United States Department of State
Bureau of Oceans and International
Environmental and Scientific Affairs

Draft Supplemental Environmental Impact Statement

for the

Keystone XL Project

Volume I

March 2013

Applicant for Presidential Permit: TransCanada Keystone Pipeline, LP

United States Department of State
Draft Supplemental Environmental Impact Statement

For the

KEYSTONE XL PROJECT

Applicant for Presidential Permit:
TransCanada Keystone Pipeline, LP

Volume I

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Cooperating Agencies

U.S. Army Corps of Engineers (USACE)
U.S. Department of Agriculture—Farm Service Agency (FSA)
U.S. Department of Agriculture—Natural Resource Conservation Service (NRCS)
U.S. Department of Agriculture—Rural Utilities Service (RUS)
U.S. Department of Energy (DOE)
U.S. Department of Interior—Bureau of Land Management (BLM)
U.S. Department of Interior—National Park Service (NPS)
U.S. Department of Interior—U.S. Fish and Wildlife Service (USFWS)
U.S. Department of Transportation—Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety (PHMSA)
U.S. Environmental Protection Agency (USEPA)

Assisting Agencies

U.S. Department of the Interior, Bureau of Reclamation (BOR)
Nebraska Department of Environmental Quality (NDEQ)
Various State and Local Agencies in Montana, South Dakota, Nebraska, and Kansas

March 1, 2013

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3.0 Affected Environment

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
µg/m^3	micrograms per cubic meter
/m	per meter
AA	alluvial aquifer
AAQS	Ambient Air Quality Standards
AAR	American Association of Railroads
ABMI	Alberta Biodiversity Monitoring Institute
AC	alternating current
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
ACVG	alternating current voltage gradient
AEO	Annual Energy Outlook
AEUB	Alberta Energy and Utilities Board
AG	agriculture
Al-Pac FMA	Alberta-Pacific Forest Industries Forest Management Area
amsl	above mean sea level
ANSI	American National Standards Institute
AOC	abnormal operating conditions
AOPL	Association of Oil Pipelines
APE	area of potential effects
API	American Petroleum Institute
APLIC	Avian Power Line Interaction Committee
AQCR	Air Quality Control Regions
AqL	aquatic life
ARM	Administrative Rules Montana
ARPA	Archeological Resources Protection Act
ASME	American Society of Mechanical Engineers
ATWS	additional temporary work space
AUB	Alberta Utilities Commission
AWBP	Aransas-Wood Buffalo National Park
BA	Biological Assessment
bbl	barrel
bcf	billion cubic feet
bcf/d	billion cubic feet/day
BEA	U.S. Bureau of Economic Analysis
BEPC	Basin Electric Power Cooperative
BG	block group
BGEPA	Bald and Golden Eagle Protection Act
bgs	below ground surface
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	best management practice
BNSF	BNSF Railway Company
BOR	U.S. Bureau of Reclamation
bpd	barrels per day
BS&W	basic sediment and water
BTEX	benzene, toluene, ethylbenzene, and xylene
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CAFE	Corporate Average Fuel Economy
CAFO	concentrated animal feeding operation
CAPP	Canadian Association of Petroleum Producers
CCPS	Center for Chemical Process Safety
CCS	Carbon capture and storage
CE	carbon equivalents
CEA	cumulative effects analysis
CEAA	Canadian Environmental Assessment Act
CEC	Commission for Environmental Cooperation
CEQ	Council on Environmental Quality

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CH_4	methane
CHAAP	Cornhusker Army Ammunition Plant
CIS	close-interval survey
CL	centerline
CL ROW	centerline of the right-of-way
cm	centimeter
CMIP	Coupled Model Intercomparison Project
CMRP	Construction, Mitigation, and Reclamation Plan
CMZ	channel mitigation zone
CN	Canadian national
CNW	commercially navigable waterway
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
co-ops	cooperatives
cP	centipoises
CP	cathodic protection
CPRS	Canadian Pacific Railway System
CRM	Control Room Management Rule
CRP	Conservation Reserve Program
CSA	Canadian Standards Association
CSS	cyclic steam stimulation
CT	census tract
CVA	Central Valley Agriculture
CWA	Clean Water Act
CY	contractor yard
dBA	decibels on the A-weighted scale
DC	direct current
DCVG	direct current voltage gradient
Department	U.S. Department of State
dilbit	diluted bitumen
DME	Dakota, Minnesota, & Eastern Railroad
DNRC	Department of Natural Resources and Conservation
DO	dissolved oxygen
DOH	Department of Health
DPHHS	Department of Public Health and Human Services
Dth/day	decatherms per day
DW	drinking water
DWT	deadweight tonnage
e-GRID	Emissions & Generation Resource Integrated Database
EC	Economic Corridor
EES	electrical equipment shelter
EI	environmental inspector
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EO	Executive Order
ERCB	Energy Resources Conservation Board
ERP	Emergency Response Plan
ESA	Endangered Species Act
ESR	Environmental Screening Report
ESRI	Environmental Systems Research Institute
EUB	Alberta Energy and Utilities Board
FBE	fusion-bonded epoxy
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
Final EIS	Final Environmental Impact Statement
FIRM	*Flood insurance rate map*
FOIA	Freedom of Information Act
FPR	failure pressure ration
FR	Federal Register
FSA	Farm Service Agency
ft	feet
ft/d	feet per day
FWCA	Fish and Wildlife Coordination Act
FWP	Farmable Wetlands Program
g	gram

g/cm^3	grams per cubic centimeter
g/hp-hr	grams per horsepower-hour
g/m^2	grams per square meter
g/ml	grams per milliliter
GAP	National Gap Analysis Program
GDP	gross domestic product
GHG	greenhouse gas
GIS	Geographic Information System
GOR	Gas-oil ratio
GPA	Great Plains Aquifer
gpm	gallons per minute
GSP	gross state product
H_2S	hydrogen sulfide
HAP	hazardous air pollutant
HC	hydrocarbons
HCA	high consequence area
HDD	horizontal directional drill
HFC	hydrofluorocarbon
HFE	hydrofluorinated ether
HHV	high heating value
hp	horsepower
HPA	high population area
HPRCC	High Plains Regional Climate Center
HPSA	Health Professional Shortage Areas
hr	hour
hr/yr	hours per year
HRSA	Health Resource Services Administration
HSSM	Hydrocarbon Spill Screening Model
HVDC	high voltage direct current
IBA	important bird area
IC	Incident Commander
ICF	ICF International LLC
ICS	Incident Command System
IEA	International Energy Agency
IEO	International Energy Outlook
IHS CERA	IHS Cambridge Energy Research Associates, Inc.
IMLV	Intermediate mainline valve
in	inch
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
ITOPF	International Tanker Owners Pollution Federation Limited
KDWPT	Kansas Department of Wildlife, Parks, and Tourism
Keystone	TransCanada Keystone Pipeline, LP
kg	kilogram
kg/m^3	kilograms per cubic meter
km	kilometer
km^2	square kilometers
KMIGT	Kinder-Morgan Interstate Gas Transmission
kPa	kilopascal
KSDA	Kansas Department of Agriculture
kV	kilovolt
kW	kilowatt
LB	Legislative Bill
lb/MMBtu	pounds per million British Thermal Units
LCA	lifecycle analysis
LCFS	low carbon fuel standard
LCNHT	Lewis and Clark National Historic Trail
Ldn	day-night sound level
LDS	leak detection system
Leq	equivalent continuous sound level
Leq(24)	24-hour equivalent sound level
LHV	Lower heating value
LLC	limited liability company
LLS	Light Louisiana Sweet
LNAPL	light non-aqueous phase liquid
LOOP	Louisiana Offshore Oil Port
LSHR	landscape hazard ranking system
LVH	lower heating value
LW	local/county noxious week
m	meter
m/d	meter per day

m^3	cubic meter
MACT	Maximum Achievable Control Technology
MALAA	may affect, likely to adversely affect
MBCA	Migratory Bird Convention Act
MBCB	Montana Building Code Bureau
MBOGC	Montana Board of Oil and Gas Conservation
MBTA	Migratory Bird Treaty Act
MCA	Montana Code Annotated
MCL	maximum contaminant level
MCR	micro carbon residue
MDA	Montana Department of Agriculture
MDEQ	Montana Department of Environmental Quality
MDNRC	Montana Department of Natural Resources and Conservation
MDT	Montana Department of Transportation
MDU	Montana-Dakota Utilities
MFSA	Major Facilities Siting Act
MFWP	Montana Fish, Wildlife, and Parks
mg	milligrams
mg/L	milligrams per liter
mgKOH/g	milligrams potassium hydroxide per gram
MGWPCS	Montana Ground Water Pollution Control System
mi^2	square miles
MJ	megajoule
MLA	Mineral Leasing Act
MLV	mainline valve
mmbpd	million barrels per day
MMBtu	million British thermal units
MMcf/d	million cubic feet per day
MMDK	million decatherms
mmhos/cm	millimhos per centimeter
$MMTCO_2e$	million metric tons of CO_2 equivalent
MNHP	Montana Natural Heritage Program
MOP	maximum operating pressure
MP	milepost
MPDES	Montana Pollutant Discharge Elimination System
mpg	miles per gallon
MROW	Midwest Reliability Organization West
MSA	metropolitan statistical area
MSDS	Material Data Safety Sheets
MT	Montana
MUA/P	Medically Underserved Areas/Populations
MW	megawatt
MWh/yr	megawatt-hour per year
N_2O	nitrous oxide
NA	not applicable
na	not available
NAAQS	National Ambient Air Quality Standards
NAC	Nebraska Administrative Code
NACE	National Association of Corrosion Engineers
NAGPRA	Native America Graves Protection and Repatriation Act
NAIP	National Aerial Imagery Program
NAS	National Academy of Sciences
NCRC	Nebraska Central Railroad Company
ND	no data
NDA	Nebraska Department of Agriculture
NDE	nondestructive examination
NDEQ	Nebraska Department of Environmental Quality
NDGFD	North Dakota Game and Fish Department
NDHHS	Nebraska Department of Health and Human Services
NDOR	Nebraska Department of Roads
NDPA	North Dakota Pipeline Authority
NE SFM	Nebraska State Fire Marshal

NEAAQS	Nebraska Ambient Air Quality Standards
NEB	National Energy Board (Canada)
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NETL	National Energy Technology Laboratory
NF_3	nitrogen trifluoride
NFO	Non-significant Fossil Occurrence
NGFC	Nebraska Game and Fish Commission
NGL	natural gas liquids
NGPAS	Northern Great Plains Aquifer System
NGPC	Nebraska Game and Parks Commission
NGPD	Nebraska Game and Parks Department
NHD	National Hydrography Dataset
NHP	Natural Heritage Program
NHPA	National Historic Preservation Act of 1986
NHPAQ	Northern High Plains Aquifer
NHTSA	National Highway Traffic Safety Administration
NID	National Interest Determination
NLAA	may affect, not likely to adversely affect
NLCD	National Land Cover Database
NMHC	non-methane hydrocarbon
NNLP	Nebraska Natural Legacy Project
NNRC	Nebraska Northeastern Railway Company
NO_2	nitrogen dioxide
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NO_X	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NPPD	Nebraska Public Power District
NPR	National Public Radio
NPS	National Park Service
NRC	National Response Center
NRCS	Natural Resources Conservation Service
NRD	Natural Resources District
NRDC	Natural Resources Defense Council
NRHP	National Register of Historic Places
NSA	noise sensitive areas
NSPS	New Source Performance Standards
NSR	New Source Review
NTSB	National Transportation Safety Board
NW	noxious weed
NWI	National Wetland Inventory
NWP	Nationwide Permit
O_2	oxygen gas
O_3	ozone
OCC	Operations Control Center
OGJ	Oil & Gas Journal
OGP	International Association of Oil and Gas Producers
OPA	other populated area
OPA 90	Oil Pollution Act of 1990
OPS	Office of Pipeline Safety
OW	open water
PA	Programmatic Agreement
PADD	Petroleum Administration for Defense District
PAH	polycyclic aromatic hydrocarbons
Pb	lead
PCIC	project cumulative impact corridor
PEM	palustrine emergent wetland
PFC	perfluorocarbon
PFO	palustrine forested wetland
PFYC	Potential Fossil Yield Classification
PHMSA	Pipeline Hazardous Material Safety Administration
PI	point of inflection (angle)

PM	particulate matter
PM_{10}	particulate matter with aerodynamic diameter of 10 microns and less
$PM_{2.5}$	particulate matter with aerodynamic diameter of 10 microns and less
PMMP	Paleontological Monitoring and Mitigation Plan
PMP	Pipeline Maintenance Program
POTW	publically owned treatment works
PPA	Protection Priority Areas
PPD	Public Power District
PPE	personal protective equipment
ppm	parts per million
ppmw	parts per million by weight
PPR	Prairie Pothole Region
Project	Keystone XL Project
PS	pump station
PSD	prevention of significant deterioration
psi	pounds per square inch
psig	pounds per square inch gauge
PSRP	Pipeline Spill Response Plan
PSS	palustrine scrub shrub wetland
ptb	pounds per thousand barrels
PWS	public water supply
py	pipeyard
QC	quality control
R	riverine wetlands
R-STRENG	remaining strength
RBOB	reformulated blendstock for oxygenate blending
Rec	recreation
Reclamation	Bureau of Reclamation
REX-W	Rockies Express-West
RFI	radio frequency interference
RFS2	USEPA Renewable Fuel Standard
riv-OW	riverine-open water
ROD	Record of Decision
ROS	rest of state
ROW	right-of-way
RP	Recommended Practice
RPMA	Recovery-Priority Management Area
RPS	Renewable Portfolio Standard
RUS	Rural Utilities Service
RV	recreational vehicle
SAGD	Steam-assisted gravity drainage
SARA	Species at Risk Act
SC	species of concern
SCADA	Supervisory Control and Data Acquisition
SCC	stress corrosion cracking
SCO	synthetic crude oil
SD	South Dakota
SD DOT	South Dakota Department of Transportation
SDA	South Dakota Department of Agriculture
SDCL	South Dakota Common Law
SDDENR	South Dakota Department of Environment and Natural Resources
SDGFP	South Dakota Game, Fish, and Parks
SDIWWG	South Dakota Interagency Wetlands Working Group
SDPUC	South Dakota Public Utilities Commission
SDSMT	South Dakota School of Mines and Technology
SDWA	Safe Drinking Water Act
SER	Supplemental Environmental Report
SF_6	sulfur hexafluoride
SFL	Significant Fossil Localities
SFM	Office of the State Fire Marshall
SHPO	State Historic Preservation Office(er)
SIP	State Implementation Plan
SMS	Scenery Management System
SO_2	sulfur dioxide
SOR	Steam-oil ratio

SPCC	Spill Prevention, Control, and Countermeasure
SPSO	Southwest Power Pool South
Supplemental EIS	Supplemental Environmental Impact Statement
SWPA	Source Water Protection Area
TAN	total acid number
TBD	to be determined
TCE	trichloroethylene
TCEQ	Texas Commission on Environmental Quality
TCP	traditional cultural properties
TDS	total dissolved solids
TEFC	The Ecological Framework of Canada
THPO	Tribal Historic Preservation Officer
TKN	total Kjehldahl nitrogen
TPG	The Perryman Group
tpy	tons per year
TSB	Transportation Safety Board
TTW	Tank-to-wheels
TWA	temporary workspace area
UP	Union Pacific Railroad Company
U.S.	United States
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USC	United States Code
USDA	U.S. Department of Agriculture
USDOE	U.S. Department of Energy
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGCRP	United States Global Change Research Program
USGS	U.S. Geological Survey
USNABCI	U.S. North American Bird Conservation Initiative
UST	underground storage tank
VES	variable frequency drive equipment shelter
VOC	volatile organic compound
vol%	percent volume
VRM	visual resource management
WCD	worst-case discharge
WCI	Western Climate Initiative
WCSB	Western Canadian Sedimentary Basin
WEG	Wind Erodibility Group
Western	Western Area Power Administration
WHIP	Wildlife Habitat Incentive Program
WHPA	wellhead protection areas
WHSRN	Western Hemisphere Shorebird Reserve Network
Williston Basin	A large sedimentary basin in eastern Montana, western North and South Dakota, and southern Saskatchewan known for its rich deposits of crude oil
WIPA	Western Interior Plains Aquifer
WMA	wildlife management area
WMD	Wetland Management District
WRCC	Western Regional Climate Center
WRP	Wetland Reserve Program
wt%	weight percent
WTI	West Texas Intermediate
WTR	Well-to-refinery gate
WTT	well to tank
WTW	well to wheels
WW	warmwater
WYGF	Wyoming Game and Fish Department
yr	year

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1.0 INTRODUCTION

On May 4, 2012, TransCanada Keystone Pipeline, LP (Keystone) filed a Presidential Permit application for a new Keystone XL Project with the U.S. Department of State (the Department) for the proposed construction, connection, operation, and maintenance of a pipeline and associated facilities at the United States border for importation of crude oil from Canada. The Keystone application is for its proposed Keystone XL Project (the proposed Project) and is modified from the previously proposed and similarly named project as discussed herein. The route in Montana and South Dakota would be largely unchanged from the route analyzed in the Final Environmental Impact Statement published in August 2011. However, the newly proposed route not only avoids the Sands Hills Region identified by the Nebraska Department of Environmental Quality but also terminates at Steele City, Nebraska and is thus approximately half the length of the previously proposed project analyzed in 2011.

The Department serves as the lead federal agency for the review of the proposed Project consistent with the National Environmental Policy Act, National Historic Preservation Act, and Endangered Species Act. The Department receives and considers applications for Presidential Permits for such oil pipeline border crossings and ancillary facilities pursuant to the President's constitutional authority over foreign relations, and as Commander-in-Chief. The President delegated this responsibility to the Department in Executive Order 13337, as amended (69 Federal Register 25299). The Department's jurisdiction to issue a Presidential Permit includes only the border crossing and the associated facilities at the border, although the analysis included in this draft Supplemental Environmental Impact Statement (Supplemental EIS)[1] discloses potential impacts of the proposed Project along its entire route in the United States.

The Department's authority over the border crossing does not include the legal authority to regulate petroleum pipelines within the United States. The Department of Transportation's Pipelines and Hazardous Materials Safety Administration is responsible for promulgating regulations regarding issues of petroleum pipeline construction, operation, and maintenance. Individual states have the legal authority to approve petroleum pipeline construction in their states, including approving the routes for such pipelines. In preparation of this Supplemental EIS, the Department has consulted extensively with those federal and state agencies that possess regulatory authority over petroleum pipelines, as well as local, state, tribal, and federal agencies that have special expertise in evaluating potential impacts of the proposed Project.

In addition to its application to the Department, Keystone also filed a right-of-way application under Section 28 of the Mineral Leasing Act of 1920, as amended (30 United States Code 185), with the U.S. Department of Interior—Bureau of Land Management.

[1] This document refers to the *draft* Supplemental EIS as the Supplemental EIS for ease of use throughout.

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1.1 BACKGROUND

On September 19, 2008, TransCanada Keystone Pipeline, LP (Keystone) filed an application with the U.S. Department of State (Department) for a Presidential Permit authorizing the construction and operation of the previously proposed Keystone XL Pipeline Project at the U.S.-Canada border crossing in Montana. The previously proposed Keystone XL Project consisted of a crude oil pipeline and ancillary facilities for transport of Western Canadian Sedimentary Basin crude oil from an oil supply hub near Hardisty, Alberta, Canada, through two pipeline segments—the Steele City Segment through Montana, South Dakota, and Nebraska, connecting with the existing Keystone Cushing Extension pipeline, and then the proposed Gulf Coast Segment through Oklahoma and Texas. The U.S. portion of the pipeline began near Morgan, Montana, at the international border of the United States and extended to delivery points in Nederland and Moore Junction, Texas. There would also have been a delivery point at Cushing, Oklahoma. These three delivery points would have provided access to many other U.S. pipeline systems and terminals, including pipelines to refineries in the Gulf Coast area[1].

Upon receipt of the September 2008 application for the Presidential Permit, the Department led a comprehensive, 3-year review of the previous Keystone XL Project. A Final Environmental Impact Statement (Final EIS) prepared consistent with the National Environmental Policy Act, the National Historic Preservation Act of 1986, and the Endangered Species Act was completed for the previously proposed Project and published on August 26, 2011. On November 10, 2011, the Department determined that, in order to make the required National Interest Determination with respect to the Keystone XL Pipeline Project, it was necessary to obtain additional information regarding potential alternative routes that would avoid the environmentally sensitive Sand Hills Region in Nebraska as identified by the Nebraska Department of Environmental Quality (NDEQ).

Due to these concerns over the environmentally sensitive Sand Hills Region, Nebraska Governor David Heineman called the Nebraska Legislature into a special session in late Fall 2011 to address the siting of the proposed Project.. On November 22, 2011, the Nebraska Legislature passed Legislative Bill (LB) 1 and LB 4, which were both signed and approved by the Governor. LB 1 adopted the Major Oil Pipeline Siting Act, and LB 4 provided for state participation in a federal supplemental environmental impact statement review process for oil production.

In late December 2011, Congress adopted a provision of the Temporary Payroll Tax Cut Continuation Act that sought to require the President to make a decision on the Presidential Permit within 60 days. On January 18, 2012, the President determined, based upon the Department's recommendation, that the previous proposed Project as presented and analyzed at that time would not serve the national interest. On February 3, 2012, a notice was published in the Federal Register informing the public that the Department had denied the application.

On February 27, 2012, Keystone advised the Department that it considered the Gulf Coast portion of the previously proposed Project as having its own independent utility, as it did not depend on the northern Steele City segment. Therefore, Keystone indicated its intention to proceed with construction of that pipeline as a separate project, the Gulf Coast Project, as soon as

[1] The Gulf Coast area refers to the region from Houston, Texas, to Lake Charles, Louisiana. Gulf Coast area refineries include 12 refineries on the Gulf Coast in Texas and three refineries in Lake Charles, Louisiana.

the necessary permits were obtained. The Gulf Coast pipeline did not require a Presidential Permit, as it did not cross an international border. Construction of the Gulf Coast Project is underway at the time of printing. Keystone also indicated its intention to file a new Presidential Permit application for the former Steele City Segment through Montana, South Dakota, and Nebraska, and to supplement that application with an alternative route in Nebraska once determined. Meanwhile, the Nebraska Legislature passed LB 1161, which clarified its direction to NDEQ to evaluate a pipeline in Nebraska. This was signed by the Nebraska Governor on April 17, 2012.

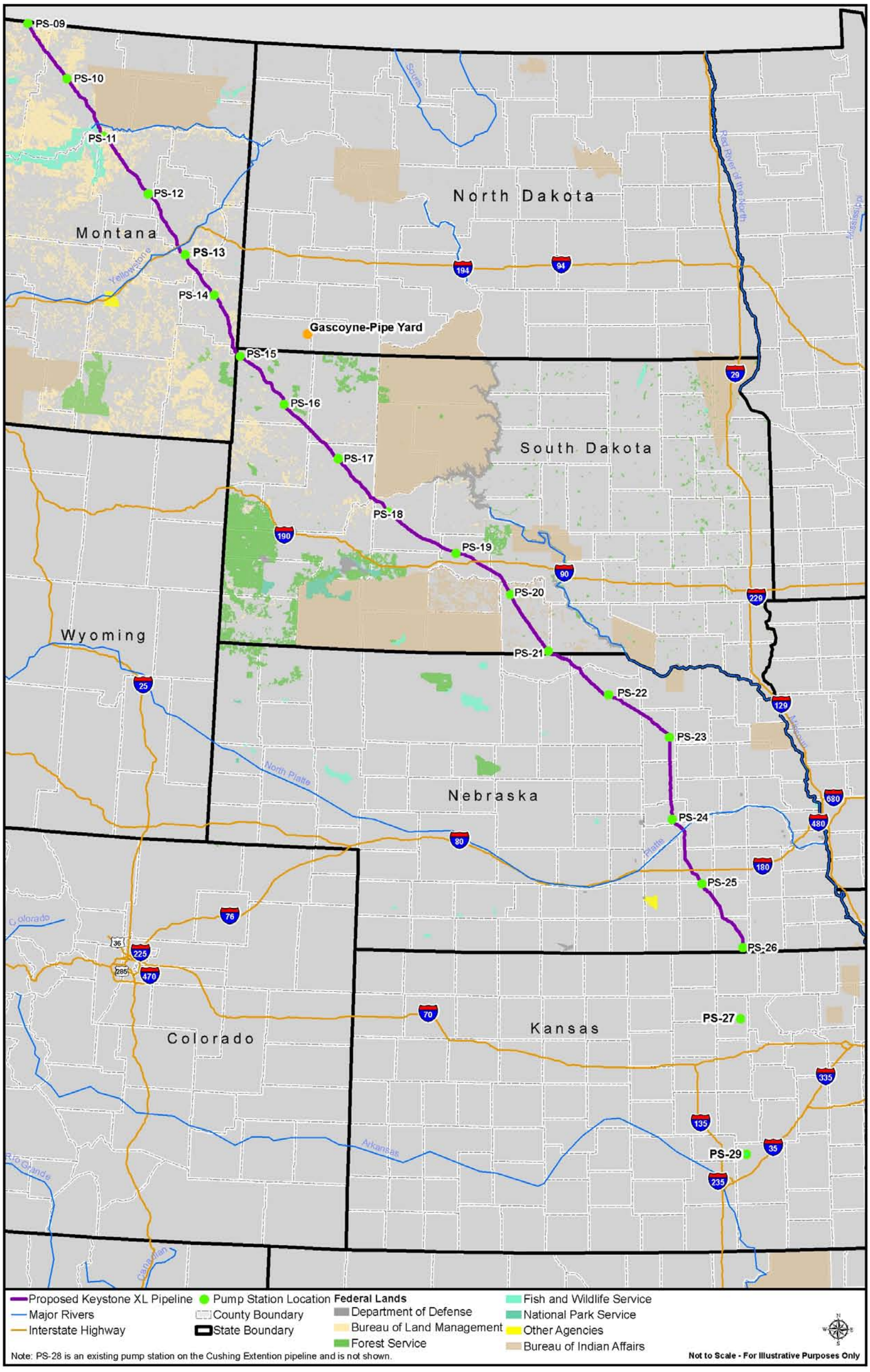
On May 4, 2012, Keystone filed a new application for a Presidential Permit for authorization to construct, connect, operate, and maintain the border crossing facility requested in connection with a modified, more limited Keystone XL Project (i.e., a modified Steele City Segment, the currently proposed Project) (see Figure 1.1-1). On May 24, 2012, the NDEQ entered into a Memorandum of Understanding with the Department to provide a framework for a timely collaborative environmental analysis of alternative routes within Nebraska consistent with the National Environmental Policy Act and all other relevant laws and regulations. In September 2012, Keystone submitted an Environmental Report in support of its Presidential Permit application that provided additional information about the proposed Project.

On January 3, 2013, NDEQ submitted the Final Evaluation Report on the proposed pipeline reroute for the Nebraska Governor's review. The Governor approved the proposed Project route under the Nebraska Major Oil Pipeline Siting Act on January 22, 2013, thus certifying the design, location, construction, operation, maintenance, and decommissioning of the Nebraska portion of the proposed Project (see Appendix A, Governor Approval of the Keystone XL Project in Nebraska; to view the report, go to http://deq.ne.gov.).

The proposed pipeline route in the United States that is the subject of this Supplemental Environmental Impact Statement (Supplemental EIS) is similar to part of the previous project evaluated in the August 2011 Final EIS (see Figure 1.1-2). The newly proposed route in Montana and South Dakota would be largely unchanged, except for minor modifications Keystone made to improve constructability and in response to comments, such as landowner requests to adjust the route across their property. The newly proposed route is 509 miles shorter than the previously proposed route; however, it would be approximately 21 miles longer in Nebraska to avoid sensitive areas including the NDEQ-identified Sand Hills Region. Thus, the newly proposed route is substantially different from the previous route analyzed in August 2011 in two significant ways: it avoids the NDEQ-identified Sand Hills Region and terminates at Steele City, Nebraska.

1.1.1 Overview and Structure of the Supplemental EIS

The Supplemental EIS includes descriptions of the affected environment, potential impacts, and alternatives of the proposed Project, including direct, indirect, and cumulative impacts. The objective of these descriptions is to provide a baseline against which proposed Project impacts could be estimated and against which actual proposed Project impacts can be measured in the future. The structure of this document has been developed consistent with the National Environmental Policy Act.



Sources: U.S. Census Bureau, Geography Division 2010; U.S. Geological Survey Gap Analysis Program 2011; ESRI Streets USA 2010; Exp Energy Services 2012.

Figure 1.1-1 Project Overview

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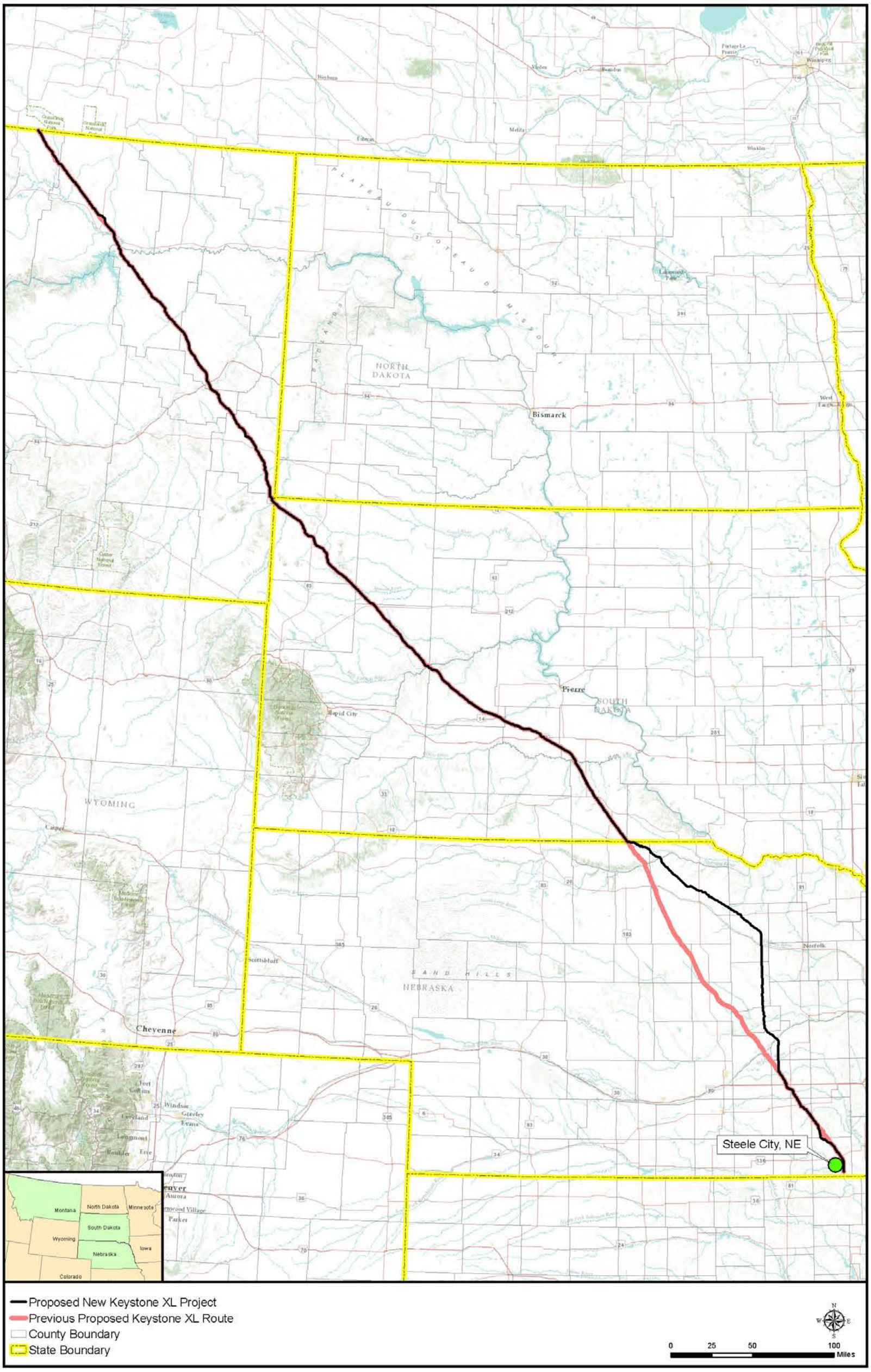

Source: Exp Energy Services 2012.

Figure 1.1-2 Comparison of Proposed Project and Previously Proposed Project in Montana, South Dakota, and Nebraska

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The main organization of the document is as follows:

- Chapter 1: Introduction;
- Chapter 2: Description of the Proposed Action and Alternatives;
- Chapter 3: Affected Environment, including descriptions of the portions of the environment that could be affected by the proposed Project;
- Chapter 4: Environmental Consequences, including descriptions of the potential environmental impacts of the proposed Project, mitigation measures that would avoid or minimize these impacts, and an assessment of cumulative effects of the proposed Project;
- Chapter 5: Alternatives, including descriptions and analyses related to No Action and Major Route Alternatives;
- Chapter 6: List of Preparers;
- Chapter 7: Distribution List; and
- Chapter 8: Index.

This Supplemental EIS describes potential impacts of the proposed Project and alternatives, including direct, indirect, and cumulative impacts. It builds on the work done in the 2011 Final EIS, including references to that document throughout the text where appropriate. The Supplemental EIS includes an analysis of the modified route in Nebraska, as well as analysis of any significant new circumstances or information that has become available since the August 2011 publication of the Final EIS for the previously proposed project. This Supplemental EIS also relies, where appropriate, on the data presented and the analyses done in the Final EIS for the previously proposed project, because much of the proposed pipeline route remains unchanged from its August 2011 publication. This Supplemental EIS also includes the latest available information on the proposed Project resulting from ongoing discussions with federal, state, and local agencies.

The remainder of this chapter addresses the following topics:

- An overview of the proposed Project (Section 1.2);
- The purpose and need for the proposed Project (Section 1.3);
- An overview of the crude oil market (Section 1.4);
- Description of agency participation (Section 1.5);
- An overview of tribal and State Historic Preservation consultation (Section 1.6);
- An environmental review of the Canadian portion of the proposed Project (Section 1.7);
- A description of the preparation for publication and review of the Supplemental EIS (Section 1.8); and
- A table identifying permits, approvals, and regulatory requirements (Section 1.9).

1.1.2 References

ESRI Streets USA. 2010. ArcInfo Program Suite.

exp Energy Services Inc. 2012. Pipeline centerline information provided via shapefiles. Received August 22, 2012, and September 10, 2012.

U.S. Census Bureau, Geography Division. 2010. Processes TIGER 2010 American Indian Lands Geospatial Dataset.

U.S. Geological Survey Gap Analysis Program. 2011. Protected Areas Database of the United States 1.2 Geospatial Dataset.

1.2 OVERVIEW OF PROPOSED PROJECT

TransCanada Keystone Pipeline, LP (Keystone) proposes to construct, connect, operate, and maintain 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. The proposed pipeline would connect to the existing Keystone Cushing Extension pipeline, which extends from Steele City, Nebraska, to Cushing, Oklahoma. The Gulf Coast Project, already under construction, would connect to the Cushing Extension, extending south to Nederland, Texas, to serve the Gulf Coast marketplace (see Figure 1.2-1)[1]. In total, the proposed Project would consist of approximately 1,204 miles of new, 36-inch-diameter pipeline, with approximately 329 miles of pipeline in Canada and approximately 875 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 and a 50-foot-wide permanent right-of-way in Montana, South Dakota, and Nebraska.

1.2.1 Proposed Project Delivery Amounts and Commitments

The proposed Project would have the capacity to deliver up to 830,000 barrels per day (bpd) of crude oil. Keystone represents that it has firm commitments to transport more than 555,000 bpd of WCSB crude oil to delivery points in the Gulf Coast area.[2] In addition, Keystone represents that the proposed Project has firm commitments to transport approximately 65,000 bpd of crude oil, and could ship up to 100,000[3] bpd of crude oil, originating in the Williston Basin (Bakken formation) in Montana and North Dakota, which would be delivered to the proposed Project through the Keystone Marketlink, LLC, Bakken Marketlink Project in Baker, Montana. Keystone also informs the Department that it has firm contracts to deliver 155,000 barrels of crude oil from the WCSB to Cushing, Oklahoma that are currently being transported via the existing Keystone Mainline pipeline and the Cushing Extension (see Figure 1.2.1-1). Keystone has indicated that if the proposed Project is approved and built that it intends to transfer the barrels currently shipped from Cushing, Oklahoma, via the proposed Project.

[1] Although the Gulf Coast Project was part of Keystone's proposed project in the previous Keystone XL application, Keystone indicated that it is proceeding with that project independently, and on February 27, 2012, Keystone informed the Department that the project was economically viable even if the current application for the proposed Project is not approved. It is reasonable to conclude the Gulf Coast Project has independent utility based on several factors, including: the current glut of crude oil in Cushing Oklahoma, which needs additional transport capacity to get to refinery markets; the projected increases in domestic crude oil production, particularly from tight oil formations, that would be delivered into Cushing potentially continuing the need for that additional transport capacity in the long-term; the rapid increase in announced projects for crude oil transport to accommodate these new flows of crude oil from increased production (including projects to transport crude oil from Cushing to the Gulf Coast by Keystone competitors). This Supplemental EIS considers the potential impacts associated with the Gulf Coast Project, where relevant, in the Section 4.15, Cumulative Effects Assessment.

[2] The Gulf Coast area refers to the region from Houston, Texas, to Lake Charles, Louisiana. Gulf Coast area refineries include 12 refineries on the Gulf Coast in Texas and three refineries in Lake Charles, Louisiana.

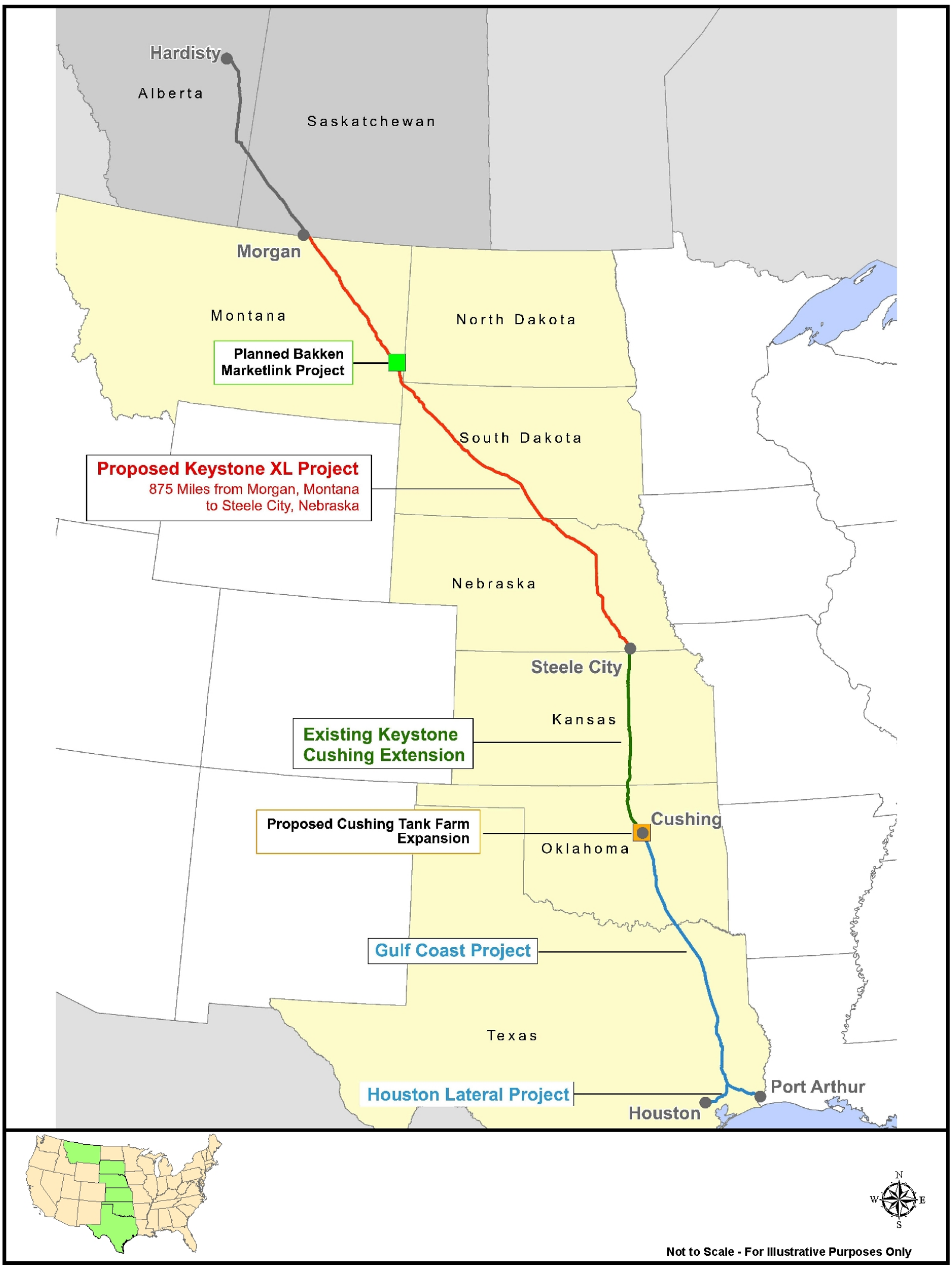
[3] The amount of crude transported via the proposed Project from the Williston Basin could be greater than 100,000 bpd depending on market conditions.

1.2.2 Project-Specific Special Conditions

To enhance the overall safety of the proposed Project, the Department and the Pipeline Hazardous Material Safety Administration (PHMSA) have developed 57 Project-specific Special Conditions. As a result, the proposed Project would be designed, constructed, operated, maintained, and monitored in accordance with the existing PHMSA regulatory requirements and in compliance with the more stringent 57 Project-specific Special Conditions that Keystone agreed to incorporate into the proposed Project, including more specifically incorporating the conditions into Keystone's written design, construction, and operating and maintenance plans and procedures. Appendix A, PHMSA 57 Special Conditions for Keystone XL and Keystone Compared to 49 CFR 195, presents the Special Conditions and a comparison of the conditions with the existing regulatory requirements.

1.2.3 References

exp Energy Services Inc. 2012. Pipeline information provided via shapefiles. Received December 4, 2012.



Source: Exp Energy Services 2012.

Figure 1.2-1 Proposed Keystone XL Project and Associated Projects

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Source: Exp Energy Services 2012.

Figure 1.2.2-1 Existing Keystone Pipeline and Proposed Keystone Expansions

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1.3 PURPOSE AND NEED

1.3.1 Project Purpose and Need

According to Keystone's May 4, 2012, application, the primary purpose of the proposed Project is to provide the infrastructure to transport Western Canadian Sedimentary Basin (WCSB) crude oil from the border with Canada to existing pipeline facilities near Steele City, Nebraska, for onward delivery to Cushing, Oklahoma, and the Texas Gulf Coast area. Most of the crude oil would be subsequently delivered to refineries in the Gulf Coast area.[1] The proposed Project would also provide transport capacity for domestically produced crude oils, notably Bakken and Midcontinent crude oils that would be on-loaded, respectively, in Montana and at Cushing.

The WCSB and the Bakken are both projected to have significant increases in production. In the WCSB, most of this increase is projected to come from the oil sands (also known as *tar sands*). Most of 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. In the Bakken, the increased production is part of a broader development in the United States of increasing crude oil production from *tight oil* areas[2], which produce a light crude oil. The exact mix and volumes of crude oil types that would be transported by the proposed Project (as well as the final destination of those crude oils) would be determined by market forces.

Keystone has firm, long-term contracts to transport approximately 555,000 barrels per day (bpd) of WCSB crude oil on the proposed Project, with more than 400,000 bpd of WCSB crude oil to existing Gulf Coast area delivery points and 155,000 bpd of WCSB heavy crude oil to Cushing, Oklahoma. This 155,000 bpd is currently transported to Cushing, Oklahoma, via the existing Keystone Oil Pipeline Project, which includes the Keystone Mainline and the Keystone Cushing Extension (as shown by solid lines in Figure 1.2-2). If the proposed Project were approved and implemented, Keystone would transfer shipment of crude oil under those contracts to the proposed Project. The existing Keystone Pipeline system would transport crude oil to and from the Midwest refineries (see Section 1.4.2, PADD Regions in the U.S. Crude Oil Market).[3]

Keystone has made available up to 100,000 bpd of capacity on the proposed Project for crude oil from the Bakken, and has signed long-term contracts to transport 65,000 bpd from the Bakken Shale supply from the Williston Basin in Montana and North Dakota.

As explained in detail in Section 1.4, Market Analysis, there is existing demand by Gulf Coast area refiners for stable sources of crude oil. Refiners in the Gulf Coast area process crude oil with 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

[1] The Gulf Coast area refers to the region from Houston, Texas, to Lake Charles, Louisiana. Gulf Coast area refineries include 12 refineries on the Gulf Coast in Texas and three refineries in Lake Charles, Louisiana.
[2] Tight oil refers to oil found in low-permeability and low-porosity reservoirs, typically shale. Bakken crude is considered tight oil. The technology of extracting crude oil from tight rock formations has only recently been exploited, but produces and supplies large quantities of crude oil into the domestic market. Shale oil extraction is a completely different process than oil sands development.
[3] Transferring the 155,000 bpd from the existing Keystone Pipeline system to the proposed Project would make that amount of capacity available for additional shipments to PADD 2.

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. The additional supply of light crude oil from formations like the Bakken is expected to enable domestic refiners to reduce their imports of more expensive (light and possibly medium gravity sweet), imported waterborne crude oil.

The proposed Project would provide one potential transportation option for crude oils sourced from the WCSB and Bakken that would compete with other transportation options, both pipeline and rail, for those sources of crude oil. Those WCSB and Bakken crude oils would also compete in the market with other domestic and foreign sources of crude oil available to the Gulf Coast area refiners.

1.3.2 Department of State Purpose and Need

As discussed above, facilities that cross the international borders of the United States require a Presidential Permit. The Secretary of State has the authority to approve or deny such applications for Presidential Permits, and to issue such permits on terms and conditions that the Secretary determines are appropriate, pursuant to Presidential authority under Executive Order 13337 of April 30, 2004 (69 Federal Register 25299), as amended. To support a Presidential Permit approval, the U.S. Department of State (the Department) must find that the border crossing and the resulting conditions associated with that crossing would serve the national interest.

The primary focus of the Department is related to the conduct of foreign affairs. In considering the national interest for purposes of applications for Presidential Permits, the Department takes into account many factors, including impacts associated with issuance of a permit, such as environmental, cultural, and economic considerations. Consistent with National Environmental Policy Act, National Historic Preservation Act, the Endangered Species Act, and other relevant laws, the Department evaluates the potential impacts that may result from approval of the Presidential Permit. The Department's purpose, therefore, is to consider Keystone's application in terms of how the proposed Project would serve the national interest taking into account the proposed Project's potential environmental, cultural, economic, and other impacts.

Consistent with the President's broad discretion in the conduct of foreign affairs, the Department has significant discretion in the factors it examines in making a National Interest Determination (NID). The factors examined and the approaches to their examination are not necessarily the same from project to project. However, previous NID processes can provide insights into the factors the Department is likely to consider in evaluating the present application. Some of the key factors considered in past decisions include the following:

- Environmental impacts of the proposed Project;
- Impacts of the proposed Project on the diversity of supply and security of transport pathways for crude oil imported to the United States;
- Impact of a cross-border facility on the relations with the country to which it connects;
- Stability of various foreign suppliers of crude oil and the ability of the United States to work with those countries to meet overall environmental and energy security goals;

- Impact of proposed projects on broader foreign policy objectives, including a comprehensive strategy to address climate change, bilateral relations with neighboring countries; and energy security;
- Economic benefits to the United States of constructing and operating the proposed Project; and
- Relationships between the proposed Project and goals to reduce reliance on fossil fuels and to increase use of alternative and renewable energy sources.

This list is not exhaustive, and the Department may consider additional factors in the NID process.

1.3.3 Department of Interior—Bureau of Land Management Purpose and Need

The proposed Project would cross lands managed by the Bureau of Land Management (BLM). The BLM has agreed to be a cooperating agency pursuant to National Environmental Policy Act for this Supplemental Environmental Impact Statement and will use this document as a basis for issuing their Record of Decision. The BLM's purpose and need for the proposed Project is to respond to the Keystone application under Section 28 of the Mineral Leasing Act, as amended, for a right-of-way (ROW) grant 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 to Keystone for the proposed Project, and if so, under what terms and conditions.

1.3.4 Western Area Power Administration Purpose and Need

The U.S. Department of Energy, Western Area Power Administration has agreed to be a cooperating agency for this Supplemental Environmental Impact Statement and intends to use this document as a basis for issuing a Record of Decision. Western's purpose and need is to consider interconnection requests, which are from entities that would provide new electricity loads at new delivery points associated with the proposed Project in Montana and South Dakota. Western evaluates the interconnection requests and whether they meet the reasonable needs of the entity requesting the interconnection to Western's system.

