may be especially true for some of the small communities along the MAR, particularly those communities that also have other concentrated businesses, industry (power plant), extensive pipeline infrastructure, rail and other planned projects and highway construction projects within their boundaries (e.g., Steele City, Nebraska). In addition, limited road networks in certain areas may hinder access to a pipeline in the event of response to an incident.

Permanent impacts associated with the MAR and the projects listed in Section 7.3 would be the beneficial impacts associated with increased property tax revenues and increased employment and earnings associated with operations of the various projects. There is also the potential for some adverse property value impacts associated with changes in land use. This would be minimized for the MAR since so much of the proposed route lies within an existing utility corridor. However, it could be a concern for any residences near a proposed wind farm. Cumulative impacts to environmental justice would be negligible to minor for the MAR and ancillary facilities. Environmental justice population within the MAR includes a few concentrated (i.e., exceeds meaningful greater population criterion) minority groups in Butler, Madison and Platte counties, and concentrated low-income population tracts in Pierre (included in the socioeconomics and environmental justice ROI for the MAR) and Stanton counties. Minority and low-income populations would experience temporary impacts during construction along the MAR, such as dust and noise, disruption to traffic patterns and increased competition for medical or health services in underserved population. However, they would not be disproportionately larger than those impacts experienced by other members of the general population. Cumulative impacts may occur from demands on local workforces, supplies, infrastructure and services in an area where overlapping construction projects (e.g., windfarms and highway improvement projects) may occur. Any combined impacts from construction would be temporary and would not be disproportionately high or adverse to minority or low-income populations. Mitigation measures that specifically target minority and low-income populations (e.g., linguistically appropriate public awareness materials relating to construction activities and schedule) would help minimize impacts. Environmental justice populations may benefit from the increased economic stimulus and local spending associated with the projects.

Overall cumulative impacts to transportation and traffic would be minor for the MAR pipeline and ancillary facilities. During construction, there would be a temporary increase in traffic from worker commutes and material deliveries, in addition to diversion of traffic to alternate routes (if applicable). Vehicle trips for other planned projects, in conjunction with the proposed Project's approximately 106 one-way daily construction worker trips during peak construction would generate cumulative traffic impacts. In addition, the state highway construction projects would contribute to incremental effects on traffic and transportation in the vicinity through road detours and closures. However, cumulative impacts are expected to be temporary and would cease after construction.

7.4.8 Cultural Resources

The 2014 Keystone XL Final SEIS concluded cumulative impacts to cultural resources would be less than significant. The Department executed a Programmatic Agreement to take into account the effects of the Keystone XL Project on historic properties listed in or eligible for listing in the NRHP resulting from construction, operations and maintenance of the Keystone XL Project (U.S. Department of State 2014). The existing Programmatic Agreement would be implemented for the Keystone XL Project portion of the MAR, as well as for the power lines necessary to service pump stations, to implement the avoidance, if possible, or mitigation of adverse effects on historic properties. If impacts to NRHP-eligible properties could not be avoided, mitigation plans would be reviewed by the Department and the consulting parties to evaluate the submitted information following the protocols outlined in the amended Programmatic Agreement developed for the Keystone XL Project.

Present and planned actions listed in Section 7.3 generally have caused, and may cause, minor impacts on heritage resources within the ROI. While new construction projects within undisturbed locations would have the greatest potential to affect archaeological resources adversely, the majority of projects identified are existing projects. The planned highway construction projects would largely occur on existing roads and infrastructure.

Regulatory oversight under the NHPA and other statutes would limit potential impacts from proposed projects. To minimize development costs, project proponents would likely choose sites and routes within previously disturbed properties and ROWs, and they would avoid known historic **properties** to the extent practicable to comply with Section 106 of the NHPA during project implementation. Future projects could contribute to cumulative impacts on cultural resources to the extent that they would disturb known or currently unidentified historic properties. However, as with past and ongoing projects, proponents would avoid known historic **properties** (preferred mitigation strategy) or mitigate impacts to **them** (e.g., record and archive cultural artifacts) in compliance with Section 106.

7.4.9 Greenhouse Gases

A one-time increase in direct and indirect greenhouse gases would occur during construction of the Keystone XL Project. During Project operations and maintenance, increased direct and indirect greenhouse gas emissions would occur due to operation of the pipeline, pump stations, and other facilities. In addition, an increase in indirect lifecycle greenhouse gas emissions could occur from the extraction, transportation, refining, and end-use of the crude oil transported on the Keystone XL pipeline. See Section 4.10 for a discussion of potential greenhouse gas emissions associated with construction and operation of the Keystone XL pipeline, including lifecycle emissions.

Greenhouse gas emissions from the proposed Project would contribute incrementally to global climate change in combination with all other global sources of greenhouse gas emissions, including the projects listed in Table 7-1 as well as those discussed in the 2014 Keystone XL Final SEIS cumulative impacts discussion. Greenhouse gas emission impacts are additive as these gases accumulate in the atmosphere; impacts would likely be long-term because of the long atmospheric lifetimes of most greenhouse gases (typically decades to centuries). **Cumulative greenhouse gas emissions from the proposed Project, in conjunction with other actions, would likely represent a significant environmental impact.**

Table 7-4 compares the potential increase in lifecycle emissions under the proposed Project to emissions from proposed future pipeline projects that would import additional supplies of WCSB crude oil into the United States, out of the various projects listed in Table 7-1. Cumulative greenhouse gas emissions from these projects span a wide range that depends primarily on market conditions. In case of partial displacement of other crude oils, cumulative emissions would range from 76.8 to 176.3 million metric tons CO_2-eq per year depending on market conditions and the specific crude oils displaced. Cumulative emissions could range from as low as 2.9 million metric tons CO_2-eq per year in the case of full displacement of other heavy crude oils such as Venezuelan crude oil, to as high as 333.9 million metric tons CO_2-eq per year in case other crude oils are not displaced from the market.

Table 7-4. Lifecycle Greenhouse Gas Emissions from Proposed WCSB Pipeline Projects

Activity	Flow Rate (bpd) / Type of Crude Oil	Annual Greenhouse Gas Emissions (million metric tons CO_2-eq)		
		No Displacement	Partial Displacement	Full Displacement
Keystone XL (Proposed Project)[a]	830,000 / WCSB Heavy	178.3	37.3 – 120.5	2.1 – 33.9
Enbridge Line 67 Expansion[b,c]	390,000 / WCSB Heavy	83.8	21.3 – 32.6	0.5 – 15.5
Enbridge Line 3[b]	370,000 / WCSB Light	71.8	18.2 – 23.2	0.3 – 7.0
TOTAL	**1,590,000 / WCSB Heavy + Light**	**333.9**	**76.8 – 176.3**	**2.9 – 56.4**

a. Greenhouse gas emissions estimates taken from Section 4.10, Table 4.10-8.
b. Crude oil flow rate and emissions estimates from Line 67 Expansion Final SEIS, Table 6-11 (U.S. Department of State 2017).
c. Line 67 is also referred to as the "Alberta Clipper".
bpd = barrels per day; CO_2-eq = carbon dioxide equivalent; WCSB = Western Canadian Sedimentary Basin

Table 7-5 compares the potential increase in emissions under the proposed Project to other regional and national sources of greenhouse gases, to provide further context and scale for a qualitative understanding of the likely impacts of the proposed Project on climate change. Greenhouse gas emissions under the proposed Project would account for:

- Up to 0.5 percent of U.S. emissions, or up to 0.07 percent of global emissions, if other crude oils are assumed to be fully displaced,
- 0.6 percent to 1.8 percent of U.S. emissions, or 0.1 percent to 0.25 percent of global emissions, if other crude oils are partially displaced, or
- 2.7 percent of U.S. emissions, or 0.4 percent of global emissions, if no displacement of other crude oils is assumed to take place.

Table 7-5. Greenhouse Gas Emissions from Regional, National and Global Activities

Activity	Annual Greenhouse Gas Emissions (million metric tons CO_2-eq)
Proposed Project, assuming the Keystone XL pipeline transports only WCSB heavy crude oil	
• With no displacement of other crude oils	178.3
• With partial displacement of other crude oils	37.3 – 120.5
• With full displacement of other crude oils	2.1 – 33.9
Oil and gas production, processing and distribution in Alberta[a]	127
Canadian oil and gas sector[b]	183
Canadian transportation sector[b]	173
Total energy-related CO_2 emissions in Montana, South Dakota, and Nebraska[c]	94
U.S. oil and gas sector[d]	250
U.S. transportation sector[d]	1,854
U.S. total greenhouse gas emissions[d]	6,511
Global greenhouse gas emissions[e]	48,893

a. Calendar year 2015 emissions, from National Energy Board (2018).
b. Calendar year 2016 emissions, from Environment and Climate Change Canada (2018).
c. Calendar year 2016 emissions, from EIA (2019). Note that these estimates include CO_2 from fossil-fuel combustion, but do not include other greenhouse gases or non-energy related sources of CO_2.
d. Calendar year 2016 emissions, from USEPA (2018o).
e. Calendar year 2014 emissions, from World Resources Institute (2018).
CO_2 = carbon dioxide; CO_2-eq = carbon dioxide equivalent; U.S. = United States; WCSB = Western Canadian Sedimentary Basin

7.4.10 Accidental Release

The potential impacts resulting from a spill would be generally the same as those described for the proposed Project in Chapter 5, Environmental Consequences from Accidental Releases. However, the site-specific impacts with respect to a given resource area (primarily soils, biological resources, wetlands, land use and cultural resources) may differ depending on the location of a spill within the ROI.

When pipelines share the same corridor, as is the case with parallel pipelines or pipelines that cross, there is the potential for cumulative impacts from accidents or incidents to cause spills from multiple pipelines. Specifically, the proposed Keystone XL pipeline shares a ROW with the Keystone Mainline along most of its route (see Table 2-2 in Chapter 2, Development of Alternatives). The impacts of individual spills resulting from separate incidents involving separate pipelines would be additive over time. However, for spills to have a cumulative effect, incidents would need to affect two or more pipelines, and the resulting spills would need to occur near and within timeframes such that the plumes from released product would overlap. The Department determined, in its analysis of another proposed pipeline, that such an incident would be unlikely (U.S. Department of State 2014).

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8 SUMMARY OF CONSEQUENCES

8.1 INTRODUCTION

Table 8-1 provides a summary of the level of potential environmental impacts discussed within this SEIS. These conclusions are based on the best management practices and impact avoidance measures contained within the CMRP located in Appendix G of the 2014 Keystone XL Final SEIS and outlined in Table 8-2, Table 8-3 and Table 8-4. **The Department added Table 8-5 in this Final SEIS to clearly describe the measures that are specific to the power infrastructure (power providers) versus the proposed Keystone XL pipeline and ancillary facilities (Keystone).** Additional measures related to electric power infrastructure can be found in Appendix B, Western Area Power Administration Standard Construction and Mitigation Practices.

Table 8-1. Comparison Summary of Impact Ratings during Construction and Normal Operations

Resource[a]	No Action Alternative	Proposed Action Construction	Proposed Action Operations & Maintenance	Cumulative Effects
Land Use, Recreation and Visual Resources	None	Minor to Moderate	Negligible to Minor	Negligible
Geology and Soils	None	Negligible (geology) Minor (soils)	Negligible (geology) Minor (soils)	Minor
Air Quality	None	Minor	Minor	Minor
Noise and Vibration	None	Minor to Moderate	Negligible to Minor	Minor to Moderate
Water Resources	None	None (wild and scenic rivers) Negligible (groundwater and floodplains) Minor (surface water and wetlands)	None (wild and scenic rivers) Negligible (floodplains and groundwater) Minor (surface water and wetlands)	Minor to Moderate
Biological Resources	None	Minor to Moderate	Minor to Moderate	Minor to Moderate
Socioeconomics and Environmental Justice	None	None to Minor Beneficial (Economic Base)	Negligible to Minor Beneficial (Economic Base and Tax Revenue)	Negligible to **Moderate** Beneficial
Cultural Resources	None	Minor to Moderate	Negligible to Minor	Minor
Greenhouse Gases and Climate Change	None	**Minor[b]**	**Significant (indirect lifecycle emissions)[c]** **Minor to moderate (direct and indirect project emissions)[d]**	**Significant[e]**
Reliability[f]	None	–	–	–

a. Refer to Section 4.1, Introduction, for a discussion of impact ratings.
b. **Construction emissions equal 0.26 million metric tons CO_2-eq**.
c. **Lifecycle emissions estimates reflect transport of 830,000 bpd of WCSB crude oil and would equal 37.3 to 120.5 million metric tons CO_2-eq per year if other crude oils are partially displaced from the market (i.e., each barrel of WCSB crude oil is assumed to displace 0.8 to 0.4 barrels of other medium to heavy crude oils). If other crude oils are fully displaced (i.e., one barrel of WCSB crude oil displaces one barrel of other medium to heavy crude oils), lifecycle emissions would equal 2.1 to 33.9 million metric tons CO_2-eq per year. If no displacement of other crude oils is assumed to occur, lifecycle emissions would equal 178.3 million metric tons CO_2-eq per year.**
d. **Direct and indirect project emissions equal 1.31 million metric tons CO_2-eq per year.**
e. **Cumulative greenhouse gas emissions include emissions from the proposed Project and other global sources.**
f. The impact intensity of an accidental release on a given resource is dependent on numerous factors including type of product released, size of the release, proximity of the resource to the point of release, weather conditions, response time and method of cleanup. Therefore, the analysis does not assign a specific impact rating. See Chapter 5, Environmental Consequences from Accidental Releases, for a more detailed description of impacts and the likelihood of an accidental release. See Chapter 7, Cumulative Impacts, for a more detailed description of cumulative impacts that could occur from current and planned crude oil pipelines within the cumulative impact ROI.