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1.4 MARKET ANALYSIS

1.4.1 Introduction

This section examines the petroleum markets with a particular focus on changes in petroleum markets since the publication of the Final Environmental Impact Statement (Final EIS) on August 26, 2011. It assesses whether these changes alter the conclusion of the 2011 Final EIS market analysis, namely, that the proposed Project is unlikely to significantly affect the rate of extraction in the oil sands or in U.S. refining activities. Specifically, this section presents changes observed in the petroleum market since August 2011 and how such changes may impact the assessment made in the Final EIS. Several changes in the outlook for the crude oil market since August 2011 are accounted for in the Supplemental Environmental Impact Statement (Supplemental EIS) analysis. First, the outlook for U.S. demand for transportation fuel is now lower than it was in 2010 and 2011. Second, domestic production of crude oil has increased and is expected to continue increasing over the next 10 to 15 years. Third, the infrastructure for crude oil transportation in North America, including pipeline, rail, and other non-pipeline modes, is undergoing significant adaptations and increases in capacity. As explained below, these changes are not anticipated to alter the outlook for the crude oil market in a manner that would lead to a change in the key conclusions reached in the 2011 Final EIS. That conclusion is based, in part, on the following factors.

While the increase in U.S. production of crude oil and the reduced U.S. demand for transportation fuels will likely reduce the demand for total U.S. crude oil imports, it is unlikely to reduce demand for heavy sour crude at Gulf Coast refineries. Additionally, as was projected in the 2011 Final EIS, the midstream industry is showing it is capable of developing alternative capacity to move Western Canadian Sedimentary Basin (WCSB) (and Bakken and Midcontinent) crudes to markets in the event the proposed Project is not built. Specifically, it is moving to develop alternative pipeline capacity that would support Western Canadian, Bakken, and Midcontinent crude oil movements to the Gulf Coast and is increasingly using rail to transport large volumes of crude oil to East, West, and Gulf Coast markets as a viable alternative to pipelines. In addition, projected crude oil prices are sufficient to support production of essentially all Western Canadian (and U.S. tight oil[1]) crude oil projects, even with potentially somewhat more expensive transport options to market in the form of alternative pipelines and rail. Rail and supporting non-pipeline modes should be capable, as was projected in 2011, of providing the capacity needed to transport all incremental Western Canadian and Bakken crude oil production to markets if there were no additional pipeline projects approved.

Approval or denial of any one crude oil transport project, including the proposed Project, remains unlikely to significantly impact the rate of extraction in the oil sands, or the continued demand for heavy crude oil at refineries in the U.S. Limitations on pipeline transport would force more crude oil to be transported via other modes of transportation, such as rail, which would probably (but not certainly) be more expensive. Longer term limitations also depend upon whether pipeline projects that are located exclusively in Canada proceed (such as the proposed

[1] Tight oil refers to oil found in low-permeability and low-porosity reservoirs, typically shale. Bakken crude is considered tight oil. The technology of extracting crude oil from tight rock formations has only recently been exploited, but produces and supplies large quantities of crude oil into the domestic market. Shale oil extraction is a completely different process than oil sands development.

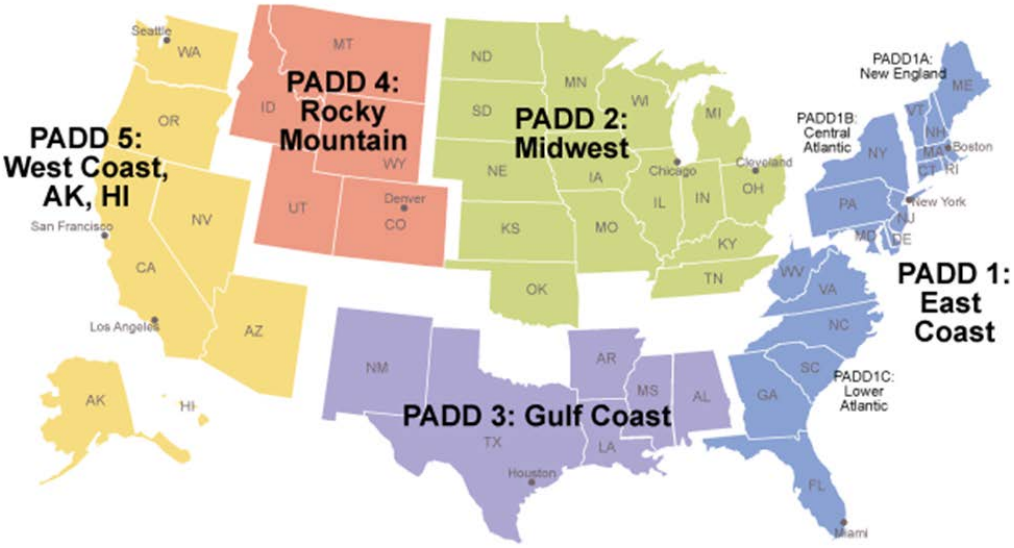
Northern Gateway, the Trans Mountain expansion, and the TransCanada proposal to ship crude oil east to Ontario on a converted natural gas pipeline).

If all such pipeline capacity were restricted in the medium-to-long-term, the incremental increase in cost of the non-pipeline transport options could result in a decrease in production from the oil sands, perhaps 90,000 to 210,000 barrels per day (bpd) (approximately 2 to 4 percent) by 2030. If the proposed Project were denied but other proposed new and expanded pipelines go forward, the incremental decrease in production could be approximately 20,000 to 30,000 bpd (from 0.4 to 0.6 percent of total WCSB production) by 2030. (As examined in section 4.15, such production decreases would be associated with a decrease in greenhouse gas emissions in the range of 0.35 to 5.3 $MMTCO_2e$ annually if all pipeline projects were denied, and in the range of 0.07 to 0.83 million metric tons carbon dioxide equivalent ($MMTCO_2e$) annually if the proposed Project were not built.)

Fundamental changes to the world crude oil market, and/or far reaching actions than are evaluated in this Supplemental EIS, would be required to significantly impact the rate of production in the oil sands.

1.4.2 PADD Regions in the U.S. Crude Oil Market

This section provides an explanation of the Petroleum Administration for Defense Districts (PADD) which are referenced throughout this market analysis. The 50 states and the District of Columbia are divided into five PADDs (Figure 1.4.2-1). The origin of PADDs dates from World War II when it was necessary to allocate the domestic petroleum supply. The "boundaries" between the different PADDs do not reflect either a regulatory or a business requirement; however, the boundaries allow the U.S. Energy Information Administration (EIA) a mechanism to consistently report the key attributes of the petroleum industry (inventory, crude processing levels, prices, consumption, etc.) over various time periods.



Source: EIA 2012.

Figure 1.4.2-1 Petroleum Administration for Defense Districts (PADDs) Locations

The supply and refining profiles of the PADDs differ significantly. For example, PADD 3 and PADD 1 both import significant amounts of crude oil. PADD 3 imports a wider variety of crude oils, including over 2 million bpd of heavy crude oil, whereas PADD 1 imports are almost entirely of light and medium crude oils. Refiners in different PADDs largely serve the market for transportation fuels and other products in that that PADD, but there are inter-PADD transfers and refiners in the different PADDs are in competition with one another. In particular, PADD 3 refiners ship refined products to both PADD 1 and PADD 2. Additional information about the PADDs, including their refining and supply profiles, is included in Section 1.1 of Appendix C, Market Analysis Supplemental Information.

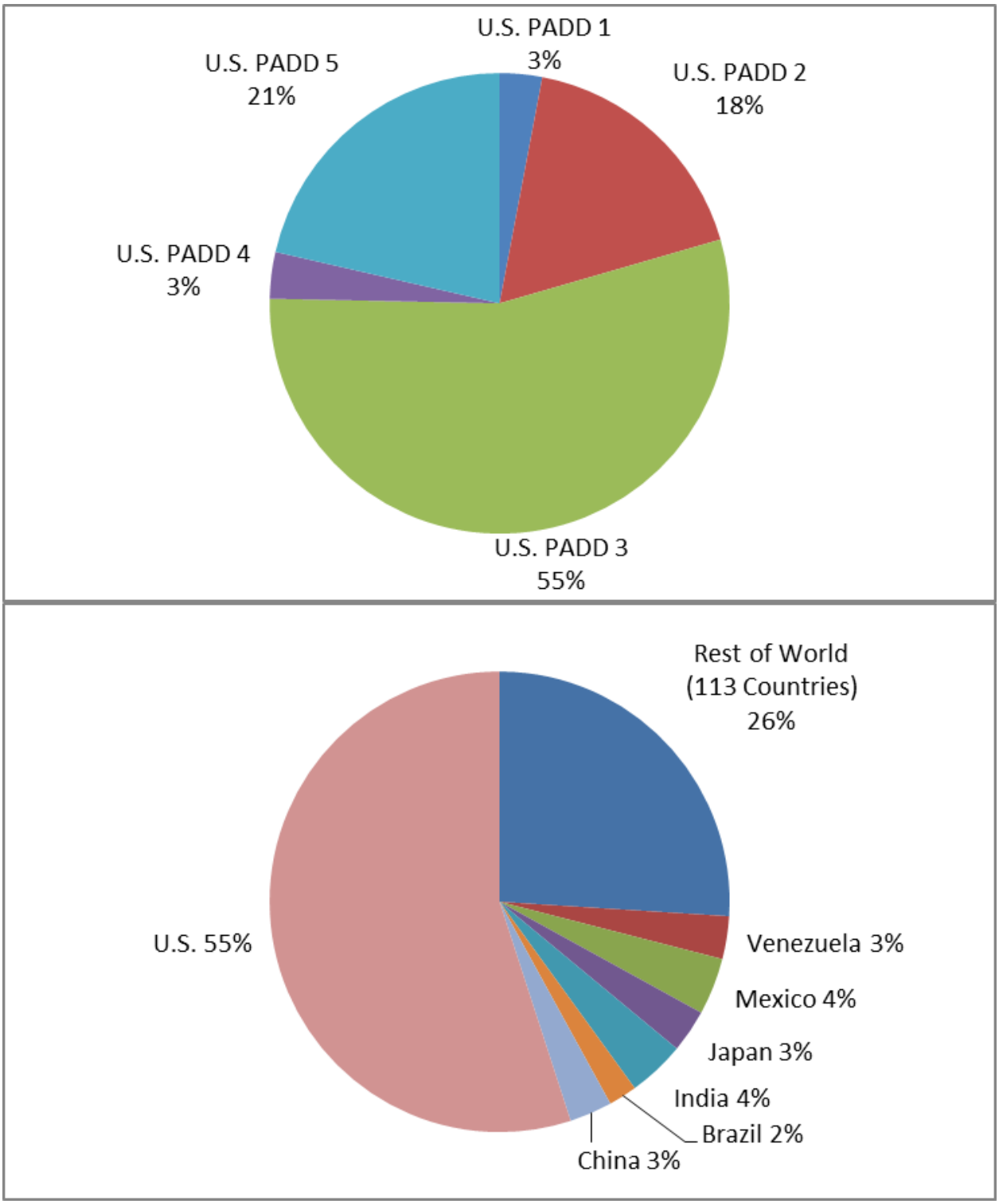
The Gulf Coast area[2] contains the single largest concentration in the world of refineries capable of processing heavy crudes. For example, the United States has over half of the world's coking[3] capacity, and the majority of this capacity is at Gulf Coast refineries (1.5 million bpd capacity in PADD 3 out of 2.74 million bpd nationwide in 2012, according to EIA data [see Figure 1.4.2-2]).

1.4.3 Market Analysis Presented in 2011 Final EIS

The assessment of the potential market impact of Keystone's previously proposed Keystone XL Project was presented in the August 26, 2011, Final EIS document. In presenting its assessment of the petroleum market outlook as seen in 2011, the U.S. Department of State (Department) drew on several studies. Notably, among the analyses and studies examined in that assessment was a study commissioned by the U.S. Department of Energy (USDOE) office of Policy and International Affairs. The USDOE commissioned the study to assist in the analysis of petroleum markets and how these markets might impact the project as proposed in 2011. The USDOE contracted with EnSys Energy and Systems, Inc. (EnSys) to develop a study of different North American crude oil pipeline scenarios through 2030. The market analysis in this Supplemental EIS focuses on an assessment of the crude oil market as it has evolved over the last 2 years. To understand the analysis in this Supplemental EIS it is necessary to understand the prior analysis in the Final EIS.

The study completed by EnSys in December 2010 assessed the potential impacts of several different scenarios of pipeline construction, including having or not having a Keystone XL pipeline, as then proposed, on U.S. refining, petroleum imports and exports, and on international crude oil markets and refining. Each pipeline scenario was evaluated against two different outlooks for U.S and global demand. A demand outlook is a projection of product demand[4] in a specified market for a given period of years.

[2] The Gulf Coast area refers to the region from Houston, Texas, to Lake Charles, Louisiana. Gulf Coast area refineries include 12 refineries on the Gulf Coast in Texas and three refineries in Lake Charles, Louisiana.
[3] Coking is a refinery operation that is used to process heavy crude oil. The process upgrades material into higher-value products and produces petroleum coke (EIA 2013).
[4] Product demand in this context refers to the full suite of refined petroleum products and biofuels. Refined petroleum products include gasoline, jet fuel, diesel, heating oil, residual fuels, and other products.



Source: Canadian Imperial Bank of Commerce (CIBC) 2012, EIA 2012b.

Note: U.S. coking capacity shown as percentage of 2.74 million barrels per stream day.

Figure 1.4.2-2 Relative Global and U.S. Coking Capacities

The first demand outlook used by EnSys was the 2010 EIA Annual Energy Outlook (AEO) Reference Case through 2030. The AEO is an annual report that is published by the USDOE's statistical agency, the EIA. The EIA provides independent and impartial energy information to the USDOE, other government agencies and the public. The second outlook employed by EnSys was a lower-demand scenario based on a U.S. Environmental Protection Agency (USEPA) study that assumed "more aggressive fuel economy standards and policies to address vehicle miles traveled" (EnSys 2010). The USEPA outlook projected that U.S. demand will be approximately 4 million bpd lower by 2030 than that projected in the AEO Reference Case. That USEPA study was used to generate a Low Demand Outlook using USDOE's Energy Technology Perspectives Model as applied by Brookhaven National Laboratory.

EnSys used these two demand outlooks to further examine the possible impacts associated with different scenarios regarding the construction of various pipelines. Besides looking at possible impacts associated with a decision to permit the Keystone XL pipeline, EnSys also looked at the impacts of other potential pipeline construction (such as Enbridge's Northern Gateway to the British Columbia coast, the Kinder Morgan Trans Mountain pipeline to the Vancouver region, and new pipelines within the United States). Finally, EnSys also looked at a "No Expansion" scenario that assumed pipeline capacity would be frozen at 2010 levels through 2030.

These different scenarios, and the market impacts associated with a denial or approval of the previously proposed Keystone XL pipeline, were evaluated using the EnSys WORLD Oil Refining Logistics and Demand model. The WORLD Oil Refining Logistics and Demand model (the WORLD Model) has been used since 1987 by the USDOE Office of Strategic Petroleum Reserve, and has been applied in analyses for organizations including the EIA, the USDOE, the USEPA, the World Bank, the American Petroleum Institute (API), and the Organization of the Petroleum Exporting Countries Secretariat.

The EnSys Report provided assessments of different scenarios of pipeline construction including scenarios with and without the Keystone XL Pipeline. These assessments were relevant to determining whether changes in upstream (extraction in the oil sands) and downstream (refining in the Gulf Coast area) activity should be considered indirect and cumulative impacts potentially caused by permitting the Keystone XL pipeline as then proposed.

The EnSys 2010 Assessment concluded that there was commercial demand for WCSB heavy crude oil in the Gulf Coast. The demand identified by the EnSys 2010 Assessment was sufficiently high that were a permit for the Keystone XL pipeline, as then proposed, denied, the market would likely respond by adding broadly comparable transport capacity over time. The EnSys 2010 Assessment forecasted that the demand for WCSB heavy crude from the oil sands would be such that irrespective of whether a permit for the Keystone XL pipeline, as then proposed, was granted, transport capacity in excess of that of the Keystone XL pipeline would likely be built.[5] The WORLD Model results indicated that under "business as usual" circumstances neither the production rate in the oil sands nor refining activities in the Gulf Coast would change substantially based on whether Keystone XL, as then proposed, was built.

[5] Ensys 2010 WORLD Model results indicated that under the range of "business as usual" pipeline scenarios considered, demand for WCSB in the Gulf Coast would reach 600,000–1,800,000 bpd by 2030 depending primarily on the amount of pipeline capacity built to the west coast of Canada. Business as usual is used in this context to mean a situation in which the industry and market react based on normal commercial incentives.

The production rate in the oil sands was only substantially reduced in scenarios that assumed all pipeline transport capacity was frozen at 2010 levels through 2030. The scenario also assumed that incremental non-pipeline transport capacity (such as rail or tanker) was not available. The EnSys 2010 report concluded that the "No Expansion" scenario had a low probability of occurring.

To better assess the "No Expansion" scenario analyzed by EnSys in 2010, the Department and the USDOE commissioned EnSys to further examine the likelihood of the No Expansion scenario, including assessing in greater detail the potential of non-pipeline transportation of crude oil. In the 2011 No Expansion Update Report, EnSys concluded that even if there were no new pipelines added beyond those existing in 2010, rail supported by barge and tanker, as well as expansions to refining/upgrading in Canada, could accommodate projected oil sands production. In other words, irrespective of whether pipeline capacity were frozen at 2010 levels, EnSys did not find it likely that oil sands production would be reduced, or "shut-in":

- "Broadly, under a Total No Expansion scenario, we see rail supported by barge, tanker and direct upgrading to product as able to deliver sufficient capacity to avert any WCSB shut-in through—and potentially beyond—2030" (EnSys 2011).
- "[W]e believe there is scope across rail and marine options to provide alternatives that, inter alia, could reach and exceed the scale of the Keystone XL pipeline such that neither WCSB nor domestic U.S. production would be shut-in, other than possibly for short periods as is happening today" (EnSys 2011).
- "[W]e do not see cost deterring rail, barge and tanker expansion in any form of "No Expansion" situation" (EnSys 2011).

In addition to its focus on non-pipeline transport modes, the 2011 No Expansion Update Report also examined the potential for modifications to already existing pipeline infrastructure to provide additional capacity and concluded that the potential was substantial. For both non-pipeline expansions and modifications to existing pipelines, EnSys concluded that permitting would likely be easier and development times shorter than for major new pipeline projects.

While the 2011 Final EIS assessment of the potential market impacts of granting or denying a permit for the Keystone XL pipeline was informed by the EnSys studies, it also took account of several other sources of information. In addition to the work by EnSys, which relied in part on inputs from the AEO by the EIA, the Department also examined other sources in preparing the 2011 Final EIS, including: input from experts at the USDOE; information from industry associations (CAPP—Canadian Association of Petroleum Producers), and private consulting companies such as Purvin & Gertz, IHS Cambridge Energy Research Associates, Hart Energy, and ICF International, as well as the numerous comments received from the public.

Taking account of all of the relevant information, the 2011 Final EIS concluded that the proposed Project is unlikely to significantly affect the rate of extraction in the oil sands or in U.S. refining activities. The Final EIS nonetheless, as a matter of policy, included information about the environmental impacts associated with extraction of crude oil in the oil sands, particularly an extensive analysis of the fact that on a life-cycle basis, transportation fuels produced from oil sands crudes emit more greenhouse gases than most conventional crude oils.[6]

[6] This information and analysis is updated in this Supplemental EIS in Section 4.15, Cumulative Effects Assessment.

1.4.4 Market Developments Since the 2011 Final EIS

The analysis presented in this Supplemental EIS uses the most current information available. It examines several recent market outlooks, including the 2013 early release version of the AEO (the 2010 AEO had provided key input assumptions for the EnSys 2010 and 2011 assessments). As in 2011, the Department again consulted with experts from USDOE, and reviewed information from industry associations such as CAPP and private consulting companies such as Ensys, Hart Energy, and ICF International.

The Department also relied on a January 2013 memorandum from the Administrator of the EIA that analyzed some of the key issues also presented in this section (2013 EIA Memo[7]). Finally, the Department also reviewed numerous comments received from the public during the National Interest Determination comment period for the previously proposed Project, and the scoping process for this Supplemental EIS.

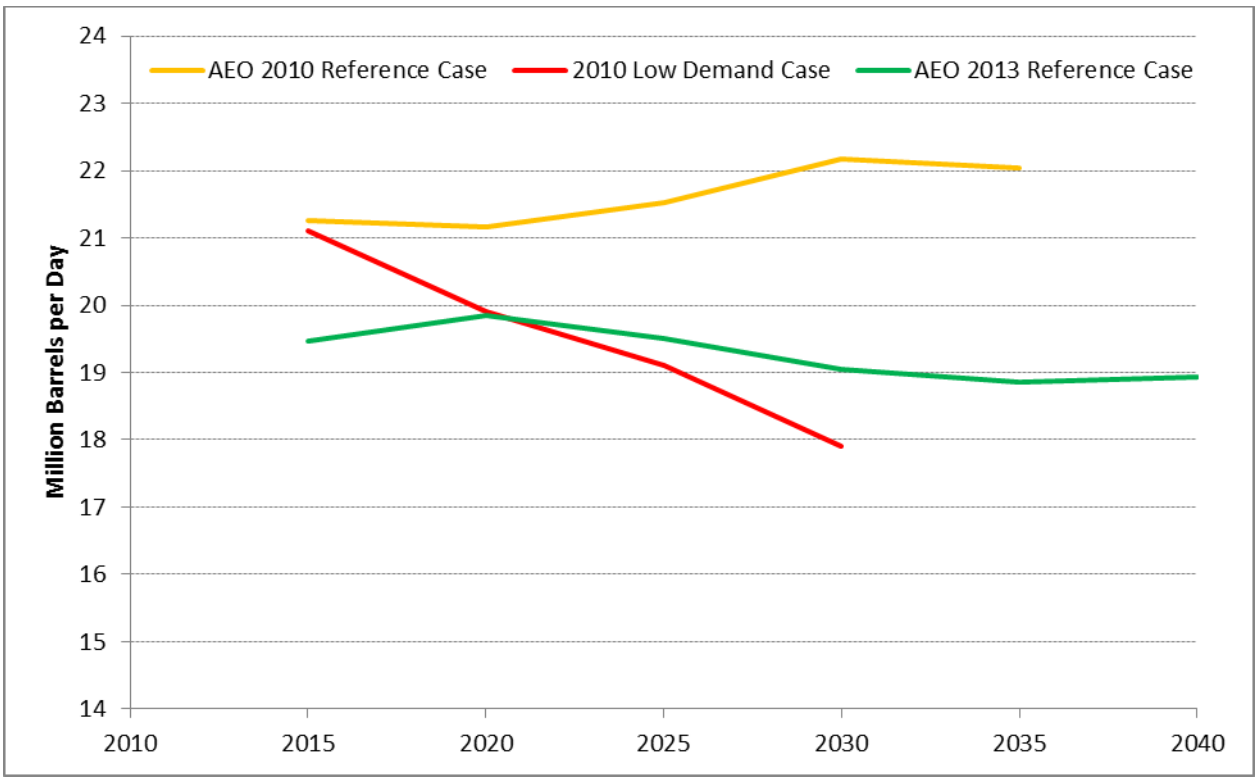
The subsections below examine significant changes to petroleum markets in North America and the potential impacts of these changes on a permitting decision for the proposed Project. Since the 2011 Final EIS and the 2010 and 2011 EnSys Assessments, there have been several developments in the crude oil market in the United States. Among the most significant developments are:

- Continued lower actual and projected demand for gasoline in the United States.
- Developing trends in increased domestic light crude oil production from shale oil formations that emerged in 2010 and 2011 resulting, among other things, in decreasing crude oil imports.
- Developments in the North American crude transport network, including new crude pipeline expansions and increasing use of rail transportation for crude oil.

[7] Included in Appendix C, Market Analysis Supplemental Information, of this Supplemental EIS.

1.4.4.1 Reduction in U.S. Demand

One of the most significant differences in the petroleum market since publication of the 2011 Final EIS is the lower actual and projected demand for liquid fuels[8] in the United States. While the AEO 2013 outlook for liquids demand is lower than the two demand outlooks assessed by EnSys through approximately 2020, it falls between them after 2020 (Figure 1.4.4-1). The majority of this decreased demand outlook comes from lowered projections of demand for gasoline. AEO 2013 has an outlook for gasoline demand that reflects the tightened Corporate Average Fuel Economy standards put in place in 2012 that require an industry-wide standard of 54.5 miles per gallon by 2025. The AEO also incorporates other factors that reduce demand for refinery production of gasoline, namely, a downward trend in per capita miles driven consistent with an ageing population, and increasing use of biofuels, based on renewable fuels mandates (Yglesias 2012).

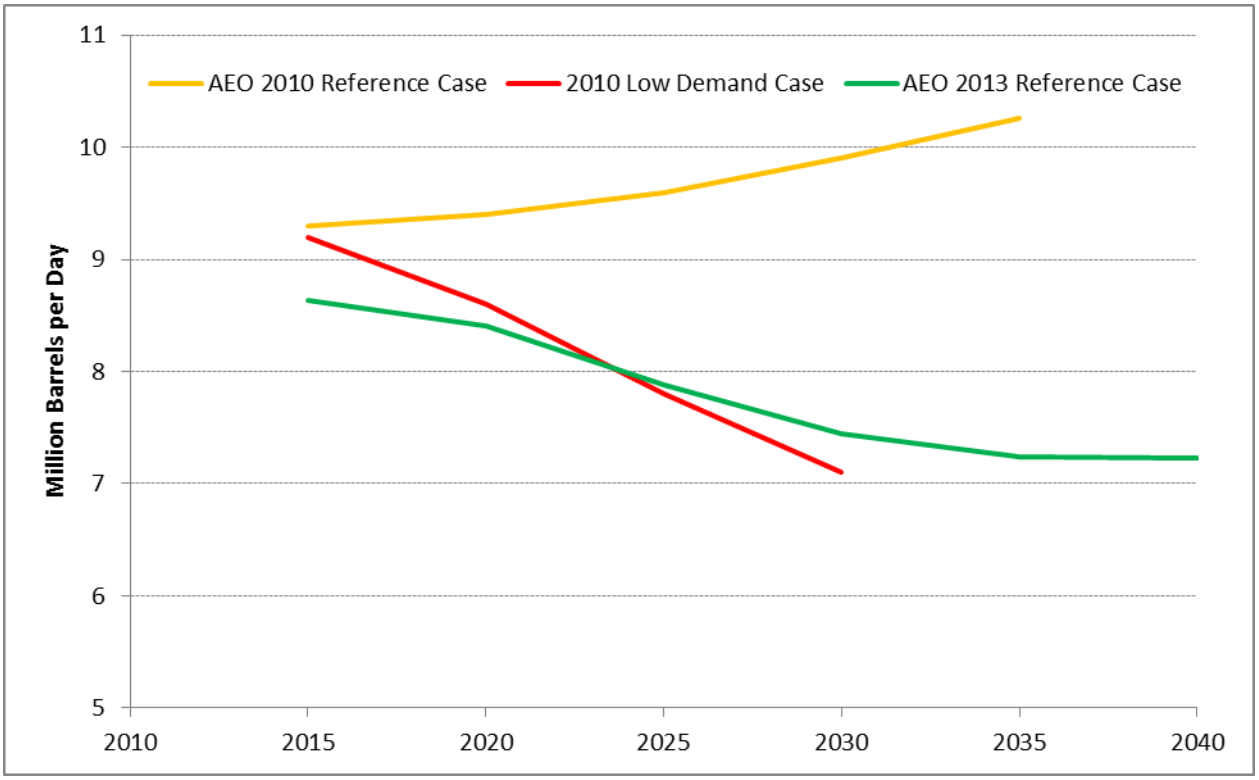


Source: EIA 2010, EnSys 2010, EIA 2013b.

Figure 1.4.4-1 U.S. Product Demand—Total Liquids

[8] Liquid fuels include refined petroleum products, other hydrocarbon fuels, and biofuels. The Total Liquids category in the AEO reports also includes petrochemical feedstocks (such as natural gas liquids).

Compared to the 2010 AEO outlook, the AEO 2013 outlook for gasoline demand is lower. The reduced demand for gasoline in AEO 2013, however, is higher than the gasoline demand in the Low Demand Outlook assessed by EnSys after approximately 2024. According to the AEO 2013, total U.S. product demand in 2030 will be 19.0 million barrels per day (mmbpd), as opposed to 22.2 mmbpd forecast in AEO 2010. By comparison, the Low Demand Outlook assessed by EnSys in 2010 had U.S. total demand dropping to 17.9 mmbpd by 2030 (Figure 1.4.4-1 above).[9] Therefore, the AEO 2013 outlook for gasoline demand falls between the two outlooks assessed by EnSys after 2024 (Figure 1.4.4-2).

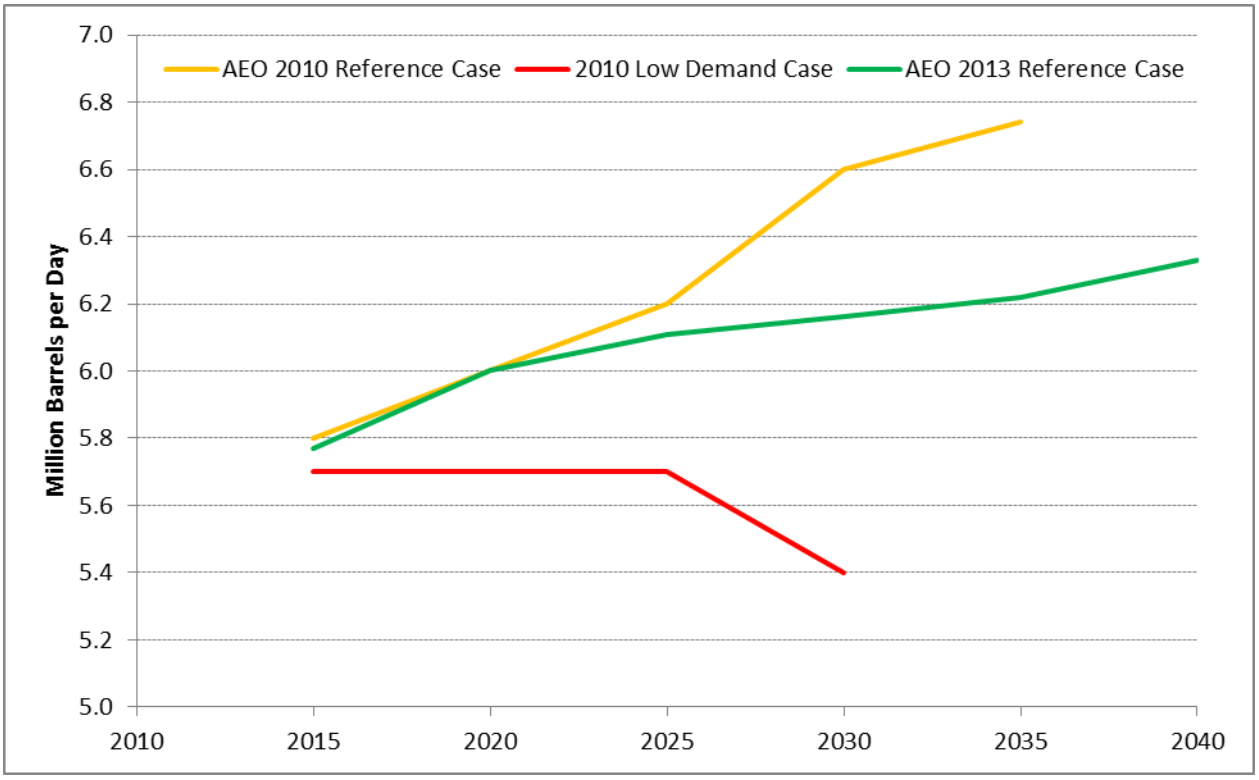


Source: EIA 2010, EnSys 2010, EIA 2013b.

Figure 1.4.4-2 U.S. Product Demand—Gasoline/E85[10]

[9] A table of the complete comparison of the demand outlooks in the AEO 2013, AEO 2010, and the EnSys Low Demand outlook is included in Section 1.2 of Appendix C to this Supplemental EIS.
[10] E85 contains 85 percent ethanol and 15 percent gasoline and is most commonly used in flex-fuel vehicles.

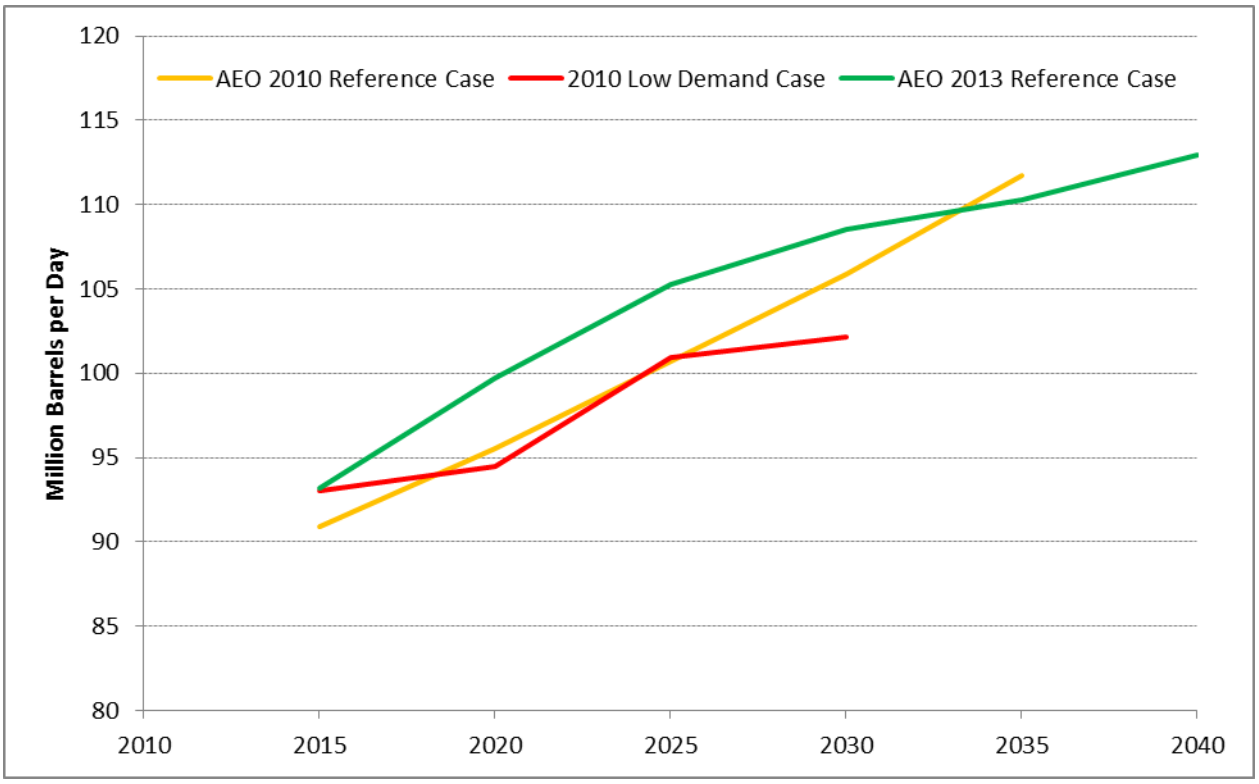
Demand for other liquid products, such as jet fuel and distillates (including diesel), is similar between all three outlooks in the period preceding 2020; however, between the years 2020 and 2030, the 2010 AEO and the 2013 AEO outlooks diverge. Despite the divergence, it is noteworthy that the 2013 AEO outlook projects demand between the two outlooks used as inputs for the 2010 EnSys assessment, namely the 2010 AEO outlook and the Low Demand Outlook (Figure 1.4.4-3). In other words, the EnSys 2010 AEO and Low Demand Outlooks "bracketed" the new AEO 2013 demand outlook for the United States.



Source: EIA 2010, EnSys 2010, EIA 2013b.

Figure 1.4.4-3 U.S. Product Demand—Jet/Distillate

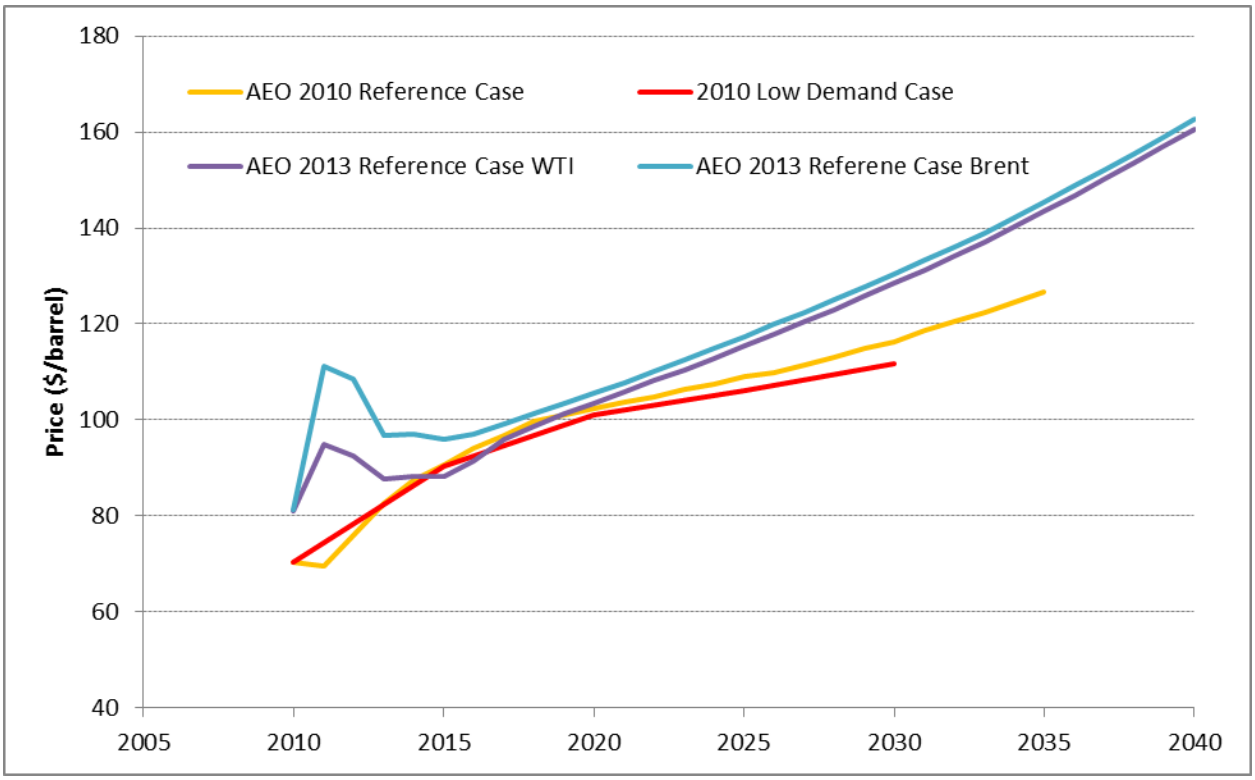
In contrast, the AEO 2013 outlook projects world liquids demand in 2020 and 2030 higher than either of the outlooks (whether the Low Demand Outlook or the 2010 AEO outlook) used by EnSys in its 2010 assessment (Figure 1.4.4-4). The increase in global demand projected by the AEO 2013 outlook is driven by assumptions regarding population and economic growth, particularly growth in non-Organization for Economic Co-operation and Development economies.



Source: EIA 2010, EnSys 2010, EIA 2013b.

Figure 1.4.4-4 Global Liquids Demand

Finally, the Low Demand Outlook used by EnSys in its 2010 assessment projected reduced world oil prices compared to the AEO 2010 outlook. However, the AEO 2013 outlook's projection is for crude oil prices higher than those in either of the outlooks used by EnSys in its 2010 assessment (Figure 1.4.4-5).[11]

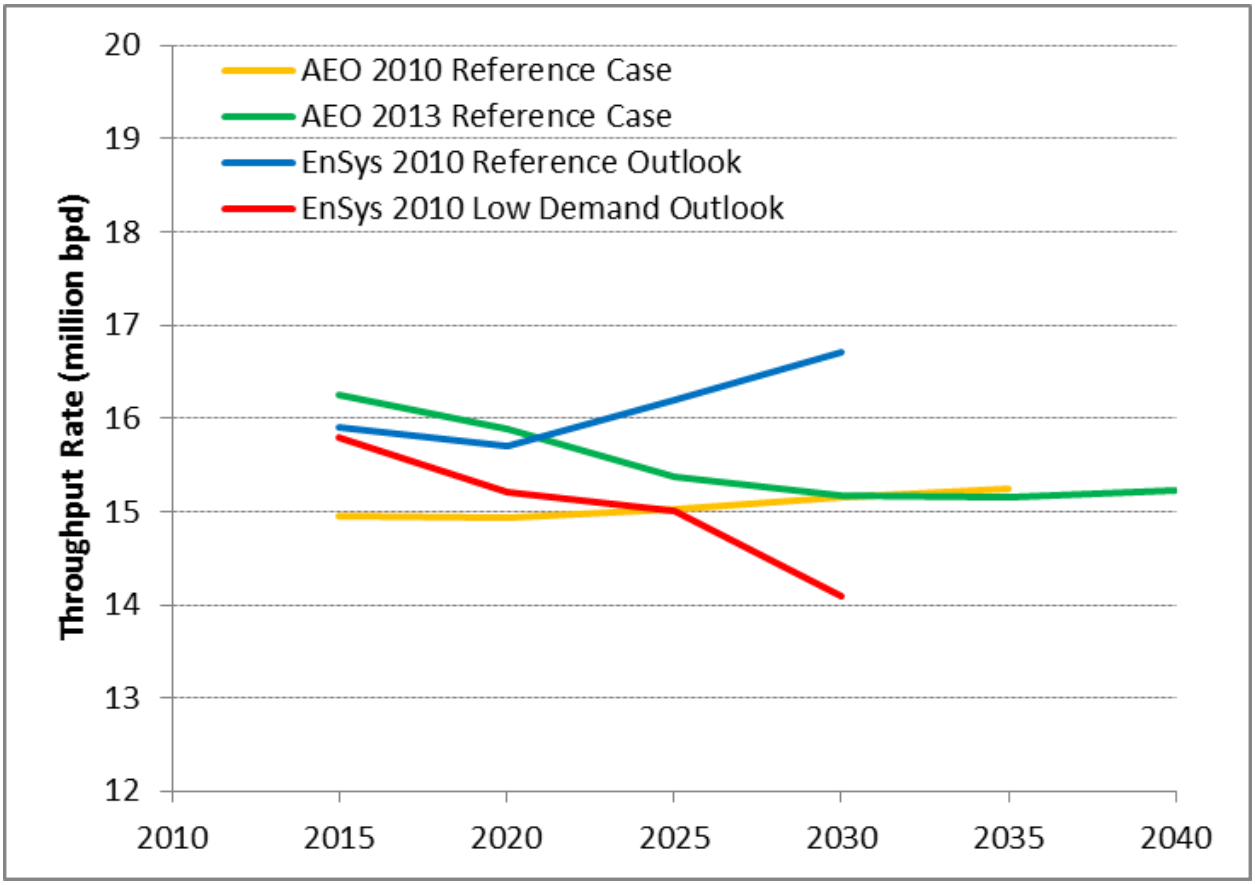


Source: EIA 2010, EnSys 2010, EIA 2013b.

Figure 1.4.4-5 AEO Crude Prices (2011 Dollars)

[11] The AEO 2013 switched its outlooks for crude oil prices to include West Texas Intermediate (WTI) and Brent (a global, light crude benchmark). This change was made to account for the fact that WTI prices have become decoupled from global crude prices because of transportation constraints. This is explained further in Appendix C, Market Analysis Supplemental Information.

While the AEO 2013 estimates a reduced demand outlook for the United States, it also projects increases in U.S. refined product exports and thus U.S. refinery throughput rates similar to those in the AEO 2010, especially longer term (Figure 1.4.4-6). Further, the AEO 2013 supply outlook for renewable liquid fuels (biofuels) is also projected to be substantially lower than the AEO 2010 outlook.



Source: EIA 2010, EnSys 2010, EIA 2013b.

Note: The EnSys 2010 Reference outlook is based on the 2010 EIA AEO reference case, but has independent projections of refinery throughput. The Low Demand Outlook scenario was based on USDOE's Energy Perspectives Model as applied by Brookhaven National Laboratory. This model was based on a USEPA study that assumed more aggressive fuel economy standards and policies to address miles traveled.

Figure 1.4.4-6 Domestic Refinery Throughput

The EnSys 2010 WORLD Model results indicated that, regardless of the input used, whether the Low Demand Outlook or the AEO 2010 outlook, the proposed Project would not affect extraction in the oil sands or refining activities on the U.S. Gulf Coast. Neither outlook materially altered the demand for heavy sour crude by refineries on the Gulf Coast or the total U.S. imports of Canadian crude.[12] In other words, demand for heavy sour Canadian crudes at U.S. refineries, including on the Gulf Coast, was projected to be relatively insensitive to the level of U.S. product demand decrease.

Thus, under the AEO 2013 outlook, U.S. product demand is lower than under the 2010 AEO Reference case (although higher than that projected under the more conservative Low Demand Outlook studied by EnSys in 2010). The outlook is now for higher U.S. exports of refined products. These are acting to offset the lower domestic demand and raise U.S. refinery throughputs back to levels similar to those projected under the AEO 2010 outlook (Figure 1.4.4-6). U.S. refineries have not materially changed over the last two to three years; indeed, the major projects that have gone ahead both in PADD 2 and on the Gulf Coast (PADD 3) have been geared to increasing heavy crudes processing. Having made significant investments in equipment to process heavy sour crude, refiners have strong incentive to obtain such crudes (Section 1.4.4.3, Increase in United States Crude Production). The combined effect of these demand, export, and refining factors is that, although the demand outlook has changed, the refining outlook is similar.

1.4.4.2 Refined Product and Crude Oil Exports

It is likely that increasing amounts of WCSB crudes will reach Gulf Coast refiners whether or not the proposed Project goes forward (products from this processing will be used in both domestic markets and for export). As a result, future refined product export trends are also unlikely to be significantly impacted by the proposed Project. Gulf Coast refiners typically seek to obtain crude oil under long-term supply contracts from reliable sources that can provide crude oil types that match their refining configurations. This is the case for heavy WCSB crudes, which match well with the large amount of heavy crude processing capacity on the Gulf Coast. Therefore, existing refinery throughputs and product exports are likely to continue, with attendant impacts. As detailed in Section 1.4.6, Crude Oil Transportation, non-pipeline transport options, particularly rail, are being used to transport WCSB crude oil, and thus the proposed Project is unlikely to significantly affect U.S. refining activities.

Projections for petroleum product import and export volumes have undergone substantive changes between the 2010 and more recent AEO reports. Table 1.4-1 compares 2010 and 2012 AEO U.S. import and export volumes. The table indicates that the 2012 AEO expects petroleum product imports and exports to essentially offset each other through 2020 (i.e., “net” zero petroleum imports), whereas the 2010 AEO anticipated a steady need for almost 2.9 mmbpd of gross product imports and a net import requirement of roughly 1.1–1.3 mmbpd over the period. This significant change is driven primarily by the lower U.S. demand forecasts shown in the figures above.

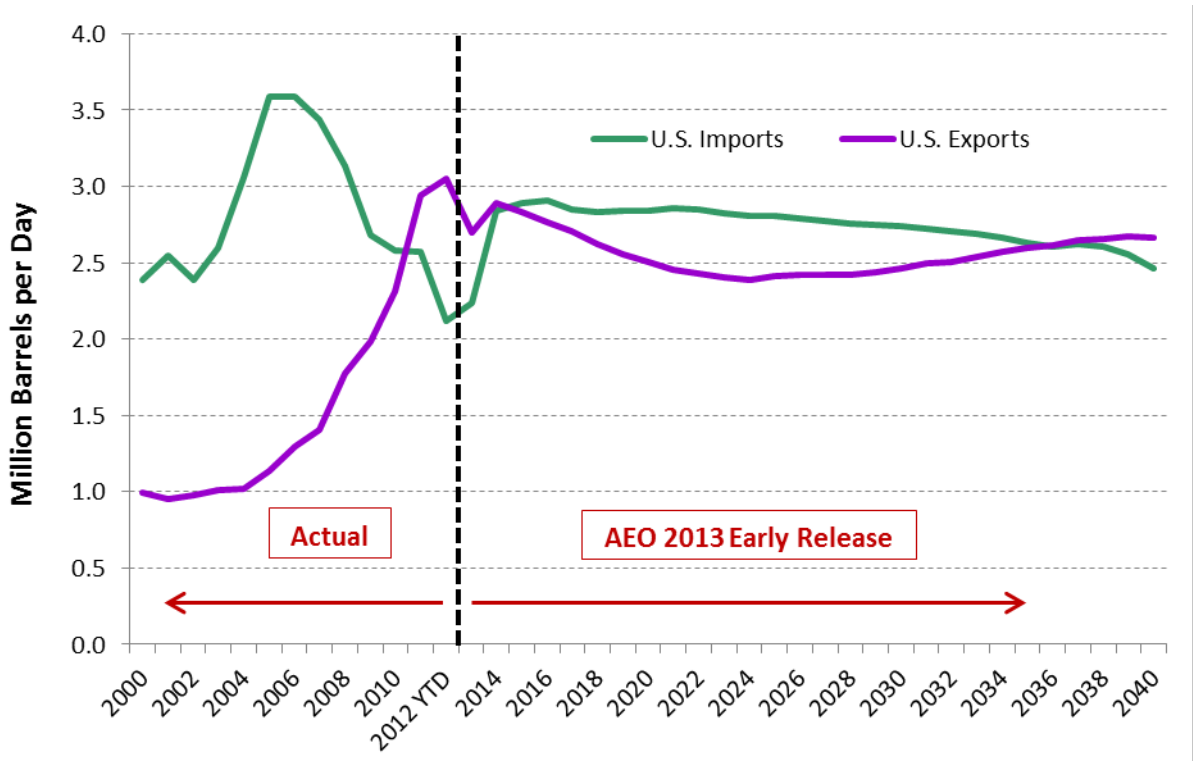
[12] Among the differences between the AEO 2010 outlook results as compared with the Low Demand Outlook results in EnSys 2010, were that in the Low Demand Outlook there were lower refinery throughputs and increases in net refined product exports from the United States.

Table 1.4-1 Comparison of 2010 and 2012 AEO U.S. Product Import and Export Volumes

	Imports (mmbpd)			Exports (mmbpd)		
	2012	**2015**	**2020**	**2012**	**2015**	**2020**
2010 AEO	2.892	2.844	2.873	1.596	1.655	1.745
2012 AEO	2.462	2.218	2.063	2.466	2.341	2.050
Change	(0.429)	(0.626)	(0.810)	0.870	0.687	0.305

Source: EIA 2010, EIA 2012c.

Exports of petroleum products averaged around 1 mmbpd throughout the 1990s up to 2005. In 2005, exports began increasing. Exports were typically either products not consumed in large quantities in the United States (petroleum coke, residual fuel, etc.) or gasoline and distillate oils (such as diesel and heating oils). Export volumes have increased to over 3 mmbpd in the first half of 2012. This increased volume of refined products is being exported by refiners as they respond to lower domestic gasoline demand and continued higher demand and prices in overseas markets (Figure 1.4.4-7). Most of these exports are from PADD 3. However, almost half of PADD 3 refined products go to the domestic market.[13]



Source: EIA 2012d.

Figure 1.4.4-7 U.S. Total Product Import and Export Trends, 2000-2012 YTD, mmbpd

[13] In 2011, 1.6 mmbpd of finished petroleum products were supplied to the U.S. market out of a total of 3.5 mmbpd produced in PADD 3 (EIA 2011).

In addition to the concerns expressed about exports of refined products, there is a question of whether the oil sands/Western Canadian Select (WCS) crude oil transported into Gulf Coast markets via the proposed Project may be simply "passed through" the market and loaded onto vessels for ultimate sale in markets such as Asia or Europe. Under the current market outlooks, such an option is unlikely to be economically justified primarily due to transportation costs. Once the WCSB crude oil arrives at the Gulf Coast, the refiners there have a significant competitive advantage in processing it compared to foreign refiners because the foreign refiners would have to incur additional transportation charges to have the crude oil delivered from the Gulf Coast to their location.

Gulf Coast refiners' traditional sources of heavy crudes, particularly Mexico and Venezuela, are declining and are expected to continue to decline. This results in an outlook where the refiners have significant incentive to obtain heavy crude from the oil sands. Both the EIA's 2013 AEO and the Hart Heavy Oil Outlook (Hart 2012b) indicate that this demand for heavy crude in the Gulf Coast refineries is likely to persist throughout their outlook periods (2040 and 2035 respectively). The EnSys 2010 analysis, discussed in more detail below, projected that, by 2030, U.S. Gulf Coast (PADD 3) refineries could economically absorb and process 1.5 to 2 million bpd of WCSB crudes (predominantly heavy/oil sands streams); less if a large amount of pipeline capacity were built to the British Columbia coast, opening up markets in Asia. Thus Gulf Coast refineries have the potential to absorb volumes of WCSB crude that go well beyond those that would be delivered via the proposed Project. On this basis, the likelihood that WCSB crudes will be exported in volume from the Gulf Coast is considered low.

For example, the transportation costs of shipping to Asia via the Canadian or U.S. West Coasts would be significantly cheaper than trying to export it via the U.S. Gulf Coast.[14] The total per barrel cost of export to Asia via pipeline to the Canadian West Coast and onward on a tanker is less than just the estimated pipeline tariff to the U.S. Gulf Coast for the proposed Project, and is less than half the cost of the Gulf Coast route to Asia. If pipelines to the Canadian West coast are not expanded or approved, even incurring the additional cost of rail transport to the West Coast ports (Vancouver, Kitimat, or Prince Rupert), estimated at $6 per barrel, results in a total transport cost to Asia that is still 40 percent cheaper than going via the Gulf Coast (Table 1.4-2). Absent a complete block on crude oil exports from the Canadian West Coast, there would be little economic incentive to use the proposed project as a pass through. The high costs of onward transport to other potential destinations tend to mitigate against WCSB heavy/oil sands crudes being exported in volume from the Gulf Coast.

Table 1.4-2 Comparison of Transport Costs for Routes to Asian Markets

	Pipeline/Rail cost	Marine Transport (Suezmax)	Marine Transport (VLCC)	Total Transport Cost
Canadian West Coast (via pipeline) to Asia	$4–5	$3	$2	$6–8
Canadian West Coast (via rail) to Asia	$6	$3	$2	$8–9
U.S. Gulf Coast (via pipeline) to Asia	$8–9	$7	$5	$13–16

Source: Poten and Partners 2013.

[14] The estimated landed cost for heavy crudes (Arab Heavy or Indonesian Duri) in Northeast Asian markets would be approximately $100–$110 per barrel. Western Canadian Select could be expected to have a slight discount from those types of crudes.

It is possible that Canadian-origin crude oil transported to the Gulf Coast area (whether by the proposed Project, other pipelines, or by rail) could be exported to other countries. There is a restriction on exporting domestically produced crude oils. Export licenses can be obtained for a foreign-origin crude provided it has not been commingled with crude oil of U.S. origin (15 Code of Federal Regulations 754.2(b)(vii)). To export a foreign-origin crude, the exporter must demonstrate to the Department of Commerce Bureau of Industry and Security that the crude oil in question is not of U.S. origin and has not been commingled with oil of U.S. origin.

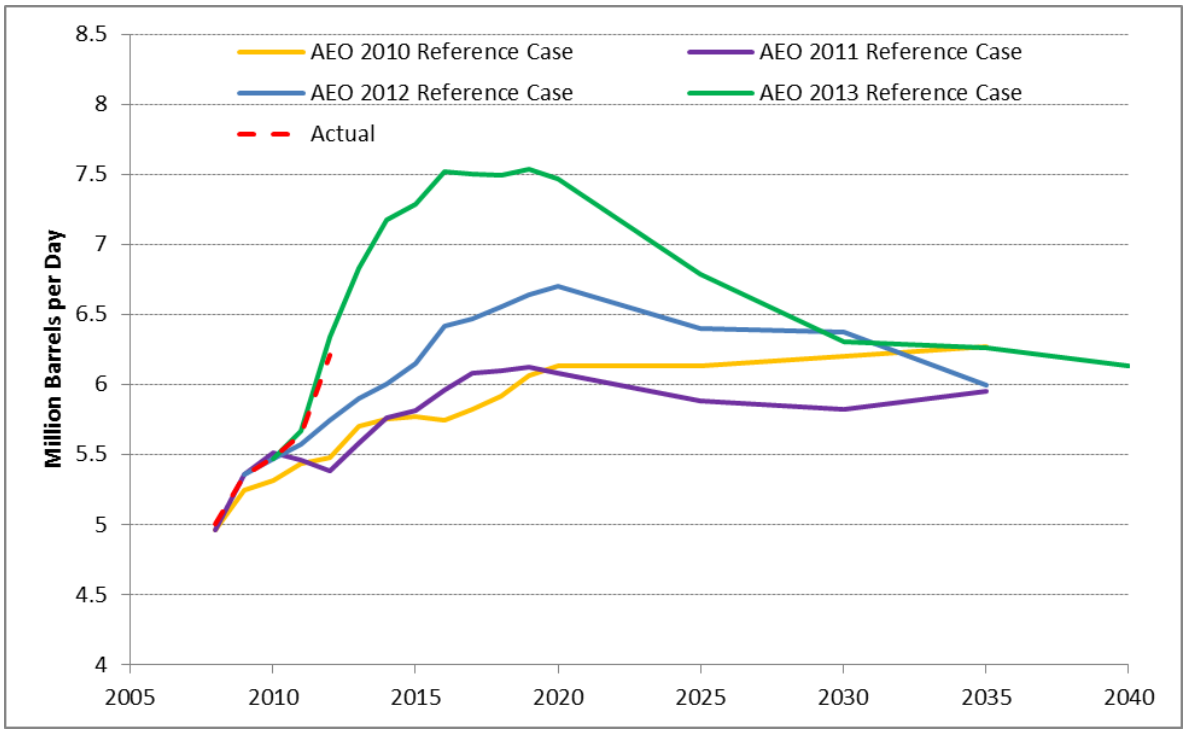
1.4.4.3 Increase in United States Crude Oil Production

The 2011 Final EIS was developed contemporaneously with the beginnings of strong growth in domestic light crude oil supply from so-called "tight" oil formations. Light crude oil that is extracted from shale formations is generally referred to as tight oil.[15] Since 2010, domestic production of crude oil has increased significantly, up from approximately 5.5 mmbpd to over 6.5 mmbpd. In addition to contributing to significant discounts on the price of inland crude because of logistics constraints, (discussed below and in Appendix C, Market Analysis Supplemental Information), there has been a sharp reduction in U.S. imports of crude oil, in particular reductions in imports of light-sweet crude oil. The outlook in AEO 2013 is for higher domestic production of light crude oil compared to AEO 2010.

This latest AEO projects a surge in U.S. crude oil production over the next 10 years driven by the shale/tight oil production increases; however, the projection is also for this surge to peak around 2020 and thereafter for U.S. production to decline such that the AEO 2010 and 2013 outlooks are very similar from 2030 onward (Figure 1.4.4-8).[16] Additionally, a study by the International Energy Agency (IEA) World Energy Outlook (WEO) 2012 has a higher outlook for U.S tight oil production, 3.2 million bpd, but shows a similar bulge trend.

[15] The major U.S. tight oil sources include the Bakken in the Williston Basin of North Dakota and Montana; the Eagle Ford in South Texas; the Mississippian Lime in Oklahoma and Kansas; the Tuscaloosa Marine Shale in Louisiana; the Monterey and Kreyenhagen in California; the Avalon, Bone Springs, and Wolfberry in the Permian Basin of Texas and New Mexico; the Niobrara in Colorado and Wyoming; and the Utica shale in Ohio and Pennsylvania.

[16] The EIA's Short Term Energy Outlook from January 2013 estimated U.S. crude production in 2013 and 2014 to be approximately 500,000 bpd more than the AEO 2013 early release. The IEA WEO 2012 has a higher outlook for U.S tight oil production, 3.2 mmbpd, but shows a similar bulge trend.



Source: EIA 2010, EIA 2011, EIA 2012c, EIA 2013.

Figure 1.4.4-8 Comparison of AEO Forecasts for Domestic Crude and Condensate Production

A substantial portion of this reduction in imports has occurred in PADD 3. As discussed above and in Section 1.3, Purpose and Need, PADD 3 is the major refining center of the United States and would be the ultimate delivery location of most of the crude oil that would be transported by the proposed Project if approved. The 2011 Final EIS market analysis cited 2009 crude import levels and total crude imports.

Based on EIA import data, total crude imports into PADD 3 were 5.029 mmbpd in 2009, compared to 4.620 mmbpd in 2012 (June year-to-date), as shown in Table 1.4-3.

Table 1.4-3 Comparison of PADD 3 Crude Oil Imports and Sources, 2009 vs. 2012 Year to Date[a]

Country	2009 (mmbpd)	2012 (mmbpd)	2009 (%)	2012 (%)
Mexico	1.089	0.936	22%	20%
Venezuela	0.842	0.774	17%	17%
Saudi Arabia	0.620	1.028	12%	22%
Nigeria	0.571	0.260	11%	6%
Other Countries (>5%)	0.260	0.889	5%	19%
Other Countries (<=5%)	1.646	0.733	33%	16%
Total	**5.029**	**4.620**	**100%**	**100%**

Source: EIA 2009, EIA 2012e.

[a] The "Other Countries" category percentages reflect percent of total imports into PADD 3. Other countries >5 percent include Iraq in 2009 and Colombia, Kuwait, and Iraq in 2012.

Light crude oil imports (crude oil over 35 API gravity)[17] were reduced by about a third, from 1.042 mmbpd to 0.690 mmbpd. Large reductions occurred in both Nigerian and Algerian imports of light crude oil, as well as from the United Kingdom and Venezuela, offset by higher Saudi light imports as well as more Mexican light crude (often used for lube production). Heavy crude imports (crude oil under 25 API) were nearly unchanged over this period (Table 1.4-4). Significant reductions in Mexican heavy crude oil were offset by increases from Brazil, Colombia, and Venezuela.

Table 1.4-4 Heavy Crude Import Trends in PADD 3, 2009 and 2012 (through June 2012), mmbpd

Country	2009 (mmbpd)	2012 (mmbpd)
Mexico	0.944	0.711
Venezuela	0.704	0.748
Brazil	0.117	0.190
Colombia	0.159	0.240
Canada	0.096	0.097
Others	0.214	0.173
Total	**2.234**	**2.160**

Source: EIA 2009, EIA 2012e.

[17] API gravity is the American Petroleum Institute's scale for expressing the gravity or density of crude oil (among other liquids). Water has an API gravity of 10. There is a range of cutoff points that are used to specify heavy crude oil. Generally, an API gravity of around 28 is considered the cutoff for the lightest heavy crude that is suited to processing in a "deep conversion" refinery, one that usually in the U.S. has a coker to upgrade the heaviest residuum fractions to light products. Nonetheless, a common cutoff is 25 API and that is what is used in this analysis. For comparison, Brent crude has an API gravity of about 38 and WTI has an API gravity of around 40.

Table 1.4-5 shows heavy crude imports (crude oil under 25 API gravity) in 2012 for Gulf Coast area refiners who are in the anticipated destination market for most of the proposed Project's heavy crude oil shipments. This table indicates that there are about 1.6 mmbpd of heavy crude imports into refiners along the Gulf Coast area through Lake Charles, Louisiana, and that 12 refineries alone processed almost 1.5 mmbpd of heavy crude in the first half of 2012.

Table 1.4-5 Gulf Coast Area Refiners Heavy Crude Processing, January–June 2012[a]

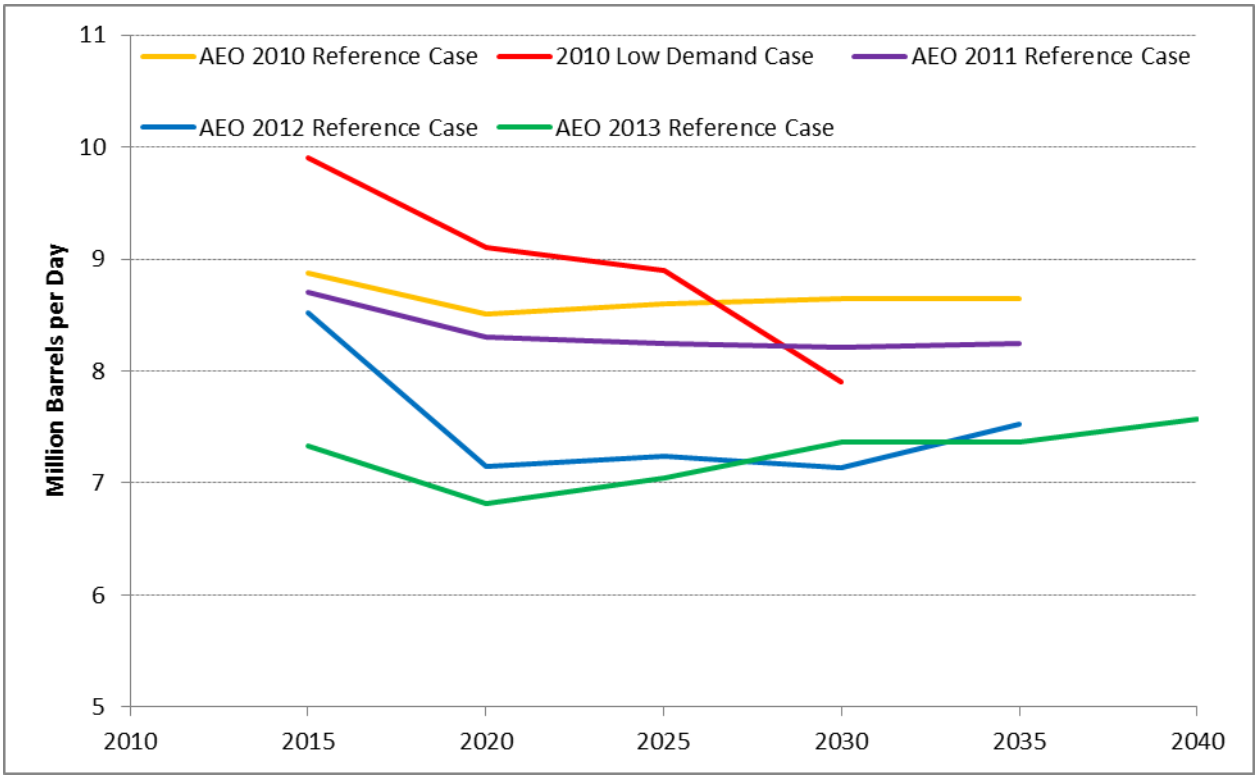
Refiner	Refinery Capacity (bpd)[b]	Heavy Crude Imports	Number of Refineries	Top 2 Import Sources of Heavy Crude
Valero Refining Co Texas LP	803,000	328,077	4	Mexico, Venezuela
CITGO Petroleum Corp	590,800	268,692	2	Venezuela, Mexico
ConocoPhillips Company	486,400	260,038	2	Venezuela, Mexico
Houston Refining LP	273,433	247,467	1	Venezuela, Colombia
Deer Park Refining LTD Partnership	327,000	198,297	1	Mexico, Colombia
ExxonMobil Refining & Supply Co	905,000	184,544	2	Mexico, Brazil
Total Petrochemicals Inc.	130,000	74,269	1	Brazil, Colombia
BP Products North America Inc.	400,780	36,709	1	Kuwait, Mexico
Flint Hills Resources LP	284,172	12,154	1	Brazil, Venezuela
Motiva Enterprises LLC[c]	285,000	2,742	1	Colombia
Total	**4,485,585**	**1,612,989**	**16**	

Source: EIA 2012d, EIA 2012e.

[a] The Gulf Coast area refers to the region from Houston, Texas, to Lake Charles, Louisiana.
[b] These figures are nameplate capacities for refineries. Actual production will vary over the year based on availability of feedstock and maintenance. The average monthly operable utilization rate from January through November 2012 for PADD 3 refineries was 89.3 percent.
[c] The Motiva Port Arthur refinery commissioned a major expansion to 600,000 bpd in early 2012. However, the refinery suffered a fire in the new crude unit and that unit was restarted in early 2013.

As discussed in the introduction to this sub-section above, the projections for production from domestic tight oil supply indicate an increase until 2020 to 2025 and then begin to decline. The 2013 AEO outlook has domestic crude oil production approximately 1.5 mmbpd higher than the 2010 AEO outlook from now until 2020 (Figure 1.4.4-8). However, the outlook suggests that after 2020, U.S. production will begin to decline. By 2025 domestic crude oil production is anticipated to be only approximately 600,000 bpd higher than the 2010 outlook. After 2025 the 2010 AEO and the 2013 AEO are essentially the same. As explained further below, the increase in domestic production of light crude is expected to result in a substantial reduction in imports of light crude oils rather than a reduction in demand for heavy, sour crude oils, including from Canada.

The combination of lower U.S. demand and increased U.S. production as assessed in the 2013 AEO has significantly reduced the outlook for total U.S. crude oil imports compared to the 2010 AEO. Similarly, compared to the EnSys Low Demand Outlook, the 2013 outlook has lower net crude oil imports until 2030, at which time the amounts are nearly equal in the two outlooks. Nevertheless, the United States is expected to remain a significant importer of crude oil throughout the AEO 2013 outlook period (to 2040), importing between approximately 7 and 7.5 mmbpd throughout the period (Figure 1.4.4-9).



Source: EIA 2010; EnSys 2010; EIA 2011; EIA 2012c; EIA 2013.

Figure 1.4.4-9 U.S. Net Crude Imports

The AEO outlooks, as well as the current trends in the market, suggest that increased production of tight oil (light, sweet grade of crude oil), has not impacted the demand for heavy, sour crude oil at the U.S. refineries optimized to process heavy crude oil. The EIA notes, "AEO2013, AEO2012, and AEO2011 all project continued strong demand for heavy sour crudes from Gulf Coast refiners that are optimized to process such oil" (see the 2013 EIA memo in Appendix C, Market Analysis Supplemental Information). A main driver for this is that although refiners' can be expected to make adjustments in their operations to take advantage of the increased supply of light crudes on the markets, shutting down their heavy crude upgrading units would likely be the

most inefficient and expensive option.[18] The 2013 EIA memorandum specifically addresses the period leading up to 2025 because that is around the time the U.S. domestic production of tight oil is expected to peak and have its most significant potential impact on the market.[19]

The trend in flattening domestic production of tight oil after 2025 in the AEO 2013 indicates that the long-term domestic production outlook is also unlikely to significantly impact demand for heavy sour crudes at Gulf Coast refiners. The Hart Energy Heavy Oil Outlook projects demand for heavy sour crude continuing in the long-term at U.S. refineries in the Midwest and Gulf Coast (Table 1.4-6).[20]

Table 1.4-6 U.S. Heavy and Canadian Heavy Crude Oil Refined

	Heavy Crude Refined (mmbpd)					
	2011	**2015**	**2020**	**2025**	**2030**	**2035**
Total U.S. Heavy Crude Refined	2,611	3,134	3,987	4,030	4,022	4,183
Canadian Heavy Crude Refined in United States	1,242	1,769	3,277	3,535	3,690	3,900

Source: Hart 2012b.

The EIA noted, "While the AEO does not identify specific supply sources for imported crude used by U.S. refiners, Canada is certainly a likely source for heavy grades" (2013 EIA Memo, included in Appendix C, Market Analysis Supplemental Information). As a result of broader heavy crude production and export trends in the world that may result in a declining supply of heavy crude oil on the export market, the Gulf Coast refiners are likely to have significant incentive to meet their demand for heavy sour crude by obtaining WCSB crudes.

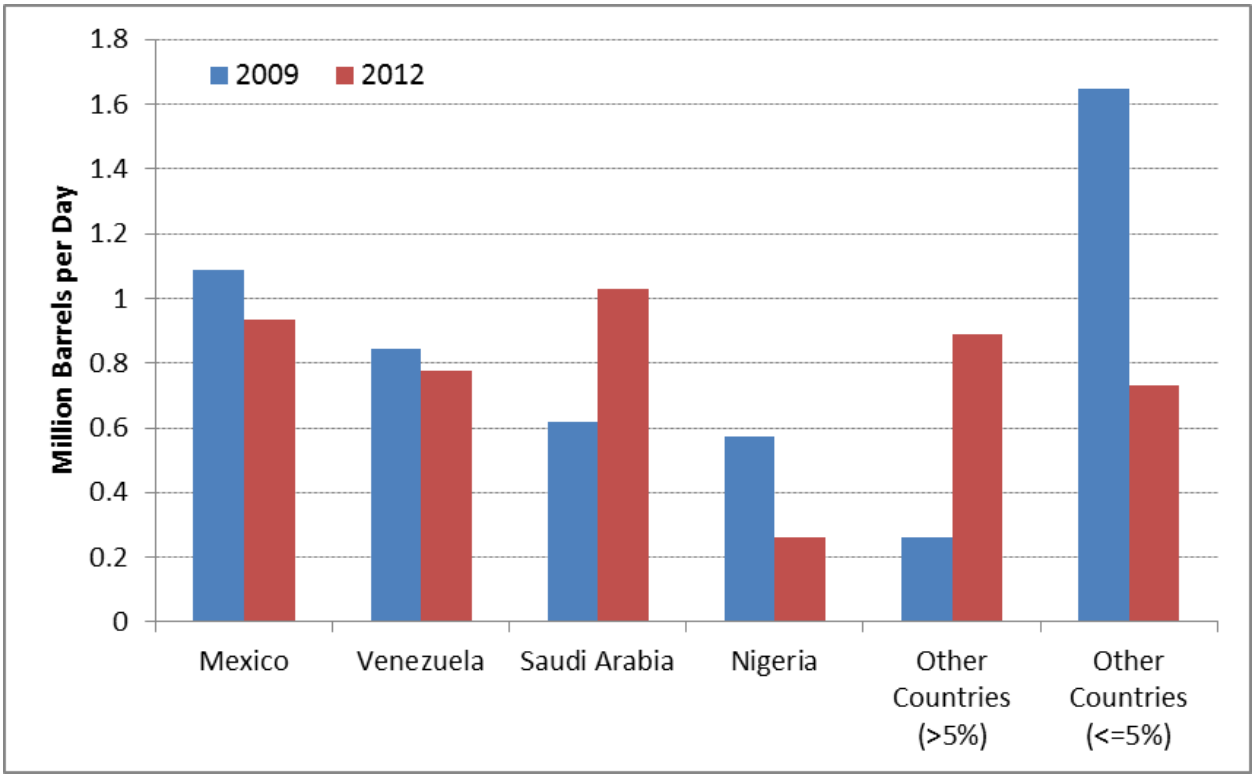
The EnSys 2010 report stated, "[D]evelopments create an outlook where PADD 3 refiners could have difficulty in the future competing for and obtaining sufficient heavy crudes to fill available heavy crude processing and upgrading capacity, and therefore a priori could be expected to have an interest in acquiring heavy WCSB crudes." EnSys arrived at this conclusion in part because of the declining production from the traditional suppliers of heavy sour crude oils to PADD 3, Mexico and Venezuela (Figure 1.4.4-10). Production from both has been in decline in recent years. Mexican production of heavy sour crude is expected to continue to decline. Venezuelan production has more potential to increase in the long-term, but political uncertainty may make it less available to U.S. refiners. EnSys 2010 also noted a trend in countries that produce heavy

[18] With the significant increase in rail facilities being constructed on the East Coast (see Section 1.4.6.2, Increases in Rail Capacity, below), it appears that significant amounts of inland light crude will be sent there as well as to the Gulf Coast. Commentators suggest the trend will be in continued reductions in crude oil imports in both PADDs.

[19] Some commentators have speculated that the increased supply of light tight oil from formations such as the Bakken could further drive down inland crude oil prices in North America and make some of the most expensive oil sands projects uneconomic (Kemp 2012; Vanderklippe 2012). Again, because the light tight oil wells are relatively new, there is limited data on their long-term productivity and as such, the long-term projections underlying those commenters' views should be understood within that context. Also, light tight oil is also a relatively expensive source of crude oil, falling somewhere in the mid-range of oil sands projects (discussed further in Section 1.4.6, Crude Oil Transportation), so the increased production of light tight oil is also sensitive to lower oil prices.

[20] Compared to previous Hart outlooks, the 2012 outlook had lower total heavy crude imports to the United States because the outlook assumed U.S. refineries would respond to the increased supply of domestic light crude by not adding any additional upgrading capacity for heavy crude beyond that already under construction before 2030. In the 2010 EnSys study relied on in the 2011 Final EIS, EnSys assumed there would be no new upgrades at U.S. refineries to process heavy crude beyond projects then-announced and under construction until after 2025.

crude oil toward upgrading or expanding their refining capacity to process more of their heavy crudes domestically, and then to export more of the higher-value light crudes. In other words, appreciable volumes of incremental heavy crude supply (notably from Saudi Arabia, Brazil, and Colombia) would not necessarily reach international crude markets and thus would not be available to PADD 3 refineries. Another study, the Hart Energy's 2012 Heavy Oil Outlook, includes a similar trend in declining supply of heavy crude oil available on the world market for U.S. refineries outside of oil sands heavy crude oil, supporting the EnSys 2010 assessment.[21]



Source: EIA 2009, EIA 2012e.

Note: Other countries >5 percent include Iraq in 2009 and Colombia, Kuwait, and Iraq in 2012.

Figure 1.4.4-10 Comparison of PADD 3 Crude Oil Imports and Sources

[21] The above information is consistent with the recent WEO produced by the IEA, an autonomous agency made up of 28 oil importing countries, including the United States, which studies global energy markets. Comparing the reference case for oil sands production in the IEA's 2012 WEO with previous years indicates that neither the large influx of light tight oil nor the significant decrease in U.S. demand significantly impacts the supply or demand outlook for heavy crude oil derived from the oil sands.

1.4.4.4 Increase in Projected Canadian Crude Oil Production

The production of Western Canadian crude oil is anticipated to increase substantially by 2020 based on the CAPP 2012 outlook. The CAPP 2012 outlook anticipates an increase from about 2.6 mmbpd in 2010 to 4.5 mmbpd in 2020. Canada's National Energy Board (NEB), a Canadian governmental agency, issued a report in 2012 that indicates similar projections (NEB 2012). According to information contained in these reports, growth in production will occur primarily from oil sands development as well as from Canadian tight oil development, including at formations in the Cardium, Viking, Lower Shaunavon, Montney/Doig, Lower Ameranth, Pekisko, Bakken/Three Forks, Exshaw, Duvernay/Muskwa, Slave Point, and Beaverhill Lake. Actual production year-to-date in 2012 is about 2.95 mmbpd, slightly under the CAPP 2012 forecast of 3.0 mmbpd, but higher than the 2010 and 2011 CAPP forecasts for 2012. Section 1.4 of Appendix C, Market Analysis Supplemental Information, shows the performance of CAPP forecasts versus actual production from 2006 to 2011.

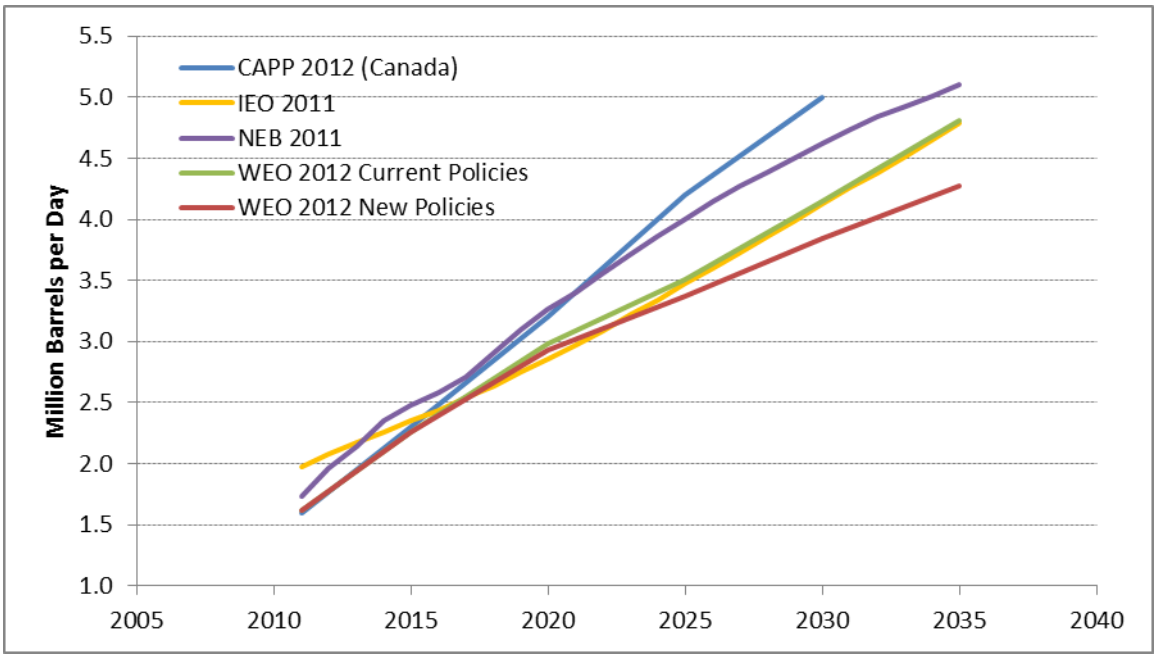
Actual growth rates from 2010 to 2012 are also approximately the rate of growth predicted from 2012 forward. Commitments from shippers on the proposed pipeline projects that connect to the Gulf Coast area (both the proposed Project and the Enbridge projects), together with projected increases in rail transport and known Midwest refinery upgrading projects, support the CAPP forecast for increasing WCSB production over the next 3 to 5 years.[22] The CAPP forecasts are slightly higher for long-term growth than the most recent forecast (from 2011) by the Canadian NEB (6 mmbpd of total Canadian production and 5 mmbpd of production from oil sands by 2035), which examines publicly announced projects but then applies a discounting factor on the likelihood of development based on what stage of production the proposed project was in (NEB 2011, 2012).

Nevertheless, it is noteworthy that both the CAPP and NEB forecasts are higher than the most recent WEO 2012 forecast, which projects an increase in oil sands production to 4.8 mmbpd by 2035 in the Current Policies Scenario and 4.3 mmbpd in the New Policies Scenario (Figure 1.4.4-11).[23] Regardless, all of these projections represent substantial potential growth in the oil sands.

CAPP forecasts over the past 6 years have varied. The actual growth in CAPP crude oil production was affected in 2008–2009 by the global economic recession and has rebounded as economic conditions have improved. The 2012 CAPP forecast represents a "middle of the road" outlook. The CAPP forecasts generally have overestimated potential production compared to the trend of actual production (Figure 1.4.4-12).

[22] U.S. Midwest refinery upgrading projects include BP in Whiting, Indiana; Marathon Oil in Detroit, Michigan; and BP-Husky in Toledo, Ohio.

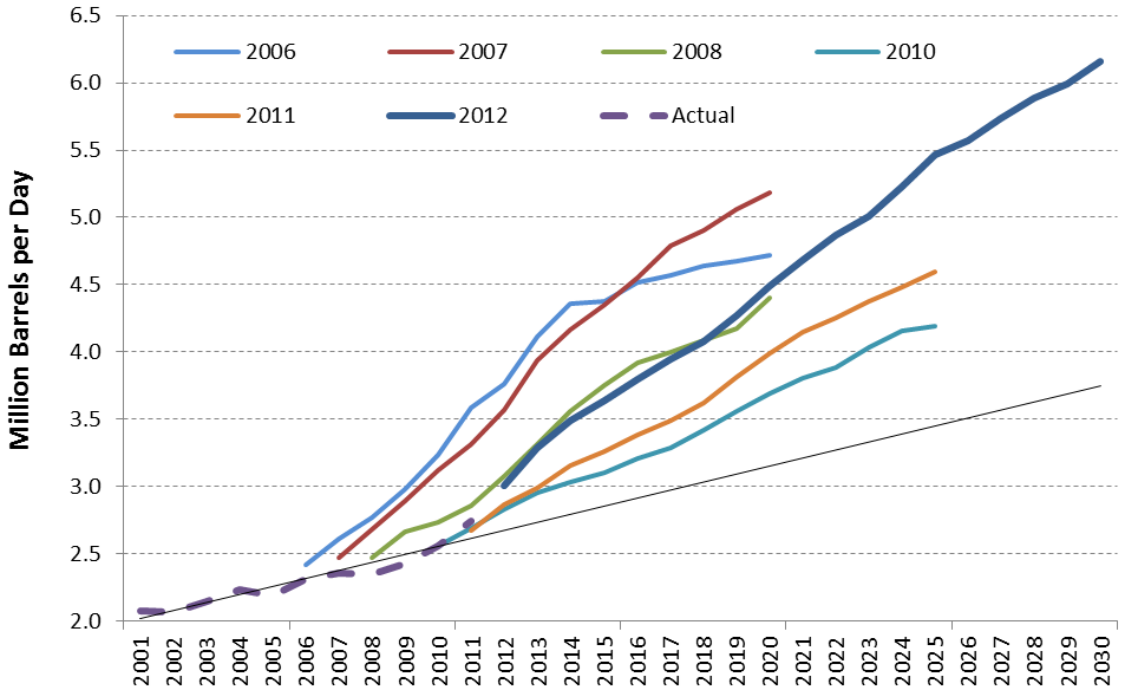
[23] The WEO includes different scenarios regarding policies to address climate change and energy use. The Current Policies Scenario assumes no change from policies currently in effect when the WEO is produced. The New Policies Scenario (which the WEO uses as its reference case) assumes policy commitments regarding climate change mitigation and energy use that countries have made, but not yet implemented, will go forward in a reasonable time. The 450 Scenario assumes policy action consistent with limiting long-term global temperature increase to 2 degrees Celsius.



Source: CAPP 2012, NEB 2011, IEA 2012, EIA 2011b.

Note: NEB 2011 data includes mined and in-situ bitumen production.

Figure 1.4.4-11 Comparison of Canadian Oil Sands Crude Oil Production Forecasts



Source: CAPP 2012; CAPP 2011; CAPP 2010; CAPP 2008; CAPP 2007; CAPP 2006.

Figure 1.4.4-12 Comparison of CAPP Forecasts and Actual Production, 2006 to 2012

The difference in long-term growth projections between the light sweet tight oil versus the WCSB heavy crudes could be expected to impact refiners' decisions regarding their investments. Refiners take long-term growth projections of different types of oils into account when they decide whether to make whatever improvements are necessary to process one grade of crude versus the other. The 2013 AEO early release version projects a relatively rapid increase in U.S. total crude oil production, spurred by shale developments, followed by a peak and decline, such that by the late 2020's the outlook is little changed from that in the 2010 AEO. Thus, this latest EIA projection indicates a relatively short- to medium-term "bulge" in U.S. crude production followed by a return to a downward trend. In contrast, projections from CAPP and others of WCSB production are for a steady, sustained growth over the medium- to long-term, in large part because the bulk of the growth is projected to come from oil sands which do not suffer the same decline profiles as do conventional and especially "tight" crudes.

Since major refinery projects are evaluated based on a presumed 15+/- year life, this distinction between projected supply growth in the United States ("bulge" of light crudes) and in Western Canada (steady growth of heavy crudes) may provide a basis for two types of capital investments: major, long-term expenditure to process heavy WCSB crude supplies, and smaller "revamp" projects with shorter payback periods to process light "tight" crude oils.

1.4.5 Pipeline Capacity out of WCSB

The analysis in the Final EIS, including the 2010 and 2011 EnSys analysis, examined estimates of current pipeline capacity relative to increases in production, and provided an estimated date of when the current capacity would be filled. The EnSys 2010 analysis estimated that existing cross-border pipeline capacity could be filled by shortly after 2020, and the EnSys 2011 update noted that it could likely be filled before 2020 based on increased production projections. Since the 2011 EnSys study, the CAPP production projection has increased from 3.8 mmbpd to 4.7 mmbpd by 2020 (and 6.2 mmbpd by 2030), implying that existing capacity would be taken up sooner. In its assessment of non-pipeline transport options, EnSys assumed those options would need to begin scaling up in 2016. The WEO 2012 noted existing pipeline capacity could be fully utilized by 2016.

There are already transportation constraints substantially impacting the prices of WCSB crude oils. As described in Section 1.4.6.3, Rail Potential to Transport WCSB Crude Oil, the benchmark heavy crude, WCS, has been trading at a $30–40 discount from Brent crude for much of the last year, even climbing to $50–60 recently. It appears these recent steep discounts are related not to reaching the limits of cross-border pipeline capacity, but to more temporary constraints within the United States related to maintenance on the Enbridge pipeline system, as well as the delay in the BP Whiting refinery starting its new heavy crude processing units. Even if these constraints are alleviated in 2013, it is likely that cross-border pipeline capacity (as well as the existing Kinder Morgan Trans Mountain pipeline to Vancouver) will be fully utilized by 2016 or earlier. The 2011 Final EIS examined other proposed WCSB pipeline projects, including the Enbridge Northern Gateway project to Kitimat, British Columbia, and the Kinder Morgan Trans Mountain pipeline expansions to the Canadian West Coast. These projects are being reviewed, but face significant opposition from various groups, and they may continue to be delayed. Enbridge is now stating in investor presentations that the Northern Gateway pipeline (525,000 bpd expandable to 800,000 bpd) may be operational by "2017+". Kinder Morgan continues to state in investor presentations that the expansion of the existing Trans Mountain

capacity (from 300,000 bpd today to 890,000 bpd capacity based on shipper commitments of 708,000 bpd) is expected to be in service in 2017 (Persily 2013).

Based on observations of the above trends, several analysts have noted that if additional pipeline capacity is not added by 2016, or earlier, then WCSB production could be shut-in, and production would be constrained by limited pipeline capacity (CIBC 2012, TD Economics 2012, Pembina Institute 2013, and Vanderklippe 2013). These analyses, however, do not have a full assessment of the potential for rail and other non-pipeline transport options to scale up in the event no additional pipeline capacity is added. Several of the reports either implicitly or explicitly assume there would be no substantial increase in transporting crude oil by non-pipeline options without explaining that assumption.[24] Other reports acknowledge that rail transport of crude oil could grow, but do not include a full assessment of the potential of other non-pipeline transportation options or provide detailed information regarding their assessment of rail potential.[25]

Pipelines have long been the preferred method of transportation for crude oil producers and shippers for long-term, relatively stable commitments. In situations where pipeline capacity is constrained, however, producers and shippers will utilize other modes of transportation, including rail, to ship large volumes of crude oil, as long as such modes are economical. As noted in the next section, rail shipments of crude oil throughout North America have increased substantially in the past 2 years because of limited pipeline capacity out of new production areas. The two Class I Canadian railroads are currently estimated to be transporting over 200,000 bpd (up from 20,000 bpd in 2011) (American Association of Railroads [AAR] 2012; CAPP 2012). Review of market information suggests the rail capacity to ship heavy oil sands crudes is expected to expand significantly beyond that by 2014.

This added rail transport capacity helps alleviate the transport constraints identified in the analyses cited above, and additional rail capacity has the potential to accommodate WCSB growth in the event no pipeline capacity is added. That rail (supported by barge and tanker) could accommodate all projected WCSB growth was a key conclusion in the EnSys 2011 report and is explored further in the next section. The assessment of WCSB transportation possibilities in the following section assumes that no new United States-Canada cross-border, or other WCSB export, pipeline capacity is added between now and 2035.

[24] "While shipping by rail is in the pilot stages, in 2011, only 20,000 barrels of crude oil per day left western Canada on rail. This volume may well grow in the future, but relative to large diameter pipelines, rail's contributions to total exports will remain very small" (Pembina 2013). A second report just noted that rail is more expensive than pipelines and that pipelines are a safer mode of transport (TD Economics 2012).

[25] The CIBC report indicated it did not believe rail would continue longer term when new pipeline projects were implemented, "unless pricing North of Cushing (Bakken and Canada) are discounted due to lack of pipeline capacity – which would be a factor if Keystone XL does not get built" (CIBC 2012). One analysis assumed shut-in could be partially offset by increases in rail; however, it found it unlikely that rail could provide total proposed Project capacity replacement by 2015 (RBC Capital Markets 2013). The analysis concluded that by 2020, absent the proposed Project, downward pressure on WCSB crude oil prices could result in a decrease in oil sands production by nearly 300,000 bpd versus their base case. That report did not include information regarding its outlook for the potential of rail shipments of crude oil to increase. The discussion of the potential for rail capacity to increase at rates sufficient to transport projected WSCB production is presented in Section 1.4.6.3, Rail Potential to Transport WCSB Crude Oil.

1.4.6 Crude Oil Transportation

The proposed Project is one element in much larger developments in North American crude oil transportation as companies respond to the new sources of crude oil production in both the United States and Canada and construct the infrastructure to move that crude oil to market. The two biggest developments have been in the additions and changes in pipeline capacity within the United States and the addition of rail capacity throughout North America.

1.4.6.1 Increases in Pipeline Capacity

The No Expansion scenario assessed in EnSys 2010 assumed that pipeline capacity would be frozen at 2010 levels for at least 20 years along three routes: 1) from Canada the WCSB across the border to the United States; 2) from the WCSB to the Canadian West Coast; and 3) from PADD 2 (Midwest) to PADD 3 (Gulf Coast) in the United States. The scenario represented a situation in which neither major new pipeline projects nor modifications and expansions to existing pipelines went ahead. The EnSys 2011 report concluded that such a scenario was unlikely. Even if a small number of major new projects did not go ahead, notably Keystone XL (which had not been approved) and Northern Gateway (which was open to uncertainty), there were many options the midstream industry possessed to modify existing pipelines and/or make use of existing rights-of-way. These options would be explored before turning to non-pipeline modes, which are also potentially significant as discussed below.

The EnSys 2011 report identified a range of then-announced projects plus additional potential projects that would start from existing infrastructure and which could add materially to the capacity to export WCSB crudes and/or movement of U.S. Bakken and Midcontinent crudes to markets. Since August 2011, when the report was published, the number of projects entailing modifications and/or use of existing rights of way has expanded. Table 1.4-7 summarizes current projects, either under construction or where there is commercial commitment, that would directly support the export of WCSB crudes and/or move WCSB and Bakken crudes to destination markets. Again, nearly every project entails either modification to existing facilities or use of existing right-of-way.

While no new additional pipeline capacity has been added from Canada into the United States or to the Canadian West Coast since the Final EIS in 2011, a number of projects are proposed, including this proposed Project. The 300,000 bpd Kinder Morgan Trans Mountain pipeline that runs from Edmonton to the British Columbia coast at Vancouver, with a spur to Washington State refineries, has been over-subscribed for some time. A successful open season led the Kinder Morgan to announce and file for expansion to 750,000 bpd by potentially 2017. After a second open season, Kinder Morgan has increased the expansion to 890,000 bpd. The bulk of the incremental crude moved on the line would potentially be destined for Asia. The review process for this project is continuing, but there is significant opposition based on concerns over environmental impacts associated with the oil sands and with additional tanker movements in the Port Vancouver harbor.

Table 1.4-7 Major New Crude Oil Transportation Expansion Projects, Late 2011 to Current

Pipeline	Crude type	Route	Date In Service	Date Announced/Last Announcement	New Capacity/ Expansion (bpd)	Capacity after Expansion(s) (bpd)
Plains All American Bakken North	Bakken	From Trenton, Montana, to Regina, Saskatchewan	2012	6/8/2012	50,000	50,000
Enbridge Bakken Pipeline	Bakken	From Berthold, North Dakota, to Cromer, Manitoba	2013	8/24/2010	120,000	145,000
Enbridge Sandpiper Pipeline	Bakken	Beaver Lodge, North Dakota, to Superior, Wisconsin	2016	12/7/2012	To Clearbrook: 225,000 Clearbrook to Superior: 375,000	375,000
Enbridge Alberta Clipper/Line 67 Expansion	WCSB	From Hardisty, Alberta to Superior, Wisconsin	2014	12/7/2012	350,000	800,000
Enbridge Southern Access Expansion/ Line 61 Enhancement	WCSB and Bakken	From Superior, Wisconsin to Flanagan, Illinois	2014	5/16/2012	160,000	1,200,000
Enbridge Flanagan South	WCSB and Bakken	Flanagan, Illinois to Cushing, Oklahoma	2014	3/26/2012	585,000	800,000
Enbridge Line 5 Expansion[a]	WCSB and Bakken	Superior, Wisconsin to Sarnia, Ontario	2013	12/7/2012	50,000	540,000
Enbridge Line 6B Replacement and Expansion[a]	WCSB and Bakken	Griffith/Hartsdale, Indiana to Sarnia, Ontario	2013/14	12/7/2012	260,000	500,000
Enbridge Line 9B Reversal and Line 9 Capacity Expansion[a]	WCSB and Bakken	From North Westover, Ontario to Montreal, Quebec	2014	12/7/2012	60,000	300,000
Enbridge/Energy Transfer Partners Natural Gas to Crude Conversion	WCSB, Bakken	Patoka, Illinois to Gulf Coast area	2015	2/15/2013	660,000	660,000
Kinder Morgan Pony Express[b]	Niobrara, Bakken	Guernsey, Wyoming to Cushing, Oklahoma	2014	8/1/2012	220,000	220,000
Enbridge/Enterprise/ Seaway Reversal and Expansion Phase I	Midcontinent, WCSB, Bakken	Cushing, Oklahoma to Gulf Coast area	2012	11/16/2011	150,000	150,000
Enbridge/Enterprise/ Seaway Reversal Phase II	Midcontinent, WCSB, Bakken	Cushing, Oklahoma to Gulf Coast area	2013	11/16/2011	250,000	400,000
Enbridge/Enterprise/ Seaway Reversal Phase III	Midcontinent, WCSB, Bakken	Cushing, Oklahoma to Gulf Coast area	2014	3/26/2012	450,000	850,000
TransCanada Gulf Coast Project	Midcontinent, WCSB, Bakken	Cushing, Oklahoma to Gulf Coast area	2013	2/27/2012	830,000	830,000
Totals					**4,570,000**	**7,820,000**

Sources: Ellerd 2012; Enbridge 2010; Enbridge 2011a; Enbridge 2011b; Enbridge 2012a; Enbridge 2012b; Enbridge 2012c; Enbridge 2012d; Industrial Commission of North Dakota 2012; Smith 2012; TransCanada 2012; Reuters 2013; Pipeline companies' websites and industry press announcements.