CO_2-eq = carbon dioxide equivalent; mmt = million metric tons; ROI = region of influence; WCSB = Western Canadian Sedimentary Basin; yr = year

Table 8-2. Summary of Resource Protection Measures for the Proposed Action

Resource	Project Phase	Description
Land Use, Recreation and Visual Resources	Construction	• Segregating the upper 12 inches of agricultural topsoil during construction and replacing it during site restoration. • Avoiding functional loss (stopping or obstructing) of active irrigation ditches during construction or providing alternate sources of water. • Avoiding or minimizing potential damage to drain tile systems and repairing damaged drain tiles using original or new material. • Restoring disturbed areas as per the Con/Rec units and landowner agreements. • Minimizing construction noise in the immediate vicinity of herds of livestock. • Installing temporary fences with gates around construction areas to prevent injury to livestock or workers. • Leaving hard plugs (short lengths of unexcavated trench) or installing soft plugs (areas where the trench is excavated and replaced with minimally compacted material) to allow livestock and wildlife to cross the trench safely where required by landowner. • Maintaining all existing improvements such as fences, gates, irrigation ditches, cattle guards and reservoirs to the degree practicable where required by the landowner agreement. • Routing the proposed pipeline along existing ROWs in forest lands, when practicable. • Felling trees toward the pipeline centerline to minimize additional tree disturbance. • Providing construction shielding for certain land improvements (e.g., fences and sheds) and to preserve landscaping and mature trees. • Restoring all fences, landscaping improvements, shrubs, lawn areas and other structures to landowner-agreed requirements following construction. • Where the transmission lines associated with pump stations would cross federal lands, following required mitigation measures according to current land or forest management plans. • Routing transmission lines and distribution lines along existing linear corridors such as existing power lines, roadways, fence lines, field lines, parcel boundaries, or section lines to reduce impacts to land use and visual resources **to the extent practicable**. • Working with individual landowners to minimize impacts to their property **to the extent practicable**. • Consulting with farm owners and operators to minimize impacts to irrigation equipment and farming practices **to the extent practicable**. • Providing compensation for crop damage associated with construction or maintenance of transmission and distribution lines that connect to pump stations. • Considering strategic structure placement and varying structure type (e.g., lattice, H-frame, or single-pole) and material (e.g., wood, steel, or weathered steel) to reduce potential impacts to visual resources **to the extent practicable**. • Where possible, utilizing topographic or vegetative screening to reduce visual impacts. • If possible, collocating transmission lines or distribution lines on the same structures to consolidate infrastructure.
Geology and Soils	Construction	• Construction of the pipeline to withstand probable seismic events within the seismic risk zones and in accordance with U.S. Department of Transportation regulations (49 CFR 195, Transportation of Hazardous Liquids by Pipeline) and all other applicable federal and state regulations.

Table 8-2. Summary of Resource Protection Measures for the Proposed Action

Resource	Project Phase	Description
Geology and Soils (continued)	Construction	• Design and construction of the pipeline in accordance with 49 CFR 192 and 193, which require pipeline facilities to be designed and constructed in a manner to provide adequate protection from washouts, floods, unstable soils, landslides or other hazards that could cause the proposed pipeline facilities to move or sustain abnormal loads. Keystone also proposes to use specialized pipeline installation techniques, such as padding and the use of rock-free backfill, which are designed to effectively insulate the proposed pipeline from minor earth movements. • Installation of sediment barriers (e.g., silt fencing, straw or hay bales and sand bags), trench plugs, temporary slope breakers, drainage channels or ditches and use of mulching in areas of high erosion potential as outlined in the CMRP. • Restoration and revegetation of areas disturbed by construction along the pipeline ROW consistent with the CMRP and specific landowner requirements. • Implementation of compaction control measures, including ripping (loosening of compacted soils with a dozer equipped with a ripper blade or deep plow) to relieve compaction, particularly in areas where topsoil has been removed. • Restricting power line work during wet conditions to minimize rutting. • Monitoring the ROW following construction for erosion, settling and landslide activity, and, in areas of prime farmland, monitoring for any degradation in soil productivity. • Removal and segregation **up to** 12 inches of topsoil in non-forested agricultural areas located within prime farmland during excavation to a windrow along the edge of the ROW, with care taken to minimize the potential for mixing topsoil and subsoil. • Compensation of landowners in the event that agricultural productivity is impaired by vehicular compaction for demonstrated losses associated with decreased productivity.
	Operations	• Implementation of erosion and sediment control and reclamation (including revegetation) procedures similar to those described for construction activities and also as described in the CMRP for operations wherever soil is exposed and steep slopes are present or erosion potential is high.
Air Quality	Construction	• Employing water trucks, sprinklers or calcium chloride (limited to roads) to control dust levels during construction activities. • Controlling speed of all contractor vehicles in work areas and on roads. • Controlling emissions from construction equipment combustion, open burning and temporary fuel transfer systems and associated tanks to the extent required by state and local agencies through the permit process. • Prevention of wind-blown particles from sand blasting operations from reaching any residence or public building by placement of curtains of suitable material, as necessary. • Compliance with all applicable state regulations and local ordinances with respect to truck transportation and fugitive dust emissions.
Noise and Vibration	Construction	• Coordinating pipeline work schedules in areas near residences and businesses where construction activities or noise levels may be considered disruptive to minimize disruption. • Minimizing noise during non-daylight hours and within 1 mile of residences or other noise sensitive areas such as hospitals, motels, campgrounds or state and federal parks.

Table 8-2. Summary of Resource Protection Measures for the Proposed Action

Resource	Project Phase	Description
Noise and Vibration (continued)	Construction	• Providing advance notice to landowners within 500 feet of the ROW prior to construction, limiting the hours during which construction activities with high decibel noise levels are conducted, and ensuring construction proceeds quickly through such areas. • Minimizing noise in the immediate vicinity of herds of livestock or poultry operations, which are particularly sensitive to noise through use of noise control measures identified above. • Establishing a toll-free telephone line for landowners to report any construction noise-related issues and follow-up on appropriate mitigation measures, as necessary.
	Operations	• Implementing a three-step noise control plan for pump station operations in a progressive order when noise reductions are required: (1) install pipe lagging for all pipe suction pipes and discharge pipes; (2) install acoustic blankets for all pumps; and (3) upgrade enclosure for all motors, which would provide 3 decibels noise attenuation for each motor compared with a standard motor enclosure.
Water Resources	Construction	• Implementing the Project's SPCC Plan to avoid or minimize the potential impact of harmful spills and leaks during construction. • Compliance with requirements of all permits issued for the waterbody and wetland crossings by federal, state or local agencies. This includes requirements imposed by USACE during **for general permit verifications or permit approvals**. USACE will determine compliance with the ESA and Section 106 within permit areas using information from the SEIS documents and any additional supporting information provided by the applicant. • Installation of sediment barriers immediately after initial disturbance of the waterbody, wetland or adjacent upland per the CMRP. • Selection of most appropriate method at each crossing based on site-specific conditions (i.e., environmental sensitivity of the waterbody, depth, rate of flow, subsurface soil conditions and the expected time and duration of construction) at the time of crossing. • Use of non-toxic drilling fluids and additives during HDD activities. • Development of a contingency plan to address a frac-out during a HDD. The plan shall include instructions for monitoring during the directional drill and mitigation in the event that there is a release of drilling fluids. Additionally, the waterbody shall be monitored downstream for any signs of drilling fluid. • Re-establishment of the streambank contour and stabilization of streambanks and installation of temporary sediment barriers following the measures provided in the CMRP and applicable permits. • Reduction of construction ROW crossing widths to 85 feet or less in standard wetlands unless non-cohesive soil conditions require utilization of a greater width and unless the USACE during review of pre-construction notifications or other regulatory authority authorizes a greater width. • Limiting the duration of construction-related disturbance within wetlands in accordance with USACE **permit requirements**. • Performing all equipment maintenance and repairs on upland locations at least 100 feet from waterbodies and wetlands. • As much as is feasible, replace topsoil and restore original contours with no crown over the trench. Remove excess spoil and stabilize wetland edges and adjacent upland areas by establishing permanent erosion control measures and revegetation, as applicable, during final clean up.

Table 8-2. Summary of Resource Protection Measures for the Proposed Action

Resource	Project Phase	Description
Water Resources (continued)	Construction	• As much as is feasible, locating transmission line structures outside of wetlands, waterbodies and floodplains. • In areas with a shallow water table, installing transmission line structures using caissons to prevent poles from contacting groundwater. • As described in the CMRP, restoring wetlands affected by construction activities to the extent practicable.
	Operations	• After a flood event, inspecting transmission line structures in floodplains and removing accumulated debris.
Biological Resources	Construction	• Limiting construction traffic to the ROW, existing roads, newly constructed roads and approved private roads. • Clearly staking construction ROW boundaries, including pre-approved TWAs, to prevent disturbance to unauthorized areas. • Implementing reclamation and revegetation measures as described in the proposed CMRP Con/Rec units. • Using certified seed mixes to limit the introduction of noxious weeds within 12 months of seed germination testing, and adjusting seeding rates based on test results per the Con/Rec units. • Seeding at a rate appropriate for the region and for the stability of the reclaimed surface based on pure live seed **as per the Con/Rec Units**. • Develop and adhere to a weed control plan for Nebraska in consultation with County Weed Boards. • Using pre-construction treatment such as mowing prior to seed development or herbicide application (in consultation with county or state regulatory agencies, and landowners) for areas of noxious weed infestations prior to clearing grading, trenching or other soil disturbing work to weed infestation locations identified on construction drawings. • Stripping and storing topsoil contaminated with weed populations separately from clean topsoil and subsoil. • On BLM lands, avoiding construction within identified big game winter ranges from December 1 to May 15 of each year. • Using mulch and straw or hay bales that are free of noxious weeds for temporary erosion and sediment control. • Cleaning all construction equipment, including timber mats, with air or high-pressure washing equipment prior to moving equipment to the next job site; cleaning the tracks, tires and blades of equipment by hand or compressed air to remove excess soil prior to movement of equipment out of weed infested areas; or use cleaning stations to remove vegetative materials with high pressure washing equipment. • Implementing weed control measures as required by **the state-specific Weed Management Plan** and in conjunction with the landowner. • Reseeding disturbed native range with native seed mixes after topsoil replacement consistent with applicable Con/Rec and landowner requirements. • Keystone would develop a Conservation Plan consistent with the December 2017 **Interior Solicitor's Opinion M-37050** and current applicable USFWS guidance. • If applicable, develop construction timing restrictions and buffer zones through consultation with regulatory agencies. • If construction would occur during the bald or golden eagle nesting season during January to August, complete pre-construction surveys to locate active nest sites. • Installation of sediment barriers immediately after initial disturbance of

Table 8-2. Summary of Resource Protection Measures for the Proposed Action

Resource	Project Phase	Description
		waterbodies or adjacent uplands.
Biological Resources (continued)	Construction	• Maintaining the ROW width and limiting the extent of riparian vegetation loss. • Minimization of grading and grubbing along streambanks. • Minimizing in-stream use of equipment, locating workspaces at least 10 feet from waterbodies to the extent practicable. • Using dry-ditch techniques at crossings where the timing of construction does not adequately protect environmentally sensitive waterbodies, as determined by the appropriate regulatory authority. • Installing BFDs on power lines across and for 0.25 mile on either side of large rivers.
Socioeconomics and Environmental Justice	Construction	• Identifying and documenting routes that would be used for moving materials and equipment, which would minimize potential impacts. • Constructing pipeline crossings of paved roads by boring beneath the roads, allowing traffic activity to continue. • During the construction phase, maintaining roads used for construction in a condition that is safe for both members of the public and the workforce. • After construction is complete, restoring the roads used to their preconstruction conditions or better. • Submitting a road use plan prior to mobilization and coordinating with the appropriate state and county representatives to develop a mutually acceptable plan.
Cultural Resources	Construction and Operations	• Implementation of the existing Programmatic Agreement for the Keystone XL Pipeline along the proposed pipeline route and along new power lines to avoid, if possible, or mitigate adverse effects on eligible historic properties. If impacts to **historic** properties could not be avoided, mitigation plans would be reviewed by the Department and the consulting parties following the protocols outlined in the Programmatic Agreement. • Implementation of an HDD contingency plan to reduce the potential for and effects of a frac-out during an HDD. This would reduce the potential for indirect effects on **historic properties** if present near HDD sites. • Avoidance of direct impacts to Ponca corn by construction during post-harvest or use of alternate construction methods such as boring the planted lands. • Following the terms of the Unanticipated Discoveries Plan should any unanticipated discoveries of **historic properties** be made during construction or operation of the pipeline or power lines.
Greenhouse Gases	Construction	• Controlling speed of all contractor vehicles in work areas and on roads. • Controlling emissions from construction equipment combustion, open burning and temporary fuel transfer systems and associated tanks to the extent required by state and local agencies through the permit process.

BFD = bird flight diverter; BLM = Bureau of Land Management; CFR = Code of Federal Regulations; CMRP = Construction Mitigation and Reclamation Plan; ESA = Endangered Species Act; HDD = horizontal directional drill; MBTA = Migratory Bird Treaty Act; SEIS = Supplemental Environmental Impact Statement; SPCC = Spill Prevention, Control and Countermeasures; ROW = right-of-way; TWA = temporary workspace area; USACE = U.S. Army Corps of Engineers; USFWS = U.S. Fish and Wildlife Service

Table 8-3. Specific Measures for Species Protected under the ESA

Bird: Interior least tern (*Sternula antillarum)*
• Crossings of major rivers and riverine habitat will be completed using HDD, resulting in a pipeline burial depth of 25 feet or greater, regardless of the season. • Keystone will implement measures identified in the HDD contingency plan, including monitoring of the HDD bore, monitoring downstream of the HDD site for evidence of drilling fluids, and mitigation measures should a frac-out occur. • Where practicable, vegetative screening at HDD sites will be maintained to prevent disturbance of interior least terns. • Should HDD activities occur at night, lights will be down-shielded when the site is within 0.25 mile of potentially suitable habitat and vegetative screening is lacking. • Pre-construction presence/probable absence surveys of pipeline crossings will occur within 0.25 mile of potentially suitable breeding habitat at the Platte, Elkhorn, and Niobrara rivers in Nebraska; the Cheyenne River in South Dakota; and the Yellowstone River in Montana during the interior least tern nesting season (April 15 to September 1) to ensure that there are no nesting pairs within 0.25 mile of the construction area. If interior least tern nests are found at the crossings, Keystone will: (1) adhere to a 0.25-mile buffer of no pipeline construction activity and (2) continue to monitor nests if any are within 0.25 mile of the construction footprint until young have fledged. • Daily surveys for nesting terns will be conducted during the nesting season when construction activities occur within 0.25 mile of potential nesting habitat. • If nesting terns are present, Keystone will make minor adjustments to the pipeline corridor, if practicable, to avoid nesting interior least terns, in coordination with USFWS. This may involve shifting the pipeline corridor away from nests to avoid disturbances to interior least tern nests or other modifications depending on the circumstances. • To the extent practicable, construction will occur mostly during daytime hours and will comply with any local noise regulations. • Construction equipment will be properly equipped with mufflers to lessen noise impacts. • Keystone will prepare and implement a project-specific SPCC Plan. • Keystone will mark and maintain a 100-foot buffer from river crossings, free from hazardous materials, fuel storage, and vehicle fuel transfers. These buffers will be maintained during construction except when fueling and refueling the water pump near the river edge, which is required for the HDD crossing and hydrostatic test water withdrawal. Water pump fueling will be completed by trained personnel and will use secondary containment; a spill kit will be onsite. • Refueling and lubrication of construction equipment will occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup will conduct these activities. • All equipment maintenance and repairs will be performed in upland locations at least 100 feet from waterbodies and wetlands. • All equipment will be parked at least 100 feet from a watercourse or wetland overnight, if possible. • Equipment will not be washed in streams or wetlands. • Construction and restoration activities will be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials. • Each construction crew and cleanup crew will have sufficient tools and materials on hand to stop leaks, including supplies of absorbent and barrier materials that will allow for rapid containment and recovery of spilled materials. • Water withdrawal for hydrostatic testing will be less than 10 percent of the baseline daily flow. • Keystone will minimize temporary water reductions by withdrawing only the volume of water needed for hydrostatic testing as outlined in its permits. Water will be returned to its source within a 30-day period except where the hydrostatic test water is used to test multiple spreads. At the conclusion of hydrostatic testing, the remaining water will be returned to the source. • During aerial surveillance, aircraft will maintain at least 1,000 feet of elevation. • If construction of power lines occurs during the interior least tern nesting season, surveys of potentially suitable riverine and/or sand pit nesting habitat within 0.25 mile of new power lines will be conducted within 2 weeks of construction to determine presence of nesting pairs. If nesting interior least terns are present, construction will cease until chicks fledge from the site.

Table 8-3. Specific Measures for Species Protected under the ESA

- **Power providers will install anti-perching measures on all structures within 0.1 mile of either side of the proposed crossings of the Platte, Elkhorn, Niobrara, Cheyenne, Yellowstone, Milk and Missouri rivers.**

Bird: Piping plover (*Charadrius melodus)*

- **Crossings of major rivers and riverine habitat will be completed using HDD, resulting in a pipeline burial depth of 25 feet or greater, regardless of the season.**
- **Keystone will implement measures identified in the HDD contingency plan, including monitoring of the HDD bore, monitoring downstream of the HDD site for evidence of drilling fluids, and mitigation measures should a frac-out occur.**
- **Where practicable, vegetative screening at HDD sites will be maintained to prevent disturbance of piping plovers.**
- **Should HDD activities occur at night, lights will be down-shielded when the site is within 0.25 miles of potentially suitable habitat and vegetative screening is lacking.**
- **Pre-construction presence/probable absence surveys of pipeline crossings will occur within 0.25 mile of potentially suitable breeding habitat at the Platte, Elkhorn, and Niobrara rivers in Nebraska; the Cheyenne River in South Dakota; and the Yellowstone River in Montana during the piping plover nesting season (April 15 to September 1) to ensure that there are no nesting pairs within 0.25 mile of the construction area. If piping plover nests are found at the crossings, Keystone will: (1) adhere to a 0.25-mile buffer of no pipeline construction activity and (2) continue to monitor nests if any are within 0.25 mile of the construction footprint until young have fledged.**
- **Daily surveys for nesting piping plovers will be conducted during the nesting season when construction activities occur within 0.25 mile of potential nesting habitat.**
- **If nesting piping plovers are present, Keystone will make minor adjustments to the pipeline corridor, if practicable, to avoid nesting plovers, in coordination with USFWS. This may involve shifting the pipeline corridor away from nests to avoid disturbances to piping plover nests or other modifications depending on the circumstances.**
- **To the extent practicable, construction within 0.25 mile of a piping plover nest will occur mostly during daytime hours and will comply with any local noise regulations.**
- **Construction equipment will be properly equipped with mufflers to lessen noise impacts.**
- **Keystone will prepare and implement a project-specific SPCC Plan.**
- **Keystone will mark and maintain a 100-foot buffer from river crossings, free from hazardous materials, fuel storage, and vehicle fuel transfers. These buffers will be maintained during construction except when fueling and refueling the water pump near the river edge that is required for the HDD crossing and hydrostatic test water withdrawal. Water pump fueling will be completed by trained personnel and will use secondary containment and a spill kit will be onsite.**
- **Refueling and lubrication of construction equipment will occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup will conduct these activities.**
- **All equipment maintenance and repairs will be performed in upland locations at least 100 feet from waterbodies and wetlands.**
- **All equipment will be parked at least 100 feet from a watercourse or wetland overnight, if possible.**
- **Equipment will not be washed in streams or wetlands.**
- **Construction and restoration activities will be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials.**
- **Each construction crew and cleanup crew will have sufficient tools and materials on hand to stop leaks, including supplies of absorbent and barrier materials that will allow for rapid containment and recovery of spilled materials.**
- **Water withdrawal for hydrostatic testing will be less than 10 percent of the baseline daily flow.**
- **Keystone will minimize temporary water reductions by withdrawing only the volume of water needed for hydrostatic testing as outlined in its permits. Water will be returned to its source within a 30-day period except where the hydrostatic test water is used to test multiple spreads. At the conclusion of hydrostatic testing, the remaining water will be returned to the source.**

Table 8-3. Specific Measures for Species Protected under the ESA

- **During aerial surveillance, aircraft will maintain at least 1,000 feet of elevation.**
- **If construction of power lines occurs during the piping plover nesting season, surveys of potentially suitable riverine and/or sand pit plover nesting habitat within 0.25 mile of new power lines will be conducted within 2 weeks of construction to determine presence of nesting pairs. If nesting plovers are present, construction will cease until all chicks fledge from the site.**
- **Power providers will install anti-perching measures on all structures within 0.1 mile of either side of the proposed crossings of the Platte, Elkhorn, Niobrara, Cheyenne, Yellowstone, Milk and Missouri rivers.**
- **Should potentially suitable breeding or foraging habitat for piping plover be identified near the proposed Project at a later time, power lines near breeding habitat (and within 0.25 mile of each side) and lines that will be built between rivers and sand and gravel mining areas will be marked with BFDs to reduce potential injury or mortality to piping plovers.**
- **Power lines will be routed to avoid construction within 0.50 mile of potentially suitable piping plover nesting habitat in alkali wetlands in Montana.**
- **NorVal Electric Cooperative will install BFDs in all locations where the power line to PS-10 comes within 0.25 mile of either side of the Milk River. Additionally, BFDs will be installed for 0.25 mile on either side of two unnamed reservoirs crossed by the proposed power line to PS-10.**

Bird: Rufa red knot (*Calidris canutus rufa*)

- **Crossings of major rivers and riverine habitat will be completed using HDD, resulting in a pipeline burial depth of 25 feet or greater, regardless of the season.**
- **Keystone will implement measures identified in the HDD contingency plan, including monitoring of the HDD bore, monitoring downstream of the HDD site for evidence of drilling fluids, and mitigation measures should a frac-out occur.**
- **Keystone will prepare and implement a project-specific SPCC Plan.**
- **To the extent practicable, construction will occur mostly during daytime hours and will comply with any local noise regulations.**
- **Construction equipment will be properly equipped with mufflers to lessen noise impacts.**
- **Keystone will mark and maintain a 100-foot buffer from river crossings, free from hazardous materials, fuel storage, and vehicle fuel transfers. These buffers will be maintained during construction except when fueling and refueling the water pump near the river edge that is required for the HDD crossing and hydrostatic test water withdrawal. Water pump fueling will be completed by trained personnel and will use secondary containment and a spill kit will be onsite.**
- **Refueling of lubrication of construction equipment will occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup will conduct these activities.**
- **All equipment maintenance and repairs will be performed in upland locations at least 100 feet from waterbodies and wetlands.**
- **All equipment will be parked at least 100 feet from a watercourse or wetland overnight, if possible.**
- **Equipment will not be washed in streams or wetlands.**
- **Construction and restoration activities will be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials.**
- **Each construction crew and cleanup crew will have sufficient tools and materials on hand to stop leaks, including supplies of absorbent and barrier materials that will allow for rapid containment and recovery of spilled materials.**
- **Water withdrawal for hydrostatic testing will be less than 10 percent of the baseline daily flow.**
- **Keystone will minimize temporary water reductions by withdrawing only the volume of water needed for hydrostatic testing as outlined in their permits. Water will be returned to its source within a 30-day period except where hydrostatic test water is used to test multiple spreads. At the conclusion of hydrostatic testing, the remaining water will be returned to the source.**