[a] Enbridge Line 5, 6B and Line 9/9B are components of their "Eastern Access" project.

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Enbridge has made regulatory filings[26] to expand one of its heavy crude pipelines, Line 67, (also known as Alberta Clipper), from Hardisty Alberta, to Superior, Wisconsin, by 120,000 bpd to 570,000 bpd, with potential to go to 800,000 bpd. The company has also announced that it has shipper support to add a new pipeline from Edmonton to Hardisty with stated initial capacity of 570,000 bpd, expandable to 800,000 bpd, and a potential 2015 in-service date.

In addition, as summarized in Table 1.4-7, there is substantial pipeline capacity coming online to take WCSB crude oils through the U.S. heartland and out to markets in both the Gulf Coast and Eastern Canada. Most of these projects would also support taking either Bakken, Rocky Mountain, or Midcontinent U.S. crudes to these same markets. These projects are, for the most part, in addition to those known during the development of the 2011 Final EIS.

Plains All American and Enbridge have projects that will take Bakken crude either north (back up into Canada) or east, in all cases connecting in to the Enbridge Mainline system that runs cross-border into northern PADD 2. Enbridge, and also Kinder Morgan, are expanding capacity to bring crude oils from northern PADD 2, (Chicago area), and PADD 4 south to Cushing, which continues to be expanded as a crude oil hub. Expansions are also being made to pipelines from West Texas, Oklahoma, and Kansas into Cushing to bring in growing production from those regions.

Enbridge has an array of projects under the heading “Eastern Access” to increase capacity to take WCSB, and also potentially Bakken, crudes to refineries in eastern PADD 2 but primarily in Sarnia, Ontario, and potentially Quebec and Montreal. In association with these projects, which include the re-reversal of Line 9 so it again runs east from Sarnia to Montreal, is the possible reversal of the Portland, Maine, to Montreal pipeline to also run east.

The U.S. crude logistics system has, until recently, included only one pipeline, the 93,000 bpd Pegasus line, that runs from PADD 2 to PADD 3 (the Gulf Coast). This was because, historically, the flow of crude oils was northward from PADD 3 to PADD 2. In 2012, reversal of the existing Seaway pipeline was completed so that it now runs south from Cushing to the Gulf Coast. Initial capacity of 150,000 bpd in the reversed direction was increased to 400,000 bpd in January 2013 by adding pumping capacity. The owners of the pipeline are also twinning it, adding another 450,000 bpd of capacity for a total of 850,000 bpd. Construction on TransCanada’s Gulf Coast Project is proceeding[27], which would add another 830,000 bpd of transport capacity between those locations, again, from Cushing to the Gulf Coast. Just recently, Enbridge and Energy Transfer Partners, LP, announced plans to convert one of three pipelines of the Trunkline system from natural gas transmission to crude oil service, which would allow transport of up to 660,000 bpd from Patoka, Illinois, to the Gulf Coast area. These combined projects add a total of 2.34 million bpd of new pipeline capacity between PADD 2 and PADD 3 that did not exist when the Final EIS was published.

In general, the projects listed in Table 1.4-7 are expected to be in service in 2013 or 2014. They constitute a subset of the total array of pipeline projects under way at present. Substantial additional capacity is also coming on stream to move Eagle Ford crude to the Gulf Coast and, as noted, to take expanding West Texas and Midcontinent crude production to Cushing, and thence

[26] This includes an application for a new Presidential Permit currently under review by the Department.
[27] The TransCanada Gulf Coast Project is the renamed southern segment of the previous Keystone XL pipeline project. While originally a single permit application, the project always comprised two separate potential construction projects, northern and southern.

onward to inland destinations and the Gulf Coast. One analysis of the new pipeline developments made in the summer of 2012 calculated that the new pipeline projects (including new construction, expansions, reversals, and the conversion of natural gas pipelines to crude oil service) amounted to a total of over 9 million bpd of additional pipeline capacity to transport crude oil in and through the United States (Hart 2012).

The Enbridge Line 67 (Alberta Clipper) and Southern/Gulf Coast Access expansions would provide a mechanism to compete with the proposed Project to deliver heavy Canadian crude oil into Cushing. In addition, the Seaway and TransCanada (Gulf Coast) projects, together with other pipeline and rail developments, will help relieve the bottleneck at Cushing, which has kept the price of the U.S. benchmark light, sweet crude oil, West Texas Intermediate (WTI), discounted heavily versus similar light, sweet crude prices on the Gulf Coast and world markets since early 2011.

The Final EIS and EnSys 2011 had noted that projects for interstate petroleum pipelines that do not cross an international border face less regulatory review, especially when they entail modifications to existing lines or rights of way, which was one of the reasons a complete No Expansion shut-in of new capacity was considered unlikely. The development of these projects supports that assessment, and supports the view that, in general, absent larger regulatory changes one can expect infrastructure developments to follow market patterns of supply and demand, which EnSys had described as “business as usual”. These firm projects add up to a major and on-going re-working of the U.S./Canadian crude oil pipeline logistics system as the industry adapts to changing market conditions precipitated by the growth in WCSB and Bakken and Midcontinent production. In addition, other possible projects are constantly being considered. The following are two important current examples that have been discussed as possibilities (no action has been taken on either):

- A possible TransCanada project to convert one or more existing natural gas pipelines that run from Alberta to Ontario and on to Quebec to crude oil service. Potential capacity has been reported as up to 600,000 bpd with capability to carry both light and heavy/oil sands WCSB streams.
- Possible reversal of the 1.2 million bpd Capline system that runs from the LOOP terminal and St. James in Louisiana to the Patoka pipeline and storage hub south of Chicago. Traditionally this line has been used to move imported and Gulf of Mexico crudes into the Midwest. Throughputs have dropped dramatically in recent years as supply of both WCSB and Bakken and Midcontinent crudes into the Midwest has built up.

In short, the logistics system is adapting, but there remain substantial price discounts on WCSB and inland Bakken and Midcontinent crude oils attributable to transport infrastructure constraints.

The next sections address how rail capacity has increased to accommodate the changing production patterns and ends with a discussion regarding how the price discounts noted here are creating overriding incentives to use alternate modes of transport.

1.4.6.2 Increases in Rail Capacity

While no new pipeline capacity has been added since 2011 across the Canada-United States border or to the Canadian West Coast, the development of rail as a viable, large-scale transport option for crude oil does potentially add significant transport capacity along these and other routes.[28] As noted in the Final EIS, the linear infrastructure (railroad tracks) necessary to transport crude oil in large volumes out of the WCSB is already in place. To utilize rail at large scale, producers and/or shippers would need to build loading and unloading facilities and add tank car capacity. Both of those activities are presently underway, and there already has been a sharp increase in rail transport of crude oil. The developments to date, as well as a review of industry information, indicate that, especially as long as pipeline capacity is constrained, significant quantities of crude oil will be transported by rail, including out of the WCSB. Although this section focuses on rail, rail is also being used with barge and tanker to deliver crude oil to refineries.

The leading production area that has developed rail, including the construction of dedicated terminals for loading unit trains[29] to transport crude oil, is in the Bakken in North Dakota and Montana. Pipeline capacity out of the Bakken has not kept pace with the increases in production in the region. Rather than allow the production there to be shut-in, companies have responded with significant additional rail capacity and have been able to do so very rapidly.

When the Final EIS (and the EnSys Reports) were prepared, rail shipments were just beginning to occur in large quantities from the Bakken. When EnSys 2010 was completed in December 2010, only approximately 50,000 bpd of crude oil were being shipped by rail. There was capacity at rail facilities to load approximately115,000 bpd of crude oil. When the Final EIS was released in August 2011, there were approximately 80,000 bpd of crude oil being shipped by rail, and capacity to load approximately 275,000 bpd of crude oil. Since the Final EIS was published, however, the volume of crude oil transported by rail out of the Bakken area has more than quadrupled to approximately 500,000 bpd and could exceed 800,000 bpd by the end of 2013. (These developments are shown in Table 1.4-8 and Figures 1.4.6-1 and 1.4.6-2.) Thus, the midstream and rail companies operating in the Bakken and at receiving terminals on the U.S. Gulf, East, and West Coasts have demonstrated an ability to rapidly develop rail infrastructure and movements on a large scale.

[28] For example, the Express Pipeline, terminating in Casper, Wyoming, with a capacity of 280,000 bpd, is underutilized because the Platte Pipeline to which it connects has a capacity of approximately 150,000 bpd. There are proposed rail facilities that could provide onward delivery for additional quantities of WCSB heavy crude delivered to Casper.

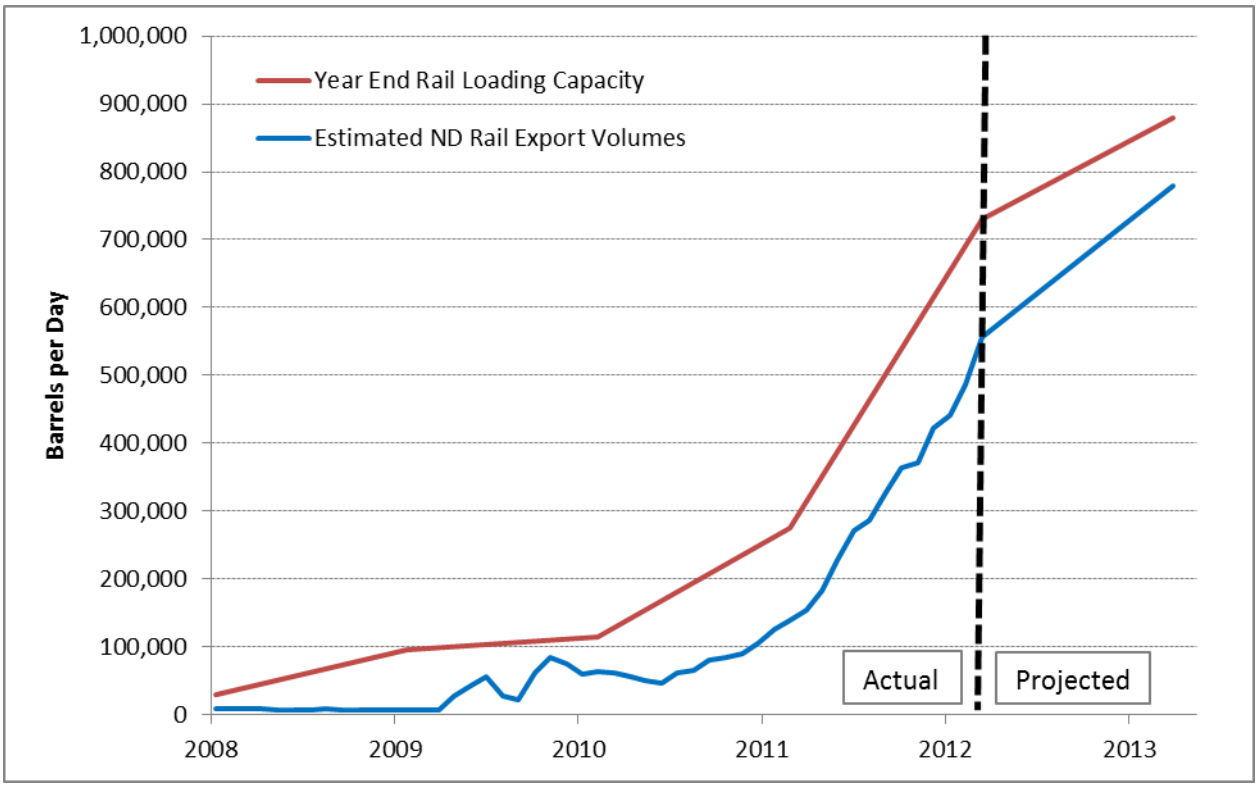
[29] A “unit train” is a train that carries one commodity and transits from origin point to one destination point. A crude-oil unit train is typically 100 cars long. As noted in EnSys 2011, before 2010 virtually no unit trains were being utilized to transport crude oil. Unit trains have been utilized for many years to transport other bulk commodities, such as coal.

Table 1.4-8 Rail Off-Loading Projects Providing Access to Gulf Coast Refineries

Crude-by-Rail Terminal/Operator/Owner(s)	Incremental Capacity (bpd)	Date In-Service
Gulf Coast Area Destination Terminals		
Cima Energy/Houston, TX	65,000[a]	2011[a]
GT Logistics GT Omni Port/Port Arthur, TX	125,000	2012
Nustar-EOG Initial Startup/St. James, LA	12,000	2011
Nustar-EOG Phase 2 Start/St. James, LA	58,000	2012
Nustar-EOG Phase 2 Realization Phase/St. James, LA	30,000	2012
Nustar-EOG Phase 3/St. James, LA	40,000	2012
U.S. Dev. Group Phase 1/St. James, LA	65,000	2011
U.S. Dev. Group Phase 2/St. James, LA	65,000	2012
Triafigura Texas Dock and Rail/Corpus Christi, TX	65,000[a]	2013
Crosstex Energy, Phase 1, Riverside, LA	14,500	2012
Crosstex Energy, Phase 2, Riverside, LA	30,000[a]	2015[a]
Watco Greens Port Industrial Park/Houston, TX	65,000[a]	2011
Sunoco, Nederland, TX	15,000	2012
Canadian National/Arc, Mobile, AL	25,000	2013
Genesis Energy, Natchez, MS	12,000	2013
Estimated Total	**686,500[a]**	
Cushing, Oklahoma Terminals		
EOG Stroud OK to Cushing, OK	60,000	2011
Watco—Kinder Morgan Energy Partners/Phase 1/Stroud, OK, to and from Cushing	140,000	2012
Watco—Kinder Morgan Energy Partners/Phase 2/Stroud, OK, to and from Cushing, OK	140,000	2015[a]
Total	**340,000**	
PADD II Rail to Barge/Marine Transloading		
Seacor Energy—Gateway Terminals/Sauget, IL	130,000	2011
Marquis Energy/Hayti, MO	42,800	2012
Marquis Energy/Hennepin, IL	35,700	2012
Total	208,500	
Grand Total	**1,235,000**	

Source: Hart Energy 2012; company public disclosures, media reports.

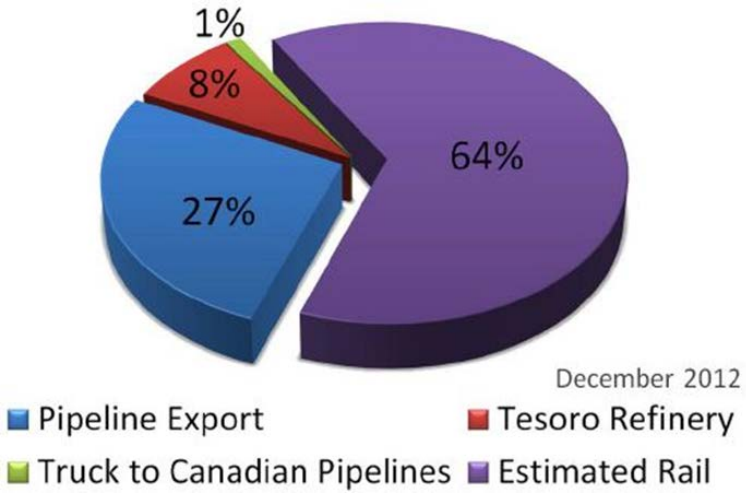
[a] Estimated.



Source: North Dakota Pipeline Authority 2013; company reports.

Note: The 2013 estimate of volume of crude oil shipped from the Bakken is based on rail company statements.

Figure 1.4.6-1 Estimated Rail Export Volumes and Projected Rail System Capacity, North Dakota



Source: North Dakota Pipeline Authority 2013b

Figure 1.4.6-2 Williston Basin Crude Oil Transportation, December 2012

Rail is now utilized to transport more than 50 percent of the crude oil out of the Bakken (compared to 32 percent by pipelines). This trend is expected to continue, even though "takeaway" pipeline capacity from the Bakken area is expanding. In contrast to rail takeaway capacity, which is moving Bakken crudes predominantly to coastal markets, the pipeline takeaway projects generally only move Bakken crude into the Enbridge Mainline system in the upper Midwest and therefore encounter the current pipeline bottlenecks in PADD 2. BNSF Railway (BNSF), the largest rail operator in the Bakken that transports approximately 80 percent of the crude by rail from the area, recently announced that in 2012 it made upgrades on its tracks such that it can now accommodate up to 1 mmbpd of crude oil out of the Bakken (up from 750,000 bpd) and that it expects its crude oil shipments from the area to grow to 700,000 bpd in 2013 (BNSF 2012; Bloomberg 2013).[30]

The Bakken area has seen the greatest construction of unit-train rail facilities to transport crude oil, but it is not the only area. Such facilities have been or are being constructed in virtually every new production area of the United States to transport crude oil where there is not sufficient pipeline capacity to accommodate the new production, including the Eagle Ford shale in Texas, the Permian basin in Texas, the Woodford/Anadarko area in Oklahoma, the Utica shale in Ohio, and the Niobrara shale in Colorado and Wyoming. Estimates are that there could be from 2.5 to 2.7 mmbpd of rail crude oil loading facility capacity by 2016 throughout these areas (Hart 2012). This represents total potential capacity to load crude oil by train in the United States by 2016, but is not a projection that 2.5 to 2.7 mmbpd will actually be transported by rail. The extent to which these facilities are utilized will depend upon many factors, including the availability of cheaper pipeline transport options from the respective production areas, the world price of oil (notably if

[30] In recent years BNSF has invested in upgrading its track capacity to handle increased crude oil transport. Although BNSF, and other railroads, have made substantial capital investments in their system capacity in areas of the Western United States over the last 30 years to accommodate increased coal transportation (discussed below), those rail lines carrying that coal traffic are different than BNSF's northernmost rail line on which the majority of the Bakken crude oil is being transported.

any drop occurred that were sharp and long enough to curb production), and the discounts between the price of oil paid in the production areas and the price of oil paid at the refinery markets (particularly on the coasts).

Rail off-loading facilities to receive unit-trains of crude oil are also being developed across the country, including at Cushing, Oklahoma, along the inland waterways, on the Gulf Coast, and on the East and West Coasts. Estimates are that there could be from 2.0 to 2.6 mmbpd of rail off-loading capacity at refineries throughout the United States by 2016 (Hart 2012). Of that amount, 1.3 million bpd is at facilities that are either on the Gulf Coast, or would provide easy onward delivery to the Gulf Coast via pipeline (from Cushing) or barge (Table 1.4-8), and many of those facilities identified have space for further capacity if economics warrant adding it.[31] In addition, rail off-loading capacity to serve U.S. East Coast refineries is developing rapidly. Current capacity of around 300,000 bpd is expected to grow to over 800,000 bpd by the end of 2013. This does not include around 70,000 bpd of rail off-loading capacity at the Irving refinery in St. John, New Brunswick.[32] Off-loading capacity on the West Coast is currently approximately 135,000 bpd and is projected to increase to approximately 400,000 bpd.

Although crude oil transport by rail predates that via pipeline, one of the primary reasons that pipelines have been preferentially used over many years is because the cost of rail transport of crude oil has generally been significantly higher than pipeline. The relatively higher costs of rail transport have not appeared to be a significant economic disincentive to producers in the Bakken. Recent press reports indicate that shippers out of the Bakken are utilizing rail transport even when pipeline capacity is available because it provides them access to markets not served by pipeline and where they can obtain better prices for the crude.

Part of the reason rail has become a more competitive alternative in the Bakken is that essentially all the rail capacity out of the region uses so-called “unit train” technology which entails loading and moving large dedicated crude oil trains. This has improved rail economics versus the traditional “manifest” trains. Rather than leave crude oil shut-in, the Bakken producers are finding it profitable to make use of rail, which was estimated in December 2012 to be transporting approximately 500,000 bpd out of the region. The EIA has also noted that transportation constraints have not appeared to result in production being shut-in in the United States:

> The phrase "transportation constraints" refers to a broad range of logistic issues, with inadequate pipeline capacity being the most common issue. EIA is not aware of any crude oil production capacity being shut in because of a lack of capacity to move the oil. (EIA 2012f)

[31] Much of the public reporting surrounding the construction of these terminals has focused on their ability to accept light crude. If rail cars hauled dilbit at pipeline specifications, they could unload at any of the terminals indicated (EnSys 2011). Hauling raw bitumen or railbit requires special handling equipment. The terminals in Mobile, Alabama, and Natchez, Mississippi, are being designed specifically to handle heavy crude, in the form of railbit or raw bitumen transported in insulated rail cars with steam coils, which would then be loaded on to barges for onward delivery to refineries throughout the Gulf Coast. Outside of the Gulf Coast, PBF Energy has also specified it is leasing railcars that can transport undiluted bitumen to its Delaware City, Delaware, refinery, and that it expects to ship 40,000 bpd of bitumen, or more, in 2013.

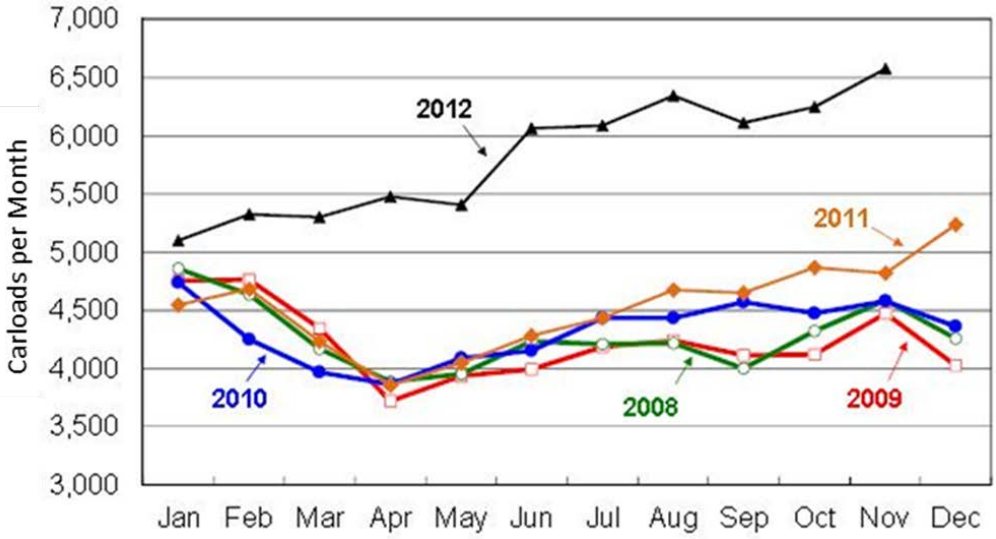
[32] A recent report indicates the Irving Refinery is moving more than 90,000 bpd, receiving Alberta crude directly by rail, and Bakken crude by rail to a port in Albany, New York, and shipped via tanker to the Saint John refinery (Penty 2012).

The Final EIS had examined the rail developments in the Bakken as an example of how rail transport could be increased to transport large quantities of crude oil when there are pipeline constraints. The continued development of rail capacity in the Bakken, and throughout the new production areas in the United States, reinforces that view.

A similar trend in increased rail transport is beginning to occur in Canada in the WCSB area. The lack of any new pipeline capacity westward to the British Columbia coast or eastward within Canada to the Sarnia area is combining with bottlenecks in the Enbridge Mainline system in the Chicago area to constrain WCSB crude exports and create today's severe price discounts versus international marker crudes. In addition, other factors such as the delay in the start-up of the upgrade project at the BP Whiting refinery to process additional heavy crude add to the constraints. A series of linked projects is under way by Enbridge to alleviate the bottlenecks out of northern PADD 2 to the Cushing area and Gulf Coast and to eastern Canada (Section 2.2, Description of Reasonable Alternatives). These are expected to be mainly complete by 2014. However, continued growth in both WCSB production and that of Bakken and Midcontinent crude oils competing for space on the same pipeline system is likely to lead to continued constraints on WCSB export capacity based on current firm pipeline projects—and before accounting for rail options.

There are two major rail operators in Canada, Canadian National and Canadian Pacific. Both have been promoting crude-by-rail as an option for transporting crude oil out of the WCSB to destinations throughout the United States and Canada. In mid-2012 each carrier projected that it would transport approximately 100,000 bpd in 2013, or approximately 200,000 bpd total (Tomesco 2012). Data from the AAR suggests that Canadian National and Canadian Pacific may already be transporting be transporting approximately 200,000 bpd of crude oil (Figure 1.4.6-3).[33] It estimated that 120,000 bpd of this is from the WCSB, and 80,000 bpd is from the Bakken (Peters & Co. Limited 2013).

[33] This estimate was arrived at by comparing two calculations. The AAR weekly rail traffic summary indicates that in December 2012, and January 2013, Canadian National and Canadian Pacific were originating an average of just over 7,000 rail cars per week in the Petroleum Products category. First, a calculation was made based on a December 2012 AAR report that indicated 38 percent of the "Petroleum Products" category for carload originations in the United States and Canada was crude by rail. Assuming a conservative 600 barrels per carload, this would be 225,000 bpd. Second, the increase in the Petroleum Products category for Canadian carload originations from December 2010 to December 2012 was assumed to be 90 percent crude by rail (based on industry statements), which (with the same 600 barrels per carload) would be an increase of 190,000 bpd. Further, based on information from Canadian Pacific in their fourth quarter 2012 earnings call with investors, it is estimated that in January 2013 Canadian Pacific was transporting between 110,000 and 130,000 bpd of crude oil. Also on that call, Canadian Pacific officials noted they expect to double or triple the amount of crude they transport.

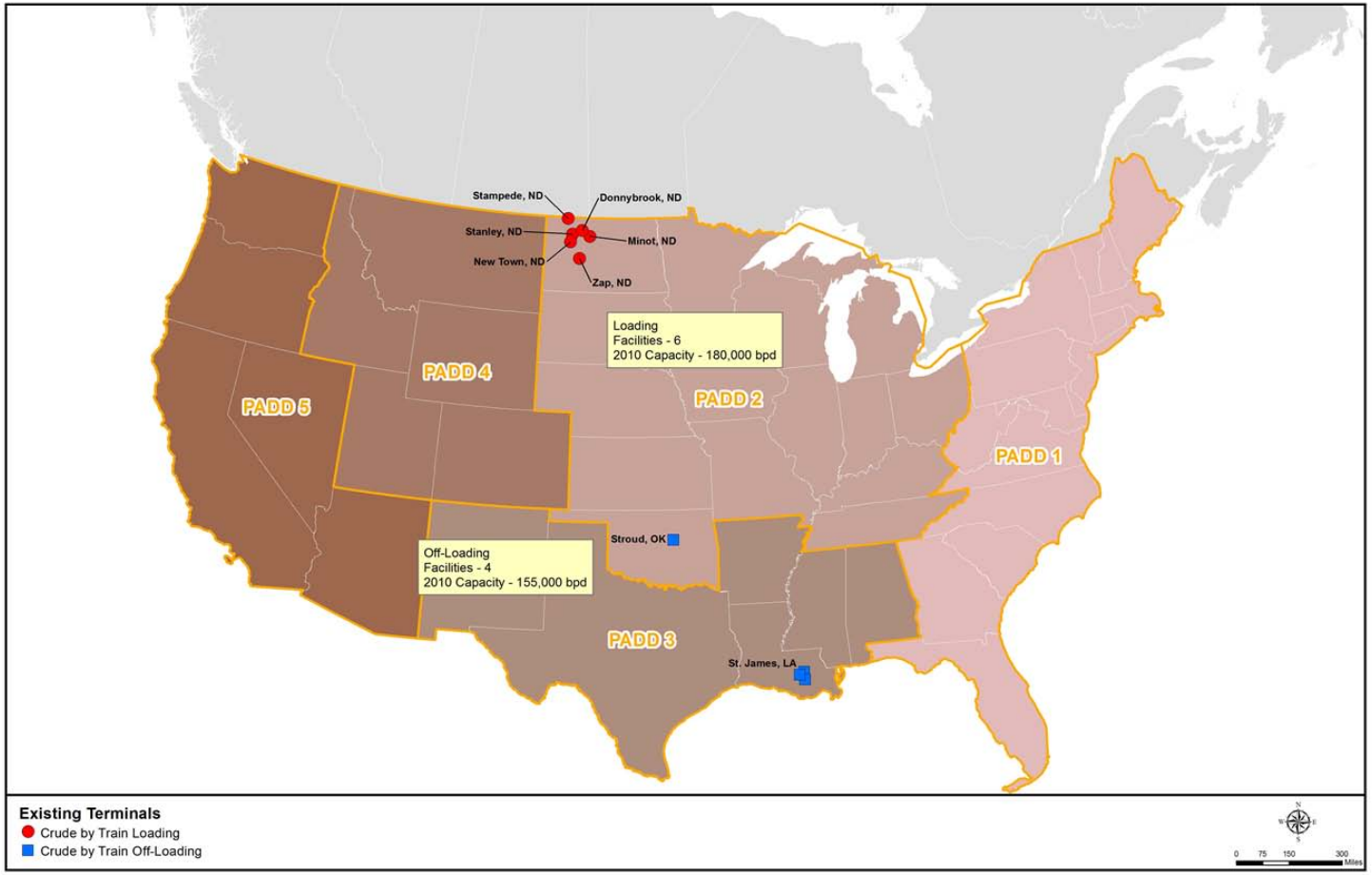


Source: AAR 2012

Figure 1.4.6-3 Actual Canadian National and Canadian Pacific Petroleum Products Transported, Carloads per Month

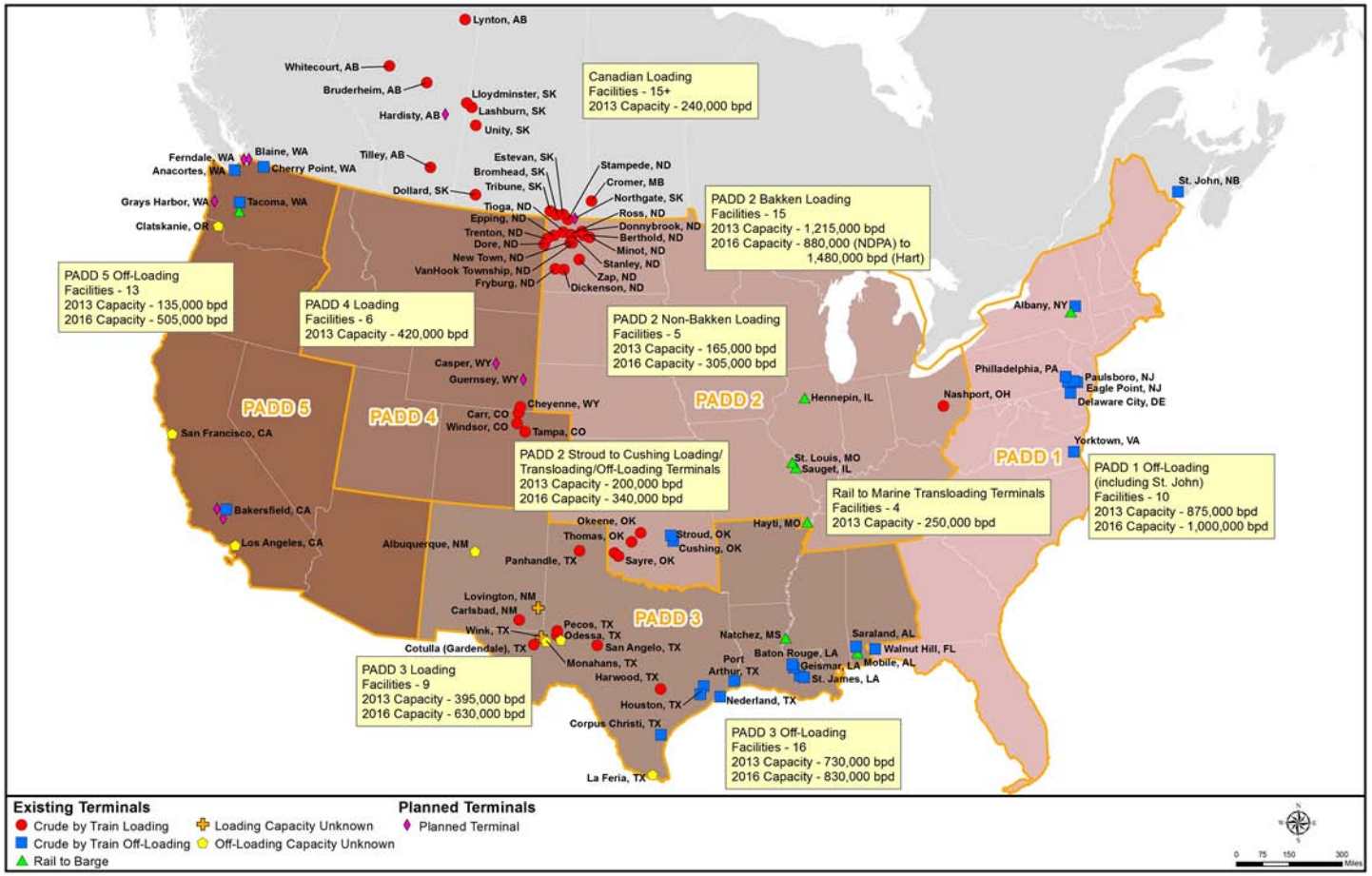
As noted in Section 1.4.5 (Pipeline Capacity out of WCSB) if the existing pipelines were the only transport option for crude oil out of the WCSB, the total transport capacity would be full by 2016 or sooner. This estimate ignores the increasing capacity of rail transport capacity in the WCSB. A more accurate calculation of current transport capacity out of the WCSB would be the current pipeline capacity, plus existing rail capacity. Any assumption that rail will stay frozen at that level would be inconsistent with the developments described above. The potential for rail to further increase its capacity to transport WCSB production is assessed in the next section.

The development of unit train loading, off-loading, and transloading facilities for crude oil since 2010 is illustrated in Figures 1.4.6-4 and 1.4.6-5. As noted, transporting crude oil by unit train requires the construction of specialized facilities that can handle the loading or unloading of a full 100-car train. Before 2010 virtually no unit trains were being used to transport crude oil. The crude oil that was transported by train was done as manifest shipments, and would have likely been as a smaller number of cars in a train with a variety of goods and commodities. As a result, although crude oil was being shipped by train (and refineries and terminals had facilities to handle crude oil and refined products by rail), there were very few facilities that were capable of handling unit trains. This is reflected by the estimate of loading and unloading facilities in 2010 that were capable of handling crude-oil unit trains (Figure 1.4.6-4). At that point the only unit train loading facilities were located in the Bakken area. Unloading facilities were located Stroud, Oklahoma, and St. James, Louisiana.



Source: Hart 2012; Walton 2010; Fielden 2013; NuStar Energy L.P. 2010; North Dakota Petroleum Council 2010; company and media reports.

Figure 1.4.6-4 Crude by Train Loading and Off-Loading Facilities in 2010, Estimated Capacities



Source: Hart 2012; company and media reports.

Note: The number of Canadian loading facilities reflects those identified on the map. Canadian National reportedly will have 14 loading facilities in WCSB by the end of 2013. Specific locations and capacities for those Canadian National facilities are not known. According to company reports, many of those facilities are likely smaller than full-unit train facilities. The locations in San Francisco and Los Angeles are listed based on Phillips 66 statements that it is utilizing rail to deliver WCSB heavy crude oil to its California refineries.

Figure 1.4.6-5 Crude by Train Loading, Off-Loading, and Transloading Facilities by PADD, and Estimated Capacities

Figure 1.4.6-4 shows the estimated unit train loading, off-loading, and transloading facilities throughout North America for crude oil and their estimated capacities in 2013 and 2016. The map includes rail to barge or tanker transloading facilities. Nearly all of these facilities have been constructed since 2010. As noted above, in the Bakken, most of the additional facilities and expansions had not been announced by the end of 2010. There is less publicly available information about the facilities in the WCSB, including about their capacities.

Many of these facilities, particularly those for off-loading or transloading to barge, were modifications or expansions of existing terminals. The number of facilities and capacities listed in the figure are primarily for facilities reported to be capable of handling unit trains. The facilities identified on the map of "unknown capacity" may not be capable of handling full unit trains. Section 1.8 of Appendix C, Market Analysis Supplemental Information, provides additional information related to these facilities and their estimated capacities and start-up dates.

1.4.6.3 Rail Potential to Transport WCSB Crude Oil

These developments point to the possibility of rail supporting WCSB crude movements in large volume. This section assesses this potential for rail to transport the increases in WCSB production in the 2012 CAPP outlook through 2035, even if no further pipeline capacity is added out of the WCSB. In other words, it assesses the potential of rail to transport the crude oil that would be transported through the proposed Project if the proposed Project were not implemented, and, more broadly, whether rail could accommodate all additional WCSB production if no new pipeline capacity were to be added between now and 2035. In this sense it considers a scenario broader than just a typical "No Action" alternative, as it assumes all proposals for pipeline expansions (beyond those already under construction) do not occur. It does so considering both issues of logistics, need for loading and unloading facilities, track upgrading adding tank cars to the rail fleet, etc. and issues of cost.

Logistics

The 2011 Final EIS analysis and the 2011 EnSys study reviewed the potential for rail as a primary alternative transport mode to support growing Western Canadian production in the event there was no expansion of pipeline capacity. The assessment made under that No Expansion scenario was that export pipeline capacity could limit WCSB export flows beginning around 2016 and that thereafter rail capacity to move Western Canadian crudes to markets would need to be expanded by around 100,000 bpd each year in order to prevent any shut-in of production. This assessment was based on the CAPP 2011 Growth Outlook for Western Canadian crude supply and did allow for other developments, notably the North West Redwater Partnership's upgrader, which it was assumed would add 150,000 bpd of direct bitumen upgrading to finished products by 2020. Nevertheless, the Final EIS assumed rail would have the main burden of supporting Western Canadian supply growth under a No Expansion scenario.

Since 2011, the CAPP has raised its estimates of Western Canadian production and supply to market. Based on the CAPP 2012 outlook for Canadian production, if no new pipeline capacity is added, other transport modes, notably rail, would need to be capable of transporting that annual expansion of approximately 175,000 bpd each year in order to keep up with (and prevent shut-in of) the increases in Western Canadian crude supplies.[34]

A key question is whether rail capacity could grow at such a rate. In order to do so from a logistics perspective, there would need to be development of loading and unloading facilities, of existing track capacity to accommodate additional traffic, and in rail tank car availability. These capacity additions would need to be capable of being sustained year after year to match WCSB crude supply increases. As detailed below, the current growth of rail in Canada (and also the United States) suggests that rail loading capacity could increase as necessary, and is already increasing, to keep pace with the latest CAPP projections. Other factors discussed below point to the potential for rail capacity growth to be sustainable and scalable to large volume over time, thus matching WCSB production growth and avoiding shut-in of WCSB production regardless of pipeline capacity.

As noted above, Canadian National and Canadian Pacific may already be carrying approximately 200,000 bpd. In 2012, Canadian National had approximately 14 crude oil loading facilities completed or under construction, up from just two in 2010. Other midstream operators are constructing crude-by-rail terminals that can accommodate unit trains, and at least eight publically reported WCSB producers are currently shipping or have announced shipping heavy crude by rail in 2013 (Table 1.4-9).

Table 1.4-9 Publically Reported Producers Currently Shipping or Announced Shipping WCSB Crude by Rail 2013, bpd

	2012 (bpd)	2013 (bpd)
Cenovous	5,000	10,000
Suncor	5,000	20,000–25,000
MEG Energy	0	32,000–40,000
Baytex	10,000	15,000
Connacher	10,000	10,000
Crescent Point	16,000	50,000
Southern Pacific	0	12,000
Grizzly	0	5,000
Devon	NA[a]	5,000–10,000

Source: Company releases, media reports.

[a] NA = not applicable.

[34] This estimate is based on rail capacity being 200,000 bpd in 2013 and increasing from that amount. Total WCSB export pipeline capacities are based on the CAPP 2012 outlook.

Also as noted above, rail on- and off-loading facilities have been constructed at a similar pace over the past 2 years throughout the United States, with an estimated 1 million bpd of off-loading capacity in place by the end of 2012 that provides access to Gulf Coast refineries.[35] The operators of many of those existing facilities have indicated in various public disclosures that their facilities can be expanded if market conditions warrant. Whereas constructing a new rail facility takes 12–18 months, expansions at an existing facility can be completed more quickly—in 6–12 months.

The EnSys 2011 study found that the rail systems of the United States and Canada were not at that time running at capacity, that there is significant scope to expand capacity on existing tracks through such measures as advanced signaling, and that adequate cross-border Canada/U.S. capacity exists to accommodate growth in rail traffic that would be associated with movements at the level of 100,000 bpd cross-border increase per year or appreciably higher. In addition, rail lines exist to ports on the British Columbia coasts (notably Prince Rupert, Kitimat, and Vancouver), which could be used for export of Western Canadian crudes.[36]

A single rail line, with a single track and the most sophisticated signaling system can accommodate up to 30 trains per day. Putting a double track along that line, which can be done without need for regulatory approval from the Surface Transportation Board, expands the potential capacity to 75 trains per day (Cambridge Systematics 2007). By comparison, U.S. Department of Transportation data presented in the EnSys 2011 report showed that, in 2010, there were 11 active rail border crossings with Canada from Washington to Minnesota. Those border crossings were running at levels of 2–20 (total) trains per day.[37]

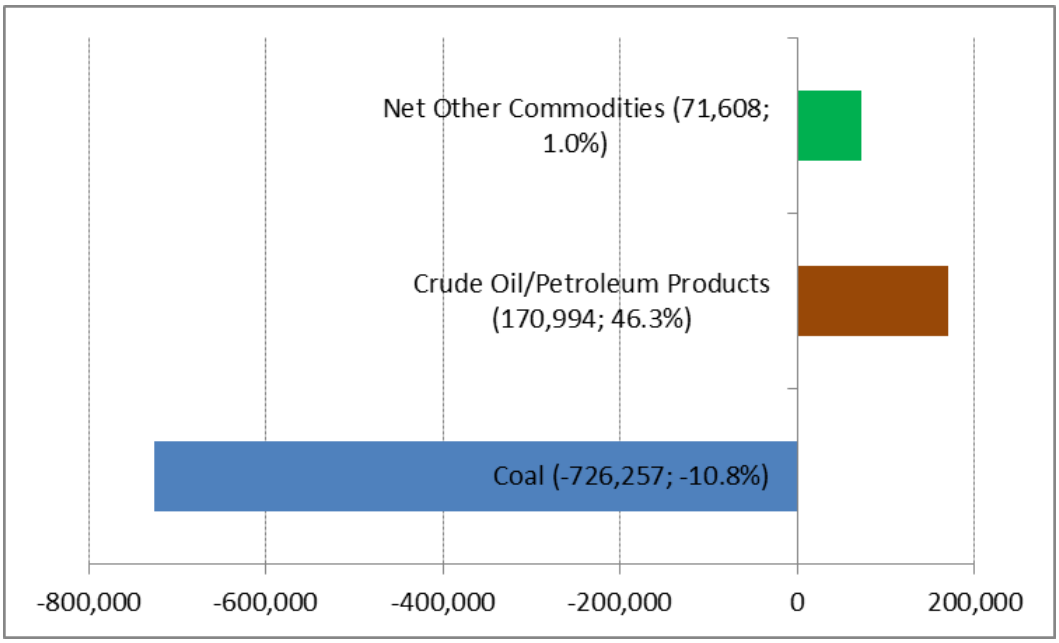
The Cambridge Systematics study assessed possible investment needs in rail infrastructure to accommodate economic growth and increased rail traffic through 2035. The report concluded that with adequate capital investment, the rail system could accommodate increased rail traffic without encountering capacity issues. A subsequent report prepared for the Surface Transportation Board concluded that the economic growth outlook relied on by the Cambridge Study may have overstated the potential additional rail traffic (Christensen 2009). For example, the forecast relied on by the Cambridge Systematics study had projected coal rail tonnage in the western United States to increase by more than 200 percent by 2030. More recent AEO forecasts have coal production in the western United States growing by less than 20 percent over that same time period (Christensen 2009; EIA 2012). For grains, the Cambridge Study relied upon a projected growth in transport of approximately 80 percent by 2035, whereas subsequent U.S. Department of Agriculture production forecasts showed less than a 40 percent increase over that period (Christensen 2009). The Christensen report concluded that the rail system would require lower levels of capital investment to accommodate projected growth in rail traffic than had been indicated by the Cambridge Study.

[35] The Gulf Coast would be the primary market for heavy WCSB crudes, but smaller volumes are already moving to U.S. and Canadian East Coast refineries. The U.S. West Coast could also be a potentially large market for heavy WCSB crudes but California Law AB32, which instituted a low-carbon fuel standard, may well act to limit the volumes of oil sands streams that could be processed in the state.

[36] Nexen Inc. is exploring moving oil by rail to Prince Rupert, British Columbia, to export crude onto tankers for delivery to Asia markets (Vanderklippe 2013b).

[37] The same data source showed that petroleum was being moved from Canada into the United States at nine of the 11 rail crossings from Washington to Michigan in 2010.

Recent trends in the movements of commodities by railroads are consistent with the more conservative growth forecasts for rail traffic noted in the Christensen report. Movements of the railroads' primary freight product, coal, have been dropping as plentiful and low-priced natural gas has been increasingly adopted in the power generation sector (Figure 1.4.6-6).



Source: EIA 2013c.

Figure 1.4.6-6 Changes in U.S. Railcar Loads by Commodity, 2011 to 2012

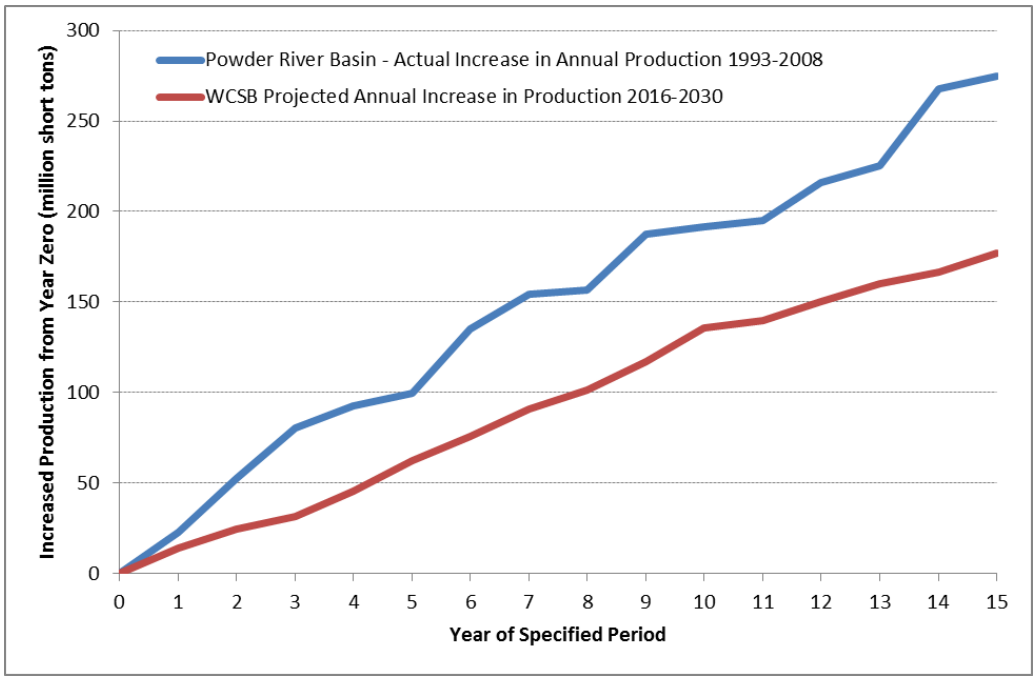
As illustrated in Figure 1.4.6-1, Bakken rail takeaway capacity has risen from 30,000 bpd at the beginning of 2009 to 730,000 in 2012 and is projected to reach 880,000 bpd during 2013. This equates to an average annual rate of approximately 255,000 bpd in the years that the majority of the expansion has been occurring (2011, 2012, and 2013).[38] The claims made by Canadian National and Canadian Pacific as noted above support this view. If such a rate of expansion began in 2013 in Canada, total rail loading capacity out of the WCSB could be over 800,000 bpd by the end of 2015.

The volume of crude oil transported out of the Bakken by rail has grown at a rate similar to that of the development of loading capacity, allowing for loading terminals running below full utilization. As noted above, BNSF has indicated it expects to transport 700,000 bpd by the end of 2013, which would indicate total transport out of the area of 750,000 bpd or more. If that level is achieved, it would be an annual rate of increase of transport in 2011, 2012, and 2013 of approximately 230,000 bpd. This rate of increase of crude oil transported (along with the rate of

[38] The first large crude-by-rail loading facility in the Bakken area was constructed in 2009. The average annual rate of expansion was 170,000 bpd over the five years 2009–2013. Only 85,000 bpd of capacity was added in 2009 and 2010. As noted in the previous section, of the 765,000 bpd of capacity added in 2011, 2012, and 2013, over 500,000 bpd of capacity came from projects that were not yet announced by the end of 2010.

increase in total capacity) indicates that expansion in Canada at an annual rate of around 200,000 bpd of crude oil actually transported should be achievable.