Table 8-3. Specific Measures for Species Protected under the ESA

Bird: Whooping crane (*Grus americana*)

- **Crossings of major rivers and riverine habitat will be completed using HDD, resulting in a pipeline burial depth of 25 feet or greater, regardless of the season.**
- **Keystone will implement measures identified in the HDD contingency plan, including monitoring of the HDD bore, monitoring downstream of the HDD site for evidence of drilling fluids, and mitigation measures should a frac-out occur.**
- **Should HDD activities occur at night, lights will be down-shielded during the spring and fall whooping crane migration seasons in areas that provide potentially suitable habitat.**
- **Where practicable, vegetative screening at HDD sites will be maintained to prevent disturbance of whooping cranes.**
- **During spring (March–May) and fall (October–November) whooping crane migration periods, environmental monitors will complete a daily brief survey of any wetland or riverine habitat areas potentially used by whooping cranes in the morning and afternoon before starting equipment and following the Whooping Crane Survey Protocol previously developed by the USFWS and NGPC. If whooping cranes are sighted, the environmental monitor will immediately contact the USFWS and respective state agency in Nebraska, South Dakota, and/or Montana for further instruction and require that all human activity and equipment start-up be delayed. Work could proceed if whooping crane(s) leave the area. The compliance manager will record the sighting, bird departure time, and work start time on the survey form. The USFWS will notify the compliance manager of whooping crane migration locations during the spring and fall migrations through information gathered from the whooping crane tracking program.**
- **Keystone will re-vegetate disturbed areas (particularly within riparian zones and in wetland habitats) in accordance with the CMRP and USACE permit requirements.**
- **Use of helicopters within 0.5 mile of any whooping crane(s) will be prohibited.**
- **Keystone will prepare and implement a project-specific SPCC Plan.**
- **Keystone will mark and maintain a 100-foot buffer from river crossings, free from hazardous materials, fuel storage, and vehicle fuel transfers. These buffers will be maintained during construction except when fueling and refueling the water pump near the river edge that is required for the HDD crossing and hydrostatic test water withdrawal. Water pump fueling will be completed by trained personnel and will use secondary containment and a spill kit will be onsite.**
- **Refueling and lubrication of construction equipment will occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup will conduct these activities.**
- **All equipment maintenance and repairs will be performed in upland locations at least 100 feet from waterbodies and wetlands.**
- **All equipment will be parked at least 100 feet from a watercourse or wetland overnight, if possible.**
- **Equipment will not be washed in streams or wetlands.**
- **Construction and restoration activities will be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials.**
- **Each construction crew and cleanup crew will have sufficient tools and materials on hand to stop leaks, including supplies of absorbent and barrier materials that will allow for rapid containment and recovery of spilled materials.**
- **Water withdrawal for hydrostatic testing will be less than 10 percent of the baseline daily flow.**
- **Keystone will minimize temporary water reductions by withdrawing only the volume of water needed for hydrostatic testing as outlined in its permits. Water will be returned to its source within a 30-day period except where the hydrostatic test water is used to test multiple spreads. At the conclusion of hydrostatic testing, the remaining water will be returned to the source.**
- **During aerial surveillance, aircraft will maintain at least 1,000 feet of elevation.**
- **Should power line routes be adjusted, they will be sited greater than 5 miles from Designated Critical Habitat and/or documented high-use areas.**
- **Power providers will mark new lines within 1 mile of potentially suitable habitat within the 95-percent migration corridor.**

Table 8-3. Specific Measures for Species Protected under the ESA

- Power providers will mark new lines near potentially suitable habitat outside the 95-percent migration corridor at the discretion of the local USFWS Ecological Services Field Office, based on the biological needs of the whooping crane. Thus far, this will include the following:
  - The power line to PS-09 will be marked with BFDs within 0.25 mile of crossings of the Milk River.
  - The power line to PS-10 will be marked with BFDs within 0.25 mile of crossings of the Milk River and within 0.25 mile of two unnamed reservoirs crossed by the line.
  - The power line to PS-12 will be marked with BFDs within 0.25 mile of crossings of the Redwater River and Buffalo Springs Creek.
  - The power line to PS-14 will be marked with BFDs within 0.25 mile of crossings of Pennel Creek and an unnamed pond in the northwest corner of section 35, township 9 north, range 58 east, in Fallon County, Montana.
- Keystone will develop a compliance monitoring plan that requires written confirmation that the power lines have been marked and that the markers are maintained in working condition.
- Power providers will complete daily presence/probable absence surveys in potentially suitable habitat according to the Project's protocol described above if construction occurs during the spring and fall migration periods. Should a whooping crane be sighted within 0.5 mile of a work area, all work will cease until the whooping crane leaves that immediate area. USFWS and NGPC will be contacted immediately and notified of the presence of whooping crane.

Mammal: Black-footed ferret (*Mustela nigripes*)

- Keystone will provide USFWS with the results of Montana prairie dog town surveys and continue to coordinate with the Montana USFWS Ecological Services Office to determine the need for black-footed ferret surveys, in accordance with the USFWS Black-footed Ferret Survey Guidelines.
- Workers will be prohibited from keeping domestic pets in construction camps and/or worksites.
- Workers will be made aware of how canine distemper and sylvatic plague diseases are spread (domestic pets and fleas).
- Workers will be prohibited from feeding wildlife.
- Concentrations of dead and/or apparently diseased animals (prairie dogs, ground squirrels, others) will be reported to the appropriate state and federal agencies.
- Keystone will prepare and implement a Project-specific SPCC Plan.
- Electrical service providers will implement protection measures to minimize raptor perching in accordance with the APLIC, Suggested Practices for Avian Protection on Power Lines.
- Big Flat Electric Cooperative will provide immediate notification to the USFWS in the unlikely event that a black-footed ferret is sighted during construction of the power line to PS-09.

Mammal: Northern long-eared bat *(Myotis septentrionalis)*

- Keystone will implement measures identified in the HDD contingency plan, including monitoring of the HDD bore, monitoring downstream of the HDD site for evidence of drilling fluids, and mitigation measures should a frac-out occur.
- Should HDD activities occur at night, lights will be down-shielded.
- Where practicable, vegetative screening at HDD sites will be maintained to prevent disturbance of northern long-eared bats.
- No tree removal will occur within 0.25 miles of a known occupied hibernaculum.
- No tree removal will occur within 150 feet of a known occupied maternity roost tree during the pup season (June 1 to July 31).
- Pre-construction presence/absence surveys will be completed if there is a need to remove potentially suitable habitat within the proposed action area during the pup season (June 1 to July 31). If required, surveys will be conducted pursuant to local USFWS field office and state resource agency requirements and the need for any additional tree clearing restrictions, if any, will be determined in coordination with applicable state and federal resource agencies pending survey results.
- During aerial surveillance, aircraft will maintain at least 1,000 feet of elevation.
- Keystone will prepare and implement a project-specific SPCC Plan.

Table 8-3. Specific Measures for Species Protected under the ESA

Fish: Pallid sturgeon (*Scaphirhynchus albus*)

- **HDD would be used under the Milk, Missouri, Yellowstone, and Platte rivers.**
- **At least a 100-foot setback from the water's edge for the HDD drill pads would be used at the HDD crossings at the Milk, Yellowstone, Missouri, and Platte rivers.**
- **Potential releases during HDD (frac-outs) would be contained by BMPs that are described within the HDD contingency plans required for drilled crossings.**
- **Broadcast applications of pesticides or herbicides would be avoided within 0.25 mile of water bodies.**
- **Upstream and downstream fish passage would be maintained during any stream habitat disturbance.**
- **The intake end of any water withdrawal pump would be screened with mesh having openings no larger than 0.125 inch, a floating surface intake would be used to avoid the benthic habitat used by the sturgeon; water velocity at the screen would not exceed 12 centimeters per second to prevent entrainment of larval fish, and the intake screens would be periodically checked for fish impingement. Should a sturgeon become impinged against the screen, all pumping operations would immediately cease and the compliance manager for Keystone would immediately contact the USFWS to determine if additional protection measures would be required.**
- **Water withdrawal from the Milk, Missouri, and Yellowstone rivers for any purpose would be avoided from May 15 through July 15 of any year to avoid pallid spawning periods and the impingement and entrainment of free embryos and larval pallid sturgeon that drift with the current during that time of year.**
- **Water withdrawal from the Platte River for any purpose would be avoided March 1 through June 30 of any year to avoid pallid spawning periods and the impingement and entrainment of free embryos and larval pallid sturgeon that drift with the current during that time of year.**
- **Care would be taken during the discharge to prevent erosion or scouring of the waterbody bed and banks to avoid impacts to spawning habitat for the species. Hydrostatic test discharge would be in upland locations near the source of the water. Water would be discharged over several days and through a hay bale apparatus or other velocity reduction and erosion control device.**
- **Temporary water reductions would be avoided based on Keystone's plan to withdraw the volume needed and to return water back to its source within a 30-day period for the Platte River.**
- **Major rivers would be crossed using the HDD method with a pipeline burial depth of 25 feet or greater below the river bed to avoid direct impacts to habitat.**
- **Proposed HDD entry and exit points are more than 600 feet from the Platte River; if these points are changed, at least a 100-foot setback from the water's edge would be maintained.**
- **Measures identified in a required HDD contingency plan would be implemented, including monitoring of the directional drill bore, monitoring downstream for evidence of drilling fluids, and mitigation measures to address a frac-out should one occur.**
- **Major river crossings are subject to an intensive integrity management program stipulated by the USDOT (Integrity Management Rule, 49 CFR 195) and require heavier wall pipe be used for the HDD method**.

Fish: Topeka shiner (*Notropis topeka*)

- **Crossing of Union Creek will be completed using HDD, resulting in a pipeline burial depth of 25 feet or greater.**
- **Keystone will implement measures identified in the HDD contingency plan, including monitoring of the HDD bore, monitoring downstream of the HDD site for evidence of drilling fluids, and mitigation measures should a frac-out occur.**
- **Pre-construction presence/probable absence surveys of Union and Taylor creeks will be completed during the year of construction.**
- **A dry crossing method or HDD will be used if the Topeka shiner is identified during pre-construction surveys.**
- **Keystone will ensure that water required for HDD operations or hydrostatic testing will be sourced from locations without Topeka shiner presence.**
- **Keystone will maintain at least a 100-foot setback from the water's edge for any HDD drill pads, should the HDD method be used.**
- **Keystone will implement BMPs outlined in the CMRP to prevent and minimize sediment runoff from construction areas from entering receiving streams that may provide potentially suitable Topeka shiner habitat.**

Table 8-3. Specific Measures for Species Protected under the ESA

- **Broadcast applications of pesticides or herbicides will be avoided near water bodies.**
- **Keystone will avoid water depletions within occupied river basins.**
- **Upstream and downstream fish passage will be maintained during any stream habitat disturbance.**
- **The intake end of any water withdrawal pump will be screened with mesh having openings no larger than 0.125 inch. Water velocity at the screen will not exceed 0.5 feet per second, and the intake screens will be checked periodically for fish impingement. Should a Topeka shiner become impinged against the screen, all pumping operations will immediately cease and the compliance manager for Keystone will immediately contact the USFWS to determine if additional protection measures will be required. An environmental inspector will be present every day during water withdrawals to ensure compliance with permit conditions and to ensure that Keystone's commitments are met.**

Insect: American burying beetle (*Nicrophorus americanus*)