There is no indication that the rail logistics system would not be able to continue to scale up at this rate, or more, over many years if the economics justified it. For example, the rail system was able to expand at an even greater rate, in terms of increased tons hauled per year, to accommodate coal production in the Powder River basin in Wyoming and Montana.[39] The Powder River basin produces approximately 40 percent of the nation's coal, over 400 million tons per year, almost all of which is transported by rail. The first truly large-scale surface mines in the area began operating in the 1970s. By 1980, approximately 99 tons per year of coal were transported out of the Powder River Basin. By 2008, this had increased to approximately 500 million tons, or an average increase of 14 million tons per year every year for 28 years. On a tonnage basis, this is equivalent to an increase of approximately 240,000 bpd per year, or 6.7 million bpd over 28 years. Figure 1.4.6-7 below compares the annual increase in rail transport of crude oil (expressed in short tons) that would be necessary to accommodate projected WCSB production from 2016 to 2030 to the annual increase in tons of coal hauled from the Powder River Basin from 1993-2008, when the most significant expansion in production occurred. This offers further evidence that the rail system (in terms of track improvements and loading facilities) would be capable of making any necessary capacity increases to accommodate all of the WCSB production, provided the economics justified it.



Source: CAPP 2012; Hellerworx, Inc. 2013.

Figure 1.4.6-7 Annual Increases in Rail Transport to Accommodate WSCB Production Compared to Coal

[39] The increase in capacity was not without challenges or setbacks, but nonetheless, even with these challenges the described capacity increases were achieved (USDOE 2007).

In short, there appears to be adequate track and route capacity to multiple destinations and the beginnings of "unit train" terminal developments which would enable movement of Western Canadian crude oil at scale.[40] There also appears to be a proven ability of the rail logistics system (in terms of improving track capacities and constructing loading and unloading terminals) to increase capacity at the rates that would be required to accommodate all of CAPP's projected increase in WCSB production, if the economics warranted such increases. The remaining potential logistics constraint on the expansion of crude oil movement by rail is the ability of the rail car industry to manufacture the necessary additional tank cars. There have been numerous press reports regarding this potential constraint.

According to recent industry reports, current U.S. rail tank car production is close to 5,000 units per quarter, or around 18,000 per year. Orders are shown as around 8,800 per quarter recently with a 2012 industry back-log of around 46,700 cars. This back-log is expected to be cleared during 2014.[41] Depending on shipping origins/destinations, and the grade of crude transported, supplying the 46,700 tank cars during the next 18 to 24 months would add approximately 1.75 million bpd of capability to ship U.S./Canadian crudes by rail. In short, the current back-log is not expected to last long term and the industry appears to be capable of adding enough cars annually to satisfy both U.S. and Canadian growth requirements.

Based on press reports, at least 60 percent of the tank cars now being manufactured are of the insulated type (Torq Transloading 2012). This high percentage is a strong indicator that most of the tank cars on order are either to carry heavy oil sands crude, or to give carriers the flexibility to do so. Crude oil grades that can be transported by pipeline (light crude oils through to heavy crude oils such as dilbit), can generally be transported in standard tank cars (although moving dilbit in cold weather can require insulated cars). The most economical way to transport oil sands crude by rail is not as dilbit (which comprises around 70-75 percent bitumen with 30-25 percent diluent) but rather as either railbit (around 15-20 percent diluent) or as undiluted bitumen (zero diluent). Transporting the bitumen in those forms can save a producer the expense of acquiring diluent, shipping the diluent (mixed with the bitumen to make the dilbit) and also, increasingly, returning the diluent to the oil sands production sites in Alberta for reuse. Railbit and raw bitumen would be transported in rail cars that are insulated and contain steam coils for re-heating the bitumen as necessary at destination. Based on a roughly 60 percent share of the current back-log in tank car orders, there should be enough new insulated rail tank cars available by late 2014 to transport approximately 800,000 bpd of heavy crude oil per day. [42]

[40] The EnSys 2011 study identified that there is adequate cross-border rail capacity at several crossings from Washington to Michigan to allow for a substantial increase in rail traffic even before any track capacity expansions at those locations are needed. In turn, these crossings act as gateways into the extensive U.S. rail network that leads to essentially any destination, including the West, Gulf, and East Coasts. In addition, Canada itself has a highly developed rail network running both west and east from Alberta and Saskatchewan.

[41] A previous high back-log for rail tank cars occurred in early 2007 following the surge in ethanol use in gasoline under the RFS-2 standard. The back-log peaked at over 35,000 cars but was cleared in around 24 months.

[42] Using the Gulf Coast as a typical destination, with a transit time of around 9 days, each daily loading would require a total of around 20 unit train sets (one loading, nine in transit laden, one off-loading, nine returning empty [or carrying diluent]). Since each unit train comprises around 100 cars, the capacity to move incrementally approximately 200,000 bpd of Western Canadian crude each year would require adding approximately 6,000 rail tank cars per year (each year an additional 3 daily loading × 20 train sets × 100 cars per train). More crude oil could be transported each day if the destination were the Canadian or U.S. West Coast as those journeys are shorter.

The CAPP projections for crude supplied to market are based on produced bitumen being moved either after upgrading to synthetic crude oil (SCO), or as synbit or dilbit blends, with the latter being predominant. Despite the fact that there is a reduction in carrying capacity per car when moving undiluted bitumen,[43] the ability for rail to reduce or eliminate diluent has the potential to decrease the total heavy crude volumes that must be shipped out from Western Canada and (increasingly) returned as diluent. For example, 800,000 bpd of raw bitumen or railbit would be equivalent to just over 1 million bpd of dilbit in terms of the volume of bitumen shipped. In other words, there are enough insulated rail cars that will be delivered by the end of 2014 that could transport a greater volume of oil sands bitumen than the proposed Project.[44]

Insulated and coiled tank cars may have been ordered in support of specific plans to transport heavy crudes, or they may have been ordered to provide the flexibility to transport such crudes in the future but without specific current plans to do so. Also, shippers of WCSB heavy crudes would be in competition with other crude oil shippers relying on rail transport. Even taking those factors into account, it does not appear that the ability to manufacture rail tank cars in sufficient numbers is likely to present logistical constraints beyond the next few years. Because it is expected the rail car manufacturers will be able to clear a large backlog over the next two years, they should be able to keep up with on-going growth requirements at the pace to match WCSB production growth.

The above analysis indicates that in order to prevent shut-in of WCSB heavy crude production, rail capacity, supported by barge and tanker, would only need to continue to increase consistent with the trends already observed. However, if the rate of production is substantially higher than indicated in the CAPP 2012 forecast (and the other forecasts shown in Figure 1.4.4-11), and if there are delays in the delivery of new rail cars and terminals (contrary to the current trends) it is possible that some short-term shut-in of WCSB heavy crude could occur.

For example, if existing rail loading/unloading capacity were not available at the time of a permit denial, and grew at a rate of 200,000 bpd each year beginning in 2014, it would take until the third quarter of 2017 for rail capacity from the WCSB to surpass the capacity provided by the proposed Project. If existing rail loading/unloading capacity were not a limiting factor, another limiting factor could be the ability to manufacture suitable rail cars. If the 28,000 new insulated and coiled rail cars to be delivered by the end of 2014 were not used to transport WCSB crude that would have been transported on the proposed Project, new cars would need to be ordered. If new cars were ordered at the time of a permit denial, at current production rates, it would take until the fourth quarter of 2016 for rail capacity to exceed the capacity of the proposed Project.

[43] Because tank car load limitations are by weight rather than volume, less volume of the more dense raw bitumen can be carried compared to dilbit in any one rail car, and less dilbit can be carried than a light crude. Thus, a rail car carrying high-density undiluted bitumen will only be able to carry around 550 barrels versus 650–700 (or more) for a light crude.

[44] Steam heating would be required at any terminals that receive undiluted or partially diluted bitumen in insulated rail cars. No information to date has indicated that either building terminals or equipping off-loading terminals with steaming capabilities would comprise a major constraint to increased rail shipping of Western Canadian heavy crudes and bitumen.

If one or both of the limiting factors described above were to occur, then WCSB production could be curtailed during that time frame by an average annual rate of 80,000 to 120,000 bpd over three years (2015, 2016, and 2017).[45] After 2017, sufficient rail infrastructure would be in place to accommodate the full capacity of the proposed Project. While such constraints could occur, considering the analysis offered at length within this section, no information has been found that would indicate rail growth in the WCSB could not grow at a similar rate to recent rail growth trends.

Costs of Non-Pipeline Transport

The Final EIS examined the costs of non-pipeline transport options, and noted that, although they were higher than pipeline, they were not likely to be a disincentive to using those transportation options if pipeline capacity was not available. "While the per barrel tariff costs of moving conventional light crude oil by rail or barge are generally higher than those for shipping via pipeline, cost differentials narrow or can even reverse when shipping oil sands. Consequently we do not see cost deterring rail, barge and tanker expansion in any form of "No Expansion" situation . . . Even if transport costs for rail, barge and tanker were appreciably higher, there would still be an overriding incentive to use those modes to avoid production shut-in" (EnSys 2011). Recent developments described above strongly support those observations.

This Supplemental EIS includes an updated estimate of rail costs versus those in the Final EIS from 2011, as described in more detail in Section 2.2, Description of Reasonable Alternatives. There is much more information available about these costs, and the current information indicates the costs are higher than were estimated in 2011.

Estimating the comparative rail costs for transporting the bitumen produced from the oil sands is not as straightforward as it is for conventional crude oils because, as mentioned above, producers can transport the bitumen to market in different forms, either as synthetic crude oil (if it is upgraded), dilbit (diluted bitumen to pipeline specifications, 25–30 percent diluent), railbit (bitumen with 15–20 percent diluent), or raw bitumen (no diluent). Synthetic crude and dilbit can be transported by rail using standard tank cars and using the same off-loading facilities as light crude oils (although the high proportion of insulated rail cars with steam coils in current orders indicates a possible trend by shippers to have these cars available to move dilbit as a safeguard against possible solidification of the crude in adverse weather conditions or in the event of delays). Unlike light crude, synthetic crude and (generally) dilbit, which can use standard cars and off-loading terminals, railbit and raw bitumen need insulated and coiled rail cars, and can only use receiving terminals that have been modified to provide steam to pass through the rail car coils (these modified terminals can also be used to offload the lighter crude grades). As noted above, producers are already transporting bitumen by rail as dilbit, railbit, and raw bitumen.

The updated cost for rail transport of dilbit from the WCSB to the Gulf Coast is estimated, in Section 2.2, Description of Reasonable Alternatives, to be approximately $15.50 per barrel based on unit train economics. CAPP provides an estimated pipeline tariff for the same transport of approximately $8–$9.50 per barrel (see Appendix C, Market Analysis Supplemental

[45] This assumes all rail transport is of dilbit or light crude. If raw bitumen or railbit is transported by rail, the total volume that must be moved by rail is less than that by pipeline. If it were assumed that rather than transporting pipeline quality dilbit (which is 30 percent diluent), the rail shipping of bitumen averaged only 10 percent diluent, then the difference in annual barrels per day shipped (expressed in terms of pipeline dilbit) averaged over 2015, 2016, and 2017 could be from 40,000 to 60,000 bpd.

Information; CAPP 2012).[46] A straight comparison of those respective costs indicates an increased cost of rail transport of $6–$7.50 per barrel. However, these two estimated costs are not on the same basis and likely overstate the cost differential because they compare a long-term committed pipeline tariff (i.e. for contracts of 10–20 years) to short-term and/or uncommitted rail prices.[47] An uncommitted pipeline tariff would be approximately $14.00 per barrel (Appendix C, Market Analysis Supplemental Information). This would reduce the estimated difference in transport costs to $1.50 per barrel. This like-with-like comparison is potentially more representative of what the pipeline-rail differential could be for both longer term committed/base load movements and shorter term/uncommitted tariff differences, which would reflect "marginal" costs/movements.

The above estimates also do not take account of the savings that a producer can achieve because shipping bitumen by rail can be done with less diluent than shipping it by pipeline. As previously mentioned, using less (or no) diluent enables a producer to save the costs of acquiring diluents, paying the tariff to transport the diluents (as part of dilbit), and, indirectly, having the diluent returned to source (Alberta) for reuse. If diluent is backhauled on the rail cars on the return trip, net transport costs are directly cut.[48] In EnSys 2011, it was estimated that the cost, on a net barrel of bitumen basis, for shipping raw bitumen by rail could be approximately the same as the cost by pipeline. With the updated higher rail transport costs cited above, the estimated net cost of shipping per barrel of bitumen still comes within $2–3 of the pipeline tariff (less, if the comparison is to the uncommitted pipeline tariffs). The orders for more than 28,000 new insulated rail tank cars provide evidence that industry considers shipping railbit or bitumen to be an economic option, and that it can be employed in large quantities.

It is assumed that the logistics constraints noted in Section 2.2, Description of Reasonable Alternatives, would prevent additional oil sands production from being shipped entirely as raw bitumen or railbit (since moving raw bitumen or railbit requires special loading/off-loading terminals and insulated cars whereas dilbit generally does not). Thus, if rail had to supply all of the additional transport capacity for WCSB production, the incremental barrels would have to move to market as dilbit or synthetic crude oil. It is also assumed that even if adequate pipeline capacity were available, the incremental barrel of production would not be able to take advantage of long-term transport contracts. Thus, not all barrels transported by either pipeline or rail could be expected to obtain the best price for each respective mode of transport.

[46] The $8 rate is listed in CAPP 2012 as a tariff rate from Hardisty to the Gulf Coast on the Enbridge system. The $9.50 rate is estimated based on tariff rates for the existing Keystone pipeline to Cushing, Oklahoma, plus the tariff rate on the Seaway pipeline from Cushing to the Gulf Coast. Where relevant, an estimated tariff rate of $9 is used for the proposed Project, on the assumption that some cost savings would be achieved over the $9.50 estimate by shipping with one pipeline operator.

[47] The freight rates most commonly quoted for rail shipments are for a spot basis. Indeed, one of the frequently highlighted differences between rail and pipeline for crude oil shipment is that rail, unlike pipeline, does not require shippers to enter into long term contracts. (For crude oil pipeline shippers, these can range from 5 to as long as 20 years.) However, term contracts for moving crude via rail are beginning to appear; for example, one such contract entails a 5 year commitment to ship bitumen (as railbit) by rail from Fort McMurray to Natchez, Mississippi, and thence by barge to Louisiana refineries. Freight rates on term rail contracts are reported to be lower than spot rates, as is the case with pipelines.

[48] Also, producers may get a better price from the refineries by avoiding a price discount incurred for dilbit because it has heavy and light crude fractions with little in the mid-gravity range (Hart Heavy Oil Outlook 2012).

For the purposes of the analysis below it is assumed that the incremental increase in cost of rail compared to pipeline transport is $5 per barrel, which is the middle of the range for the potential difference in cost of $2–$7.50.[49]

The current recession coupled with a fundamental reduction in domestic coal use have negatively affected the revenues and traffic volumes of most North American railroads. Increased demand for rail transportation of crude oil has not only been an important growth area, but the crude oil business has the key characteristics that railroads are targeting. These include: unit train movements from a single origin to a single destination; no need for intermediate handling or investment in yard and terminal facilities; third party or shipper investment in railcars, loading, and unloading facilities; large volumes moving over the long term; and ample margins . As a result, the carriers have and will continue to invest in the infrastructure required to handle increased crude oil volumes.

Current rail prices for crude oil reflect limited competition among the carriers; but prices are high enough to generate attractive margins that justify long term capital investment. Over the long term, rail pricing will likely fluctuate to reflect changes in both the price of oil and the margins available in the petroleum business. When oil prices increase, the carriers will attempt to capture a portion of the increase in the net rents available through rail rate increases. But these increases will be tempered by their competing goal of continuing to encourage volume growth.

In sum, the rail carriers would be expected to invest the capital required to support increased crude oil shipments, and set prices at levels that will encourage volumes sufficient to provide sustained returns on these long term investments.

Oil Sands Breakeven Costs

To assess the potential impact of increased transport costs on crude oil production in the oil sands, the Department reviewed information regarding breakeven costs for different types of oil sands project. The “breakeven cost” is often expressed as the lowest price of a selected marker crude that is necessary to enable a potential production project to cover all its costs and earn a commercial rate of return on capital employed—typically 10–15 percent (NEB 2011). A long-term increase in transport cost to take crude oil to market from potential extraction projects acts as an increase in the breakeven costs for those projects.

In the oil sands, breakeven costs vary according to the type of extraction project, as well as the business plan of the producer in terms of whether to upgrade the bitumen to synthetic crude oil. The Canadian NEB in 2011 provided estimated breakeven costs for new oil sands projects. Those prices expressed in terms of WTI price in 2011 dollars were: $51–61 per barrel for new in-situ crude; $66–76 per barrel for mining (without upgrader); and $86–96 per barrel for mining (with upgrading) (NEB 2011).[50] If an estimated incremental cost for rail compared to pipeline of

[49] Despite estimates for larger differences in price, $5 was selected for this analysis in part because if no pipelines are available then larger producers would utilize rail delivery options and it would be expected that they would get better prices than the most expensive rail estimates, and because of the opportunity for at least some portion of producers to take advantage shipping railbit or raw bitumen.

[50] Break-even costs for oil sands projects are expressed in terms of WTI, but the crude oil produced from all of the projects, save for the mining with upgraders, is a heavy crude oil that is sold at a discount from WTI. The benchmark for the Canadian heavy crude is WCS. Estimates for the breakeven oil cost for the crude oil in the Bakken range from approximately $55 to $70 per barrel for WTI (Gebrekidan 2012).

$5 per barrel is applied to the above cost estimates, then the total range of oil sands projects breakeven costs becomes WTI $56–$101 per barrel as summarized in Table 1.4-10.[51]

Table 1.4-10 Economic Threshold for New Oil Sands Projects

	WTI Price Dollars per Barrel[a]	
	NEB 2011	**NEB + Rail Cost**
New In Situ	$51– $61	$56–$66
New Mining and Extraction Only (No Upgrading)	$66–$76	$71–$81
New Mining, Extraction, and Upgrading	$86–$96	$91–$101

Source: NEB 2011.

[a] In 2011 dollars.

The AEO 2013 outlook projects both Brent and WTI crude oil prices (in constant 2011 dollars) above the band of breakeven costs for in situ and for mining without upgrading for all years through 2040. For new mining-plus-upgrading projects, these crude oil prices are within the band of breakeven costs ($91–$101) through approximately 2018, then move well above the breakeven costs (Figure 1.4.6-8).[52] At approximately $120 to $145, the WEO Current Policies Scenario oil price is above the breakeven costs for all projects from 2015 through 2035. NEB 2011 noted that the oil price in its reference case (U.S. $90/barrel (bbl) in 2011, rising to $115 in 2035) is "sufficient to promote active growth in oil sands capacity." While lower than the other projected prices, the NEB price is high enough to support in situ and mining (no upgrading) projects and is above the mining with upgrading breakeven costs by 2019.

The graph does indicate that, particularly in the shorter term, the most expensive oil sands projects—new mining project with upgraders—are economically challenged. This is consistent with the NEB 2011 report.[53] Decisions on whether to proceed with those types of projects could be impacted by an increase in transportation costs.

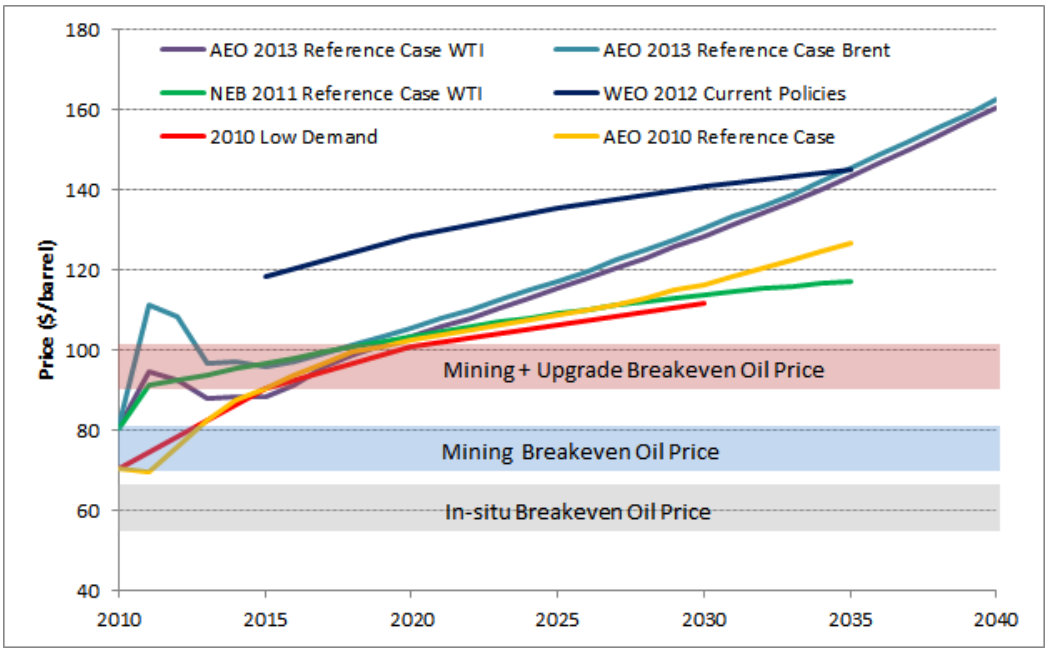
It does not appear, however, that there are any new mining plus upgrading projects included in the CAPP 2012 projections, although there are expansions of existing mining plus upgrading projects, and new or expanded stand-alone upgraders.[54] Thus, most of the increased production in the CAPP projection is expected to come from the types of oil sands projects with adjusted NEB estimated breakeven costs of $76 or below. The implication is that a $5 (or more) per barrel increase in breakeven cost through a shift to rail transport would have little impact on WCSB oil sands projects on the basis of EIA and IEA crude price projections.

[51] These cost estimates do not include a projection in how costs of production projects may change over time. Factors that would decrease costs compared to the NEB estimates are improving technology (which NEB noted could reduce costs by 1.5 percent per year) and an outlook for natural gas prices lower than the NEB used. Conversely, shortages in labor and supplies in the oil sands region driven by significant expansion in extraction projects could increase production costs.

[52] The AEO 2013 includes an outlook for Brent and WTI prices, but does not include outlooks for low and high oil price scenarios because it is the early release version. Alternate cases and scenarios from the various outlooks are discussed in this section.

[53] The NEB Report noted that because in the period between 2008–2010 the differential between light and heavy crudes had been relatively narrow, and was expected to remain narrow for the near to medium term, this, along with the high capital costs of constructing upgraders, is not supportive of constructing new upgrading facilities NEB (2011).

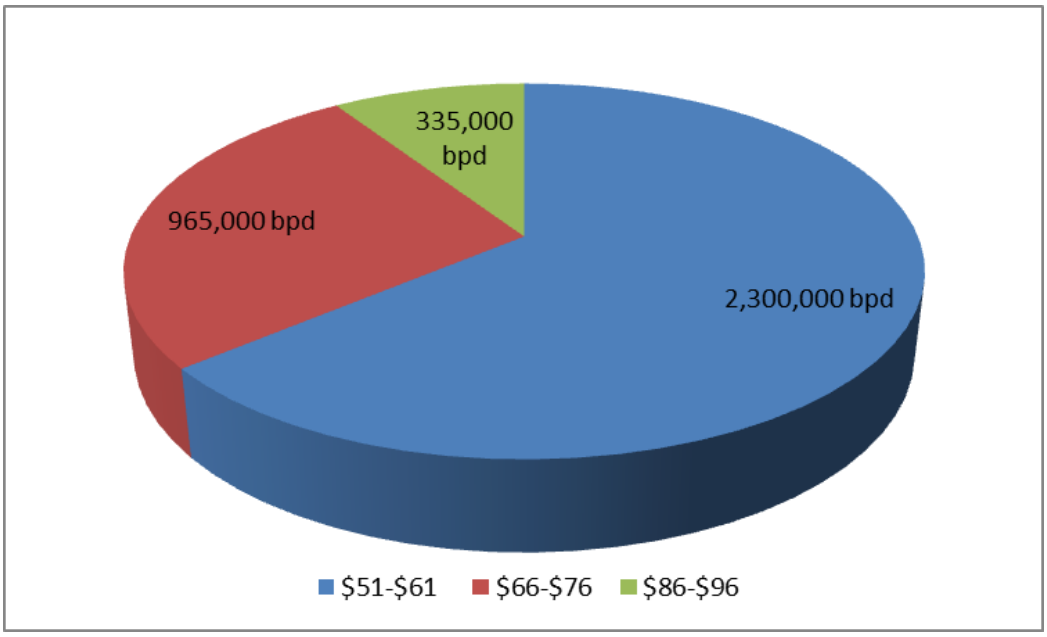
[54] The 2012CAPP Growth Outlook has SCO supply to market rising from 804,000 bpd in 2012 to 983,000 bpd in 2015 but thereafter remaining in the 1.0–1.15 million bpd range through 2030.



Source: EIA 2013, EIA 2010, EnSys 2010, NEB 2011, IEA 2012c.

Figure 1.4.6-8 Comparison of Crude Oil Prices (2011 dollars) To Oil Sands Breakeven Costs Including Cost of Rail Transport

The CAPP 2012 outlook estimates that by 2030 oil sands raw bitumen production will increase to 5.3 million bpd, up from 1.7 million in 2011. Of that increase, 2.3 million bpd comes from in-situ projects (64 percent) and 1.3 million bpd comes from mining projects (36 percent). That outlook does not break out the estimates between mining projects with and without upgraders. The 2012 Hart Heavy Oil Outlook, which had a slightly higher estimate of oil sands production (and an outlook period to 2035), does not include any new mining projects with upgraders in its estimate, but does have approximately 335,000 bpd coming from expansions to existing mining projects with upgraders. This is consistent with the CAPP projection of SCO supply rising from just over 800,000 bpd in 2012 to the 1–1.15 mmbpd range from 2016 on. On the basis that the expansions of the mining with upgrading projects in the Heavy Oil Outlook are included in the CAPP figures for mining, then the outlook for the increases in production in each range of breakeven costs is approximately: 2.3 million bpd by 2030 in the $51–$61 breakeven range; approximately 965,000 bpd in the $66–$76 range; and approximately 335,000 bpd in the $86–$96 range (Figure 1.4.6-9).



Sources: CAPP 2012, Hart 2012b

Figure 1.4.6-9 Estimated Additional Production in Oil Sands Raw Bitumen (bpd by 2030) by Project Break-Even Cost

Compared to industry analysis in 2012, this may slightly underestimate the potential volume of oil sands production that could be brought to market from projects with breakeven costs under $70 per barrel. As noted above, in the CAPP forecast there would be approximately 1 million bpd of additional raw bitumen production by 2020 (and 2.3 million bpd by 2030) with breakeven costs below $70. However, the referenced industry analysis examined all announced oil sands projects (which would result in production of an additional 3.4 million bpd by 2020 if they all went forward) and estimated that by 2020 there are 2.4 million bpd of those projects with breakeven costs below $70 per barrel (CIBC 2012). Therefore, if all announced projects in the industry analysis went forward, then the production level would already by 2020 slightly exceed the 2030 level forecasted by CAPP. That industry analysis also estimated that there is 1 million bpd of potential additional production by 2020 with breakeven costs in the $70–100 per barrel range.

There has been a general trend in the outlook for oil sands production away from upgrading bitumen in recent years.[55] The 2008 and 2012 CAPP forecasts each had similar total volume of oil sands crude oil coming to market by 2020, approximately 3.8 million bpd. There was a significant difference in the projected percentage of that crude oil that would go to market as upgraded synthetic crude oil, 47 percent in the 2008 forecast, dropping to 28 percent in the

[55] There has also been a trend away from mining projects and towards in-situ projects. The 2006 forecast had in-situ production decreasing from a projected 53 percent of oil sands production in 2010 to 43 percent by 2020. In contrast, the 2012 forecast showed actual in-situ production in 2010 being 50 percent, increasing to 58 percent by 2020 and 62 percent by 2030.

2012 forecast.[56] Any continuation of this trend would mean that even the limited number of planned upgrading projects integrated with mining may not go ahead, thereby eliminating or delaying construction of just the "high breakeven cost" upgrading portion of the project but without any reduction in overall oil sands output. The associated oil sands production would be sent to market as bitumen, potentially diluted depending on the transport mode.

Although it appears that most oil sands projects in the CAPP forecast (and the CIBC report) likely have breakeven costs low enough that the incremental increase in transportation costs would not drive project costs above the breakeven costs at expected oil prices, that does not mean that oil sands production would be completely insensitive to changes in costs (or the outlook in oil prices). To assess the potential impacts of a change in costs of production (or change in price of oil) on the rate of production, the next section examines the most recent International Energy Outlook (IEO)[57] from the EIA, as well as the previously mentioned analyses of oil sands project breakeven costs, as well as other sources.

The IEO includes three price cases for the outlook for oil prices, a high price case, the reference case, and a low price case. Total oil sands production is one of the outputs in each price case. Correlating the change in oil sands production amounts with the change in price in those cases gives some sense of the potential sensitivity of future production to incremental changes in oil price. A change in oil price can be considered equivalent to a change in costs in that both impact netbacks (profits) to the producer. In this sense, a decrease in oil price of $1 has an equivalent impact on a producer of an increase in production cost of $1. Both result in $1 less in netback and would be expected to have a similar impact on production.

In the IEO 2011 (the most recent version published), the reference case oil price was approximately $108 in 2020, growing to $125 by 2035. The low oil price case had oil prices dropping to approximately $50 throughout the projection period to 2035. The difference in oil sands production between those two cases was approximately 500,000 bpd in 2020, increasing to 1.3 million bpd in 2030, and to 1.7 million bpd in 2035. Assuming a linear relationship between oil price and amount of production,[58] then for every $5 change in oil price, the change in production would be approximately 40,000 bpd in 2020, 90,000 bpd in 2030, and 120,000 bpd in 2035.

It is unlikely that the relationship between these two variables is linear throughout the full $50 to $125 price range. One would expect a larger impact on production amounts when oil prices are below $100, and thus within the range of breakeven costs of the oil sands projects. To assess the potential difference in impacts in different price ranges, two studies were analyzed in addition to the IEO: the CAPP projections (combined with NEB cost estimates) and the CIBC report. According to the analysis above, it is assumed that a $30 reduction in oil price (a decrease from $100 to $70) would result in all projects with breakeven cost above $70 being delayed/canceled. It is assumed that within the $70 to $100 price range, there is a linear relationship between change in oil price and change in production amount.

[56] In 2006 the forecast was that approximately 55 percent of the oil sands crude oil coming to market in 2020 would do so in the form of upgraded synthetic crude oil (either transported as synthetic crude oil itself, or used to dilute bitumen to form a synbit).
[57] The EIA's AEO reports do not include oil sands production as one of their outputs, but the EIA's IEO do.
[58] A linear relationship means that every dollar in oil price change will result in the same amount of change in production.

Table 1.4-11 presents estimates of potential impacts on oil sands production per $5 change in netback to oil sands producers (e.g. either a $5 change in oil price or a $5 change in production/delivery costs) according to the three different reports mentioned above. The range of potential changes in production is from 40,000 to 210,000 bpd depending on the study, the time horizon, and the range of world oil price. The table also presents those changes in volume as a percentage change in total oil sands production in each respective outlook.

Table 1.4-11 Estimated Potential Change in Oil Sands Production per $5 Increase in Cost per barrel of Oil in Different Outlooks[a,b]

	2020		2030	
	Production Change (bpd)	% of Total Production	Production Change (bpd)	% of Total Production
IEO 2011 (Oil Price $50–$125)	40,000	1.3%	90,000	2.1%
NEB/CAPP (Oil Price $70–$100)	105,000	3.1%	210,000	4.0%
CIBC (Oil Price $70–$100)	170,000	3.3%	NA[d]	NA

Source: NEB 2011, CAPP 2012, CIBC 2012, Hart 2012b.

[a] The IEO assumes a linear relationship between price and production amount where oil prices are between $50 and $125 per barrel, the NEB and CIBC numbers assume a linear relationship between those variables when crude prices are between $70 and $100.
[b] In 2011 dollars.
[c] The IEO outlook extends to 2035. In 2035, the production change would be 120,000 bpd, which would be 2.4% of the total IEO forecasted production for the oil sands.
[d] NA = not applicable.

This range of potential changes in production is consistent with the modeling undertaken by Brookhaven National Laboratory to produce the 2010 Low Demand Outlook for the EnSys 2010 study. There, the Low Demand Outlook in 2030 (when compared to AEO 2010) resulted in a decrease of $5 in world oil price with a corresponding decrease of 170,000 bpd in oil sands production.

As discussed above, the incremental cost of transporting a barrel of crude oil to the Gulf Coast by rail versus pipeline is between approximately $2 and $7.50. It is most likely that if all incremental production in the oil sands had to be carried by rail, that production would be shipped in a variety of forms (raw bitumen, railbit, dilbit, and SCO) and under a variety of terms (long-term committed, to uncommitted) that would result in different incremental costs. If it were assumed that the incremental cost of transport for all additional barrels were only $2 more than pipeline, then the change in production could be less than half that indicated in Table 1.4-11 (36,000–84,000 bpd in 2030). On the other hand, if it were assumed that the incremental cost of all additional barrels were $7.50 more than pipeline, the change in production could be approximately 50 percent higher (from 135,000 to 315,000 bpd in 2030).

These potential changes in production volume would not necessarily result just from a decision on any single infrastructure project, including the proposed Project. Rather, the above analysis of the potential changes is an indication of the scope of impact on rate of production if all pipeline projects did not go forward, and the industry had to absorb the additional costs of non-pipeline transport options across all incremental production. If only a small marginal volume of oil sands production had to be shipped at higher cost, it would only be that small marginal volume that would suffer the reduced netback and whose production could be affected. All other projects that were moving their production via lower cost pipeline would achieve the higher netback and their

production would not be impacted. In that sense, a decision on the proposed Project alone likely would not impact the market enough over the medium to long-term to result in changes in production at the scale indicated in Table 1.4-11. If the estimates of percentage changes in production per dollar change in oil price/netback indicated in Table 1.4-11 were applied to the volume of crude oil that could be shipped by the proposed Project rather than the total volume of forecasted increased production (i.e., if the 830,000 bpd capacity of the proposed Project had to be shipped by rail and other means with an average increase in transport cost of $5 per barrel), then the implied potential change in production could be from 20,000 to 30,000 bpd in 2030 (from 0.4 to 0.6 percent of total WCSB production).[59]

As discussed in Section 2.2, Description of Reasonable Alternatives, and as was set out in EnSys 2011, a range of listed pipeline projects exists and others are likely to be forthcoming over time. If even one of the pipeline projects went forward, but all other projects did not proceed, the logistical challenge of having rail transport all growth in production would be reduced.[60] Nonetheless, the environmental analysis in this Supplemental EIS takes account of the possible impact on the rate of production in the oil sands, where relevant.

Incentives to Use Rail and Other Non-Pipeline Transport

When there are constraints on pipeline capacity to transport crude oil from the production area to market (or from a particular crude oil hub to market), one of the impacts is a local supply glut, which puts downward pressure on the price of crude oil in that area. Such a situation is currently occurring with respect not only to crude oils produced in the WCSB, but to much of the inland crude oil production in North America. As noted above, much of the recent rapid increase in production is in areas such as the Bakken, Eagle Ford, Niobrara, Permian, and others that either do not yet have adequate pipeline capacity, or where the crudes from those areas are being delivered into the Cushing, Oklahoma, hub that has not had adequate outbound pipeline capacity, especially southward.[61]

Until late 2010, WTI and Brent crude oil prices moved in parallel with only small differentials between them. Beginning in early 2011, that situation changed. Growth in domestic U.S. and Western Canadian production put pressure on a crude logistics system that was designed to take crude oils to the central United States rather than out to the coasts. This in turn has led to discounted prices for WTI and all inland U.S. and Canadian crudes (nearly all of which are priced off WTI). The discounting has persisted into 2013 and is expected to continue unless and

[59] As noted elsewhere in the Supplemental EIS, the near-term initial throughput of the proposed Project is projected to be 830,000 barrels of crude per day with 100,000 bpd supplied by Bakken crude production and the remaining 730,000 bpd supplied by the WCSB oil sands. However, this estimate assumes that the full 830,000 bpd pipeline capacity is used to transport only WCSB crude, resulting in a slightly greater reduction in WCSB production.

[60] Furthermore, this assessment of the potential production impacts that could arise from the differential between rail and pipeline transport costs was based on present day uncommitted tariffs for each mode. As rail became more established, it could become more efficient. Such a trend, together with increased incidence of longer term contracts, would tend to push rail tariffs down. Conversely, it is possible that, over time, pipeline operators may be successful in moving tariffs up, given the presence of higher cost rail tariffs. The recent approval by the Federal Energy Regulatory Commission for a shift from cost-based rates to much higher market-based rates on the Pegasus pipeline from Patoka, Illinois, to the Gulf Coast arguably reflects pipeline versus pipeline competition but is, nonetheless, a possible indicator that such a trend could occur in the event of extensive pipeline versus rail competition. In short, the effect of these trends could be to narrow the gap over time between the costs of rail and pipeline transport.

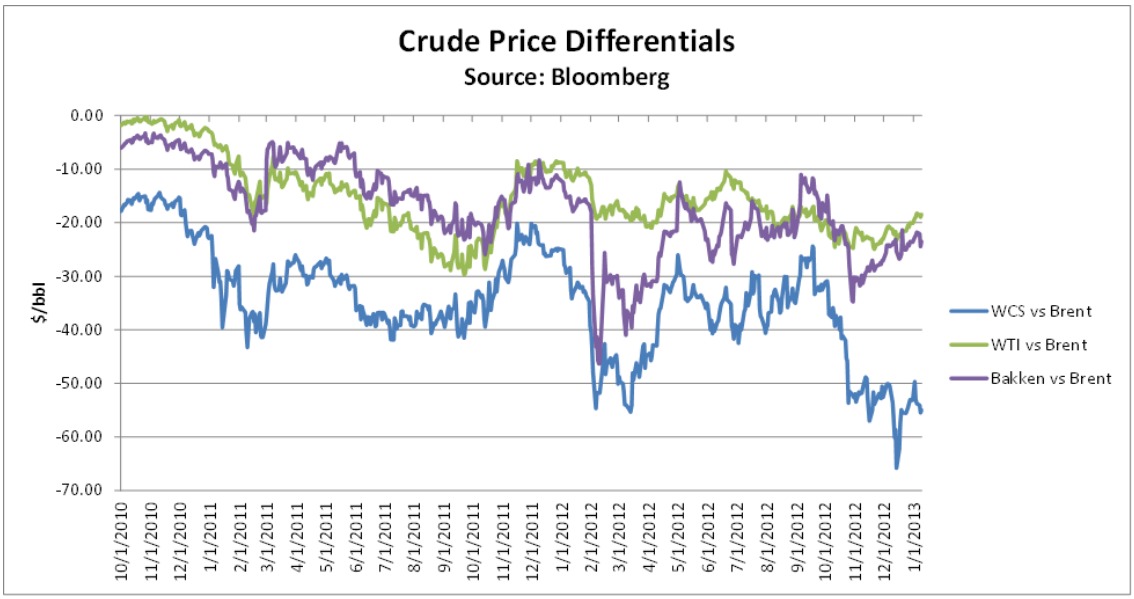
[61] Even with the additional pipeline capacity slated to come on line, AEO 2013 (EIA 2013b) continues to have inland crude oil at a discount compared to coastal crude (Figure 1.4.3-6).

until adequate capacity becomes available to enable crudes to move to U.S. and Canadian coastal markets. The continued growth in crude supply in both the United States and Canada has led to a race to move crude by whatever means available to coastal markets. As a result, the logistics system is adapting, with changes in pipeline, rail, and to some degree marine infrastructure.

Recent trends for transportation of Bakken crude are illustrative. Bakken discounts versus Brent initially followed those for WTI. In early 2012, Bakken discounts steepened severely but have since recovered. Arguably, this recovery has occurred because of the strong growth in rail movements out of the Bakken, especially during the second half of 2012. By the end of 2012, rail takeaway capacity from the North Dakota part of the Bakken was in excess of 700,000 bpd. Rail movements out of North Dakota were reported as reaching almost 500,000 bpd, indicating an average load terminal utilization of around 65 percent. While rail takeaway capacity is projected by the North Dakota Pipeline Authority to grow to over 900,000 bpd by the end of 2013, the North Dakota Pipeline Authority also sees pipeline takeaway capacity plus crude oil consumption at a refinery in North Dakota growing to over 750,000 bpd by end 2013 and to over 1.2 million bpd by 2015, excluding Keystone XL.

There are, however, notable differences between the two sets of capacity. The bulk of the pipeline expansions are designed to move Bakken crude either north or east into the Enbridge Mainline system (or possibly the existing Keystone Mainline). Thus, these expansions do not directly move the Bakken crude out of the Midwest (PADD 2). Rather, they are reliant on expansions to additional lines, generally either south to the Gulf Coast or east to eastern PADD 2 and eastern Canada to move the Bakken crude to additional markets. In contrast, the rail takeaway systems have been set up primarily to move Bakken crude directly to coastal markets. Only one new unit train terminal has been built inland with access to Cushing: the terminal at Stroud, Oklahoma. Conversely, unit train off-loading capacity on the Gulf Coast is estimated to be more than 600,000 bpd by early 2013. This encompasses capacity for both light and heavy crudes. Gulf Coast off-loading capacity is projected to be exceeded, however, by the U.S. East Coast off-loading capacity. Off-loading capacity on the U.S. East Coast was minimal in early 2012, but is projected to reach over 800,000 bpd by the end of 2013. Moreover, an additional 70,000 bpd of off-loading capacity is available in New Brunswick, Canada. Finally, rail off-loading capacity in Washington and California is expected to reach 135,000 bpd during 2013.

What this capacity means for the Bakken is significant. The bulk of the movements to the East and West Coasts are for light, i.e., predominantly Bakken crude, which will be priced against Brent and other international market crudes. These developments should help limit Bakken discounts to potentially the $10–$20 per barrel range, possibly less, as represented by the difference in freight costs between moving a Brent or West African type crude from the North Sea/West Africa to, for example, Philadelphia, versus moving Bakken crude from North Dakota (or more technically from Clearbrook, Minnesota, which is the location for setting Bakken crude pricing) to that same destination (Figure 1.4.6-10). Thus, rail out of the Bakken is having the effect of enabling Bakken crudes to avoid the Cushing pipeline bottleneck and realize pricing based off international marker crudes.



Source: Bloomberg 2013b.

Figure 1.4.6-10 Crude Oil Price Differentials Compared to Brent

In contrast to the recent trend for Bakken crude, discounts for the marker heavy grade WCS have been growing in recent months. Prior to the advent of current logistics constrains, WCS discounts versus Brent were generally of the order of $15–$20/barrel, (primarily reflecting differences in refining values of the two crudes[62]). These discounts deepened to the $30–$40 per barrel range in 2011 and through much of 2012. Recently, the discount widened further to the $50–$60 per barrel range. There is sufficient pipeline capacity today to take Western Canadian crudes cross-border into the central United States, but the severe pricing discounts indicate these crudes are not able to move further and access coastal markets, notably in the Gulf Coast where their value would match that of heavy Venezuelan crudes and Mexican crudes such as Mayan.

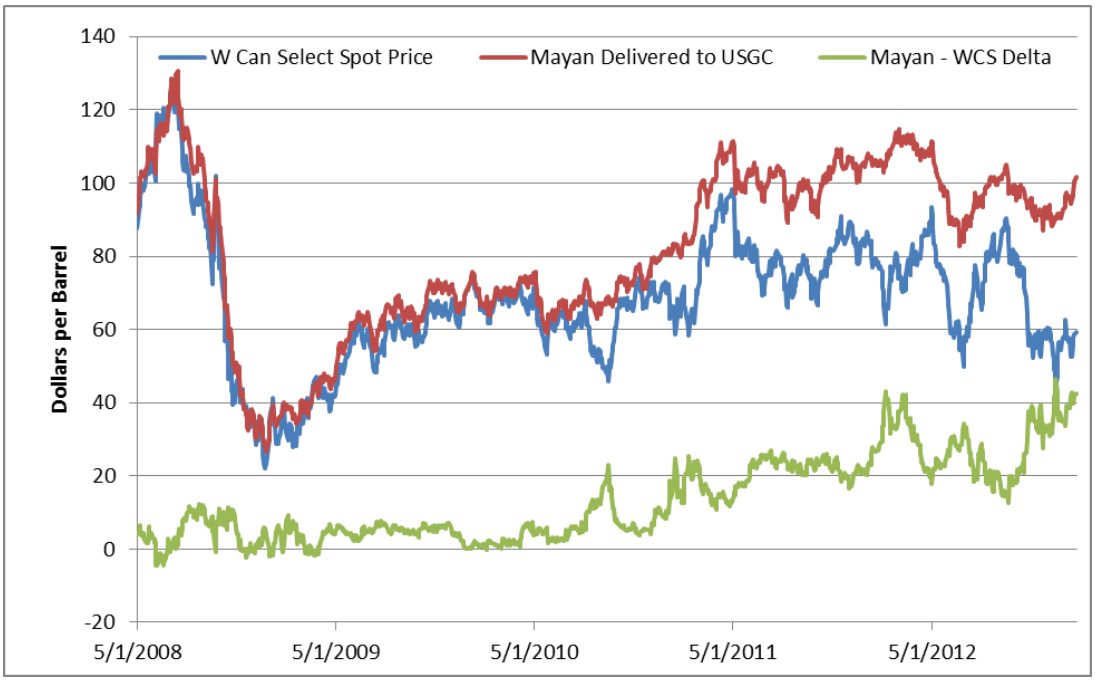
Proposed pipeline projects such as the Enbridge Flanagan South expansion from Chicago to Cushing, as well as the two-stage expansion of the reversed Seaway line from Cushing to the Gulf Coast, would add more capacity to move Western Canadian production to the Gulf Coast. However, the Western Canadian crudes traveling on pipeline will have to compete for space with growing production from the Bakken and Midcontinent, much of which is feeding into the Cushing hub. This competition is made more acute based on the projections outlined above that foresee Western Canadian production growing at an average of approximately 210,000 bpd per year through 2020.

These steep crude discounts are a disincentive to producers to proceed with new extraction projects. In particular, they put pressure on the more economically marginal extraction projects.

[62] Producing sufficient quantities of high-value products such as gasoline and low sulfur diesel from a heavy sour crude requires the installation of additional processing units at a refinery. As explained in section 1.4.4, Market Developments Since the 2011 Final EIS, the installation of these units requires significant capital investment and higher operating expenses. The heavy crudes are discounted from lighter crudes to reflect this increased refining expense.

Recent commentary has suggested that if the current prices persist some conventional heavy production may be idled, but also noted that larger operating in-situ projects in the oil sands likely could sustain even lower prices (below $30 per barrel) before considering idling (Reuters 2013b). Also, Suncor, one of the largest oil sands producers, has noted that it was taking a write down on an upgrader project, and was delaying a decision on proceeding with two new mining projects (as well as an upgrading project) because of concerns about rising costs for the projects and oil prices. Canadian Natural Resources cut its capital spending in 2012, primarily related to expansions at one of its mining projects. On the other hand, even at the current depressed oil prices in the WCSB, both of those companies are planning 10 percent increases in their capital spending in 2013 (RBC Economics 2013).

At the same time these steep discounts in the prices of oil sands crudes (and other inland crudes) also create a significant incentive for refiners to obtain those crudes.[63] The discounts mean that, even taking into account the additional cost of non-pipeline transportation options such as rail, a refiner can obtain the inland crudes at a discount to the global prices they pay for water born crudes. Figure 1.4.6-11 shows the WCS discount to Gulf Coast heavy crude prices (Mexican Mayan) leaves significant room for accommodating increased transport costs and still making a profit by transporting the crude oil to the Gulf.



Source: Bloomberg 2013b

Figure 1.4.6-11 Western Canadian Select Spot and Mayan U.S. Gulf Coast Prices

[63] "The price of Canadian oil exports is low relative to international benchmarks because of infrastructure limitations that prevent oil from getting to market. The larger the price difference grows, the more incentive there is to add infrastructure to get product into regions that earn a higher return (i.e. the more incentive there is to develop further infrastructure" (RBC Economics 2013).

If the producer ships the crude oil to the Gulf Coast (or East or West Coast), that producer can achieve better netbacks than it would by selling the crude into the discounted WCS market in Alberta. If a refiner pays to ship the crude to the Gulf Coast, the cost difference between the delivered WCS and equivalent waterborne international crude represents a substantial cost savings. Or a midstream company may take possession of the crude and pay the shipping costs, keeping the difference in price as profit. This phenomenon is what is driving East Coast refiners and producers in the Bakken to execute medium-term (5-year) contracts to deliver crude by rail, despite an estimated rail cost of $10.50 to $13.75 per barrel. At the current WCS discounts (compared to a comparable heavy crude oil on the U.S. Gulf Coast), a producer/shipper/refiner could absorb the additional rail cost (paying a short-term rate compared to a long-term pipeline rate) and still net over $26 per barrel. These exceptional economic incentives are what is driving the move to transport increasing volumes of crude oil by rail to the coasts when pipeline capacity is not available (see Table 1.4-12 below).

Table 1.4-12 Delivered Costs of WCSB Heavy Crude Compared to Maya Crude

	Crude Cost/bbl	Transport Cost/bbl	Total Texas Gulf Coast Landed Cost/bbl	WCS U.S. Gulf Coast vs. Maya Landed/bbl
Pipeline—WCS U.S. Gulf Coast	58.75	$9.75[a]	68.50	-32.25
Rail—WCS U.S. Gulf Coast	58.75	$15.50[b]	74.25	-26.25
Mexican Maya to U.S. Gulf Coast	NA	NA	100.50	NA

[a]Long-term committed tariff
[b]Short-term rail rate includes fees for loading and unloading tank car and railcar lease.

Over time, as additional transport capacity is brought on line, the price discounts for inland crudes compared to coastal crudes would be expected to narrow. If there are no transport constraints, these would tend to narrow to the point where they reflect the transportation costs for moving the inland crude to the coastal market, plus any quality differences versus the corresponding open market crude used for pricing. As noted above, it is expected that the inland crude discounts could persist for several years as the logistics system continues to adjust and catch up to the new production patterns throughout North America.

1.4.7 Additional Issues in Market Outlook

As with all projections of these types, there is uncertainty as to what will in fact happen. Among the uncertainties identified in the various forecasts examined in preparing this assessment are the following:

Economic growth. The forecasts make certain assumptions about general economic growth, in particular regions and throughout the world. In general, the relatively high forecasted world oil prices are driven by increased demand attendant to economic growth in developing countries led by those in Asia. A long period of global recession could result in lower demand growth and lower oil prices as could a significant increase in potential supply.

Price of crude oil. There is significant volatility in day to day crude oil prices and uncertainty over their long-term direction. Projects to extract oil sands crude are long-term investments and producers generally focus on long-term projections of oil price when making business decisions rather than short-term fluctuations in oil price. The reports examined generally provide different scenarios to account for higher or lower crude oil prices and how those fluctuations might impact the projections.

Technological advances. Technological advances can impact both the supply and demand sides of the petroleum market. On the supply side, technological advances have made it possible for substantial increases in light tight oil production in the United States. As a result of these technological increases, the United States is projected to increase crude oil production by more than 3 mmbpd. Similarly, because the development of light tight oil wells is new, there is uncertainty surrounding their depletion rate, which is a key input in the projections of crude oil production volumes. Similarly, oil sands technology developments are occurring that could over time improve their economics, resource consumption, and greenhouse gas profile. On the demand side, technological advancements in areas such as battery storage or biofuels development could reduce the demand for petroleum based transportation fuels.

Costs of production. Costs of production can be related to each of the above uncertainty factors. Production cost is a potentially significant factor for development of the oil sands as the more expensive oil sands projects are among the most expensive extraction projects globally. Shifts in costs, possibly driven by an increased rate of inflation in the WCSB area as more producers compete for labor and supplies, could impact the economic viability of future projects. On the other hand, improvements in extraction technology, such as the addition of solvents to the in-situ extraction projects, could drive cost savings.

To assess how some of those uncertainties might impact the projected growth in production for both oil sands and light tight oil, the Department examined the different scenarios in recent IEA WEO reports (IEA 2010, 2011, and 2012), the AEO (EIA 2010, 2011, and 2012c), the NEB (2011), and industry commentary and analysis. The different scenarios examined in those reports (whether the scenario is one with a low or high oil price, and whether it assumes more aggressive climate change policies) can have a substantial impact on the projected rates of extraction from the oil sands over the next two decades. However, in all of the scenarios examined, production from the oil sands is expected to increase substantially over current levels.

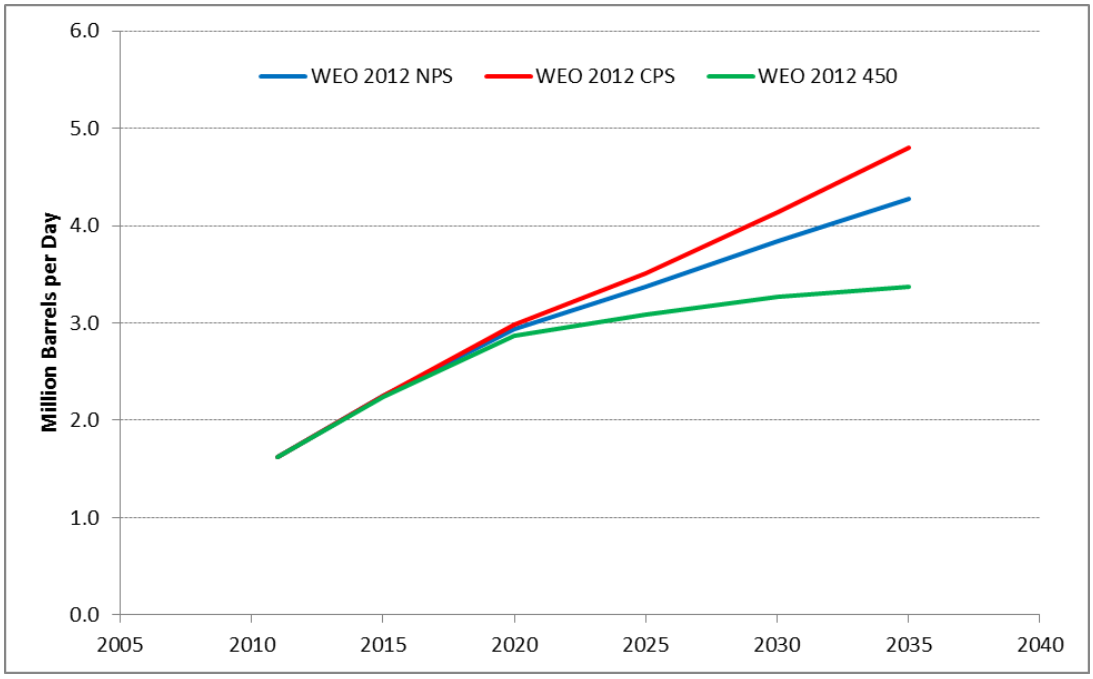
The AEO includes low and high oil price scenarios in addition to a reference case in its projections. In the AEO 2010 and 2011[64], the low oil price case resulted in a slower rate of growth for oil sands production compared to the reference case or the high oil price case . In the 2011 AEO, that production was forecasted to grow from 2010 to 2035 from its initial level of 1.9 mmbpd to 3.23 mmbpd in the low oil price case, to 5.3 mmbpd in the reference case, and to 7.1 mmbpd in the high oil price case.[65] In the AEO 2012 low oil price case, however, the EIA adjusted its assumption about the relationship between a lower oil price and the cost of production for oil sands crude. In the 2010 and 2011 outlooks, the assumption had been that oil sands costs of production were not sensitive to lower crude oil prices in the low oil price case.

[64] Both the AEO 2010 and 2011 low oil price cases included long-term oil prices around $50-$60 per barrel rather than $100+ per barrel in the reference case.

[65] Comparing the AEO 2011 "Unconventional Production North America: Other" to the IEO 2011, which reports oil sands volumes, indicates the AEO category may be 90 percent or more oil sands.

In the 2012 AEO low price case, the EIA assumed that lower oil prices could result in lower costs for steel, cement, and other equipment necessary to produce unconventional resources, including oil sands. This resulted in the low oil price case for 2012 having a higher growth rate in North American unconventional production through 2035 compared to the reference case.

The IEA WEO reports evaluated global policies related to energy use and climate change. Three main scenarios were examined. The Current Policies Scenario assumes no change from policies currently in effect when the WEO is produced. The New Policies Scenario (which the WEO uses as its reference case) assumes policy commitments regarding climate change mitigation and energy use that countries have made, but not yet implemented, will go forward in a reasonable time. The 450 Scenario assumes policy action consistent with limiting long-term global temperature increase to 2 degrees Celsius. As with the AEO's different oil price cases, the different policy scenarios do show different trajectories for oil sands development, but all of the scenarios have significant increases in oil sands production from now to 2035. For example, in the 450 scenario the production from the oil sands is projected to increase from 1.6 million bpd in 2011 to 3.3 mmbpd by 2035.[66] This is a significantly lower growth rate than the Current Policies scenario (which has oil sands production at 4.8 million bpd by 2035), or the New Policies scenario, (4.3 million bpd by 2035), but is a growth rate that would still require additional transport capacity between now and 2020 (IEA 2012) (Figure 1.4.7-1).



Source: IEA 2012.

Figure 1.4.7-1 Comparison of WEO 2012 Projection Scenarios

[66] The 450 scenario assumes aggressive development and deployment of mitigation measures, such as carbon capture and storage, to mitigate greenhouse gas emissions. The WEO indicates that to be consistent with a 450 scenario, even the reduced production amount indicated above (as compared to the Current Policies Scenario) would need to be complemented with deployment of mitigation measures such as carbon capture and storage.

An additional potential impact not examined in detail above, but addressed in the EnSys 2010 and 2011 reports, is the potential for pipeline developments to impact the disposition of WCSB crude oils. As noted in the EnSys reports, as well as in the updated cost estimates in Section 2.2, Description of Reasonable Alternatives, of this Supplement EIS, the transport cost from the WCSB to Asia via the West Coast of North America is significantly less than the costs from the WCSB to the U.S. Gulf Coast. The EnSys 2010 results indicated that because of this cost advantage and the growing demand for petroleum in Asia, if transport capacity was available to the Canadian West Coast, producers would export crude oil to Asia instead of exporting to the U.S. Gulf Coast. This finding has since been reinforced by the high degree of over-subscription that has been occurring on the Trans Mountain Pipeline Expansion Project from Alberta to Vancouver. Its operator, Kinder Morgan Canada, has progressively revised upward its planned expanded capacity for the line. The company's latest announcement, in January 2013, lists a planned expansion from the current 300,000 bpd to 890,000 bpd based on committed shipper volumes of 700,000 bpd (Trans Mountain 2013). This is an increase over the expansion to 750,000 bpd Kinder Morgan proposed in April 2012 and reflects additional shipper support based on a successful supplemental open season. It is a strong indicator of interest in taking WCSB crude oils west. In addition, Enbridge continues to pursue its Northern Gateway project which would comprise a wholly new line to Kitimat on the British Columbia coast with initial capacity of 525,000 bpd, expandable to 800,000 bpd.

As noted above, both of these proposed pipeline projects to Canada's West Coast face significant resistance and uncertainty, but there are strong cost advantages when compared with moving WCSB crude to the Gulf Coast even if rail were used to access the Canadian West Coast (this is further discussed Section 2.2, Description of Reasonable Alternatives). In fact, using rail and tanker to ship crude oil from the WCSB via the West Coast to China is comparable to the pipeline rate to reach the U.S. Gulf Coast. An increase in the transport costs to the Gulf Coast (utilizing alternative transport options such as rail) would have a tendency to increase the economic incentive to utilize any West Coast export options, if they are available.

Also not examined above, are more speculative political impacts that might occur as a result of a decision on the permit application for the proposed Project. In 2012, the Canadian government enacted new laws changing the way some major infrastructure projects, such as pipelines, are reviewed. Among the changes made were limits on the amount of time for such reviews. A declared intent was to promote alternative routes for the export of WCSB crude oils, especially ones that would reduce reliance on the United States as, essentially, the sole market option.

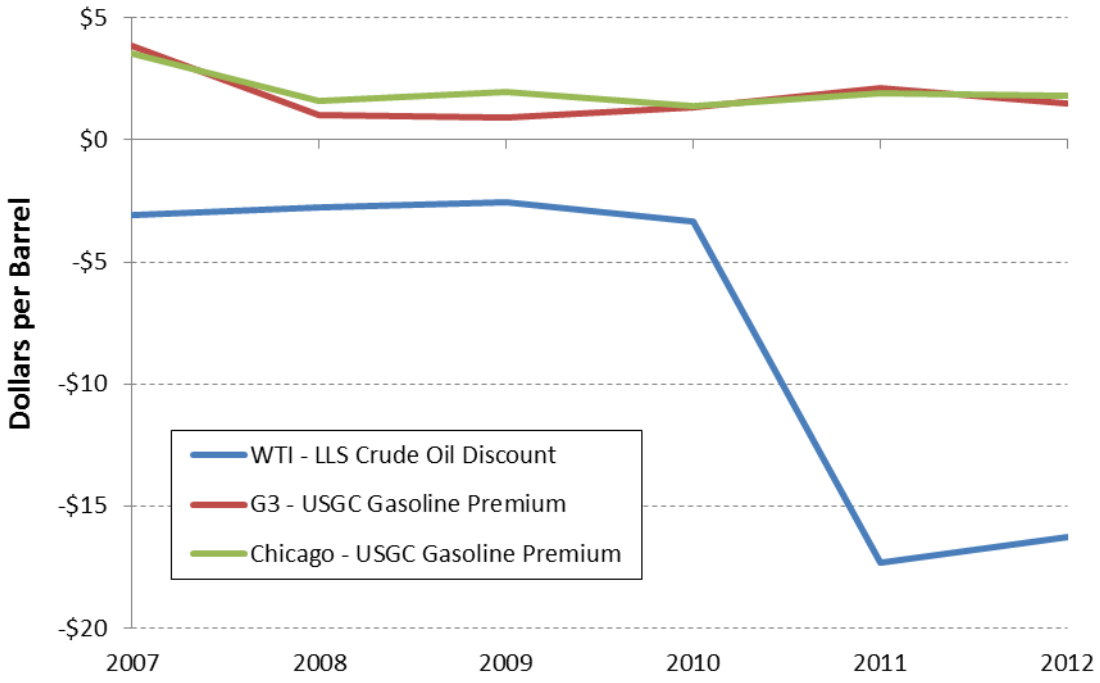
1.4.8 Additional Market Issues From Scoping Comments—Crude Price Differences and Gasoline Prices

Comments were received during the scoping process for this Supplemental EIS and throughout the review process leading up to the Final EIS about whether the steep discounts in the Midcontinent and upper Midwest/Chicago crude prices were resulting in lower gasoline prices for Midwest consumers, and, conversely, whether approving a project that would relieve the crude bottleneck at Cushing would raise gasoline prices in the Midwest. As the Seaway pipeline(s) and the Gulf Coast Project will provide more pipeline transport capacity from Cushing, Oklahoma, to the Gulf Coast, this issue is not solely related to the proposed Project. Because of the significant public interest in the question, and because it provides additional helpful background on the North American crude oil market, this issue is discussed briefly below

and further information and analysis of this issue is provided in Appendix C, Market Analysis Supplemental Information.

Since early 2011 there has been a glut of crude oil at the Cushing, Oklahoma, oil hub where WTI crude oil is priced. This glut has been caused by a variety of factors including growth in domestic light crude production, displacement of light crude by several refiners bringing on-line heavy crude upgrading projects in the Midwest to process heavy WCSB crude oils, and constraints in the transportation capacity out of Cushing because of the change in production areas and associated crude flows. With no viable options to move light crude to coastal refineries, notably on the Gulf Coast, the crude at Cushing and further north to the Bakken region became heavily discounted by producers relative to traditional markers such as Light Louisiana Sweet (LLS) or Brent. This led to the prevailing highly unusual market situation where a Gulf Coast refiner processing LLS would have had to pay as much as $20 to $25 per barrel more (at various times) for a light crude than a refiner in Oklahoma would pay for a crude with similar yields (WTI). This situation gives refiners in the Midcontinent region that purchase crude oil based on the WTI price a significant crude oil cost advantage over Gulf Coast (or East or West Coast) refiners that rely on purchases of foreign crude oils since those are priced off Brent or other international markers.

The steep discounts in crude prices in the Midcontinent and upper Midwest/Chicago regions compared to Gulf Coast crude prices have not, however, resulted in lower wholesale gasoline prices in those regions compared to the Gulf Coast. According to market data, (Figure 1.4.8-1), despite the discounts in WTI and hence regional crude prices, wholesale product prices in the Chicago and Group 3 markets—for the most part—have not followed crude price discounts. Figure 1.4.8-1 shows that during the period that WTI crude has been steeply discounted to similar crude oils on the Gulf Coast (shown by the blue line in Figure 1.4.8-1), the wholesale price of gasoline in the Midwest (Chicago and Group 3 region) has remained generally higher than that on the Gulf Coast (shown by the green and red lines in Figure 1.4.8-1). This is because there is an active flow of gasoline, and other clean products, from the Gulf Coast into the Midwest, mainly via the Explorer pipeline. As a consequence, Midwest product prices are derived from Gulf Coast prices, both of which are in turn driven by international (rather than U.S. inland) crude oil prices. Enabling (additional volumes of) WCSB crudes to flow to the Gulf Coast would not change this dynamic. What would change it is product demand or refinery processing changes that result in product flowing out from the Midwest to the Gulf Coast rather than the opposite.



Source: Bloomberg 2012.

Notes: Bloomberg WTI pricing (ticker symbol: USCRWTIC Index). Bloomberg LLS pricing (ticker symbol: USCRLLSS Index). Danaher Oil Midcontinent Unleaded Gas pricing (ticker symbol: G3OR87PC Index). Bloomberg U.S. Gulf Coast Reformulated Blendstock for Oxygenate Blending pricing (ticker symbol: RBOBG87P Index). Bloomberg Chicago Conventional Blendstock for Oxygenate Blending pricing (ticker symbol: CHOR87PC Index).

Figure 1.4.8-1 Average Crude Oil and Gasoline Price Spreads, $/bbl

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1.5 AGENCY PARTICIPATION

1.5.1 Federal Lead Agency—U.S. Department of State

As noted in Section 1.3.2, Department of State Purpose and Need, the U.S. Department of State (Department) is responsible for issuance of Presidential Permits for certain cross-border facilities. In addition, the Department is the lead agency for the environmental review consistent with National Environmental Policy Act (NEPA), the National Historic Preservation Act of 1986 (NHPA) Section 106 consultation process, and the Endangered Species Act (ESA) Section 7 consultation process for the proposed Project. As the lead agency, the Department directed the preparation of the Supplemental Environmental Impact Statement (EIS) for the proposed Project consistent with NEPA, directed the Section 106 tribal consultation process consistent with the NHPA (16 United States Code [USC] § 470 et seq.), and initiated both informal and formal consultation with the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the ESA (ESA 16 USC § 1536) to determine the likelihood of effects on listed species.

The Department coordinated with the cooperating agencies to ensure compliance with laws and regulations within their authority as well as to ensure compliance with the following executive orders:

- Executive Order (EO) 11988—Floodplain Management;
- EO 11990—Protection of Wetlands;
- EO 12114—Environmental Effects Abroad of Major Federal Actions;
- EO 12898—Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations;
- EO 13007—Indian Sacred Sites;
- EO 13112—Invasive Species;
- EO 13175—Consultation and Coordination with Indian Tribal Governments;
- EO 13186—Responsibilities of Federal Agencies to Protect Migratory Birds;
- EO 13212—Actions to Expedite Energy-Related Projects; and
- EO 13337, as amended (69 Federal Regulation 25299)—Issuance of Permits with Respect to Certain Energy-Related Facilities and Land Transportation Crossings on the International Boundaries of the United States

EO 13337 governs the Department's issuance of Presidential Permits that authorize construction of pipelines carrying petroleum, petroleum products, and other liquids across U.S. international borders. Within the Department, the Bureau of Energy Resources, Office of International Energy and Commodity Policy, receives and processes Presidential Permit applications. Upon receipt of a Presidential Permit application for a cross-border pipeline, the Department is required to request the views of the Secretary of Defense, the Attorney General, the Secretary of the Interior, the Secretary of Commerce, the Secretary of Transportation, the Secretary of Energy, the Secretary of Homeland Security, the Administrator of the U.S. Environmental Protection Agency (USEPA), and other government department and agency heads as the Secretary of State deems

appropriate. The Department must conclude that the proposed Project is in the national interest in order to issue a Presidential Permit.

1.5.2 Cooperating Agencies

The following agencies have agreed to be cooperating agencies. A cooperating agency is any federal or state agency, other than a lead agency, that has jurisdiction by law or special expertise relevant to a proposed action and has agreed to formally become a cooperating agency.

1.5.2.1 U.S. Environmental Protection Agency

Under Section 402 of the Clean Water Act (CWA; 33 USC §1251 et seq.), USEPA has jurisdiction over the discharge of pollutants from a point source into waters of the United States. Administration of permit programs for point-source discharges that require a National Pollutant Discharge Elimination System permit has been delegated to the states affected by the proposed Project. USEPA maintains oversight of the delegated authority. Regulated discharges include, but are not limited to, sanitary and domestic wastewater, gravel pit and construction dewatering, hydrostatic test water, and storm water (40 CFR 122). Section 401 of the CWA considers approval of water use and crossing permits and is implemented through each state's Water Quality Certification Program.

Under Section 404 of the CWA (33 USC § 1251 et seq.), the USEPA reviews and comments on U.S. Army Corps of Engineers (USACE) Section 404 permit applications for compliance with the Section 404(b)(1) guidelines and other statutes and authorities within its jurisdiction (40 CFR 230).

Under Section 309 of the Clean Air Act (42 USC § 7401 et seq.), USEPA has the responsibility to review and comment in writing on the EIS for compliance with the Council on Environmental Quality's Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500 to 1508).

Under Sections 3001 through 3019 of the Resource Conservation and Recovery Act (42 USC § 3251 et seq.), USEPA establishes criteria governing the management of hazardous waste. In accordance with 40 CFR 261.4(b)(5), any hazardous waste generated in conjunction with construction or operation of the proposed Project would be subject to the hazardous waste regulations.

The proposed Project would extend through USEPA Regions 7 and 8.

1.5.2.2 U.S. Department of Interior, Bureau of Land Management

The Bureau of Land Management (BLM) has authority to issue right-of-way (ROW) grants under the Mineral Leasing Act (MLA) of 1920, as amended (30 USC 181 et seq.). BLM will consider the issuance of a new ROW grant and issuance of associated temporary use permits that would apply to BLM-managed lands crossed by the proposed Project. Conformance with land use plans and impacts on resources and programs will be considered in determining whether to issue a ROW grant. BLM staff participated in interagency meetings with the Department and other federal agencies and reviewed and approved proposed routing across BLM managed lands.

1.5.2.3 U.S. Department of the Interior, National Park Service

The National Park Service (NPS) provided technical review of the proposal in the vicinity of NPS-administered lands affected by the proposed Project. TransCanada Keystone Pipeline, LP's (Keystone's) proposed route crosses several National Historic Trails that are managed with the assistance of the NPS. As a result, NPS was a cooperating agency for the proposed Project and a consulting party under Section 106 of the NHPA.

1.5.2.4 U.S. Department of the Interior, U.S. Fish and Wildlife Service

The USFWS is responsible for ensuring compliance with the ESA. Section 7 of the ESA, as amended, states that any project authorized, funded, or conducted by any federal agencies should not:

> …jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined…to be critical… (16 USC § 1536[a][2] [1988])

USFWS also reviews project plans and provides comments regarding protection of fish and wildlife resources under the provisions of the Fish and Wildlife Coordination Act (16 USC § 661 et seq.). USFWS is also responsible for the implementation of the provisions of the Migratory Bird Treaty Act (16 USC § 703) and the Bald and Golden Eagle Protection Act (16 USC § 688). Easements are protected under the National Wildlife Refuge Systems Administration Act (16 USC § 668dd[c]).

1.5.2.5 U.S. Department of Agriculture, Natural Resources Conservation Service

The Natural Resources Conservation Service (NRCS) administers the Wetlands Reserve Program (WRP; 16 USC § 3837 et seq.), under which it purchases conservation easements and provides cost share to landowners for the purposes of restoring and protecting wetlands. Under the WRP, the United States may purchase 30-year or permanent easements. Land eligibility for the WRP is based on NRCS's determination that the land is farmed or converted wetland, that enrollment maximizes wildlife benefits and wetland values, and that the likelihood of successful restoration merits inclusion into the program. Lands under WRP easement are subject to development and other use restrictions to ensure protection of wetland and wildlife conservation values. NRCS also administers a number of other easement programs, including the Emergency Watershed Protection Program (Floodplain Easements), the Healthy Forest Reserve Program, the Farm and Ranch Land Protection Program, and the Grassland Reserve Program. (The Farm Service Agency administers Grassland Reserve Program rental agreements, as described below.) In addition, NRCS administers a number of financial assistance programs, including the Environmental Quality Incentives Program and the Conservation Stewardship Program, among others. Under these programs, NRCS provides cost-share assistance and other payments to farmers and ranchers who implement conservation practices that improve the condition and sustainability of the natural resources affected by their agricultural operation. NRCS is also responsible for implementation of the Farmland Protection Policy Act, including protection of prime, unique, and important agricultural lands. As proposed, the Project would cross lands covered by a number of NRCS conservation financial assistance program agreements.

1.5.2.6 U.S. Department of Agriculture, Farm Service Agency

The Farm Service Agency administers several land conservation programs, including the Conservation Reserve Program, the Conservation Reserve Enhancement Program, the Farmable Wetlands Program, and rental agreements under the Grasslands Reserve Program. These programs provide annual rental payments and cost-share assistance to establish long-term resource conservation measures on eligible farmland. The terms of rental agreements are from 10 to 30 years, during which most uses of the affected lands are prohibited. The Grasslands Reserve Program is managed jointly with NRCS and includes provisions for rental agreements as well as for easements administered by NRCS. The proposed Project would cross lands included in Farm Service Agency land conservation programs.

1.5.2.7 U.S. Department of Agriculture, Rural Utilities Service

The Rural Utilities Service (RUS) is an agency that administers the U.S. Department of Agriculture's Rural Development Utilities Programs. These programs include the provision of loans and loan guarantees to electric utilities and other entities to serve customers in rural areas, through the construction or expansion of generation, transmission, and distribution facilities. Applications for financing have been submitted to RUS by several rural electric cooperatives to provide electricity to the proposed Project's pump stations. RUS is responsible for NEPA compliance for facilities proposed by the cooperatives to provide these services.

1.5.2.8 U.S. Army Corps of Engineers

The USACE has jurisdictional authority pursuant to Section 404 of the CWA (33 USC 1344), which governs the discharge of dredged or fill material into waters of the United States, and Section 10 of the Rivers and Harbors Act (33 USC 403), which regulates any work or structures that potentially affect the navigable capacity of a waterbody. Because the USACE must comply with the requirements of NEPA before issuing permits under these statutes, it has elected to participate as a cooperating agency in the preparation of this Supplemental EIS. The USACE would adopt this Supplemental EIS pursuant to 40 CFR 1506.3 if, after an independent review of the document, it concludes that its comments and suggestions have been satisfied.

As an element of its review, the USACE must consider whether a proposed project avoids, minimizes, and compensates for impacts on existing aquatic resources, including wetlands, to achieve a goal of no net loss of values and functions. Although this Supplemental EIS addresses environmental impacts associated with the proposed Project as it relates to Section 404 of the CWA and Section 10 of the Rivers and Harbors Act, it does not serve as a public notice for any USACE permits. Such notice will be issued separately. The USACE's Record of Decision resulting from consideration of this Supplemental EIS and materials submitted by Keystone will formally document the agency's decision on the proposed Project, including the Section 404 (b)(1) analysis and the required environmental mitigation commitments. It is likely that most or all of the crossings in waters of the U.S. would be processed in accordance with the USACE general permit procedures, specifically Nationwide Permit (NWP) Number 12 for Utility Line Crossings. If all work in waters of the U.S. would meet the terms and conditions of this NWP, including applicable regional conditions, then the USACE would not prepare a separate Record of Decision because a NEPA sufficient document would have already been completed for the NWPs. Verification of activities under NWPs would not require the USACE to advertise the activities on separate public notices. If any work in waters of the U.S. does not meet the terms

and conditions of the NWP, then those activities would be evaluated in accordance with individual permit procedures, including publication of a public notice and completion of project-specific NEPA documentation and project-specific determination of compliance with the Section 404(b)(1) Guidelines.

1.5.2.9 U.S. Department of Energy

At the request of the Department of State, the Department of Energy (DOE) provided expert assistance in the analysis of the previously proposed Project. In the preparation of the EIS finalized in 2011, DOE consulted with the Department on factors such as domestic and international oil markets and GHG emissions. As part of this assistance, DOE commissioned EnSys Energy and Systems, Inc. (EnSys), to conduct two studies specific to the previously proposed Project (EnSys 2010 and 2011).

DOE's role in the Department's Presidential Permit process is advisory. DOE's advisory role does not involve a DOE proposal, determination, or decision that is itself subject to the provisions of NEPA.

DOE's Western Area Power Administration (Western) sells and delivers federal electric power to municipalities, public utilities, federal and state agencies, and Native American tribes in 15 western and central states. Most of the proposed Project is located within DOE Western's Upper Great Plans Region, which includes substations and transmission lines in Minnesota, South Dakota, North Dakota, Montana, Nebraska, and Iowa. Western is responsible for responding to requests to interconnect to Western's transmission system and ensuring the transmission system's reliability and stability.

Western has received requests to provide new electricity load at new delivery points associated with the proposed Project in Montana and South Dakota. To determine the potential effects of the proposed Project's additional facilities and services on transmission system reliability and stability, Western conducted joint system engineering studies and determined that accommodating these requests would require:

- Construction and operation of new transmission lines. At the proposed Project's maximum throughput (830,000 barrels per day), power demands for pump stations in South Dakota would require a 70-mile long 230-kilovolt (kV) single-circuit electric transmission line (from Big Bend to Witten) and approximately 1 mile of 230-kV double-circuit transmission line (from Big Bend to Lower Brule);
- Construction and operation of two new electric substations; and
- Expansion of six existing substations.

(See Sections 2.1.12.2, Big Bend to Witten 230-KV Transmission Line, and 2.1.12.3, Electrical Distribution Lines and Substations, for detailed description of these actions.) These actions are considered connected actions, as defined by 40 CFR 1508.23(a)(1), since they would be needed as a direct result of implementation of the proposed Project.

Western's Big Bend to Lower Brule project is part of the larger Big Bend to Witten 230 kV Transmission Line project. The Big Bend to Witten project serves to stabilize and increase the reliability of the entire Integrated System and, therefore, has independent utility. It is being

evaluated under NEPA in the Big Bend to Witten Transmission Line Environmental Assessment (DOE/EA-1880) being prepared by RUS with Western as a Cooperating Agency.

DOE also consulted with the Department to ensure that cultural resources potentially affected by any Western transmission lines are taken into account.

1.5.2.10 U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety

Pipeline Hazardous Material Safety Administration (PHMSA) is responsible for protecting the American public and the environment by ensuring the safe and secure movement of hazardous materials to industry and consumers by all transportation modes, including the nation's pipelines. Through PHMSA, the U.S. Department of Transportation develops and enforces regulations for the safe, reliable, and environmentally sound operation of the nation's 2.3-million-mile pipeline transportation system and the nearly 1 million daily shipments of hazardous materials by land, sea, and air. Within PHMSA, the Office of Pipeline Safety has the safety responsibility for the nation's natural gas and hazardous liquid pipelines. For those pipelines, PHMSA identifies and evaluates risks; develops and enforces standards for design, construction, operations and maintenance of pipelines; responds to accidents/incidents; educates operators and the public; conducts research on promising technologies; provides grants to states in support of their pipeline safety programs; and reviews oil spill response plans, with a special focus on protecting unusually sensitive areas. The regulations for Transportation of Hazardous Liquids by Pipeline are presented in 49 CFR Part 195; the regulations for Response Plans for Onshore Oil Pipelines are presented in 49 CFR Part 194. PHMSA, as a cooperating agency, provided technical expertise to the Department in the assessment of the proposed Project and in identifying appropriate mitigation measures.

1.5.3 Assisting Agencies and Other State Agencies

The U.S. Department of Interior, Bureau of Reclamation (BOR), is a water management agency that manages many programs initiatives and activities designed to help the western states, Native American tribes, and others to meet new water needs and balance the multitude of competing uses of water. The mission of BOR is to assist in meeting the increasing water demands of the western states while protecting the environment and public investments in these structures. The agency emphasizes fulfilling its water delivery obligations, water conservation, water recycling, and re-use; developing partnerships with its customers, states, and Native American tribes; and in finding ways to bring together the variety of interests to address the competing needs for limited water resources.

The federal lands that would be included within the MLA application for the proposed Project include canals, water lines, and ditches managed by BOR along the proposed pipeline route. BOR must determine whether or not to issue "use authorization" for the proposed Project in accordance with requirements of 43 CFR 429.3 and whether or not the ROW grant issued under MLA by BLM is in compliance with BOR standards. Those standards for each facility are presented in Appendix D, Waterbody Crossing Tables and Required Crossing Criteria for Reclamation Facilities. BOR consulted with the Department and BLM regarding the ROW grant and the use authorization.

The Montana Department of Environmental Quality (MDEQ) is the lead agency for compliance with the State of Montana Environmental Policy Act. On December 22, 2008, Keystone submitted an application to MDEQ and the Certificate of Compliance from MDEQ under the Montana Major Facility Siting Act was signed on March 30, 2012, thus certifying the design, location, construction, operation, maintenance, and decommissioning of the Montana portion of the proposed Project.

The South Dakota Public Utilities Commission (SDPUC) is the lead agency for compliance with the South Dakota Energy Conversion and Transmission Facilities Act. On March 12, 2009, Keystone submitted an application to SDPUC. The Permit to Construct from SDPUC under the South Dakota Energy Conversion and Transmission Facilities Act was granted, with conditions, on February 18, 2010. An amended order was issued on June 29, 2010, thus certifying the design, location, construction, operation, maintenance, and decommissioning of the South Dakota portion of the proposed Project.

The Nebraska Department of Environmental Quality (NDEQ) is the lead agency for review and evaluation of compliance with the Nebraska Major Oil Pipeline Siting Act. The Nebraska Governor, however, was responsible for granting approval of the proposed Project route based on the NDEQ's review and evaluation. On April 18, 2012, Keystone submitted proposed alternative routes to NDEQ. The Nebraska Governor approved the proposed Project route under the Nebraska Major Oil Pipeline Siting Act on January 22, 2013, thus certifying the design, location, construction, operation, maintenance, and decommissioning of the Nebraska portion of the proposed Project.

Further, many county governments in Nebraska assisted the Department in addressing their concerns regarding local planning processes and laws. The Lower Big Blue Natural Resources and Upper Elkhorn Natural Resources districts in Nebraska served as assisting agencies on the previously proposed Project.

In addition to these assisting agencies, many other state and local resource agencies from each of the states crossed by the proposed Project have responsibilities for state and local permit issuance. The permits required by the various state and local jurisdictions crossed by the proposed Project are listed in Section 1.9, Permits, Approvals, and Regulatory Requirements.

1.5.4 References

EnSys Energy and Systems, Inc. 2010. Keystone XL Assessment. 1775 Massachusetts Avenue, Lexington MA.

_____. 2011. Keystone XL Assessment – No Expansion Review. Prepared for DOE and DOS. Final Report, August 12.

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1.6 TRIBAL AND SHPO CONSULTATION

1.6.1 Tribal Consultation

In its Notice of Intent to prepare a Supplemental Environmental Impact Statement (Supplemental EIS) (see Section 1.8, Preparation of Publication), the U.S. Department of State (the Department) also presented its intent to conduct a parallel Section 106 consultation consistent with the National Historic Preservation Act of 1986 (NHPA). Consultation was done in parallel with the previous EIS process (as described in the 2011 Final EIS). The Department and the Bureau of Land Management initially contacted potentially affected Native American tribes to determine whether the tribes were interested in reviewing the previously proposed Project and whether they were interested in participating in consultation consistent with Section 106. Tribes potentially affected by the undertaking were invited to become consulting parties consistent with Section 106 of the NHPA. Consultation was initiated on January 30, 2009 and included the development of a Programmatic Agreement between the consulting parties that would guide the continuing compliance with Section 106 if Keystone receives all necessary permits and implements the proposed Project. Consultation included many Section 106 consultation meetings, a meeting at the Department offices in Washington, D.C. in December 2010. A Programmatic Agreement was included in the Final EIS as Appendix S.

Additional government-to-government consultation is underway for the current Supplemental EIS process for the proposed Project. As the lead federal agency for the proposed Project, the Department is continuing throughout the Supplemental EIS process to engage in consultation on the Supplemental EIS, the proposed Project generally, and on cultural resources consistent with Section 106 of the NHPA with identified consulting parties, including federal agencies, state agencies, State Historic Preservation Offices (SHPOs), the Advisory Council on Historic Preservation, and interested federally recognized Native American tribes (70 Federal Register 71194) in the vicinity of the proposed Project. Tribal meetings were held in October 2012 in Montana, South Dakota, and Nebraska. A complete list and discussion of the consultation efforts, to date, are included in Appendix E, Record of Consultation.

1.6.2 SHPO Consultation

Consultation with the SHPOs was initiated on February 2, 2009, for the 2011 Final EIS process and has continued for the proposed Project. Consultation to date has included consultation meetings in Lincoln, Nebraska; Helena, Montana; and Pierre, South Dakota. The SHPOs, other agencies, and Native American tribes have been active participants in providing feedback to the Department. Additional meetings were held with Montana SHPOs to address the development of mitigation measures for adverse effects to historic properties in Montana that would occur if the proposed Project is implemented.

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1.7 ENVIRONMENTAL REVIEW OF THE CANADIAN PORTION OF THE KEYSTONE XL PROJECT

As a matter of policy, in addition to its environmental analysis of the proposed Project in the United States, the U.S. Department of State (Department) monitored and obtained information from the ongoing environmental analysis of the Canadian portion of the Project. In so doing, the Department was guided by Executive Order 12114 (Environmental Effects Abroad of Major Federal Actions), which stipulates the procedures and other actions to be taken by federal agencies with respect to environmental impacts outside of the United States. The Canadian government conducted an environmental review of the portion of the proposed Project in Canada. As a result, and consistent with Executive Order 12114, the Department did not conduct an assessment of the potential impacts of the Canadian portion of the proposed Project. However, as a matter of policy, the Department has included information in this Supplemental EIS on the Canadian government's assessment of potential direct and indirect impacts of the proposed Project in Canada (see Section 4.15.4, Extraterritorial Concerns).

The Canadian environmental analysis process began on July 18, 2008, when TransCanada Keystone Pipeline, LP (Keystone) submitted a Preliminary Information Package regarding the initially proposed Keystone XL Pipeline to Canada's National Energy Board (NEB). Upon receipt of the Preliminary Information Package, the NEB issued a Federal Coordination Notice that formally initiated an environmental assessment process pursuant to the Canadian Environmental Assessment Act. In early 2009, Keystone submitted an application to NEB for a Certificate of Public Convenience and Necessity for the Canadian portion of the proposed Project pursuant to Section 52 of the NEB Act. The NEB solicited comments from provincial governments and agencies and other potential intervening parties in the process and held hearings on Keystone's application from September 15 through October 2, 2009.

On March 11, 2010, the NEB issued its Reasons for Decision granting Keystone's application. The NEB's Reasons for Decision included an Environmental Screening Report (ESR) that was prepared to meet the requirements of Canadian Environmental Assessment Act for the Canadian portion of the proposed Keystone XL Project. The ESR concluded that implementation of the proposed Keystone XL Project in Canada would not likely result in significant adverse environmental effects with incorporation of Keystone's proposed measures to avoid or minimize impacts and with Keystone's acceptance of the NEB's regulatory requirements and recommended conditions attached to the ESR. According to the Presidential Permit application from Keystone, construction began on the Hardisty B Terminal on September 13, 2010. In the first quarter of 2012, the horizontal directional drilling (trenchless method for underground installment) crossings for the Red Deer and South Saskatchewan Rivers were completed.

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1.8 PREPARATION OF PUBLICATION

The principal objectives of the Supplemental Environmental Impact Statement (Supplemental EIS) EIS are as follows:

- Identify and assess potential impacts on the natural and human environment that would result from implementation of the proposed Project in the United States;
- Describe and evaluate reasonable alternatives, including a no action alternative, to the proposed Project that would avoid or minimize adverse effects to the environment;
- Identify and recommend specific mitigation measures, as necessary, to avoid or minimize environmental impacts; and
- Facilitate public, tribal, and agency involvement in identifying significant environmental impacts.

This section provides an overview of the preparation, publication, and public review process of the previous Keystone XL EIS documents (Section 1.9.1, below) as well as the preparation, scoping, and review process of the Supplemental EIS for the proposed Project (Section 1.9.2, Scoping for the Supplemental EIS).

1.8.1 Previous Keystone XL EIS Documents

1.8.1.1 Preparation of Draft EIS for the 2011 Final EIS Process

As discussed, the initial Keystone XL Pipeline Project was proposed by TransCanada Keystone Pipeline, LP (Keystone) in September 2008. Following receipt of the Presidential Permit application, the U.S. Department of State (Department) led a 3-year review of all aspects of the project, beginning with the issuance of an Notice of Intent (NOI) to prepare an EIS to address reasonably foreseeable impacts from the proposed action and alternatives, and to conduct a parallel consultation process consistent with Section 106 of the National Historic Preservation Act of 1986. The NOI informed the public about the proposed action, announced plans for scoping meetings, invited public participation, and solicited public comments for consideration in establishing the scope and content of the EIS. The Department held 20 separate scoping meetings in the vicinity of the proposed route to give the public the opportunity to provide comments regarding the scope of the EIS.

A draft EIS, developed consistent with the scoping process required under the National Environmental Policy Act (NEPA), the Council on Environmental Quality NEPA regulations under 40 Code of Federal Regulations (CFR) 1500, and the Department regulations for implementing NEPA under 22 CFR 161, was issued for public review in April 2010. The notice of availability (NOA) for the draft EIS included notice of public comment meetings, provided information regarding the draft EIS, and requested the submission of all comments by May 31, 2010. In response to requests from several organizations, on April 30, 2010, the Department extended the public comment period on the draft EIS until June 16, 2010 (75 Federal Register (FR) 22890). During that period, the Department received additional requests to extend the review period and, in response, the Department again extended the public comment period, this time until July 2, 2010 (75 FR 33883). The public comment meetings were held in May 2010 to

solicit both verbal and written comments on the draft EIS. The meetings were held in the vicinity of the proposed route and corresponded with the locations of the scoping meetings. In addition to the public review process, the Department conducted agency consultations to identify issues to be addressed in the EIS. From June 2010 through April 2011 the Department participated in interagency teleconferences and meetings and corresponded with concerned agencies.

1.8.1.2 Preparation of Supplemental Draft EIS for the 2011 Final EIS Process

A supplemental draft EIS was issued for public review and the NOA was published in the Federal Register in April 2011 (75 FR 20653). In addition to the public review process, the Department continued to conduct agency consultations after the supplemental draft EIS was published to identify issues to be addressed in the Final EIS. From April 2011 through July 2011, the Department participated in interagency teleconferences and meetings and corresponded with concerned agencies.

1.8.1.3 Preparation of the 2011 Final EIS

Portions of the EIS were revised in response to comments received on the draft and supplemental draft EISs and as a result of updated information that became available after the issuance of the supplemental draft EIS. The Final EIS was issued on August 26, 2011, and U.S. Environmental Protection Agency published the NOA in the Federal Register on September 2, 2011.

After publication of the Final EIS, the Department held many meetings to give individuals an opportunity to voice their views on whether granting or denying a Presidential Permit for the pipeline would be in the national interest and to comment on economic, energy security, environmental and safety issues relevant to that determination. The Department determined that, in order to make the required National Interest Determination (NID) with respect to the previous Keystone XL Pipeline Project, it was necessary to conduct an in-depth assessment of potential alternative routes that would avoid the environmentally sensitive Sand Hills Region in Nebraska as identified by the Nebraska Department of Environmental Quality (NDEQ). Further, in late December 2011, Congress adopted a provision of the Temporary Payroll Tax Cut Continuation Act that that sought to require the President to make a decision on the Presidential Permit within 60 days. On January 18, 2012, the President determined, based upon the Department's recommendation, that the previous proposed Project as presented and analyzed at that time would not serve the National Interest. On February 3, 2012, a notice was published in the Federal Register informing the public that the Department had denied the application.

1.8.2 Scoping for the Supplemental EIS

In response to Keystone's application for the modified Keystone XL Pipeline, the Department issued a NOI on June 15, 2012 to prepare a Supplemental EIS to address reasonably foreseeable impacts from the proposed action and alternatives. The NOI informed the public about the proposed action, announced plans for public scoping opportunities, invited public participation in the scoping process, and solicited public comments for consideration in establishing the scope and content of the Supplemental EIS. The scoping period extended from June 15 to July 30, 2012. A summary of public comments related to the scope of the Supplemental EIS is presented in Table 1.8-1, along with the Supplemental EIS section that addresses the concern. Additional comments may be added to this table as necessary pending review of additional scoping items. The Scoping Summary Report may be found in Appendix F.

Table 1.8-1 Summary Comments Received on Environmental Issues during the Public Scoping Process for the Proposed Project

Issue	Comment	Section Where Comment/Issue Addressed in Supplemental EIS
Purpose and Need	1. Re-evaluate the purpose and need for the proposed Project to determine whether execution of this Project is in the United States' national interest, specifically in light of concerns about climate change, and U.S. goals of reducing fossil fuel consumption and dependence on foreign petroleum sources, as well as other broad economic and environmental policies. 2. The Final EIS was flawed and should not be used as a baseline for a supplemental review; as a result, the Supplemental EIS must include a revised purpose and need, including revised supporting documentation. In particular, this includes revised crude oil demand projections (to account for refinements to the projections used to establish the purpose and need in the Final EIS). 3. The purpose and need for the proposed Project, particularly the National Interest Determination (NID), should be reconsidered in light of the Project's role in facilitating oil exports, rather than satisfying domestic demand. 4. The Steele City and Gulf Coast segments of the Keystone XL Project are interdependent parts of one larger project, and should be evaluated as such. If the Department chooses to evaluate the currently proposed Project as an independent segment, it must incorporate a different purpose and need for the Project. 5. There is considerable existing unused pipeline capacity, as well as other planned pipeline capacity to transport crude oil from Canada or the Bakken to the Gulf Coast. The purpose and need in the Supplemental EIS should only define the Project as transporting crude oil between Alberta and Steele City, Nebraska. 6. The need for the proposed Project should be reexamined in light of decreasing domestic demand for petroleum products (imported and domestically produced). 7. The purpose and need for the proposed Project should be reevaluated in light of the benefits of focusing on renewable energy sources rather than fossil fuels, and the degree to which future development of renewable sources would offset demand for crude oil. 8. As currently conceived, the proposed Project's benefits are outweighed by the potential environmental risks. The purpose and need for the proposed Project should be re-evaluated in this light. 9. To help achieve U.S. goals of energy security and reduced carbon emissions, the proposed Project should only be approved if it includes mitigation measures, such as carbon offsets, provided by the applicant. 10. The proposed Project should be approved because it would provide employment, other economic benefits, and reduced dependence on oil from hostile countries.	1.3

Issue	Comment	Section Where Comment/Issue Addressed in Supplemental EIS
Overview of the Proposed Project	1. The Supplemental EIS should not evaluate the Gulf Coast segment as part of the proposed Project (i.e., the Steele City segment) because Keystone is independently pursuing the Gulf Coast segment. 2. The Supplemental EIS should evaluate the Gulf Coast segment as a connected action. 3. The Supplemental EIS should identify required inspection and monitoring measures and the frequency that these measures will be implemented. 4. Specific project requirements (especially drilling techniques) should be implemented for the protection of Wild and Scenic Rivers and their related tributaries/upstream segments, flood plains, and other sensitive resources. 5. Provide as rigorous an analysis for the natural resources of the newly proposed routes as done for the previously proposed route. Specifically, the Supplemental EIS must analyze impacts related to ground and surface water resources, seismic risks, soils, vegetation, taxes, employment, cultural resources, and natural resources including, but not limited to, endangered species, parks, recreational waterways, fisheries, wildlife, and conservation lands. 6. As part of the proposed Project, Keystone should commit to greater use of the recommended seed mixes at the time of reclamation; to use seed mixes containing native vegetation, especially for areas of native short- and tall-grass prairie communities; and to inspect all disturbed areas after the first growing season to determine revegetation success and to perform noxious weed control. 7. Keystone should be required to have substantial funds in escrow to be used for pipeline spill response, recovery, and compensation of affected parties. 8. Keystone should be required to demonstrate the presence of spill response materials and properly trained personnel within reasonable proximity of all segments of the pipeline and all ancillary facilities. 9. The adequacy of available or planned crude oil storage in Cushing, Oklahoma and the Gulf Coast[1] area should be addressed, given existing reported deficiencies. 10. The Supplemental EIS should discuss the economic impacts of refinery changeover necessary to process extracted bitumen. 11. The timeframe evaluated in the Supplemental EIS must match that of the extraction and production of the oil sands the proposed Project would transport.	2.1

[1] The Gulf Coast area refers to the region from Houston, Texas, to Lake Charles, Louisiana. Gulf Coast area refineries include 12 refineries on the Gulf Coast in Texas and three refineries in Lake Charles, Louisiana.