- **Mowing: The purpose of mowing construction areas is to ensure that the American burying beetle is not attracted to the active construction site. Mowing occurs when the American burying beetle is active, so depending on the ground disturbance timeframe, the period when these procedures will be implemented is from March 15 through October 31, based on NGPC guidance. NGPC recommends mowing construction areas 2 weeks prior to the commencement of ground disturbing activities between these dates. For winter construction activities (October 31 to March 31) mowing would occur by October 15. Mowing and raking away grass clippings allows the ground to dry out. In accordance with NGPC guidance, construction areas will be mowed such that the vegetation is as low as possible without causing erosion (less than 8 inches). Hand clearing or mechanical mowing will be used to mow uplands. Forested uplands will not be cleared ahead of mainline construction and wetlands and streams will also be avoided. This short vegetation height will be maintained for the duration of active construction during the American burying beetle overall active period (until October 31) or until construction in the vicinity is completed, whichever is earlier. Mowing will be completed every 2 weeks, if necessary, to ensure vegetation is kept less than 8 inches tall until grading commences. Once mowed, clippings will be removed. Possible methods include raking, windrowing, or baling. If the grass has stopped growing, or grading commences, mowing can stop. All construction, work vehicles and personal vehicles will be staged in mowed areas. If it is not possible to maintain vegetation under 8 inches in height, construction will avoid such areas until the vegetation can be mowed to less than 8 inches in height. For power line construction in potentially suitable American burying beetle habitat, mowing will be done only in construction areas with soil disturbance (pole installation), as recommended by the USFWS and NGPC. Once mowing procedures have been initiated, weekly reports will be kept and submitted to USFWS, NGPC, and SDGFP. These reports will demonstrate that the conservation measures are being implemented and become part of the records. Weekly reports are only required during the American burying beetle active period (April 1 to October 31) while construction on the project is active. Photos documenting grass heights will be provided.**
- **Carrion removal: Removing carrion (essential for American burying beetle feeding and reproduction) will make the work area less attractive to the American burying beetle. By removing carrion in areas where construction would occur, this ensures that American burying beetle would not be feeding or burying carcasses in an area where they could encounter construction equipment. In accordance with NGPC guidance, the work area will be prepared by removing any and all carcasses prior to construction. Carcasses as small as songbirds, snakes, and rodents are ideal food for the American burying beetle; therefore, this removal activity will be thorough. Carcass removal will occur between March 15 and October 31 or until construction is completed, whichever is earlier. Personnel will survey the ROW daily to remove carrion. Carcass removal can be done at any time throughout the day; however, the preferred timing is in the late afternoon, since the American burying beetle is active at night. This will ensure that American burying beetles are not drawn to the area by roadkill caused by daytime traffic. Disposal of carcasses will be at least 0.5 miles away from the work site. For power line construction in potentially suitable American burying beetle habitat, carrion removal will be done only in construction areas with soil disturbance (pole installation), as recommended by the USFWS and NGPC. Carrion removal reports will be submitted as with the mowing reports. Once carrion removal procedures have been initiated, weekly reports will be kept and submitted to USFWS, NGPC, and SDGFP, as well as the designated Environmental Inspector for filing. These reports demonstrate that the conservation measures are being implemented and become part of the records. Weekly reports are only required during the American burying beetle active period (April 1 to October 31) while construction on the project is active. If the number and species of carrion can be easily identified (for example, deer carcass, bull snake, mouse, etc.), this information will be included in the report. Photo documentation of carrion removed will be provided.**

Table 8-3. Specific Measures for Species Protected under the ESA

- **During the construction phase, most construction activity will take place in daylight hours. Construction activities taking place at night would require artificial lighting and could thereby have an effect on American burying beetle by disruption of normal behavior patterns. Construction at night and the use of lights will be limited to specific situations requiring this activity such as critical tie-ins, HDDs, and during certain weather conditions. Where such activities require lighting, the lights will be down shielded and utilize warm amber-colored lights with a color temperature of 3000 Kelvin or less and intensity no greater than 70,000 lumens. Lighting required for contractor yards and pump stations will also be down shielded, except where required for safety and security, and will utilize sodium vapor or LED lighting meeting the above specifications.**
- **Keystone will implement an education program for construction personnel engaged in the proposed Project. This will include a presentation focused on identifying the American burying beetle, explaining its life history, its current range, and its habitat requirements. Construction personnel will be instructed to report any sightings of American burying beetle or brood chambers if encountered. Education cards will be provided to all construction personnel. Signs will be placed at construction entrances identifying the area as potential American burying beetle habitat.**
- **Immediately following construction, disturbed areas will be ripped to a depth of 24 inches to relieve soil compaction existing at the site from the use of heavy equipment. This effort will improve or enhance American burying beetle habitat by making soils easier for beetles to bury in. Keystone's CMRP provides further details with regard to relief of soil compaction within ROWs following construction.**
- **Erosion control techniques such as silt fencing, hay bales, water bars, and other efforts will be used to prevent washing away of topsoil, formation of gullies, or other erosion that could negatively affect American burying beetle habitat through the action of surface water. Keystone's CMRP provides further details with regard to erosion control following construction.**
- **Immediately following construction, disturbed areas will be temporarily stabilized by broadcasting cool season species such as annual rye grass or wheat seed. Where necessary, clean, weed-free wheat straw will be used as mulch to protect seed and increase soil moisture. These grasses are annual species that senesce when temperatures warm during summer; they will not become permanently established. During the spring, a mixture of native warm season grasses will be planted within the ROW. This will include species such as little bluestem, big bluestem, Indiangrass, and switchgrass. Natural recruitment of other native grasses and forbs will also occur. It should be noted that some portions of the ROW, in response to landowner requirements, will be revegetated using non-native species such as smooth brome. This type of re-vegetation will likely be restricted to areas that are currently dominated by improved grass pastures and will therefore not lead to a reduction of habitat dominated by native species. In the limited circumstance where landowners request re-vegetation of previously native vegetation to non-native vegetation, Keystone will consider this as a permanent effect on habitat and will provide appropriate mitigation for those areas. Keystone's CMRP provides further details with regard to restoration of ROWs following construction.**
- **Keystone is committed to habitat restoration following construction. The American burying beetle monitoring program will provide assurances that the acres disturbed would be restored appropriately. Failure is unlikely due to Keystone's commitment to re-seed in subsequent years if unsuccessful after the first growing season. Criteria for successful reclamation are: 1) reclamation will be measured 4 years after the commencement of construction; 2) for reclamation to be deemed successful, native grasslands restored on the ROW must be comparable to those on adjacent undisturbed lands; 3) 70 percent of the dominant species on the ROW must be the same as those that occur on adjacent off-ROW lands.**
- **WAPA and the power providers would endeavor to reduce the likelihood of American burying beetles occurring in the potentially affected area by mowing vegetation to less than 8 inches in height, removing grass clippings, and inspecting the work area daily to remove all carcasses; these measures would be in force from March 15 through October 31 or until construction in the vicinity is completed, whichever is earlier.**
- **The NPPD and Rosebud Electric Cooperative will schedule power line and switching station construction activities during the American burying beetle dormant or inactive time (October 31 to March 31). The power providers will coordinate with USFWS and NGPC to determine appropriate measures to minimize potential effects if such scheduling cannot be accomplished due to unexpected circumstances, including weather delays.**

Table 8-3. Specific Measures for Species Protected under the ESA

Plant: Western prairie fringed orchid *(Platanthera praeclara)*
• Pre-construction presence/probable absence surveys will be conducted within potentially suitable habitat that was not previously surveyed, including the power line route to PS-21. Survey results will be submitted to the USFWS for review. Species presence will be assumed in potentially suitable habitat if surveys cannot be conducted during the flowering period. • The Project alignment will be adjusted to avoid any identified populations as practicable and/or approved by the landowner. • To the greatest extent practicable, the width of the construction ROW will be reduced in areas where western prairie fringed orchid populations have been identified. • Keystone will develop and implement a noxious and invasive weed control program consistent with the CMRP to reduce the potential for spread or invasion of weeds. • Herbicide application will occur by spot spraying. • Use of herbicides within 100 feet of documented western prairie fringed orchid occurrence will be restricted. • Keystone will minimize the potential for altered hydrology (e.g., surface water flow, infiltration and groundwater levels) in potentially suitable habitat through BMPs outlined in the CMRP. • Keystone will salvage and segregate topsoil appropriately where populations have been identified to preserve native seed sources in the soil for use in revegetation efforts in the ROW. • Keystone will restore wet meadow habitat using a USFWS- and NGPC-approved seed mix. • Potentially suitable wet meadow habitats will be restored following Project construction. • Restoration of construction-related impacts on wet meadow habitats identified as potentially suitable for the western prairie fringed orchid will be monitored for a 5-year period, per USACE guidelines. • Keystone has sited aboveground facilities to avoid potentially suitable western prairie fringed orchid wetland habitat. • Keystone will prepare and implement a project-specific SPCC Plan. • Keystone will mark and maintain a 100-foot buffer from river crossings, free from hazardous materials, fuel storage, and vehicle fuel transfers. These buffers will be maintained during construction except when fueling and refueling the water pump near the river edge that is required for the HDD crossing and hydrostatic test water withdrawal. Water pump fueling will be completed by trained personnel and will use secondary containment and a spill kit will be onsite. • Refueling and lubrication of construction equipment will occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup will conduct these activities. • All equipment maintenance and repairs will be performed in upland locations at least 100 feet from waterbodies and wetlands. • All equipment will be parked at least 100 feet from a watercourse or wetland overnight, if possible. • Equipment will not be washed in streams or wetlands. • Construction and restoration activities will be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials. • Each construction crew and cleanup crew will have sufficient tools and materials on hand to stop leaks, including supplies of absorbent and barrier materials that will allow for rapid containment and recovery of spilled materials. • Water withdrawal for hydrostatic testing will be less than 10 percent of the baseline daily flow. • Keystone will minimize temporary water reductions by withdrawing only the volume of water needed for hydrostatic testing as outlined in its permits. Water will be returned to its source within a 30-day period except where hydrostatic test water is used to test multiple spreads. At the conclusion of hydrostatic testing, the remaining water will be returned to the source. • Pre-construction presence/probable absence surveys will be conducted in potentially suitable habitat along the power line routes to PS-22 through PS-25, during the appropriate flowering period. The NPPD will delineate and designate areas where western prairie fringed orchid habitat is present as "avoidance areas" where placement of structures and construction traffic will not occur.

APLIC = Avian Power Line Interaction Committee; BA = Biological Assessment; BFD = bird flight diverter; CMRP = Construction Mitigation and Reclamation Plan; ESA = Endangered Species Act; HDD = horizontal directional drill; NGPC = Nebraska Game and Parks Commission; NPPD = Nebraska Public Power District; PS = Pump Station; ROW = right-of-way; SDGFP = South Dakota Game Fish and Parks; SEIS = Supplemental Environmental Impact Statement; SPCC = Spill Prevention Control and Countermeasure; USACE = U.S. Army Corps of Engineers; USFWS = U.S. Fish and Wildlife Service; WAPA = Western Area Power Administration

Table 8-4. BLM Sensitive Species, State Protected Species, and Animals and Plants of Conservation Concern

Species	Conservation Measures
Bald eagle (*Haliaeetus leucocephalus*)	• Conduct additional nest/roost surveys within 1 mile of the ROW prior to construction. Aerial surveys (preferably by helicopter) would be conducted between March 1 and May 15, before tree leaf-out to ensure nests are more visible. These aerial surveys would use helicopters instead of fixed-wing aircraft when possible because helicopters have the ability to hover and facilitate ground observations. • Regardless of aircraft, whenever possible, two observers would conduct the surveys. Experienced observers may only find 50 percent of nests on a flight; therefore, two flights would be performed prior to any on-the-ground activities of the proposed Project, including other biological surveys. • Record observations of any eagles and/or nest sites using geographic positioning system equipment. The date, location, nest condition, activity status, raptor species and habitat would be recorded for each sighting. • Submit the biologist(s) qualifications, survey methods, and survey results to the USFWS. • Report the location of any active bald eagle nests identified during nest/roost surveys to the USFWS and appropriate state agencies; if possible, reroute the pipeline to avoid any nests that occur within 600 feet of the proposed ROW. • Maintain a no-disturbance buffer of at least 600 feet around active nests during the nesting season (January 1 through August 15). • Consult with USFWS under the Bald and Golden Eagle Protection Act regarding required buffers and construction activities within 600 feet of active winter roost sites during the winter roosting season (November 1 through April 1) and the ability to conduct construction activities within 600 feet of active winter roosts between 10 a.m. and 3 p.m. • Implement measures in the Montana Bald Eagle Management Plan, if applicable, or apply current guidance from the USFWS. • Restrict construction activities within 0.62 mile of all active territories from March 15 to July 15, including documented sites within 0.5 mile of the proposed Project route on the Missouri River in Montana.
Blacknose shiner (*Notropis heterolepis*)	• Suitable habitat determinations along the route would be made by SDGFP. • Conduct presence/absence surveys if suitable habitat is present. • If surveys results are negative for these minnows, no further conservation measures would be required. • If survey results are positive for these minnows, exclude construction activities during the spawning period (to be provided by SDGFP), and/or salvage and relocate the minnows. • Conduct presence/absence surveys in tributaries of the Niobrara and main stem Elkhorn rivers. • Keystone will re-consult with NGPC to identify additional conservation measures if the species is found in surveyed streams.
Finescale dace (***Chrosomus** neogaeus*)	• Suitable habitat determinations along the route would be made by SDGFP. • Conduct presence/absence surveys if suitable habitat is present. • If surveys results are negative for these minnows, no further conservation measures would be required. • If survey results are positive for these minnows, exclude construction activities during the spawning period (to be provided by SDGFP), and/or salvage and relocate the minnows. • Conduct presence/absence surveys in tributaries of the Niobrara and main stem Elkhorn rivers. • Keystone will re-consult with NGPC to identify additional conservation measures if the species is found in surveyed streams.