Issue	Comment	Section Where Comment/Issue Addressed in Supplemental EIS
Geology and Soils	1. The Supplemental EIS must fully consider how the following soil-related conditions impact or are impacted by pipeline construction and operation: drought, increased soil temperatures over the pipeline, increased risk of soil subsidence and instability, and difficulty of revegetating the pipeline right-of-way in drought conditions. 2. The pipeline route should avoid sandy soils altogether, in favor of clay-based soils. There is no safe route through the Ogallala Aquifer.	3.1, 3.2, 4.1, 4.2
Water Resources	1. The Supplemental EIS should disclose practices that will ensure pipeline integrity, including methods and monitoring that will protect water resources. 2. The Nebraska Department of Environmental Quality (NDEQ)-identified Sand Hills Region only encompasses a portion of the sandy soils and aquifer recharge areas that are of concern along the proposed route. 3. The Supplemental EIS should include alternatives that avoid the Ogallala Aquifer and the NDEQ-identified Sand Hills Region, and that avoid impacts to the Mni Wiconi water supply system. The alternatives analysis must also address the way that the extended drought and record heat in the U.S. affect the proposed Project's potential impacts on water resources. 4. Previous analyses improperly relied on the U.S. Army Corps of Engineers Section 404 Clean Water Act permitting process to address impacts to waters, and did not evaluate water resources in appropriate detail; the Supplemental EIS should include its own analysis of water impacts. 5. The Supplemental EIS should clearly evaluate (through text and maps) the linkages between the proposed pipeline, distance to groundwater, and proximity to drinking water in the Ogallala Aquifer and NDEQ-identified Sand Hills Region. 6. The Supplemental EIS should include provisions for protecting groundwater, stream, and wetland resources at crossing points and along the entire route of the proposed pipeline.	3.3, 4.3
Wetlands	1. The Supplemental EIS should identify wetlands, vegetation, wildlife, and fish (including threatened and endangered species) that may be affected by the newly proposed alternative routes, and should evaluate potential impacts on wetland functions. 2. The Supplemental EIS should provide an analysis of impacts associated with ancillary facilities and connected actions, including staging areas, access roads, construction camps and storage locations. The following specific topics should be discussed: • Compensatory mitigation for losses of aquatic resources and wetland functions and services; • A thorough conceptual wetland monitoring plan; • Information on the proposed areas of construction zones and rights-of-way for wetland crossings; • More detailed information about which wetland areas would be revegetated, and which wetland areas are considered of "special concern and value:"	3.4, 4.4

Issue	Comment	Section Where Comment/Issue Addressed in Supplemental EIS
	• Equal mitigation commitments for connected actions, including transmission lines; and • Analysis of prairie pothole wetlands and bottomland hardwood forested wetlands.	
Terrestrial Vegetation; Fisheries; Wildlife; and Threatened and Endangered Species and Species of Conservation Concern	1. The Supplemental EIS should provide information that addresses the direct and indirect impacts of pipeline construction and operation on endangered and threatened species, specifically related to the whooping crane, American burying beetle, pallid sturgeon, piping plover, interior least tern, western prairie-fringed orchid, and woodland caribou. 2. The Supplemental EIS should provide the Biological Assessment and Biological Opinion in an appropriate timeframe to allow public comment. 3. The Supplemental EIS is required by the Endangered Species Act (ESA) to evaluate the impacts of the proposed Project in Canada; these activities may also "be cause for certification" under the Pelly Amendment, and may diminish the effectiveness of the Western Hemisphere Convention and the Migratory Bird Convention. 4. The Bureau of Land Management (BLM) has responsibility for designating and protecting sensitive species on BLM-managed lands that require special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA. As such, BLM must analyze the impacts to resources, including sensitive species and habitat, affected by the proposed Project. 5. The Supplemental EIS should assess extraterritorial or trans-boundary impacts such as greenhouse gas emissions and migratory bird habitat destruction from increased tar sands extraction. 6. The Supplemental EIS should address the impact of temporarily disrupted habitat connectivity during construction activities and provide mitigation measures including native plant restoration and invasive species treatment. 7. The Supplemental EIS should provide an analysis of the proposed Project's impacts to water resources and sensitive wildlife species. 8. The Department should work closely with United States Fish and Wildlife Service (USFWS) and the South Dakota Game, Fish and Parks, respectively, in developing conservation plans to help avoid or minimize potential Project impacts to birds, and incorporate these conservation measures into the Supplemental EIS. The Supplemental EIS should include a Migratory Bird Conservation Plan and a sage-grouse conservation plan to help avoid and minimize expected impacts to birds and their habitats in the states where the proposed Project will be constructed, operated, and maintained. 9. The Department should consult with the USFWS regarding mussel surveys, relocation protocols or mussel propagation and reintroduction. 10. The Supplemental EIS should include provisions that ensure compliance with the Migratory Bird Treaty Act (MBTA) or prevention of the take of migratory birds (including those resulting from oil sump pits and other contamination related to oil	3.5, 3.6, 3.7, 3.8, 4.5, 4.6, 4.7, 4.8

Issue	Comment	Section Where Comment/Issue Addressed in Supplemental EIS
	production); address the potential impacts of power lines, noise from blasting and operation of pump stations, and loss of habitat resulting from blasting and ripping of rock outcrops used for nesting and foraging. Also, the Supplemental EIS should provide information to assure compliance with the Western Hemisphere Convention and the Migratory Bird Convention. 11. The Supplemental EIS should provide an analysis of the Pelly Amendment of the Fisherman's Protective Act of 1967 as it pertains to the proposed Project, specifically that tar sands development diminishes the effectiveness of the treaties protecting wildlife and fails to prevent takings of woodland caribou and migratory birds, including whooping cranes. 12. The Supplemental EIS should address habitat connectivity issues and associated mitigation.	
Land Use, Recreation, and Visual Resources	1. The BLM must ensure compliance with land use plans and all federal, state, and local laws and ordinances before granting a right-of-way, and should extract reimbursements for such rights-of-way, where appropriate. 2. The Supplemental EIS should evaluate impacts from the proposed Project on parks and conservation lands, including National Park Service (NPS) units and affiliated areas.	3.9, 4.9
Socioeconomics	1. The Supplemental EIS should include a revised environmental justice analysis. 2. The Supplemental EIS should evaluate the impacts of the proposed product on oil production and oil prices within the U.S. 3. The No Action alternative in the Final EIS did not adequately incorporate U.S. and Canadian export data sources. 4. The Supplemental EIS should disclose how changes to the proposed Project impact property values and tax benefits. 5. The Supplemental EIS should disclose how farmers will be impacted by the proposed Project changes. 6. The Supplemental EIS should disclose how changes to the proposed Project impact job creation predictions. 7. The Supplemental EIS should include a more complete population growth analysis. 8. The Supplemental EIS should discuss the proposed Project's impacts on transportation infrastructure.	3.10, 4.10
Cultural Resources	1. Further consultation, including a tribal consultation plan, is needed and should be disclosed in the Supplemental EIS to address the presence of cultural sites and tribal members' use of resources. 2. The Supplemental EIS should discuss the federal government's trust responsibility and address potential impacts to and proposed mitigation for resources that are culturally important to tribes. 3. The Supplemental EIS should detail a clear process regarding the inadvertent discovery of cultural resources. 4. The process for legally crossing existing water pipeline easements that the Oglala Sioux Tribe owns and operates should be followed and disclosed in the Supplemental EIS. 5. The process for legally transporting oil through tribal lands should be followed and disclosed in the Supplemental EIS. 6. The affected tribes should be granted cooperating agency status.	3.11, 4.11

Issue	Comment	Section Where Comment/Issue Addressed in Supplemental EIS
	7. The Oglala Tribe has not given its permission to Keystone to have the proposed Project cross over the Tribe's Mni Wiconi Project water pipeline easements; the proposed Project would trespass on tribal and fee lands. 8. A new Programmatic Agreement should be developed for the Supplemental EIS.	
Air Quality and Noise	*Note: Additional comments about climate change and greenhouse gas (GHG) emissions from downstream use of bitumen or upstream bitumen extraction are included in the Climate Change section below.* 1. The Supplemental EIS should analyze GHG emissions resulting from additional tar sands production in Canada, due to the causal link between construction and operation of the pipeline and additional tar sands production. 2. The Supplemental EIS should provide an analysis of the increased GHG emissions associated with construction and operation of the proposed Project. 3. The Supplemental EIS should include petroleum coke (petcoke) production and consumption in the life cycle impacts of tar sands crude oil production, as well as increased petcoke production in U.S. refineries. 4. The Supplemental EIS should review the trans-boundary impacts of increased tar sands crude oil exports on the proposed Project, including increased climate emissions, regardless of whether production of tar sands crude oil would increase by other means. 5. The Supplemental EIS should provide an analysis of local impacts of increased refinery emissions in the Gulf Coast region, associated with the proposed Project operation. 6. The Supplemental EIS should provide an analysis of how GHG emissions associated with pipeline operation and tar sands oil extraction and processing can be mitigated (including by energy efficiency, energy conservation, and green power utilization for pipeline operations). 7. Concerns about Project-related noise are not adequately addressed in the Final EIS.	3.12, 4.12
Potential Releases	1. The Supplemental EIS should analyze the risks to groundwater and drinking water, specifically the Ogallala Aquifer and Mni Wiconi Project, due to a spill along the pipeline. 2. The Supplemental EIS should analyze the risks to surface water, wildlife, and vegetation (as well as threatened and endangered species) due to a spill. 3. The proposed Project should be evaluated in light of the increased risk of damage due to heavy flooding events and related waterbody scouring at waterbody crossing locations. 4. The Supplemental EIS should analyze increased risk to the pipeline and to spill response due to climate change. 5. The Supplemental EIS should provide an assessment of the safety risks associated with diluted bitumen pipelines, including the adequacy of proposed construction materials and the effects of higher internal temperature and corrosion rates. 6. The Department committed to commission an independent consultant to review the risk assessment for the Keystone XL Project, which would include, but not be limited to, an assessment	3.13, 4.13

Issue	Comment	Section Where Comment/Issue Addressed in Supplemental EIS
	of valve placement and the possibility of deploying external leak detection systems in areas of particularly sensitive environmental resources. 7. Pipeline companies do not have a good record of rapidly and effectively responding to spills, nor does the proposed Project include adequate provisions to detect, prevent, and clean up spills of diluted bitumen. 8. The Integrity Management Plan and the Emergency Response Plan for the proposed Project should be reviewed to ensure that they fully comply with federal law. 9. The Supplemental EIS should investigate mitigation and spill response measures such as bioremediation. 10. Spills could result in potential economic costs such as reduced property value, reduced agricultural production, and job losses in the agriculture, tourism, and other related sectors. 11. Who is liable for damage caused by pipeline spills? 12. The assumption that Pipeline and Hazardous Materials Safety Administration (PHMSA) oversight of the proposed Project and Project-specific PHMSA conditions are adequate and sufficient to protect water resources from spills is flawed.	
Cumulative Effects Assessment	1. The Supplemental EIS should evaluate the impacts of the proposed Keystone XL Project and the Gulf Coast segment of the proposed Project together. 2. The Supplemental EIS should study the economic impact of increased crude oil and wholesale fuel prices. 3. The Supplemental EIS should consider the cumulative effects of other existing or planned pipelines and their ancillary facilities. 4. The Supplemental EIS should include an analysis of the trans-boundary impacts associated with tar sands development in Canada, including regulatory considerations in Canada. 5. The Final EIS conclusion that production levels of tar sands would not be affected by whether or not the Keystone XL Project is built remains flawed. 6. Speculating on the potential for future projects that would displace similar impacts from the proposed Project is contrary to NEPA and impermissibly narrows the scope of the Supplemental EIS analysis by excluding consideration of trans-boundary, indirect, and cumulative impacts. 7. The Supplemental EIS review should consider the global/geographic context, including climate change. 8. The Supplemental EIS should examine impacts (including wildlife, threatened and endangered species, and environmental justice) both in the United States and Canada, pursuant to international treaties. 9. The Supplemental EIS should evaluate the impacts of process water demand for oil sands mining (four to six barrels of water to produce one barrel of oil sands) and contamination of that water.	4.15

Issue	Comment	Section Where Comment/Issue Addressed in Supplemental EIS
Alternatives	1. The Supplemental EIS should fully analyze reasonable alternatives to the proposed Project, including alternative routes and the no-action alternative, including identifying existing pipelines with available capacity and the markets they already serve. 2. The Supplemental EIS should analyze alternative routes that avoid risks to homes, farming operations, and wells and springs used by rural residents, livestock, and wildlife. 3. The Supplemental EIS should identify and analyze routes that avoid the NDEQ-identified Sand Hills Region in Nebraska. 4. The Supplemental EIS should evaluate an alternative route to avoid the sovereign Lakota territory encompassed by the boundaries of the Great Sioux Reservation as identified in the 1851 and 1868 Fort Laramie Treaties. 5. The Supplemental EIS should evaluate an alternative route to avoid the easements for the Mni Wiconi Water Project. 6. The alternatives analysis in the Supplemental EIS should examine how the infrastructure choice to build the proposed Project would compare to other infrastructure alternatives that would favor lower carbon impacts. 7. The Supplemental EIS should evaluate existing and proposed transportation options available to move oil sands and Bakken crude oil to market, including pipeline and rail capacity. 8. The Supplemental EIS should evaluate options to refine oil sands crude in Canada, and/or transport raw or refined products to market via Canadian ports and territory, without a pipeline crossing into the United States.	2.2, 5.0
EIS Process	*Includes comments about both the Supplemental EIS and the Final EIS.* 1. The Final EIS was flawed and contained inadequate information. It should not be used as a baseline for the Supplemental EIS due to those flaws and due to changes in the proposed Project. 2. Provide enough information to raise the EPA-issued rating of EO-2 (Environmental Objections-Insufficient Information) for the EIS. 3. The Department should work with appropriate international, federal, and state agencies, and tribes to develop plans and procedures necessary to comply with the ESA/MBTA and to protect wildlife, vegetation, habitat, and other resources. 4. Previous comments submitted on the Draft EIS and Final EIS that were not addressed need to be considered and incorporated into the scope of the Supplemental EIS. 5. Due to the proposed Project's complexity and lack of clear communication with the public so far, the Supplemental EIS must allow adequate time and opportunity for public review and involvement. 6. NEPA requires a "full and fair" analysis and disclosure of all alternatives, mitigation measures, and potential impacts related to the proposed Project, including the significance of all direct, indirect, and cumulative effects, prior to commencement of the proposed Project.	Throughout Document and Supplemental EIS Process

Issue	Comment	Section Where Comment/Issue Addressed in Supplemental EIS
	7. Federal agencies must comply with NEPA, environmental laws, and CFR Title 40, but have failed to do so in the past. Other agencies or contractors contributing to the proposed Project must be qualified and adequately vetted. 8. The Department must properly consult with tribes to address their concerns, engage in official consultation, protect tribal resources, and consider tribal agencies' involvement as cooperating agencies. This should include a new round of consultation for the Supplemental EIS. 9. A new NID must be completed, and supporting information/criteria for the NID should be made transparently available to the public and included in the Supplemental EIS. 10. Keystone has used eminent domain (as a common carrier) to acquire land for the Gulf Coast segment, often over landowner objections. This is inappropriate and should not be allowed for the proposed Project. 11. The information collected and the subsequent evaluation from the Final EIS should be used for the Supplemental EIS; the review process should not be started over. 12. A Health Impact Assessment should be conducted prior to the Final Supplemental EIS.	
Climate Change Impacts on the Proposed Project	1. The Supplemental EIS should evaluate the proposed Project's impact on climate change, specifically the way in which the project enables the processing and consumption of bitumen and impacts to Canada's boreal forests. 2. The Supplemental EIS should include a lifecycle analysis of GHG emissions throughout the proposed Project's entire life, including development, processing, and consumption of bitumen resources, which should be treated as contingent on (and resultant from) the proposed Project. 3. The Supplemental EIS must fully consider the impact of the current drought on pipeline construction and operational impacts, including the increased risk of wildfires caused by construction, increased soil temperatures over the pipeline, increased risk of soil subsidence and instability, and the much greater difficulty of revegetating the pipeline right-of-way in drought conditions. 4. The Supplemental EIS should consider the global climate impacts of the bifurcation of the northern and southern segments of the Keystone XL Project. 5. The Supplemental EIS should consider the impacts of future climate change, particularly increased rainfall and potential flooding, and higher temperatures, on the proposed Project's design (e.g., deeper river crossings, appropriate spill response capabilities, physical and chemical impacts of higher temperatures). 6. The Supplemental EIS should include a discussion of existing conditions in the areas that will be affected by the proposed Project, including how those conditions will change during its 50-year projected lifespan from the intensifying impacts of climate change as required by 40 CFR 1502.15.	4.14

Issue	Comment	Section Where Comment/Issue Addressed in Supplemental EIS
	7. The Supplemental EIS should include a discussion of the impact of the proposed Project on broader foreign policy objectives, including a comprehensive strategy to address climate change. 8. The Supplemental EIS should use and disclose the most relevant science on climate change and the scientific prescription for climate recovery.	

The analysis in this Supplemental EIS is consistent with NEPA and is based on existing federal and state laws, regulations, and policy. The purpose of preparing a project-specific EIS is to provide a public disclosure document that takes a hard look at the specific impacts of a proposed project (including alternatives and cumulative impacts) to inform decision makers on the potential impacts. Consistent with NEPA, this Supplemental EIS is not intended to dictate national or international policy or to speculate on potential changes to laws or policies that may occur at some undetermined time in the future. Therefore, the Supplemental EIS for the proposed Project does not address such issues. The Department recognizes that the proposed Project, if approved, would need to adhere to all applicable laws that exist at the time of construction and operation.

The extraction of oil sands in Canada and construction and operation of the Canadian portion of the Keystone XL Project are under the jurisdiction of the Canadian government. Detailed review by the Department of the activities in Canada that were approved by Canadian authorities is beyond the scope of this document. As a policy decision, however, the Department has included information about some impacts that may occur in Canada in this Supplemental EIS, including a summary of the environmental reviews conducted by the Canadian government on the Canadian portion of the Keystone XL pipeline, a life-cycle analysis of greenhouse gas emissions from transportation fuels produced from oil-sands crude oil, and analysis of potential impacts associated with alternative modes of transportation for oil-sands crude oil.(see Sections 4.15.4, Extraterritorial Concerns, and 5.2, Route Alternatives).

Refining the oil that would be transported by the proposed Project is not part of the proposed Project. Keystone would not own the oil and would not determine its destination or what refined products ultimately would be processed from the oil (such as fuel, plastics, and lubricants). In addition, as described in the Final EIS (Section 3.14) and in Section 1.4, Market Analysis, construction and operation of the proposed Project would be independent of the level of oil refining in PADD 3 and would not directly result in increased or significantly changed refinery emissions in Gulf Coast area refineries. Therefore, neither refining nor end-use is considered part of the review of the proposed Project, although they are discussed in the Cumulative Impacts analysis of this Supplemental EIS (Section 4.15.3.12, Air Quality and Noise).

1.9 PERMITS, APPROVALS, AND REGULATORY REQUIREMENTS

The cooperating agencies and the assisting federal, tribal, state, and local agencies with jurisdiction over various aspects of the proposed Project participated in the Supplemental Environmental Impact Statement (Supplemental EIS) process by providing direct input to the U.S. Department of State (Department) or through the review and comment process (see Sections 1.5.2, Cooperating Agencies; 1.5.3, Assisting Agencies and Other State Agencies; and 1.6, Tribal and SHPO Consultation). The Department has initiated Section 106 consultation consistent with the National Historic Preservation Act of 1986 (NHPA) for the current Supplemental EIS process for the proposed Project. As the lead federal agency for the proposed Project, the Department is continuing throughout the Supplemental EIS process to engage in consultation with identified consulting parties, including federal agencies, state agencies, State Historic Preservation Offices (SHPOs), the Advisory Council on Historic Preservation, and interested federally recognized Native American tribes (70 Federal Register 71194) in the vicinity of the proposed Project. Federal agencies may conduct any additional consultation as appropriate to demonstrate compliance with Section 106 of NHPA for activities that are within their control and responsibility.

If approved, the proposed Project would be constructed in accordance with the regulatory requirements in 49 Code of Federal Regulations (CFR) 195 and also in accordance with the 57 Project-specific Special Conditions developed by PHMSA and agreed to by TransCanada Keystone Pipeline, LP (Keystone). These special conditions are described in Sections 2.1.7, Pipeline System Design and Construction Procedures, and 4.14.5.1, Pipeline Hazardous Material Safety Administration (PHMSA) 57 Special Conditions, and are presented in Appendix B, PHMSA 57 Special Conditions.

Table 1.9-1 lists the major permits, licenses, approvals, authorizations, and consultation requirements for the proposed Project that would be required by federal, state, and local agencies prior to implementation of the proposed Project.

Table 1.9-1 Permits, Licenses, Approvals, and Consultation Requirements for the Proposed Project[a]

Agency	Permit or Consultation/Authority	Agency Action
Federal		
U.S. Department of State	Presidential Permit, Executive Order 13337 of April 30, 2004 (69 Federal Register 25299, et seq.)	The Department is responsible for issuance of Presidential Permits for certain cross-border facilities. In addition, the Department is the lead agency for the review consistent with the National Environmental Policy Act (NEPA), the NHPA Section 106 consultation process, and the Endangered Species Act (ESA) Section 7 consultation process for the proposed Project. As the lead agency, the Department directs the preparation of the Supplemental EIS for the proposed Project consistent with NEPA, directs the Section 106 tribal

Agency	Permit or Consultation/Authority	Agency Action
		consultation process consistent with the NHPA (16 United States Code § 470 et seq.), and initiates both informal and formal consultation with the U.S. Fish and Wildlife Service under Section 7 of the ESA (ESA 16 United States Code § 1536) to determine the likelihood of effects on listed species.
Bureau of Land Management	Right-of-way (ROW) grant(s) and short-term ROWs under the Federal Land Policy and Management Act of 1976 as amended and Temporary Use Permit under Section 28 of the Mineral Leasing Act (MLA)	Considers approval of ROW grant and temporary use permits for the portions of the proposed Project that would encroach on public lands.
	Archeological Resources Protection Act Permit	Considers issuance of cultural resource use permit to survey, excavate, or remove cultural resources on federal lands.
	Notice to Proceed	Following issuance of a ROW grant and approval of the proposed Project's Plan of Development, considers the issuance of a Notice to Proceed with Project development and mitigation activities for federal lands.
	Section 106 of NHPA	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies for activities that are within their control and responsibility.
U.S. Army Corps of Engineers	Section 404, Clean Water Act (CWA)	If individual Section 404 permitting is required, considers issuance of Section 404 CWA permits for the placement of dredge or fill material in Waters of the United States, including wetlands.
	Section 10 Permit (Rivers and Harbors Act of 1899)	Considers issuance of Section 10 permits for pipeline crossings of navigable waters.
	Section 106 of NHPA	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies for activities that are within their control and responsibility
U.S. Fish and Wildlife Service	ESA Section 7 Consultation, Biological Opinion	Considers lead agency findings of an impact of federally listed or proposed species; provide Biological Opinion if the proposed Project is likely to adversely affect federally listed or proposed species or their habitats.

Agency	Permit or Consultation/Authority	Agency Action
National Park Service	Management of National Historic Trail crossings	Consults with SHPOs under Section 106 of the NHPA.
U.S. Bureau of Reclamation	ROW Grant and Temporary Use Permit under Section 28 of the MLA	Determines if ROW grant issued under MLA by the Bureau of Land Management is in compliance with Reclamation standards.
	Section 106 of NHPA	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies for activities that are within their control and responsibility.
Federal Highway Administration	Crossing Permit	Considers issuance of permits for the crossing of federally funded highways
U.S. Department of Transportation, PHMSA, Office of Pipeline Safety	49 CFR Part 195—Transportation of Hazardous Liquids by Pipeline	Reviews design, construction, operations, maintenance, and emergency operations plan (termed Emergency Response Plan in this Supplemental EIS), inspection of pipeline projects, including Integrity Management Programs and identifying high consequence areas prior to installation.
	49 CFR Part 194—Response Plans for Onshore Pipelines	Reviews Response Plans (termed Pipeline Spill Response Plan in this Supplemental EIS) prior to initiation of operation and within 2 years of startup approves the Pipeline Spill Response Plan.
U.S. Environmental Protection Agency, Regions 7 and 8	Section 401, CWA, Water Quality Certification	Considers approval of water use and crossing permits for non-jurisdictional waters (implemented through each state's Water Quality Certification Program).
	Section 402, CWA, National Pollutant Discharge Elimination System (NPDES)	Reviews and issues NPDES permit for the discharge of hydrostatic test water (implemented through each state's Water Quality Certification Program, where required).
	Section 404, CWA (dredged and fill material)	Reviews and comments on U.S. Army Corps of Engineers Section 404 CWA permit applications for dredged and fill material.
	Section 309, Clean Air Act	Review and comment in writing on compliance with CEQ's Regulations for Implementing the Procedural Provisions of NEPA.
	Sections 3001 through 3019 of Resource Conservation and Recovery Act	Establishes criteria governing management of hazardous waste.

Agency	Permit or Consultation/Authority	Agency Action
U.S. Department of Agriculture (USDA)—National Resources Conservation Service	Section 106 of NHPA	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies for activities that are within their control and responsibility.
	WRP, Emergency Watershed Protection Program (Floodplain Easements), Healthy Forests Reserve Program, Grassland Reserve Program, and Farmland Protection Policy Act	Notifies local Natural Resources Conservation Service office that conservation lands will be disturbed by pipeline construction.
USDA—Farm Service Agency	Section 106 of NHPA	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies for activities that are within their control and responsibility.
	Conservation Reserve Program, Conservation Reserve Enhancement Program, Grassland Reserve Program, and Farmable Wetlands Program notifications	Notifies local Farm Service Agency office that conservation lands will be disturbed by pipeline construction.
USDA—Rural Utilities Service	Section 106 of NHPA	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies for activities that are within their control and responsibility.
U.S. Department of Energy—Western Area Power Administration	Section 106 of NHPA	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies for activities that are within their control and responsibility.
	Energy network balancing authority	Perform joint system engineering studies to determine effects that additional facilities or services might have on system reliability and stability.
Advisory Council on Historic Preservation	Consultation	Advises federal agencies during the Section 106 of NHPA consultation process; signatory to the Programmatic Agreement.
U.S. Department of Justice—Bureau of Alcohol, Tobacco, and Firearms	Treasury Department Order No. 120-1 (former No. 221), effective 1 July 1972	Considers issuance of permit to purchase, store, and use explosives should blasting be required
Montana		
Montana SHPO—Montana Historical Society[c]	Consultation under Section 106 of NHPA	Reviews and comments on activities potentially affecting cultural resources.
Montana Department of Environmental Quality (MDEQ)	Certificate of Compliance under the state Major Facilities Siting Act (MFSA)	Considers issuance of a certificate of compliance under MFSA for construction and operation. A MFSA Certificate was issued in March 2012.

Agency	Permit or Consultation/Authority	Agency Action
MDEQ—Permitting and Compliance Division—Water Protection Bureau	Montana Ground Water Pollution Control System and Nondegredation Review (three levels of water protection based on water classification, i.e., outstanding resource waters etc.), Standard 318 (Permitting conditions for Pipeline Crossings at Watercourses—short term turbidity)	Considers issuance of permit for stream and wetland crossings; provides Section 401CWA certification consults for Section 404CWA process.
	Montana Pollutant Discharge Elimination System	Considers issuance of permit for hydrostatic test water discharge into surface water, trench dewatering, and stormwater discharge.
MDEQ—Permitting and Compliance Division—Waste and Underground Tank Management Bureau	Septic Tank, Cesspool, and Privy Cleaner New License Application Form (for work camps)	Reviews and licenses Cesspool, Septic Tank and Privy Cleaners, inspects disposal sites for septic tank, grease trap and sump wastes.
MDEQ—Permitting and Compliance Division—Air Resources Bureau	Air Quality Permit Application for Portable Sources; Air Quality Permit Application for Stationary Sources	Considers issuance of air quality permit(s) for work camps dependent on source of power such as portable diesel generator or use of non-electrical equipment is used during construction or operation of the pipeline (i.e., diesel powered pumps during hydrostatic testing).
MDEQ—Permitting and Compliance Division—Public Water Supply Bureau	Water and Wastewater Operator Certification (for work camps)	Reviews and licenses operators of certain public drinking water and wastewater treatment facilities; issues approval to construct, alter or extend public water or sewer systems (including hauling, storage and distribution of water).
Montana Department of Natural Resources and Conservation (DNRC)—Water Resources Division (General)	Water Appropriation Permit (Beneficial Water use Permit) and/or Water Wells Drilling/ Alteration	Considers issuance of permit for water use for hydrostatic testing or waters for dust control.
Montana DNRC State Board of Land	Management of timber, surface, and mineral resources for the benefit of the common schools and the other endowed institutions in Montana	Considers approval of permanent easements across state land.
Montana DNRC State Board of Land and, Real Estate Management Division	Administers all activities on lands classified as "Other" and all secondary activities on lands classified as grazing, agriculture, or timber	Considers issuance of license to use state land.
Montana DNRC Trust Land Management Division	Navigable Rivers/Land use License/Easement	Consults on and considers issuance of permit for projects in, on, over, and under navigable waters.
Montana DNRC, Conservation Districts	Natural Streambed and Land Preservation Act (also known as the 310 Law)	Consider issuance of permits for construction in perennial streams, rivers, or designated reservoirs on private land.
Montana Fish, Wildlife and Parks	Natural Streambed and Land Preservation Act (also known as the 310 Law)	Provide technical oversight to DNRC Conservation Districts in review of applications for 310 permits.

Agency	Permit or Consultation/Authority	Agency Action
Department of Transportation—Glendive District	State and Highway Crossing Permit for pipeline and access roads that encroach state highway ROW, with traffic control based on the Manual on Uniform Traffic Control Devices	Considers issuance of permits for crossings of state highways.
Department of Transportation—Helena Motor Carrier Services Division Office	Oversize/Overweight Load Permits, where required	Considers issuance of permit for oversize/overweight loads on state maintained roadways.
Montana Public Service Commission	Grant Common Carrier Status	Considers whether or not an applicant qualifies as a common carrier under Montana Code Annotated 69-13-101; if a common carrier, the commission would supervise and regulate operations under Montana Code Annotated Title 69 allowing Keystone to cross state highways and state streams.
County Road Departments	Crossing Permits	Considers issuance of permits for crossing of state highways.
County Floodplain Departments	County Floodplain permitting	Considers issuance of permits and review of work in floodplains.
County and Local Authorities	Pump Station Zoning Approvals, where required	Reviews under county approval process.
	Special or Conditional Use Permits, where required	Reviews under county approval process (Note: These permits are not required after a Certificate of Compliance under MFSA is issued)
County Weed Control Boards	Approval of reclamation plan	Considers approval of a reclamation/weed control plan (Note: These approvals still required after Certificate of Compliance under MFSA is issued).
South Dakota[b]		
South Dakota Historical Society[c]	Consultation under Section 106 of NHPA	Reviews and comments on activities potentially affecting cultural resources.
South Dakota Public Utilities Commission	Energy Conversion and Transmission Facilities Act	Considers issuance of permit for a pipeline and appurtenant facilities, a Public Utilities Commission Certificate was issued in March 2010.
Department of Environment and Natural Resources, Surface Water Quality Program	Section 401, CWA, Water Quality Certification	Considers issuance of permit for stream and wetland crossings; consult for Section 404CWA process.
	Hydrostatic Testing/Dewatering and Temporary Water Use Permit (SDG070000)	Considers issuance of General Permit regulating hydrostatic test water discharge, construction dewatering to waters of the state, and Temporary Water use Permit.

Agency	Permit or Consultation/Authority	Agency Action
	South Dakota Codified Law 34A-18 (oil spill response plans).	Review and consider approving crude oil pipeline spill response plans.
Department of Game, Fish, and Parks	Consultation	Consults regarding natural resources.
Department of Transportation	Crossing Permits	Considers issuance of permits for crossing of state highways.
County Road Departments	Crossing Permits	Considers issuance of permits for crossing of county roads.
County and Local Authorities	Pump Station Zoning Approvals, where required	Reviews under county approval process.
	Special or Conditional Use Permits, where required	Reviews under county approval process.
Nebraska		
Nebraska SHPO[c]	Consultation under Section 106 of NHPA	Reviews and comments on activities potentially affecting cultural resources.
Department of Environmental Quality	Section 401, CWA, Water Quality Certification	Considers issuance of permit for stream and wetland crossings; consult for Section 404 CWA process.
	Excavation Dewatering and Hydrostatic Testing Permit Form NEG6720000 Dewatering Form NEG6721000 Relocation	Considers issuance of permit regulating hydrostatic test water discharge and construction dewatering to waters of the state.
	Environmental Evaluation under Legislative Bill 4 and Legislative Bill 1161	Analyzes the environmental, economic, social, and other impacts associated with the Nebraska Reroute
	Title 117—Nebraska Surface Water Quality Standards	Applies water quality criteria to protect downstream beneficial uses.
	NPDES Construction Stormwater Permit NER110000	Considers issuance of a permit for projects that disturb more than 1 acre of land.
	Onsite Wastewater Permit or Wastewater Construction Permit (Title 124 if under 1,000 gallons per day; Title 123 if larger than 1,000 gallons per day)	Considers issuance of permit for a new wastewater treatment system.
	Agricultural Chemical Secondary Containment Program (Title 198)	Requires that a Professional Engineer registered in Nebraska certify that facilities comply with Title 198.
	Solid or Hazardous Waste (Title 128 and Title 132)	Considers disclosure of waste products, containerization, and transportation to an appropriate disposal facility.
Department of Natural Resources	Water Appropriations—Groundwater and Surface Water	Considers issuance of permit to use Public Waters (for hydrostatic test water or dust control).

Agency	Permit or Consultation/Authority	Agency Action
	Permit to Appropriate Surface Water	Considers issuance of permit to use surface water (for hydrostatic test water or dust control).
	Interbasin Transfer of Surface Water	Considers issuance of permit for diversion of water in one river basin and the transportation of such water to another river basin for storage or for a beneficial use.
	Interbasin Transfer of Water *Addendum* to Application for a Permit to Appropriate Water	Considers adverse impacts and beneficial uses of the proposed interbasin transfers.
	Petition for Leave to File an Application to Appropriate Water within a Moratorium or Stay Area (Variance Petition)	Considers issuance of permit to use surface waters where no new surface waters are being appropriated.
Game and Parks Commission	Consultation	Consults regarding natural resources and impacts on State-listed threatened or endangered species.
	Crossing Permit	Considers issuance of a permit to cross State-owned lands, such as the Cowboy Recreation and Nature Trail.
Board of Educational Lands and Funds	Notification and easement	Notify Board of Educational Lands and Funds that state-owned lands will be crossed.
Lower Niobrara Natural Resource District (NRD)	Ground Water Well Permit	Considers issuance of a permit for a well that pumps more than 50 gallons of water per minute.
Upper Elkhorn NRD	Ground Water Well Permit	Considers issuance of a permit for a well that pumps more than 50 gallons of water per minute.
	Request for Variance	Considers issuance of permit to use groundwater where water rights are limited for new development.
Lower Loup NRD	Well Construction Permit	Considers issuance of a permit for a well that pumps more than 50 gallons of water per minute.
Upper Big Blue NRD	Authorization to Transfer Ground Water	Considers issuance of authorization to use groundwater.
Central Platte NRD	Request for Variance	Considers issuance of permit to use ground water where water rights are fully appropriated.
Department of Transportation	Crossing Permits	Considers issuance of permits for crossing of state highways.
County Road Departments	Crossing Permits	Considers issuance of permits for crossing of county roads.
County and Local Authorities	Pump Station Zoning Approvals, where required	Reviews under county approval process.

Agency	Permit or Consultation/Authority	Agency Action
	Special or Conditional Use Permits, where required	Reviews under county approval process.
Kansas		
Department of Health and Environment, Bureau of Water	Hydrostatic Testing Permit (if applicable)	For pump station piping, may be below permitting thresholds.
	Water Withdrawal Permit (if applicable)	For pump station piping, may be below permitting thresholds.
Department of Wildlife and Parks	Non-game and Endangered Species Action Permit (if applicable)	Review of new pump station locations .
SHPO[c]	Historical Resources Review (if applicable)	Reviews of new pump station locations.
County and Local Authorities	Pump Station Zoning Approvals, where required	Reviews under county approval process.

[a] All permits are considered attainable and consistent with existing land use plans based on consultation with the relevant agencies listed in the table.
[b] Permits associated with construction camps are described in Section 2.1.5.4, Construction Camps.
[c] The SHPO has the opportunity to review federal agency decisions under Section 106 of the NHPA, but it is not a legal obligation.

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2.0 DESCRIPTION OF THE PROPOSED PROJECT AND ALTERNATIVES

This chapter describes the proposed Keystone XL Project (proposed Project) and alternatives to the proposed Project that will be analyzed in full in this Supplemental Environmental Impact Statement (Supplemental EIS). This chapter also describes those alternatives that were considered by the Department of State (Department), but were eliminated from detailed analysis in the document. All alternatives that were eliminated from further analysis were subjected to a screening process to assess whether they were reasonable. In all, three alternatives were carried forward for full analysis in the Supplemental EIS in addition to the Proposed Action. These three alternatives include:

- No Action Alternative, including two intermodal options involving rail-pipeline and rail-tanker transport;
- Keystone XL 2011 Final EIS Proposed Alternative, provided as a reference point to illustrate the differences between it and the proposed route and other alternatives; and
- I-90 Corridor Alternative.

Consistent with the National Environmental Policy Act (NEPA), federal agencies must consider reasonable alternatives to a proposed action, which in this case is an application for a Presidential Permit for a border crossing for a pipeline and ancillary facilities. Considering alternatives helps to ensure that ultimate decisions concerning the proposed Project are well founded and consistent other national policy goals and objectives.

The Department and the cooperating agencies conducted an analysis of alternatives to the proposed Project. The alternatives were developed based on the purpose and need for the proposed Project, as discussed in Chapter 1 - Purpose and Need (Section 1.3). The alternatives analysis relied on information obtained through independent research and analyses conducted by the Department and its third-party contractor, information provided to the Department, state permitting applications (including supplemental submittals), and information and comments provided during scoping for the Supplemental EIS.

TransCanada Keystone Pipeline, LP (Keystone) proposes to construct, operate, maintain, inspect, and monitor a pipeline system that would transport crude oil from its existing facilities in Hardisty, Alberta, Canada, as well as crude oil from an on-ramp in Baker, Montana, to Steele City, Nebraska. The proposed pipeline would connect at that point to the existing Keystone Cushing Extension pipeline (see Figure 2.0-1), which extends from Steele City, Nebraska, to Cushing, Oklahoma.

The proposed Project would have the capacity to deliver up to 830,000 barrels per day (bpd) of crude oil. Keystone has firm contracts to transport more than 555,000 bpd of Western Canadian Sedimentary Basin (WCSB) to delivery points in the Gulf Coast area[1].

[1] The Gulf Coast area refers to the region from Houston, Texas, to Lake Charles, Louisiana. Gulf Coast area refineries include 12 refineries on the Gulf Coast in Texas and three refineries in Lake Charles, Louisiana.

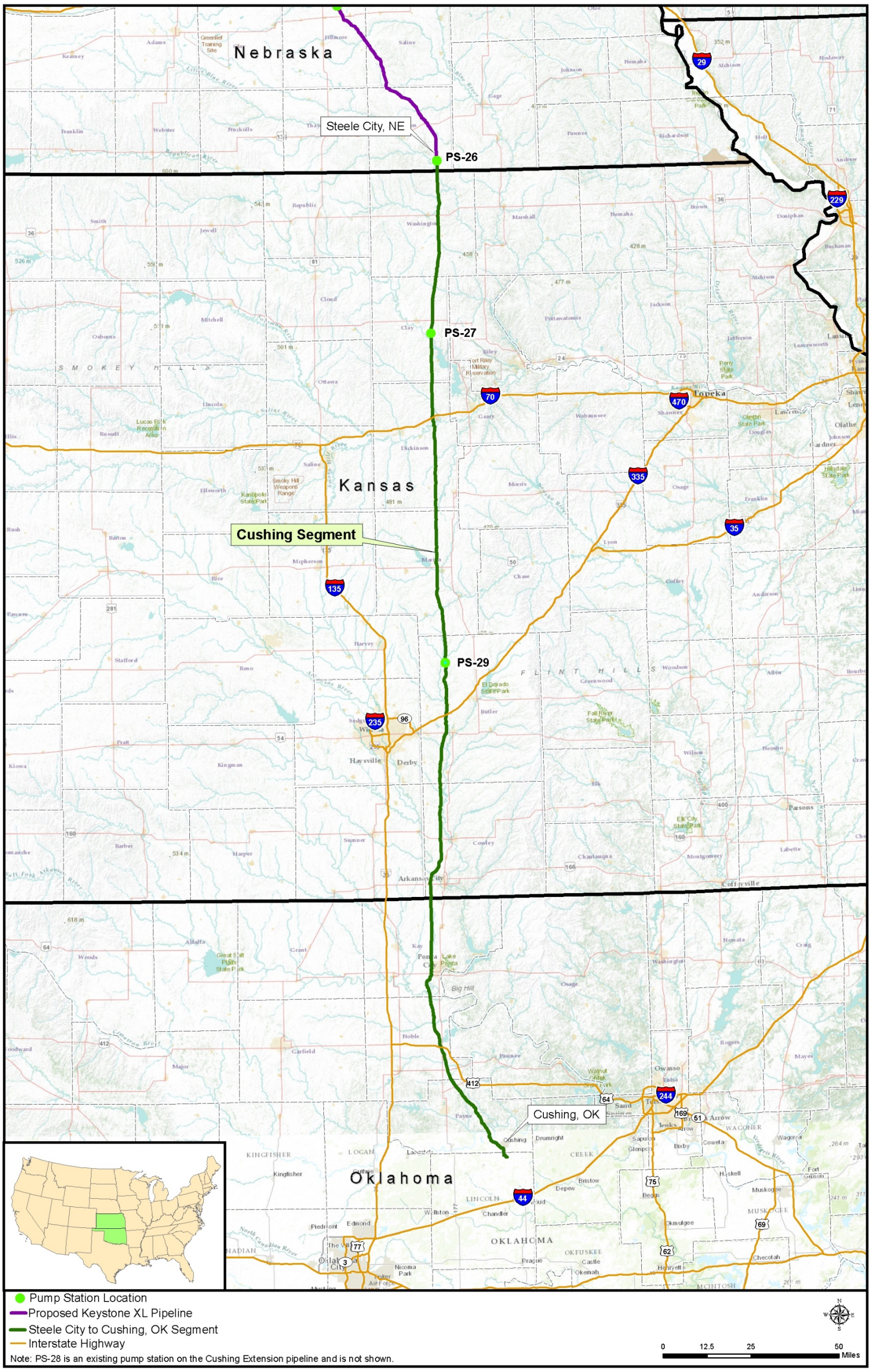
If the proposed Project were approved and implemented, Keystone intends to ship those barrels of crude oil from WCSB to Cushing, Oklahoma via the proposed Project and the existing Cushing extension, and then transport them onward to delivery points on the Gulf Coast via a pipeline currently under construction. Keystone has long-term, firm contracts to deliver 500,000 barrels of crude oil from the WCSB to Cushing, Oklahoma that are currently being transported via the original Keystone pipeline and the Cushing Extension. Keystone has indicated that if this project were approved, it intends to transfer the barrels currently shipped from Cushing, Oklahoma, via the proposed Project. In addition, the proposed Project has firm commitments to transport approximately 65,000 bpd of crude oil, and could ship up to 100,000 bpd of crude oil, originating in the Williston Basin in Montana and North Dakota, which would be delivered to the proposed Project through the planned Keystone Marketlink, LLC, Bakken Marketlink Project in Baker, Montana.

The WCSB crude oil would be extracted predominantly from the oil sands (also referred to as tar sands), which are primarily a combination of clay, sand, water, and bitumen. Bitumen is a material similar to soft asphalt and is extracted from the ground by mining or by injecting steam underground to heat it to a point where it liquefies and can be pumped to the surface. Raw bitumen is too thick to be transported by pipeline. To overcome this, producers reduce the density of the bitumen, generally by diluting it with light, low-viscosity petroleum compounds. Bitumen might require as much as 40 percent dilution. The bitumen can be diluted by mixing it with diluents, which are light hydrocarbon liquids such as natural gas condensate (a low-density mixture of hydrocarbon liquids that are present as gases in the raw natural gas produced and which changes from gas to liquid if the temperature is reduced), refinery naphtha (a very light oil obtained from natural gas production), or a lighter crude oil, such as synthetic crude oil. This diluted bitumen is referred to as dilbit or synbit. This dilution is done to reduce the viscosity of the bitumen so that it is in a more liquid form that can be transported via pipeline.

Dilbit is also processed to remove sand, water, and other impurities. Dilbit is considered a heavy crude oil. The American Petroleum Institute (API) weight, known as API gravity, is a measure of how heavy or light a petroleum liquid is compared to water. If its API gravity is greater than 10 °API, it is lighter and floats on water; if less than 10 °API, it is heavier and sinks. Crude oil is classified as light, medium, or heavy, according to its measured API gravity.

- Light crude oil is defined as having an API gravity higher than 31.1 °API.
- Medium crude oil is defined as having an API gravity between 22.3 °API and 31.1 °API.
- Heavy crude oil is defined as having an API gravity below 22.3 °API.

Another type of Canadian crude oil that would be transported by the proposed Project is synthetic crude oil. Synthetic crude oil is produced from bitumen through a process called upgrading. Upgrading means using fractional distillation and/or chemical treatment to convert bitumen and reduce its viscosity so that it can be pumped through pipelines (bitumen is 1000x more viscous than light crude oil). This process produces a medium weight crude oil. Both synthetic crude oil and dilbit are similar in composition and quality to the crude oils currently transported in pipelines in the United States and being refined in Gulf Coast refineries. Neither type of crude oil requires heating for transport in pipelines.



Source: TransCanada 2012.

Figure 2.0-1 Existing Keystone Cushing Extension

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This chapter includes the following sections:

- Overview of the Proposed Project (Section 2.1), which includes a detailed discussion of the proposed Project, including land requirements, aboveground facilities, design and construction procedures, operation and maintenance, and connected actions, among other aspects; and
- Description of Reasonable Alternatives (Section 2.2), which describes the process used to identify reasonable alternatives to the proposed Project and provides an overview of each of those alternatives.

Information presented in this Supplemental EIS on the proposed Project was obtained from various documents, including the following sources:

- Keystone's application to the Department for a Presidential Permit, dated 4 May, 2012;
- The Department's Final Environmental Impact Statement (FEIS) and attachments, dated 26 August 2011 and prepared for a previous Keystone application;
- Keystone's Environmental Report on the proposed Project;
- Keystone's Supplemental Environmental Report for the Nebraska Reroute portion of the proposed Project;
- Keystone's responses to the Department's data requests; and
- Public comments received.

References

TransCanada Keystone Pipeline, LP. 2012. Keystone Cushing Extension information provided via shapefile. Received November 16, 2012.

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2.1 OVERVIEW OF THE PROPOSED PROJECT

This section describes the proposed route and the overall land and borrow material requirements. The proposed Project would include construction of approximately 875 miles of pipeline within a new 110-foot-wide construction right-of-way (ROW) and a 50-foot-wide permanent ROW in Montana, South Dakota, and Nebraska, as follows:

- Montana: approximately 286 miles
- South Dakota: approximately 315 miles
- Nebraska: approximately 274 miles

The proposed Project would involve the construction of 20 pump stations. Eighteen of these would be constructed and operated along the newly built pipeline on land parcels ranging in area from 5 to 15 acres; there would be six pump stations in Montana, seven in South Dakota, and five in Nebraska. The locations of four of the Nebraska pump stations have yet to be finally determined. Two additional pump stations would be constructed in Kansas along the existing Keystone Cushing Extension. One pump station would be constructed on an undeveloped site in Clay County (see Figure 2.0-1); another pump station would be constructed in Butler County. These pump stations would enable the proposed Project to maintain the pressure required to transport crude oil at the desired throughput volumes.

Certain ancillary facilities (e.g., pump stations, access roads, and mainline valves) would be needed to support pipeline operations. Table 2.1-1 outlines these ancillary facilities by state and by type. In addition, other facilities are needed to support pipeline construction, including access roads, pipe stockpile sites, railroad sidings, and construction camps. A description of this is included in Sections 2.1.5, Ancillary Facilities, and 2.1.6, Access Roads.

Table 2.1-1 Ancillary Facilities Supporting Operations by State

State	Ancillary Facilities
Montana	6 Pump Stations 21 permanent access roads 25 IMLVs[a]
South Dakota	7 Pump Stations 17 permanent access roads 15 IMLVs
Nebraska	5 Pump Stations TBD number of permanent access roads 15 IMLVs
Kansas	2 Pump Stations

Source: exp Energy Services, Inc. 2012a.

[a] Intermediate mainline valve (IMLV).

This Supplemental Environmental Impact Statement (Supplemental EIS) also describes and addresses the impacts of three actions, which are separate from the proposed Project and not part of the Presidential Permit application submitted by TransCanada Keystone Pipeline, LP (Keystone). Those actions have been determined to be connected actions for the purposes of this review, consistent with the National Environmental Policy Act (NEPA) as defined by Title 40 of the Code of Federal Regulations (CFR) Part 1508.25(a)(1) and are described in Section 2.1.12, Connected Actions.