Table 8-4. BLM Sensitive Species, State Protected Species, and Animals and Plants of Conservation Concern

Species	Conservation Measures
Golden eagle (*Aquilla chryaetos*)	• Conduct pre-construction raptor surveys prior to March 15. • Restrict construction activity within 0.62 mile of active nests from March 15 to July 15 in Montana.
Greater sage-grouse (*Centrocercus urophasianus*)	• Conduct surveys of greater sage-grouse leks prior to construction using approved methods to determine lek locations and peak number of males in attendance within 3 miles of the facility, unless the facility is screened by topography; also survey leks identified by MFWP, BLM, and SDGFP more than 3 miles from the facility for use as a baseline to determine construction effects on sage-grouse abundance. • Implement the conservation plan developed in coordination with MFWP, Montana Sage-Grouse Habitat Conservation Program, SDGFP, USFWS, and BLM to address impacts to greater sage-grouse, including construction timing restrictions, habitat enhancement, and any mitigation measures that would be necessary to maintain the integrity of designated habitat areas (W**estech** 2017), including lek habitats as well as other important habitat necessary for greater sage-grouse to meet life requisites. • Along power lines necessary to serve the pump stations in Montana, implement the three sage-grouse mitigation plans approved by the Montana Sage-Grouse Oversight Team on December 18, 2018. • For proposed power lines in Montana that would serve Pump Station 9, Pump Station 10 and Pump Station 13, local power providers would implement specific measures to avoid, minimize and mitigate impacts to sagebrush habitat in coordination with the Montana Sage-Grouse Habitat Conservation Program. For one or more of these projects, such measures include considering alternate routes, burying distribution lines, observing seasonal stipulations for construction activities, installing poles to minimize disturbance to sagebrush cluster locations, using non-nest supporting poles and conducting monthly inspections for avian impacts. • For proposed power lines in Montana that would serve Pump Station 9 and Pump Station 10, local power providers would compensate for residual impacts to habitat by completing habitat credit projects approved through the Montana Mitigation System, by obtaining credits from other entities, or by making in lieu fee payments to the State of Montana Greater Sage-Grouse Stewardship Fund. • Follow all protection and mitigation efforts as identified by USFWS, MFWP, and SDGFP including identify all greater sage-grouse leks within the buffer distances from the construction ROW set forth for the greater sage-grouse by USFWS, and avoid or restrict construction activities as specified by USFWS within buffer zones between March 1 and June 15, unless the facility is screened by topography. • Prohibit construction during March 1 to June 15 within 3 miles of active greater sage-grouse leks in suitable nesting habitat not screened by topography, with an allowance made for onetime equipment movement during midday hours through ROW areas with a timing restriction that does not require grading for equipment passage to lessen disturbance to greater sage-grouse leks. • Prohibit construction within 2 miles of active greater sage-grouse leks on federal land during March 1 to June 15. • Reduce the mound left over the trench in areas where settling would not present a path for funneling runoff down slopes in sagebrush habitat; additional measures would be taken to compact backfilled spoils to reduce settling. • TransCanada would make an in lieu fee payment to the State of Montana Greater Sage-Grouse Stewardship Fund for $761,519 for a habitat conservation project, according to a plan approved by the Montana Sage-Grouse Oversight Team on September 14, 2018. • Limit inspection over-flights to afternoons from March 1 to June 15 during operations as practicable in sagebrush habitat designated by MFWP.

Table 8-4. BLM Sensitive Species, State Protected Species, and Animals and Plants of Conservation Concern

Species	Conservation Measures
Greater sage-grouse (*Centrocercus urophasianus*) (continued)	• Fund a 4-year study under the direction of MDEQ, MFWP, and BLM that would show whether the presence of the facility has affected greater sage-grouse numbers based on the peak number of male sage-grouse in attendance at leks. • Implement restoration measures (i.e., application of mulch or compaction of soil after broadcast seeding, and reduced seeding rates for non-native grasses and forbs) that favor the establishment of silver sagebrush and big sagebrush in disturbed areas where compatible with the surrounding land use and habitats unless otherwise requested by the affected landowner. • Prior to construction, conduct studies along the route to identify areas that support stands of silver sagebrush and big sagebrush and incorporate these data into restoration activities to prioritize reestablishment of sagebrush communities. • Monitor and report on establishment of sagebrush on reclaimed areas, unless otherwise requested by the landowner, annually for at least 4 years to ensure that sagebrush plants become established at densities similar to densities in adjacent sagebrush communities, and implement additional sagebrush seeding or planting if necessary. • Establish criteria in conjunction with MDEQ, MFWP, and BLM to determine when restoration of sagebrush communities has been successful based on pre- and post-construction studies in addition to revegetation standards. • Use locally adapted sagebrush seed collected within 100 miles of the areas to be reclaimed, unless otherwise requested by the affected landowner (seed would be collected as close to the proposed Project as practicable as determined by regional seed production and availability). • Monitor cover and densities of native forbs and perennial grasses exclusive of noxious weeds on reclaimed areas and reseed with native forbs and grasses where densities are not comparable to adjacent communities. • Work in conjunction with the landowner to appropriately manage livestock grazing of reclaimed areas until successful restoration of sagebrush communities has been achieved (livestock grazing in restored sagebrush communities may promote establishment of sagebrush). • Implement measures to reduce or eliminate colonization of reclaimed areas by noxious weeds and invasive annual grasses such as cheatgrass to the extent that these plants do not exist in undisturbed areas adjacent to the ROW (noxious weed management plans would be developed and reviewed by appropriate county weed specialists and land management agencies for each state crossed by the proposed Project). • Establish a compensatory mitigation fund in consultation with SDGFP, managed by a third party, for temporary and permanent impacts to greater sage-grouse habitat. The fund would be used by SDGFP to enhance and preserve sagebrush communities within the sagebrush ecosystem in South Dakota, which is found within the following counties: Butte, Custer, Fall River, Harding, Perkins, and Meade counties. • As part of the compensatory mitigation fund, implement a research fund in consultation with SDGFP, which would be managed by a third party to evaluate the effects of pipeline construction on greater sage-grouse. • Monitor leks that are within 3 miles of the proposed Project footprint in South Dakota and are within the viewshed of the construction ROW if construction were to take place between March 1 and June 15. • In consultation with SDGFP, implement a modified 3-mile buffer between March 1 and June 15 around active greater sage-grouse leks. The buffer would be modified on a lek-by lek basis to account for differences in topography, habitat, existing land uses, proximity of the proposed Project to the lek, and line-of-sight between the proposed Project and each lek. • Restrict construction equipment activity in South Dakota to occur only between 10 a.m. and 2 p.m. to avoid impacts to breeding greater sage-grouse from March 1 through June 15 in areas where a lek is either within 3 miles of the ROW and visible from the ROW or within 1 mile of the ROW.

Table 8-4. BLM Sensitive Species, State Protected Species, and Animals and Plants of Conservation Concern

Species	Conservation Measures
Massasauga (*Sistrurus catenatus*)	• Complete surveys of suitable habitats to identify areas potentially containing the massasauga along the proposed Project route in Jefferson County, Nebraska, to clear the area for the massasauga prior to construction. • Continue consultations with the NGPC. • Locate the power line to Pump Station 26 in Jefferson County, Nebraska next to a road.
Mountain plover (*Charadrius montanus*)	• Prohibit construction, reclamation, and other ground disturbing activities from April 10 to July 10 to minimize destruction of nests and disturbance of breeding mountain plovers unless surveys consistent with the Plover Guidelines or other methods approved by the USFWS find that no plovers are nesting in the area. Potential mountain plover habitat must be surveyed three times between April 10 and July 10, with each survey separated by at least 14 days. The earlier date will facilitate detection of early-breeding plovers. • Schedule routine maintenance activities outside the April 10 to July 10 period in mountain plover nesting habitat unless surveys were conducted that indicate that no plovers were nesting in the area and that flightless chicks were not present. • Delay construction activities within 0.25 mile of active nests for 37 days (i.e., the typical incubation and fledging duration) or until fledging, whichever is sooner. • Delay construction activities in the vicinity of a brood of flightless chicks for at least 7 days or until fledging, whichever is sooner.
Northern redbelly dace (***Chrosomus** eos*)	• Suitable habitat determinations along the route would be made by SDGFP. • Conduct presence/absence surveys if suitable habitat is present. • If surveys results are negative for these minnows, no further conservation measures would be required. • If survey results are positive for these minnows, exclude construction activities during the spawning period (to be provided by SDGFP), and/or salvage and relocate the minnows. • Conduct presence/absence surveys in tributaries of the Niobrara and main stem Elkhorn rivers. • Keystone will re-consult with NGPC to identify additional conservation measures if the species is found in surveyed streams.
Northern Pearl dace (***Margariscus nachtriebi***)	• Suitable habitat determinations along the route would be made by SDGFP. • Conduct presence/absence surveys if suitable habitat is present. • If surveys results are negative for these minnows, no further conservation measures would be required. • If survey results are positive for these minnows, exclude construction activities during the spawning period (to be provided by SDGFP), and/or salvage and relocate the minnows. • Conduct presence/absence surveys in tributaries of the Niobrara and main stem Elkhorn rivers. • Keystone will re-consult with NGPC to identify additional conservation measures if the species is found in surveyed streams.
River otter (*Lontra Canadensis*)	• Conduct river otter surveys prior to proposed Project construction along the Bad River, the White River, and the Cheyenne River in South Dakota and along the Niobrara River, the Loup River, the main stem of the Elkhorn River, and the Platte River in Nebraska (if suitable den habitat occurs near the river crossings and if construction would occur during the denning period). • Restrict construction activities within one-quarter mile of active natal dens. • Use the HDD method to cross under all of the rivers identified as potentially supporting river otters. This would avoid impacts to shoreline habitats that could potentially be used by denning river otters.

Table 8-4. BLM Sensitive Species, State Protected Species, and Animals and Plants of Conservation Concern

Species	Conservation Measures
Sicklefin chub (*Macrhybopsis meeki*)	• Suitable habitat determinations along the route would be made by SDGFP. • Conduct presence/absence surveys if suitable habitat is present. • If surveys results are negative for these minnows, no further conservation measures would be required. • If survey results are positive for these minnows, exclude construction activities during the spawning period (to be provided by SDGFP), and/or salvage and relocate the minnows. • Conduct presence/absence surveys in tributaries of the Niobrara and main stem Elkhorn rivers. • Keystone will re-consult with NGPC to identify additional conservation measures if the species is found in surveyed streams.
Small white lady's slipper (*Cypripedium candidum*)	• Conduct presence/absence surveys within suitable habitat prior to the proposed Project construction in Antelope, Boyd, Holt, Keya Paha, Nance, and Merrick counties in Nebraska. If this plant is observed within the proposed Project ROW in Nebraska, appropriate mitigation measures would be developed and implemented in consultation with the NGPC.
Sprague's pipit (*Anthus spragueii*)	• Seed disturbance areas in native range with native seed mix after topsoil replacement. • Monitor the ROW to determine the success of revegetation after the first growing season and, for areas in which vegetation has not been successfully re-established, reseed the area. • Control unauthorized off-road vehicle access to the construction ROW through the use of signs; fences with locking gates; slash and timber barriers, pipe barriers, or boulders lined across the construction ROW; or plant conifers or other appropriate trees or shrubs in accordance with landowner or manager request. • Develop and implement a migratory bird conservation plan in consultation USFWS, consistent with the MBTA and the Bald and Golden Eagle Protection Act and consistent with provisions of Executive Order 13186. The conservation plan would include avoidance and mitigation measures for migratory birds and bald and golden eagles and their habitats within the states where the proposed Project would be constructed, operated, and maintained. • If construction would occur during the April 15 to July 15 grassland ground-nesting bird nesting season, complete nest-drag surveys to determine the presence or absence of nests on federal land in eastern Montana. • Delay construction activity from April 15 to July 15 within 330 feet of discovered active nests in eastern Montana (MDEQ and MFWP).
Sturgeon chub (*Macrybopsis gelida*)	• Suitable habitat determinations along the route would be made by SDGFP. • Conduct presence/absence surveys if suitable habitat is present. • If surveys results are negative for these minnows, no further conservation measures would be required. • If survey results are positive for these minnows, exclude construction activities during the spawning period (to be provided by SDGFP), and/or salvage and relocate the minnows.

Table 8-4. BLM Sensitive Species, State Protected Species, and Animals and Plants of Conservation Concern

Species	Conservation Measures
Swift fox (*Vulpes velox*)	• Revegetate the ROW to support small mammal and insect prey. • Conduct surveys of potential den sites on federal land and within suitable habitat in the proposed Project footprint in South Dakota. • Restrict construction activities within one-quarter mile of active natal dens between April 1 and August 31. • Conduct surveys of potential den sites between February 15 and July 31 in suitable habitat in the proposed Project footprint Phillips, Valley, Prairie, Dawson, and Fallon counties in Montana (MDEQ and MFWP). • Restrict construction activities within 0.31 mile of active dens from February 15 to July 31 in Montana on state or federal land (MDEQ and MFWP).

BLM = Bureau of Land Management; HDD = horizontal directional drill; MBTA = Migratory Bird Treaty Act; MDEQ = Montana Department of Environmental Quality; MFWP = Montana Fish, Wildlife, and Parks; NGPC = Nebraska Game and Parks Commission; ROW = right-of-way; SDGFP = South Dakota Department of Game, Fish, and Parks; USFWS = U.S. Fish and Wildlife Service

Table 8-5. Summary of Resource Protection Measures for the Proposed Electrical Power Infrastructure

Resource	Description
Land Use and Recreation	• **If construction is planned for agricultural areas, measures would be taken to avoid or minimize crop damage, restore the disturbed land to its prior condition, and to compensate landowners for any damages.** • **In accordance with BLM requirements, each power line that crosses BLM-managed lands would submit a BLM-Specific Construction, Mitigation, and Reclamation Plan.** • **Where the power infrastructure associated with pump stations would cross federal lands, required mitigation measures would be followed according to current land or forest management plans.** • **Power providers would attempt to route power infrastructure along existing linear corridors such as existing power lines, roadways, fence lines, field lines, parcel boundaries, or section lines to reduce impacts to land use and visual resources.**
Soils	• **To minimize soil impacts, work would be restricted during wet conditions to minimize rutting; compaction would be relieved by disking, chiseling or ripping; stones would be removed; topsoil or soil amendments may be added; and industry standard soil erosion and sedimentation controls would be used.**
Air Quality	• **Power providers will comply with all applicable state regulations and local ordinances with respect to truck transportation and fugitive dust emissions.**
Noise	• **Construction equipment would be properly equipped with mufflers to lessen noise impacts.**

Table 8-5. Summary of Resource Protection Measures for the Proposed Electrical Power Infrastructure

Resource	Description
Water Resources	• To minimize impacts on surface water, industry standard soil erosion and sedimentation controls would be used during construction. • When feasible, power pole structures would be located outside of wetlands, waterbodies, and floodplains. • In areas with a shallow water table, power pole structures would be installed using caissons to prevent poles from contacting groundwater. • After a flood event, power pole structures would be inspected in floodplains and accumulated debris would be removed. • Refueling and lubrication of construction equipment would occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup would conduct these activities. • All equipment maintenance and repairs would be performed in upland locations at least 100 feet from waterbodies and wetlands. • All equipment would be parked at least 100 feet from a watercourse or wetland overnight, where possible. • Equipment would not be washed in streams or wetlands. • Broadcast applications of pesticides or herbicides would be avoided within 0.25 miles of water bodies.
Wetlands	• When feasible, power pole structures would be located outside of wetlands, waterbodies, and floodplains. • Refueling and lubrication of construction equipment would occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup would conduct these activities. • All equipment maintenance and repairs would be performed in upland locations at least 100 feet from waterbodies and wetlands. • All equipment would be parked at least 100 feet from a watercourse or wetland overnight, where possible. • Equipment would not be washed in streams or wetlands. • Wetlands affected by construction activities, if any, would be restored to the extent practicable. • Construction in wetland areas would utilize protective matting or be restricted to frozen conditions to help minimize rutting. • Emergent wetlands would be allowed to persist within the permanent ROW outside of access roads and power pole structure locations.
Terrestrial Vegetation	• During the construction phase, equipment and support vehicles would be power washed before entering or leaving a work area where noxious weeds are present. • If noxious or invasive plant species are detected in the ROW at any time during the life of the proposed Project and connected actions, the appropriate local weed and pest control agency would be contacted to ensure that proper methods are used for eradication of the noxious or invasive plants. • Herbicides would not be applied broadly to the ROW, but could be applied to individual tree stumps to eliminate re-sprouting.

Table 8-5. Summary of Resource Protection Measures for the Proposed Electrical Power Infrastructure

Resource	Description
Wildlife	• Workers would be prohibited from feeding wildlife. • Workers would be prohibited from keeping domestic pets at worksites. • Concentrations of dead and/or apparently diseased animals (prairie dogs, ground squirrels, others) would be reported to the appropriate state and federal agencies. • To the extent practicable, construction would occur during daytime hours and comply with any local noise regulations. • Construction equipment would be properly equipped with mufflers to lessen noise impacts. • Construction within identified big game habitat priority areas would be avoided from December 1 to May 15 of each year. This measure would be mandatory on all BLM-managed lands and may be implemented on other portions of the proposed infrastructure, as well. • Perch deterrents would be installed under certain circumstances where the structure configuration allows and risk to wildlife from increased avian predation would be high.
Protected and Special Status Species[a]	• The power provider for PS-09 would provide immediate notification to the USFWS in the unlikely event that a black-footed ferret is sighted during construction of the power line to PS-09. • Workers would be prohibited from keeping domestic pets at worksites. • Workers would be informed of how canine distemper and sylvatic plague diseases are spread (namely, domestic pets and fleas). • Workers would be prohibited from feeding wildlife. • Concentrations of dead and/or apparently diseased animals (prairie dogs, ground squirrels, others) would be reported to the appropriate state and federal agencies. • Power providers would implement protection measures to minimize raptor perching in accordance with the Avian Power Line Interaction Committee (APLIC) Suggested Practices for Avian Protection on Power Lines (APLIC 1996, 2012). • Power providers would install anti-perching measures on all structures within 0.1 mile of either side of the proposed crossings of the Platte, Elkhorn, Niobrara, Cheyenne, Yellowstone, Milk and Missouri rivers. • For the power infrastructure that would serve PS-14, the power provider would install perch discouragers on the structures as requested by MTFWP to minimize raptor use of structures to prey on sage grouse. • To the extent practicable, construction would occur during daytime hours and comply with any local noise regulations. • Construction equipment would be properly equipped with mufflers to lessen noise impacts. • A 100-foot buffer from river crossings, free from hazardous materials, fuel storage, and vehicle fuel transfers would be marked and maintained. • Refueling and lubrication of construction equipment would occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup would conduct these activities. • All equipment maintenance and repairs would be performed in upland locations at least 100 feet from waterbodies and wetlands.

Table 8-5. Summary of Resource Protection Measures for the Proposed Electrical Power Infrastructure

Resource	Description
Protected and Special Status Species (continued)	• **All equipment would be parked at least 100 feet from a watercourse or wetland overnight, where possible.** • **Equipment would not be washed in streams or wetlands.** • **Construction and restoration activities would be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials.** • **Each construction crew and cleanup crew would have sufficient tools and materials on hand to stop leaks, including supplies of absorbent and barrier materials that would allow for rapid containment and recovery of spilled materials.** • **If construction of power lines occurs during the interior least tern or piping plover nesting season, surveys of potentially suitable riverine and/or sand pit nesting habitat within 0.25 mile of new power lines would be conducted within 2 weeks of construction to determine presence of nesting pairs. If nesting interior least terns or piping plovers are present, construction would cease until chicks fledge from the site.** • **The power provider for PS-09 would provide immediate notification to the USFWS in the unlikely event that a black-footed ferret is sighted during construction of the power line to PS-09.** • **Workers would be prohibited from keeping domestic pets at worksites.** • **Workers would be informed of how canine distemper and sylvatic plague diseases are spread (namely, domestic pets and fleas).** • **Workers would be prohibited from feeding wildlife.** • **Concentrations of dead and/or apparently diseased animals (prairie dogs, ground squirrels, others) would be reported to the appropriate state and federal agencies.** • **Power providers would implement protection measures to minimize raptor perching in accordance with the Avian Power Line Interaction Committee (APLIC) Suggested Practices for Avian Protection on Power Lines (APLIC 1996, 2012).** • **Power providers would install anti-perching measures on all structures within 0.1 mile of either side of the proposed crossings of the Platte, Elkhorn, Niobrara, Cheyenne, Yellowstone, Milk and Missouri rivers.** • **For the power infrastructure that would serve PS-14, the power provider would install perch discouragers on the structures as requested by MTFWP to minimize raptor use of structures to prey on sage grouse.** • **To the extent practicable, construction would occur during daytime hours and comply with any local noise regulations.** • **Construction equipment would be properly equipped with mufflers to lessen noise impacts.** • **A 100-foot buffer from river crossings, free from hazardous materials, fuel storage, and vehicle fuel transfers would be marked and maintained.** • **Refueling and lubrication of construction equipment would occur in uplands and greater than 100 feet from streams and wetlands. Where this is not possible, designated personnel with special training in refueling, spill containment, and cleanup would conduct these activities.** • **All equipment maintenance and repairs would be performed in upland locations at least 100 feet from waterbodies and wetlands.** • **All equipment would be parked at least 100 feet from a watercourse or wetland overnight, where possible.**

Table 8-5. Summary of Resource Protection Measures for the Proposed Electrical Power Infrastructure

Resource	Description
Protected and Special Status Species (continued)	• Equipment would not be washed in streams or wetlands. • Construction and restoration activities would be conducted to allow for prompt and effective cleanup of spills of fuel and other hazardous materials. • Each construction crew and cleanup crew would have sufficient tools and materials on hand to stop leaks, including supplies of absorbent and barrier materials that would allow for rapid containment and recovery of spilled materials. • If construction of power lines occurs during the interior least tern or piping plover nesting season, surveys of potentially suitable riverine and/or sand pit nesting habitat within 0.25 mile of new power lines would be conducted within 2 weeks of construction to determine presence of nesting pairs. If nesting interior least terns or piping plovers are present, construction would cease until chicks fledge from the site. • During spring (March–May) and fall (October–November) whooping crane migration periods, environmental monitors would complete a brief daily survey of any wetland or riverine habitat areas potentially used by whooping cranes in the morning and afternoon before starting equipment and following the Whooping Crane Survey Protocol previously developed by the USFWS and NGPC (USFWS 2017). If whooping cranes are sighted, the environmental monitor would immediately contact the USFWS and respective state agency in Nebraska, South Dakota, and/or Montana for further instruction and require that all human activity and equipment start-up be delayed. Work could proceed if whooping crane(s) leave the area. The compliance manager would record the sighting, bird departure time, and work start time on the survey form. The USFWS would notify the compliance manager of whooping crane migration locations during the spring and fall migrations through information gathered from the whooping crane tracking program. • Disturbed areas, as applicable, would be re-vegetated (particularly within riparian zones and in wetland habitats). • Use of helicopters within 0.5 mile of any whooping crane(s) would be prohibited. • Should power line routes be adjusted, they would be sited greater than 5 miles from Designated Critical Habitat and/or documented high-use areas for whooping cranes. • Power providers would mark new lines within 1 mile of potentially suitable habitat within the whooping crane 95 percent migration corridor. • Power providers would mark new lines near potentially suitable whooping crane habitat outside the 95-percent migration corridor at the discretion of the local USFWS Ecological Services Field Office, based on the biological needs of the whooping crane. Thus far, this would include the following: (1) The power line to PS-09 would be marked with BFDs within 0.25 mile of crossings of the Milk River. (2) The power line to PS-10 would be marked with BFDs within 0.25 mile of crossings of the Milk River and within 0.25 mile of two unnamed reservoirs crossed by the line. (3) The power line to PS-12 would be marked with BFDs within 0.25 mile of crossings of the Redwater River and Buffalo Springs Creek. (4) The power line to PS-14 would be marked with BFDs within 0.25 mile of crossings of Pennel Creek and an unnamed pond in the northwest corner of section 35, township 9 north, range 58 east, in Fallon County, Montana. • For the power infrastructure that would serve pump stations in Nebraska, the power provider(s) would complete a field review with the USFWS and NGPC to determine if any areas are present with a higher probability of whooping crane use (i.e., wetlands or large ponded areas (stock ponds), meadows, and obvious flight corridors to and from such areas to feeding habitats). The power provider(s) would install spiral BFDs, consistent with APLIC standards, in appropriate areas as identified during the field review.

Table 8-5. Summary of Resource Protection Measures for the Proposed Electrical Power Infrastructure

Resource	Description
Protected and Special Status Species (Continued)	• **For the power infrastructure that would serve pump stations in Nebraska, the power provider(s) would install spiral BFDs on the shield wire on the line span between the banks at the Platte River crossing and one span on each side of the crossing.** • **Should potentially suitable breeding or foraging habitat for piping plover be identified near the proposed infrastructure at a later time, power lines near breeding habitat (and within 0.25 mile of each side) and lines that would be built between rivers and sand and gravel mining areas would be marked with BFDs to reduce potential injury or mortality to piping plovers.** • **Keystone would develop a compliance monitoring plan that requires written confirmation that the power lines have been marked and that the markers are maintained in working condition.** • **Broadcast applications of pesticides or herbicides would be avoided within 0.25 miles of water bodies.** • **No tree removal would occur within 0.25 miles of a known occupied northern long-eared bat hibernaculum.** • **No tree removal would occur within 150 feet of a known occupied northern long-eared bat roost tree during the pup season (June 1-July 31)** • **Pre-construction presence/absence surveys would be completed if there is a need to remove trees during the northern long-eared bat pup season.** • **Should power line routes be adjusted, they would be routed to avoid construction within 0.50 mile of potentially suitable piping plover nesting habitat in alkali wetlands in Montana.** • **Along power lines necessary to serve the pump stations in Montana, the three sage-grouse mitigation plans approved by the Montana Sage-Grouse Oversight Team on December 18, 2018, would be implemented.** • **For proposed power lines in Montana that would serve PS-09, PS-10 and PS-13, local power providers would implement specific measures to avoid, minimize, and mitigate impacts to sagebrush habitat in coordination with the Montana Sage-Grouse Habitat Conservation Program. For one or more of these projects, such measures include considering alternate routes, burying distribution lines, observing seasonal stipulations for construction activities, installing power pole structures to minimize disturbance to sagebrush cluster locations, using non-nest supporting poles and conducting monthly inspections for avian impacts.** • **For proposed power lines in Montana that would serve PS-09 and PS-10, local power providers would compensate for residual impacts to habitat by completing habitat credit projects approved through the Montana Mitigation System, by obtaining credits from other entities, or by making in lieu fee payments to the State of Montana Greater Sage-Grouse Stewardship Fund.** • **Local power providers would implement measures developed in coordination with Keystone and the USFWS regarding ways to minimize or mitigate impacts on the greater sage-grouse and threatened and endangered species from the proposed infrastructure, per Keystone's mitigation plan for the greater sage-grouse.**

Table 8-5. Summary of Resource Protection Measures for the Proposed Electrical Power Infrastructure

Resource	Description
Protected and Special Status Species (continued)	• For the power infrastructure that would serve PS-14, the power provider would work with Keystone to avoid any construction of the electric transmission line from March 1 to June 15. However, if construction is projected to occur during the period of March 1 to June 15 within three miles of active greater sage-grouse leks that are not screened by topography or that are within suitable nesting habitat regardless of screening, the power provider would avoid construction within 1 mile of leks from 8 pm until 2 hours after sunrise the following day on a daily basis and monitor active leks (displaying males) within three miles of the project during construction between March I and June 15. The power provider would contact the USFWS to obtain additional guidance if construction-related disturbance of lekking sage grouse is noted. • For the power infrastructure that would serve PS-14, the power provider would, where approved by landowners, control unauthorized off-road vehicle access to the construction ROW through the use of signs; fences with locking gates; slash and timber barriers, pipe barriers, or boulders lined across the construction ROW; or plant conifers of other appropriate trees or shrubs in accordance with landowner or manager request where such planting would not diminish the quality of adjacent Sprague's pipit habitat. • For the power infrastructure that would serve pump stations in Nebraska, the power provider(s) would complete field surveys for the western prairie fringed orchid and small white lady's slipper during the appropriate bloom periods only in areas along the final line routes that are considered "suitable" habitat. The power provider(s) would delineate and mark areas where either species is observed as "avoidance areas" where placement of structures and construction traffic would not occur. • Pre-construction presence/probable absence surveys would be conducted within potentially suitable western prairie fringed orchid habitat that was not previously surveyed, including the power line route to PS-21. Survey results would be submitted to the USFWS for review. Presence of this species would be assumed in potentially suitable habitat if surveys cannot be conducted during the flowering period. • Power Line alignments would be adjusted to avoid any identified populations of western prairie fringed orchid as practicable and/or approved by the landowner. • To the greatest extent practicable, the width of the construction ROW would be reduced in areas where western prairie fringed orchid populations have been identified. • A noxious and invasive weed control program would be developed and implemented to reduce the potential for spread or invasion of weeds. • Herbicide application would occur by spot spraying only. • Use of herbicides within 100 feet of documented western prairie fringed orchid occurrence would be restricted. • Potentially suitable wet meadow habitats disturbed by construction, if any, would be restored using a USFWS- and NGPC-approved seed mix following construction. • Restoration of construction-related impacts on wet meadow habitats identified as potentially suitable for the western prairie fringed orchid, if any, would be monitored for a 5-year period, per USACE guidelines. • Pre-construction presence/probable absence surveys for western prairie fringed orchid would be conducted in potentially suitable habitat along the power line routes to PS-22 through PS-25, during the appropriate flowering period. The power provider(s) would delineate and mark areas where western prairie fringed orchid habitat is present as "avoidance areas" where placement of structures and construction traffic would not occur.

Table 8-5. Summary of Resource Protection Measures for the Proposed Electrical Power Infrastructure

Resource	Description
Protected and Special Status Species (continued)	• Power Line alignments would be adjusted to avoid any identified populations of western prairie fringed orchid as practicable and/or approved by the landowner. • To the greatest extent practicable, the width of the construction ROW would be reduced in areas where western prairie fringed orchid populations have been identified. • A noxious and invasive weed control program would be developed and implemented to reduce the potential for spread or invasion of weeds. • Herbicide application would occur by spot spraying only. • Use of herbicides within 100 feet of documented western prairie fringed orchid occurrence would be restricted. • Potentially suitable wet meadow habitats disturbed by construction, if any, would be restored using a USFWS- and NGPC-approved seed mix following construction. • Restoration of construction-related impacts on wet meadow habitats identified as potentially suitable for the western prairie fringed orchid, if any, would be monitored for a 5-year period, per USACE guidelines. • Pre-construction presence/probable absence surveys for western prairie fringed orchid would be conducted in potentially suitable habitat along the power line routes to PS-22 through PS-25, during the appropriate flowering period. The power provider(s) would delineate and mark areas where western prairie fringed orchid habitat is present as “avoidance areas” where placement of structures and construction traffic would not occur. • The NPPD and Rosebud Electric Cooperative would schedule power line and switching station construction activities during the American burying beetle dormant or inactive time (October 31 to March 31). The power providers would coordinate with USFWS and NGPC to determine appropriate measures to minimize potential effects if such scheduling cannot be accomplished due to unexpected circumstances, including weather delays. • WAPA would follow a set of standard construction and mitigation practices; these practices would be mandatory on portions of the power infrastructure involving WAPA. • WAPA and the power providers for PS-20, PS-21, and PS-22 would endeavor to reduce the likelihood of American burying beetles occurring in the potentially affected area by mowing vegetation to less than 8 inches in height, removing grass clippings, and inspecting the work area daily to remove all carcasses; these measures would be in force from March 15 through October 31 or until construction in the vicinity is completed, whichever is earlier.
Visual Resources	• Power providers would attempt to route power infrastructure along existing linear corridors such as existing power lines, roadways, fence lines, field lines, parcel boundaries, or section lines to reduce impacts to land use and visual resources. • Strategic structure placement and varying structure type (e.g., lattice, H-frame, or single-pole) and material (e.g., wood, steel, or weathered steel) would be considered to reduce potential impacts to visual resources. • Where feasible, power lines would be collocated on the same structures to consolidate infrastructure.
Socioeconomics and Environmental Justice	• A program that would include inspection of roadways and roadway structures, repair of damage that may occur to those facilities, establishment of an approved Traffic Management Plan, and coordination with state and local transportation agencies would be implemented. Before construction begins, contractors would develop detailed traffic plans that address all applicable laws, regulations, and ordinances.

Table 8-5. Summary of Resource Protection Measures for the Proposed Electrical Power Infrastructure

Resource	Description
Cultural Resources	• If impacts on NRHP-eligible properties could not be avoided, mitigation plans will be developed and implemented. • Whenever feasible, known cultural resources would be avoided, impacts would be minimized when avoidance is not possible, and impacts would be mitigated when minimization is not sufficient. In addition, Unanticipated Discovery Plans would be implemented to ensure minimization of impacts on unknown cultural resources that may be inadvertently encountered during construction or operation of the proposed infrastructure. • For the power infrastructure that would serve PS-14, PS-22, PS-23, PS-23B, PS-24, PS-25, and PS-26, power providers would provide an opportunity for SHPO(s) and consulting Indian tribes and other interested parties to review and comment on the proposed power infrastructure. • For the power infrastructure that would serve PS-14, field surveys of all remaining areas would be completed and consultation with Montana SHPO would occur before construction. Prior to construction, any known sites would be marked to avoid adverse impacts on sites.

a. Protected and Special Status Species in relation to the electrical power and infrastructure include species protected under the ESA, the MBTA, and the Bald and Golden Eagle Protection Act, as well as BLM and state-specific regulations.

APLIC = Avian Power Line Interaction Committee; BA = Biological Assessment for the Keystone XL Project; BFD = Bird Flight Diverter; BLM = Bureau of Land Management; DR = Data Request to Keystone; HDD = horizontal directional drill; MDEQ = Montana Department of Environmental Quality; MTFWP = Montana Department of Fish, Wildlife and Parks; NGPC = Nebraska Game and Parks Commission; NHPA = National Historic Preservation Act; PS = Pump Station; SEIS = Supplemental Environmental Impact Statement; SHPO = State Historic Preservation Office; USFS = U.S. Forest Service; USFWS = U.S. Fish and Wildlife Service

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9 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

9.1 INTRODUCTION

Irreversible or irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources would have on future generations. Irreversible effects primarily result from use or destruction of a specific resource (e.g., energy from hydrocarbons and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored after implementing a Proposed Action (e.g., extinction of threatened or endangered species).

For the construction and operation of the MAR portion of the Keystone XL Project, some of the resource commitments would be irreversible and irretrievable. The land areas needed for the pipeline along the MAR would be cleared and graded as needed to accommodate pipeline construction. Although portions of the pipeline would be adjacent to an existing utility ROW and access roads, and the land areas and their associated resources could be reclaimed at some point in the future, it is unlikely that they would be restored to original conditions and functionality across the entire ROW. In addition, the new permanent aboveground features would result in land commitments that would be considered irreversible.

Raw materials needed for construction of the pipeline and associated facilities would include crushed stone and sand, water, diesel fuel, gasoline and steel, for example. Construction would consume these materials, which would constitute an irretrievable commitment.

The construction and operation of the pipeline would require the irreversible commitments of human resources that would not be available for other activities during the period of their commitment, but these commitments would not be irretrievable.

Finally, the implementation of the Proposed Action would require the commitment of financial resources for construction and operation. This commitment, however, would be consistent with the Project's purpose of and need for the Proposed Action as described in Chapter 1, Introduction.

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