2.1.1 Pipeline Route

The proposed Project would extend from an oil supply hub near Hardisty, Alberta, Canada, and extend to the U.S. border pursuant to an alignment that has been approved by the Government of Canada. The proposed 875-mile-long pipeline route in the United States that is the subject of this Supplemental EIS is similar to the original Steele City Segment evaluated in the August 2011 Keystone XL Project Final Environmental Impact Statement (Final EIS) in that it would enter the United States near Morgan, Montana; traverse Montana, South Dakota, and Nebraska; and terminate at a delivery point at Steele City, Nebraska (see Figure 2.0-1).The proposed Project route in Montana and South Dakota is largely unchanged from that presented in the Final EIS except for relatively minor route modifications to improve constructability and in response to agency and landowner comments (see Table 2.1-2).

Table 2.1-2 Pipeline Route Modifications

County	Begin MP	End MP	Base Route Length (Miles)	Reroute Length (Miles)	Maximum Perpendicular Distance from Center Line (Feet)	Reason for Route Change[a]
Montana						
Phillips	25.17	25.67	0.54	0.51	229	To accommodate an HDD through Frenchman Creek as opposed to the original open-cut method.
McCone	108.10	110.31	2.19	2.21	209	To avoid paralleling a creek and to eliminate two creek crossings.
South Dakota						
Harding	296.22	297.72	1.46	1.49	2,307	To avoid constructability issues (rough terrain, large hill, multiple drop-offs, side hill construction, etc.) and future pipeline integrity issues. Landowner prefers this more southerly route.
Harding	315.09	315.75	0.66	0.67	260	To shift CL and TWA away from a side slope and avoid difficult construction and restoration.
Harding	331.94	332.92	0.97	0.99	356	To avoid crossing drainage multiple times, to avoid paralleling drainage, and to avoid one drainage entirely.
Harding	350.84	351.58	.073	0.74	370	To shift CL and TWA away from a pond.
Harding	354.62	355.27	0.64	0.65	313	To avoid approximately 350 feet of difficult terrain features.
Butte/ Perkins	361.76	362.44	0.67	0.68	251	To avoid a hill finger that would require additional soil handling and TWA.

County	Begin MP	End MP	Base Route Length (Miles)	Reroute Length (Miles)	Maximum Perpendicular Distance from Center Line (Feet)	Reason for Route Change[a]
Perkins	366.31	366.82	0.49	0.51	234	To avoid multiple creek crossings. Would also eliminate two of the three current creek crossings.
Perkins	370.18	370.82	0.59	0.64	701	To shift CL and TWA away from a potential unmarked grave site and to a more constructible creek crossing locale.
Meade	380.56	381.20	0.64	0.65	214	To avoid laying pipeline along drainage feature and eliminate one of the two current creek crossings.
Meade	388.26	388.90	0.62	0.64	244	To avoid a well and levee.
Meade	398.24	400.78	2.55	2.54	733	To avoid multiple stream crossings and more difficult construction.
Meade	424.03	426.52	2.44	2.50	2,225	To shift CL and TWA to avoid ridgelines, rough terrain, and drop-offs, and eliminate the one HDD.
Meade/ Haakon	426.83	436.12	9.00	9.29	1,980	To avoid ridgelines, rough terrain, and drop-offs, and eliminate two HDDs. Also to improve the current HDD crossing location of the Cheyenne River and straighten the route to allow the use of HDD at two locations south of the Cheyenne River crossing.
Haakon	447.16	448.77	1.59	1.61	788	To avoid a creek crossing that is too close to a road and to avoid impacting a wetland area and tree removal.
Haakon	449.61	450.13	0.51	0.52	270	To avoid laying pipeline along a drainage feature.
Haakon	452.01	453.00	0.98	0.99	343	To relocate the CL crossing at Highway 73 to a narrower area of state-road ROW, reduce the crossing length, and avoid steep slopes at highway's edge. Also relocates the pipeline away from the side slope of a meandering waterbody.
Haakon	455.22	456.75	1.56	1.53	635	To eliminate a PI and straighten the route.
Haakon	461.83	462.26	0.45	0.43	315	To eliminate a PI and straighten the line, place MLV-19A on higher ground, and move CL/TWA away from an existing culvert south of current CL.
Haakon	475.48	477.77	2.27	2.29	630	To avoid difficult construction and save cost of reclamation by avoiding routing along a drainage feature and have a better crossing location at a creek. Also avoids three creek crossings and moves CL away from a pond.

County	Begin MP	End MP	Base Route Length (Miles)	Reroute Length (Miles)	Maximum Perpendicular Distance from Center Line (Feet)	Reason for Route Change[a]
Haakon	484.38	486.13	1.76	1.75	498	To avoid a drop-off and eliminate approximately80 ft. of wetland crossing, relocate CL to a first ridge where landowner has already excavated some portions, avoid elevation, terrain, and slope changes, and straightens alignment to accommodate a HDD crossing of the Bad River, the Bad River road and a railroad.
Jones	493.54	494.98	1.45	1.44	550	To shorten the route.
Jones	501.75	503.60	1.87	1.85	442	To shorten the route and remove one PI.
Jones	506.33	507.63	1.26	1.30	329	To avoid CL and TWA crossing a pond and a levee, avoid terrain issues such as a side slope/side hill, and eliminate reclamation issues at the pond/levee.
Lyman	534.03	535.07	1.01	1.04	253	To avoid a drainage feature, avoid impact to an ineligible cultural site nearby, straighten a road crossing, and move MLV-22 to suitable ground.
Lyman	540.23	541.06	0.95	0.82	1,142	To move CL and TWA off a side slope. Would impact the entry/exit point at the White River HDD.
Tripp	542.62	545.21	2.54	2.59	810	To shift the CL off a side hill, avoid CL running under field road by shifting it out of field road, and eliminate approximately 5,626 feet of side slope construction.
Tripp	547.33	549.23	1.87	1.90	555	To avoid difficult terrain (side slopes, bluffs) and having TWA inside a drainage/creek.
Tripp	578.31	579.00	0.65	0.69	550	To accommodate two requests from landowners: avoid locating the pipeline on tract ML-SD-TR-11345 and avoid a row of trees.
Tripp	599.41	599.88	0.47	0.47	415	To avoid a drainage crossing, straighten a road crossing, and eliminate reclamation issues at the drainage crossing.
Keya Paha, Boyd, Holt	601.76	637.42	34.57	35.67	41,951	See Section 2.3-1 of Nebraska SER. Approximately, 74 tracts, 36 new landowners and one State Land tract (Board of Education Lands, School Lands) are impacted. Additionally, eight new CARs will be added for the reroute; one Mainline Valve will be impacted (CK-MLV-25);
Holt	657.93	658.43	0.49	0.50	279	The proposed route variation accommodates landowner's (tract ML-NE-HT-30345.000) request to avoid a newly planted (3 years) shelter belt on the property as well as a cattle feed lot by shifting the CL and TWAs further south.
Holt	659.08	660.83	1.68	1.75	1,481	Landowner preference

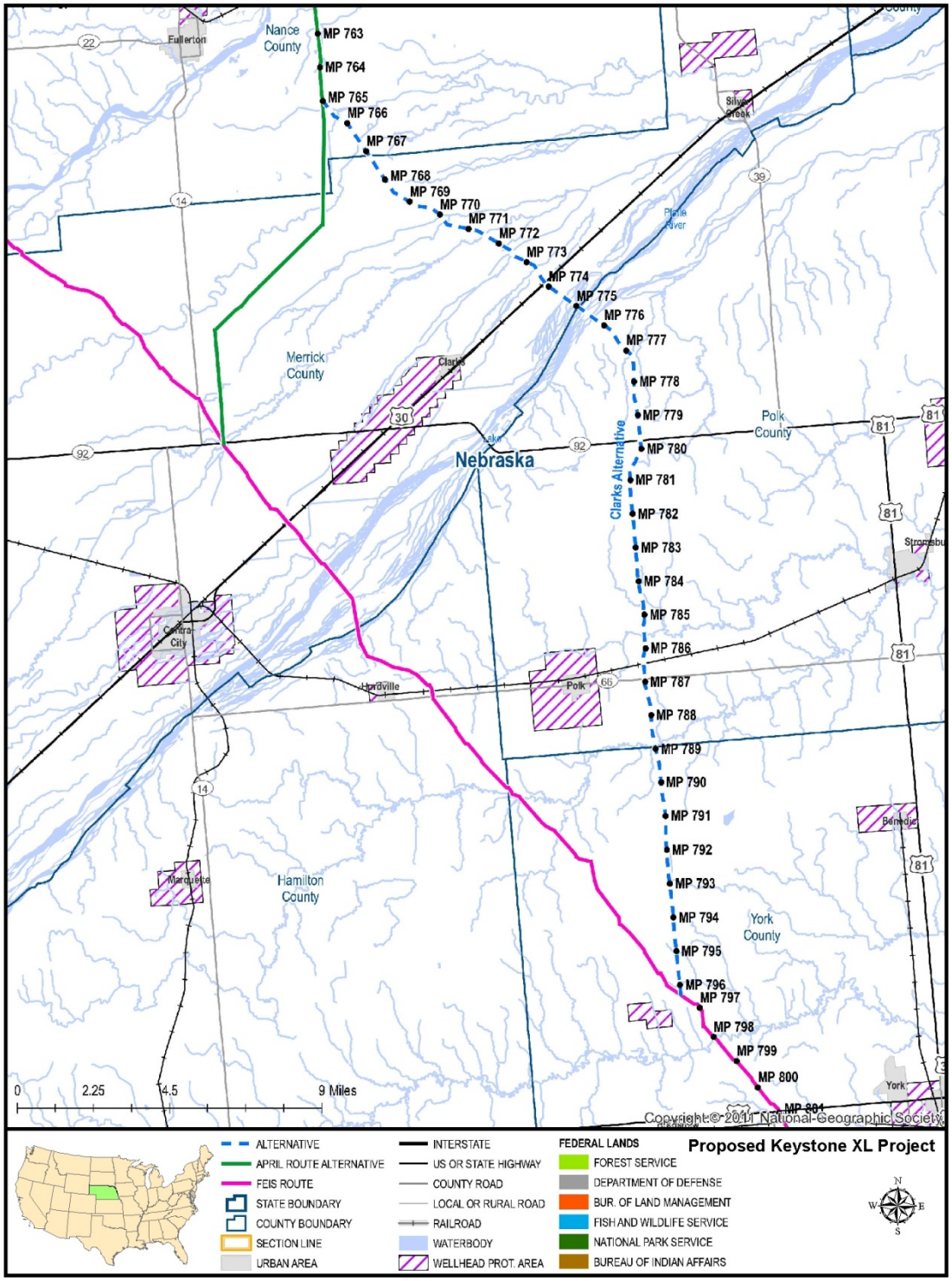
County	Begin MP	End MP	Base Route Length (Miles)	Reroute Length (Miles)	Maximum Perpendicular Distance from Center Line (Feet)	Reason for Route Change[a]
Holt	661.82	663.75	1.77	1.94	1,796	The primary reason for this proposed reroute is to avoid landowner's row of trees located in tract ML-NE-HT-30405.000 by shifting the CL and TWAs east.
Holt	665.44	667.47	1.85	2.03	1,845	Landowner preference
Boone	740.05	741.02	0.93	0.98	457	Landowner preference
Boone	745.45	746.88	1.47	1.44	1,344	Landowner preference
Boone	749.98	750.94	0.96	0.96	201	The primary reason for this proposed reroute is to avoid a large drain that is located next to a road and to allow the drainage feature and road be crossed separately by shifting the centerline and work spaces further west.
Nance, Merrick, York, Polk	764.99	796.31	31.49	31.33	50,938	See Table 2.3-2 of Nebraska SER (exp Energy Services, Inc. 2012a).
Saline, Jefferson	840.95	855.03	13.49	14.08	18,546	See Table 2.3-3 of Nebraska SER (exp Energy Services, Inc. 2012a).
Jefferson	873.29	874.50	1.29	1.20	275	The primary reason for this proposed reroute is to shift CL and TWAs away from fence that runs parallel to the current CL.

Source: exp Energy Services, Inc. 2012a.

[a] CL = Centerline; TWA = Temporary Workspace Area; HDD = Horizontal Directional Drill; MLV = mainline valve; PI = Point of Inflection (angle).

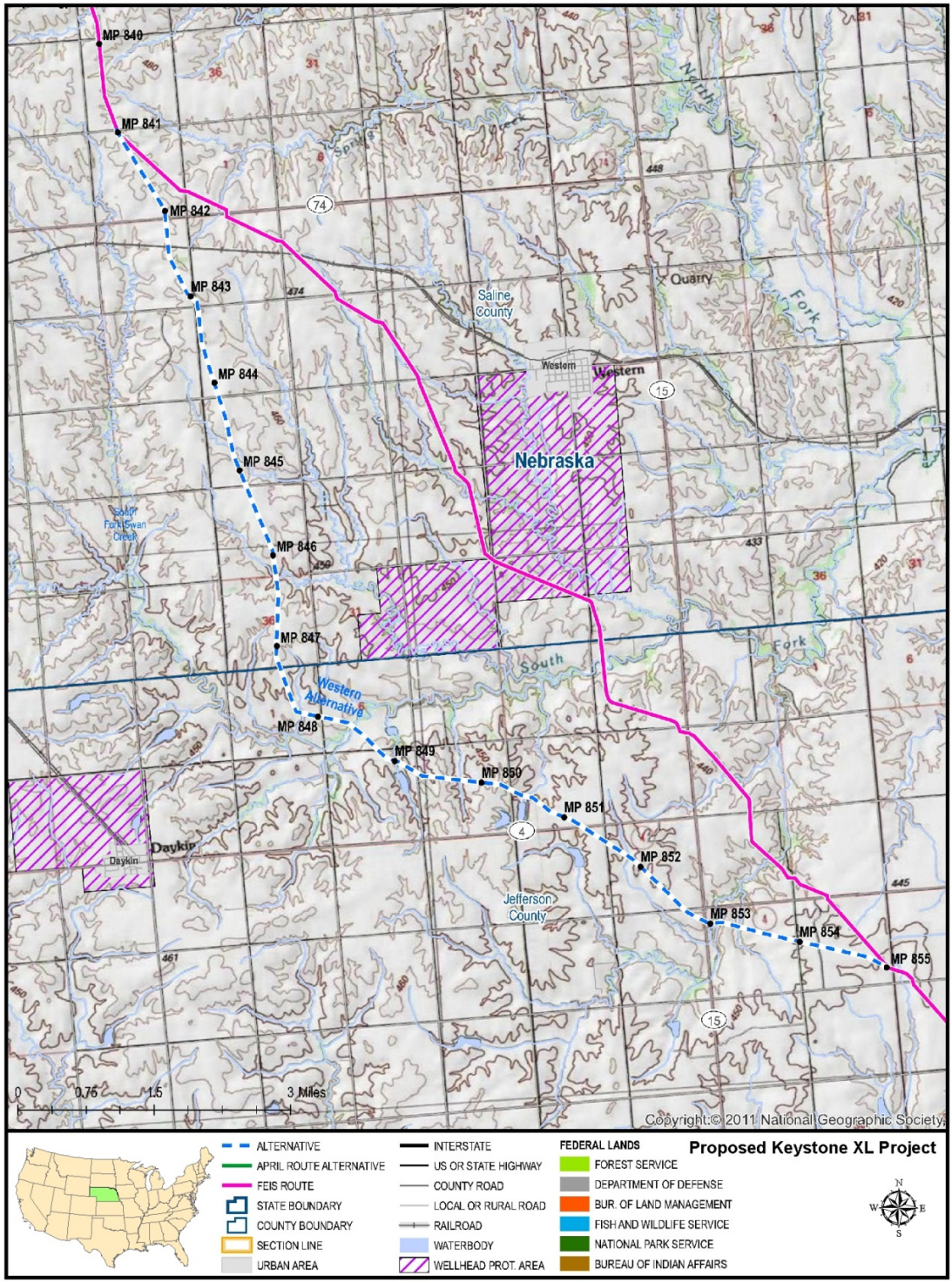
The route as proposed by Keystone is modified from the Final EIS route to avoid the Nebraska Department of Environmental Quality (NDEQ)-defined Sand Hills Region. The original pipeline route in Nebraska as presented in the Final EIS trended northwest to southeast beginning at the South Dakota and Nebraska border in Keya Paha County, Nebraska, and ending at Steele City, Nebraska. The route as proposed by Keystone avoids the NDEQ-defined Sand Hills Region as well as additional areas in Keya Paha County identified by the NDEQ that have soil and topographic characteristics similar to the Sand Hills Region. The proposed route also avoids the Village of Clarks wellhead protection areas in response to concerns expressed by NDEQ and other stakeholders. The proposed route places the pipeline approximately 4 miles downgradient and to the east of the wellhead protection area boundary as shown in Figure 2.1.1-1.The proposed route also avoids the newly designated Village of Western wellhead protection area, which is depicted in Figure 2.1.1-2.

The original Final EIS route for Nebraska included approximately 254 miles of pipeline and associated project facilities. The total proposed route in Nebraska is now approximately 275 miles long, of which approximately 209 miles comprise the route modification portion of the proposed route. Table 2.1-3 shows the changes between the original Final EIS route and the proposed route. Keystone's proposed route also includes four pump stations, which are only tentatively sited at this time. There is one pump station on the portion of the proposed route that has not changed from the original route evaluated in the Final EIS.



Source: exp Energy Services, Inc. 2012b.

Figure 2.1.1-1 Clarks Route Modification



Source: exp Energy Services, Inc. 2012b.

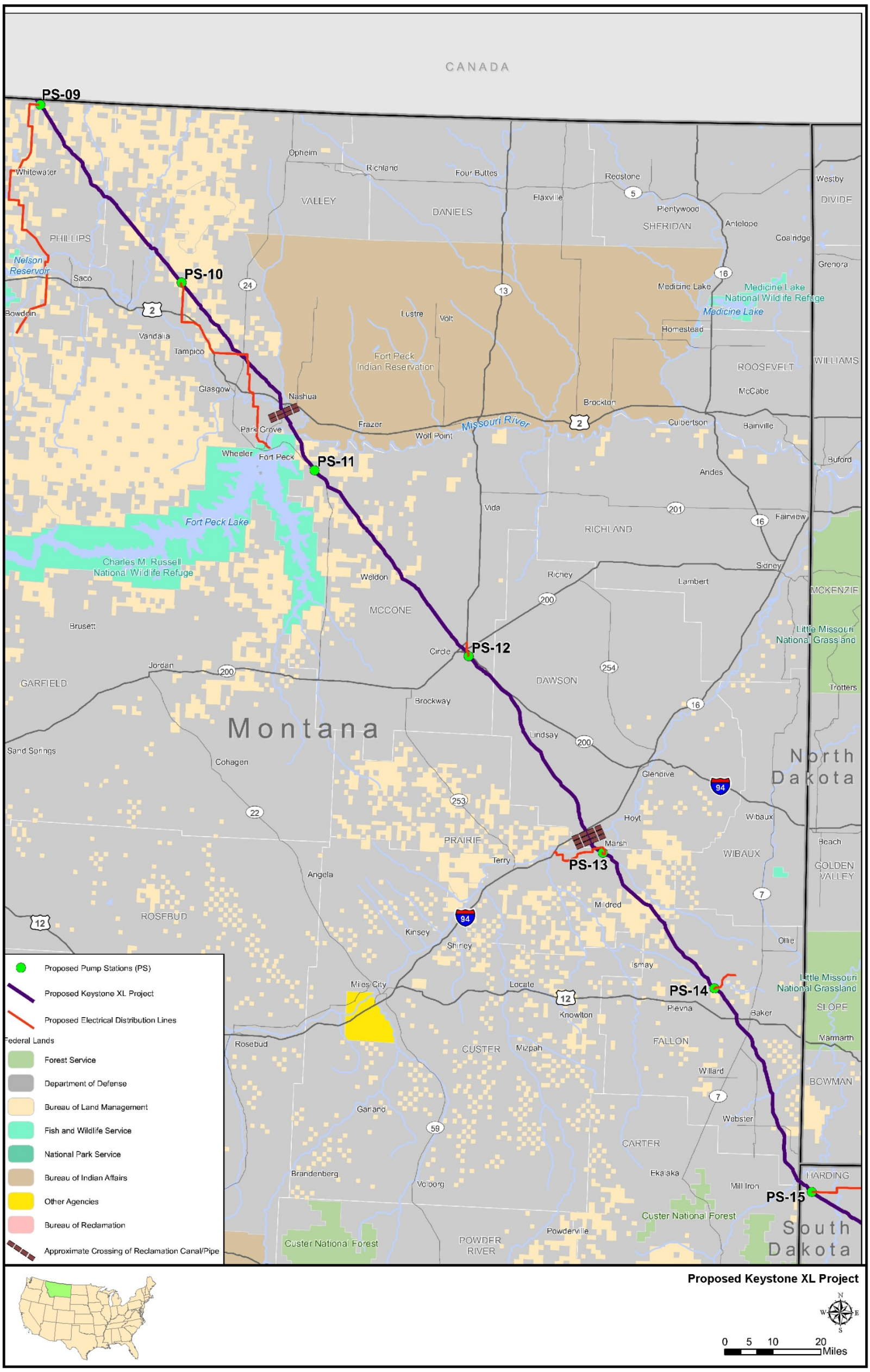
Figure 2.1.1-2 Western Route Modification

Table 2.1-3 Summary of Lands Affected

	Preferred Alternative Route in Nebraska			
	Final EIS Portion		Route Modification Portion	
Facility	**Land Affected During Construction[a,d] (acres)**	**Land Affected During Operation[b] (acres)**	**Land Affected During Construction[a,d] (acres)**	**Land Affected During Operation[b] (acres)**
Pipeline ROW	875.28	399.14	2762.13	1264.54
Additional TWAs	86.09	0.00	140.79	0.00
Pump Stations[e]	22.12	22.12	45.00	45.00
Access Roads[c]	12.02	0.00	58.48	0.00
Pipe Stockpile Sites, Rail Sidings, Contractor Yards	TBD	0.00	TBD[f]	0.00
Construction Camp	TBD	0.00	TBD[f]	0.00
Totals	995.51	421.26	3006.40	1309.54

[a] Disturbance is based on a total of 110-foot construction ROW for a 36-inch-diameter pipe, except in certain wetlands, cultural sites, shelterbelts, residential areas, and commercial/industrial areas where an 85-foot construction ROW will be used, or in areas requiring extra width for workspace necessitated by site conditions.
[b] Operational acreage was estimated based on a 50-foot permanent ROW in all areas. Any pigging facilities will be located within pump stations. IMLVs and densitometers will be constructed within the construction easement and operated within a 50-foot-by-50-foot area or 50-foot-by-66-foot area, respectively, within the permanently maintained 50-foot ROW. All MLVs and meters will be located within the area 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 Facilities categories within the table.
[c] Temporary and permanent disturbances associated with access roads are based on 30-foot width; all non-public roads are conservatively estimated to require upgrades and maintenance during construction.
[d] TBD = To Be Determined.
[e] Pump station acreages are a nominal 15 acres each for the four pump stations that are tentatively sited. For PS-26 (sited on the Final EIS portion of the preferred alternative route) the actual acreage is 7.12 acres.
[f] Typical sizes and numbers of ancillary facilities are: three pipe yards per spread averaging 40 acres each, one rail siding per spread averaging 10 acres, and one main contractor yard per spread averaging 30 acres. Construction camp sites can range between 50 and 100 acres in size (may include a contractor yard adjacent to the camp).

There are currently 48 access roads (private roads) along the Nebraska portion of the proposed route, but additional access roads may be needed. The proposed Project would also include contractor yards, pipe storage yards, and rail sidings. In addition, a construction worker camp could be required in northern Nebraska to avoid occupying all of the limited available rental units and hotel rooms during construction. All pigging facilities (high-resolution internal line inspection, maintenance, and cleaning tools) would be located within pump station yards (see Section 2.1.4.1, Pump Stations).All proposed Project facilities for which the locations have been selected are depicted on the pipeline route sheets in Figures 2.1.1-3, 2.1.1-4, and 2.1.1-5. Section 2.1.2, Land Requirements, provides a full description of land requirements for the project.



Source: exp Energy Services, Inc. 2012b.

Figure 2.1.1-3 Proposed Project Overview—Montana

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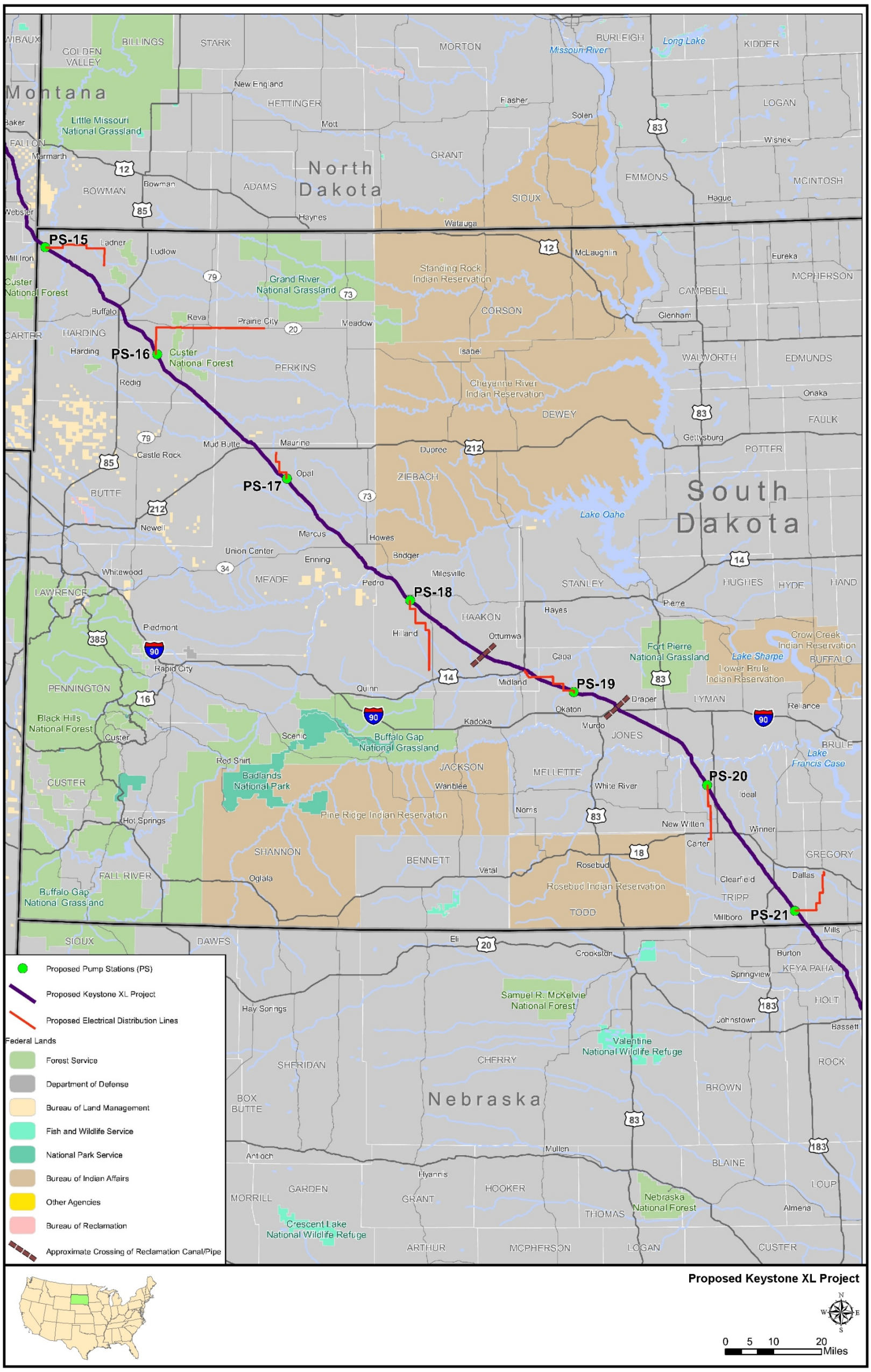

Source: exp Energy Services, Inc. 2012b.

Figure 2.1.1-4 Proposed Project Overview—South Dakota

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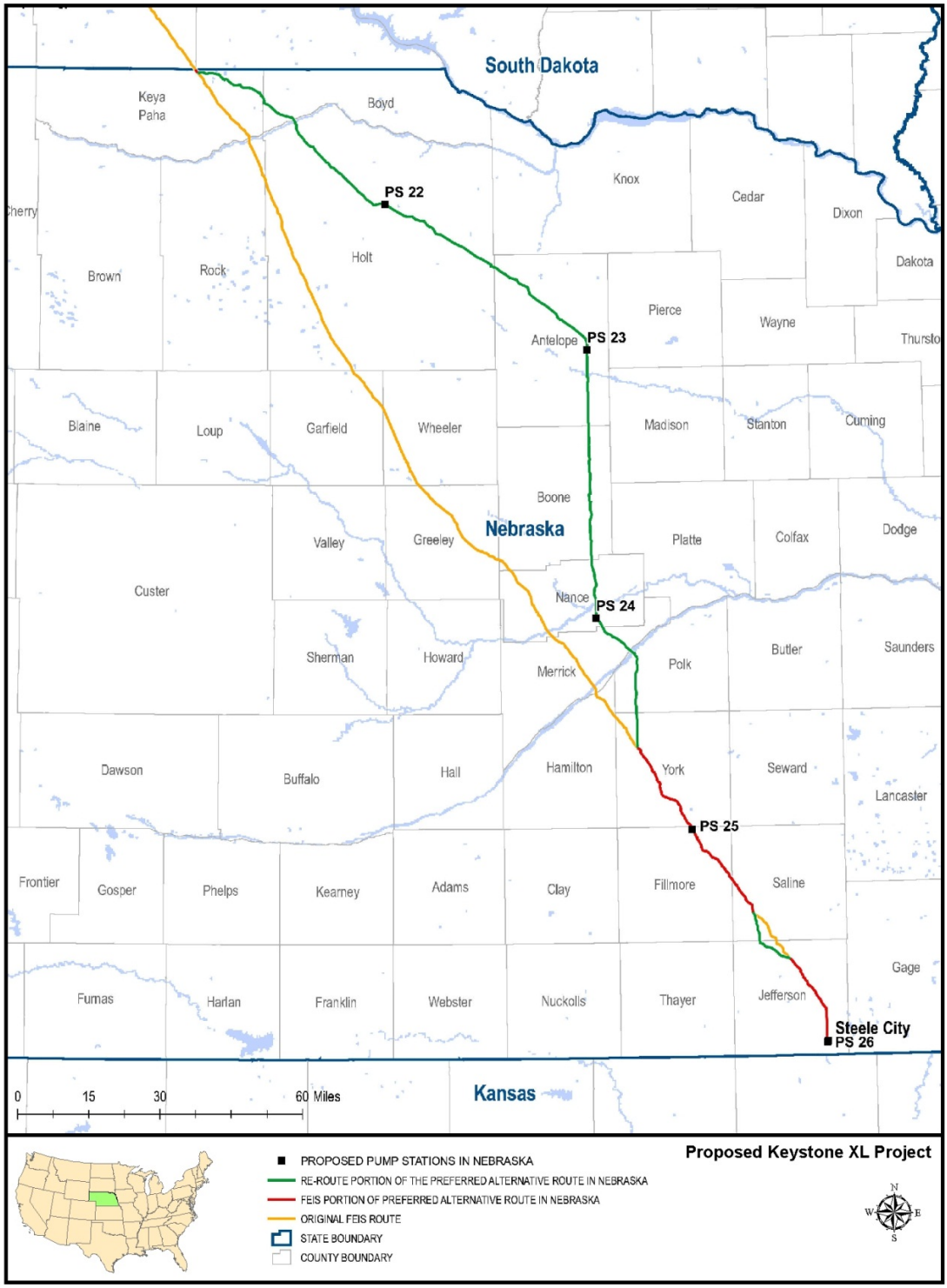


Source: exp Energy Services, Inc. 2012a.

Figure 2.1.1-5 Proposed Project Overview—Nebraska

2.1.2 Land Requirements

Approximately 15,493 acres of land would be disturbed during construction. The permanent ROW and aboveground facilities make up a total of 5,583.7 acres. Table 2.1-3 shows the areas in acres affected by construction and operation of the proposed Project. The following are proposed Project activities that would require the use of land:

- Pipeline ROW;
- Additional temporary workspace areas (TWAs);
- Pipe stockpile sites, rail sidings, and contractor yards;
- Construction camps;
- Pump stations and delivery facilities; and
- Access roads.

Construction of the proposed Project would require a 110-foot-wide construction ROW. In certain sensitive areas, which may include wetlands, cultural sites, shelterbelts, residential areas, or commercial/industrial areas, the construction ROW would be reduced to 85 feet to minimize impacts to these sensitive areas. Figure 2.1.2-1 illustrates typical construction areas along the ROW. After construction, the ROW would be restored consistent with applicable federal and state regulations and permits, the easement agreements negotiated between Keystone and individual landowners or land managers, and the construction methods and environmental protection procedures described in the Keystone Construction, Mitigation, and Reclamation Plan (CMRP) (presented in Appendix G and described in Section 2.1.7, Pipeline System Design and Construction Procedures). Those measures would be incorporated into the proposed Project to reduce the potential impacts of construction. After restoration, the approximately 9,909 acres of temporary ROW would be returned to the property owners for their use.

The permanent ROW would be approximately 5,584 acres, which includes approximately 214 acres for pump stations, valves, and other aboveground facilities. Access to the permanent ROW would be maintained for the life of the proposed Project to support surface and aerial inspections and any repairs or maintenance as necessary.

2.1.3 Borrow Material Requirements

Borrow (or fill) material would be required for temporary sites (such as storage sites, contractor yards, temporary access roads, and access pads at ROW road crossings) to stabilize the land for permanent facilities (including pump stations, valve sites, and permanent access roads), and for padding the bottom of the pipeline trench in some areas. All gravel and other borrow material would be obtained from existing, previously permitted commercial sources located as close to the pipe or contractor yards as possible.

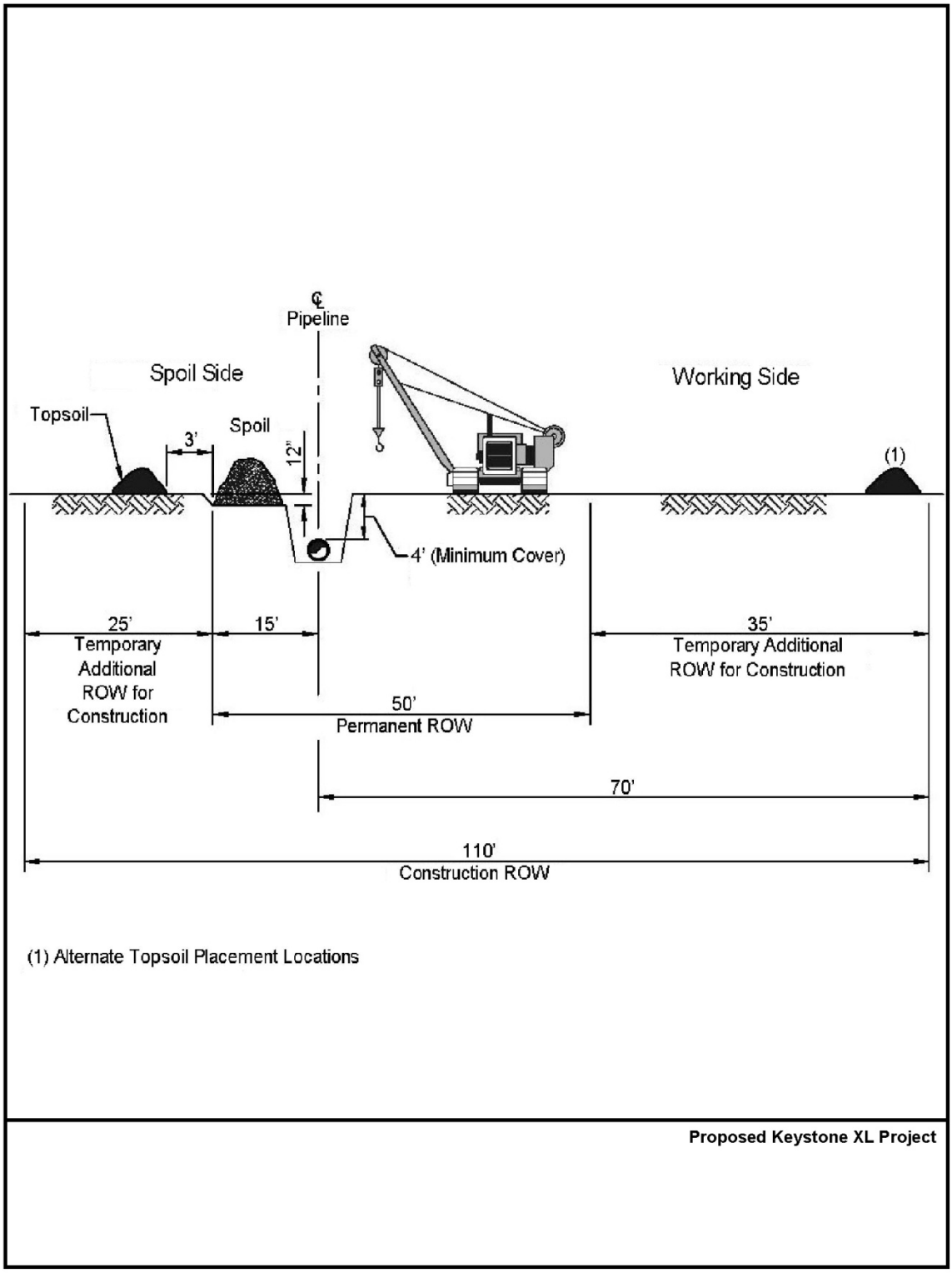


Figure 2.1.2-1 Construction ROW without Adjacent Pipeline

In general, about 7,000 cubic yards of gravel would be required for each pipe storage site and about 4,600 cubic yards of gravel would be required for each contractor yard. The approximately 191 temporary access roads would be graveled, as would access pads at ROW crossings of public and private roads. Permanent access roads would also be graveled. About 6inches of gravel would typically be used at pump stations and mainline valve (MLV) sites. Along portions of the route, the trench bottom would be filled with padding material such as sand or gravel, to protect the pipeline coating. Table 2.1-4 lists the approximate amount of borrow material that would be required in each state and Table 2.1-5 lists the borrow material required for each facility type.

Table 2.1-4 Borrow Material Requirements by State

State	Cubic Yards of Material
Montana	180,267
North Dakota	Quantities unknown at this time
South Dakota	167,615
Nebraska	128,735
Kansas[a]	8,830
Total	**415,588**

[a] Borrow material required for the two proposed pump stations on the Keystone Cushing Extension.

Table 2.1-5 Total Borrow Material Requirements by Facility Type

Facility Type	Cubic Yards of Material
Pipe Storage Site	108,000
Contractor Yard	134,400
Temporary Access Roads	28,579
Access Pads for Road Crossings	37,860
Pump Stations	180,000
Valve Sites	2,812
Permanent Access Roads	242,970
Trench Bottom Padding [a]	85,000
Total	**415,588**

[a] Gravel may be replaced with sand or soil.

2.1.4 Aboveground Facilities

The proposed Project would require approximately 214 acres of land for aboveground facilities, including pump stations, delivery facilities, densitometer sites, and intermediate mainline valves (IMLVs).During operations, Keystone would use approved agricultural herbicides to control the growth of vegetative species on all aboveground sites. See Table 2.1-6 for details regarding aboveground facilities.

Table 2.1-6 Aboveground Facilities

State	Facility	Areas Affected (Acres) Construction	Operation
Montana	Pipeline ROW	3784.42	1727.75
	Additional Temporary Workspace Areas	518.64	0.00
	Pipe Stockpile Sites and Contractor Yards	517.28	0.00
	Construction Camp	242.88	0.00
	Pump Stations and Delivery Facilities	65.79	65.79
	Access Roads	337.03	47.41
	Rail Sidings[a] (Three Sites)	60.00	0.00
	Montana Subtotal	**5526.04**	**1840.95**
South Dakota	Pipeline ROW	4153.37	1906.83
	Additional Temporary Workspace Areas	460.37	0.00
	Pipe Stockpile Sites and Contractor Yards	605.07	0.00
	Construction Camp	250.04	0.00
	Pump Stations and Delivery Facilities	65.63	65.63
	Access Roads	222.96	24.34
	Rail Sidings[a] (Three Sites)	60.00	0.00
	South Dakota Subtotal	**5817.44**	**1996.80**
North Dakota	Pipeline ROW	0.00	0.00
	Additional Temporary Workspace Areas	0.00	0.00
	Pipe Stockpile Sites, Contractor Yards, and Rail Sidings (One Site)	56.05	0.00
	Construction Camp	0.00	0.00
	Pump Stations and Delivery Facilities	0.00	0.00
	Access Roads	0.00	0.00
	North Dakota Subtotal	**56.05**	**0.00**

State	Facility	Areas Affected (Acres) Construction	Operation
Nebraska	Pipeline ROW	3637.41	1663.68
	Additional Temporary Workspace Areas	226.88	0.00
	Pipe Stockpile Sites, and Contractor Yards	TBD	TBD
	Construction Camp	TBD	TBD
	Pump Stations and Delivery Facilities	67.12	67.12
	Access Roads	70.50	0.00
	Rail Sidings[a]	TBD	TBD
	Nebraska Subtotal	**4001.91**	**1730.80**
Kansas	Pump Stations	15.15	15.15
	Kansas Subtotal	**15.15**	**15.15**
	TOTAL	**15492.64**	**5583.70**

Source: exp Energy Services, Inc. 2012a.

[a] Rail siding acreage represents 20 acres per site.

2.1.4.1 Pump Stations

Keystone would construct a total of 20 pump stations: six in Montana, seven in South Dakota, five in Nebraska (including an expansion to the existing pump station 26 at Steele City), and two on the existing Keystone Cushing Extension in Kansas. Each pump station would be situated on an approximately 5- to 15-acre site dependent upon the number of pumps present. Each new pump station would consist of three to five pumps driven by approximately 6,500-horsepower electric motors, an electrical equipment shelter, a variable frequency drive equipment shelter, an electrical substation, one sump tank, two MLVs, a communication tower, a small maintenance and office building, and a parking area for station maintenance personnel. The electrical shelter would house the electrical systems and the communication and control equipment. Communication towers at pump stations generally would be approximately 33-feet high, but the antenna height at some pump stations may be greater based on final detailed engineering studies. In no event would antennae exceed a maximum height of 190 feet.

The pipe entering and exiting the pump station sites would be below grade. As required by 49 CFR 195.260, there would be an MLV installed on the entry pipe and on the exit pipe to allow isolation of the pump station equipment in the event of an emergency. The manifold connecting the pipeline to the equipment at each pump station would be aboveground and entirely within the pump station boundaries. Inspection and maintenance personnel would access the pump stations through a gate that would be locked when the pump station is unoccupied.

Keystone would use down-lighting at the pump stations wherever possible to minimize impacts to wildlife and would install a security fence around the entire pump station site. The pump stations would operate on locally purchased electric power, with diesel-fired emergency generators, and would be fully automated for unmanned operation. Batteries would be used to maintain power to all communication and specific control equipment in the event of a power outage. Keystone has proposed the pump station locations based on hydraulic analyses of the flow in the pipeline and other relevant variables. Figures 2.1.1-3 through 2.1.1-5 show the proposed locations of the pump stations. Table 2.1-7 lists the locations of the pump stations by milepost.

Table 2.1-7 Proposed Project Pump Station Locations

State	Approximate Milepost
Montana	
Pump Station 09[a]	1.2
Pump Station 10	49.3
Pump Station 11	99
Pump Station 12	151.5
Pump Station 13	203.1
Pump Station 14	239.5
South Dakota	
Pump Station 15	288.6
Pump Station 16	337.3
Pump Station 17	391.5

State	Approximate Milepost
Pump Station 18	444.6
Pump Station 19	500.4
Pump Station 20	550.9
Pump Station 21	598.9
Nebraska	
Pump Station 22	TBD
Pump Station 23	TBD
Pump Station 24	TBD
Pump Station 25	TBD
Pump Station 26	875.3.4
Kansas	
Pump Station 27	49.0
Pump Station 29	144.5

Source: exp Energy Services, Inc. 2012a.

[a] Pump stations 1 through 8 are in Canada.

2.1.4.2 Pigging Facilities

Keystone would use high-resolution internal line inspection, maintenance, and cleaning tools known as "pigs" during operation of the proposed Project. The proposed Project would be designed to allow full pigging of the entire pipeline with minimal interruption of service. Pig launchers and receivers would be constructed and operated completely within the boundaries of the pump stations (see Figure 2.1.4-1).

2.1.4.3 Densitometer Facilities

Densitometer facilities on the pipeline would be equipped with densitometer/viscometer analyzers that measure the density of the product prior to delivery. Keystone proposes to install and operate two densitometers within the permanent ROW of the proposed Project. The location of the densitometers would be on the upstream side of Pump Stations 13 and 14. Densitometer information would be incorporated into quality and custody metering located at all injection points and delivery points.

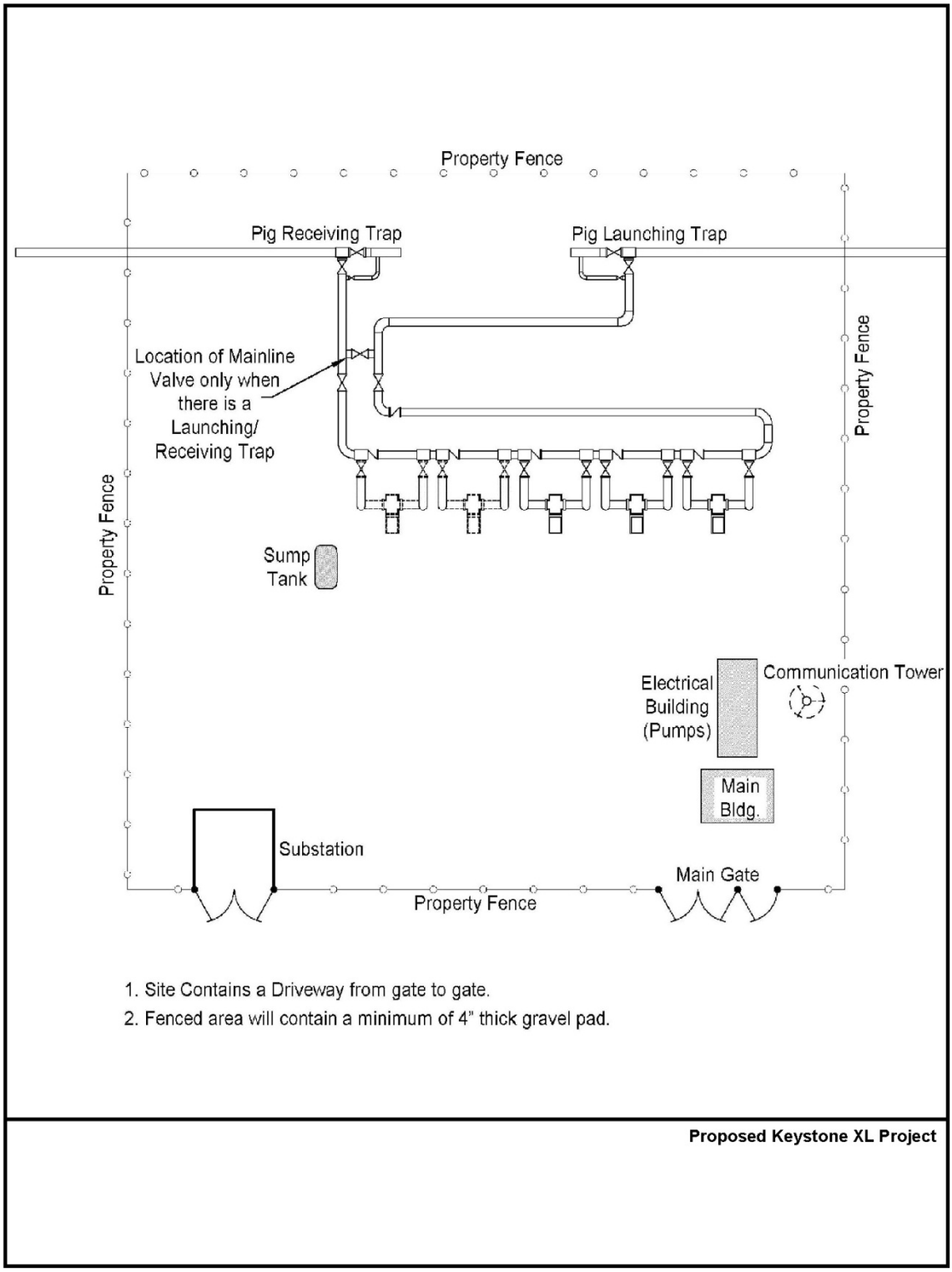


Figure 2.1.4-1 Pump Facility with Pigging

2.1.4.4 Mainline Valves

Keystone would install 55 IMLVs along the proposed route and 1 MLV at each pump station, all of which would be located within the permanent ROW as shown in Table 2.1-8. These IMLVs include both manual and remotely operated mainline block valves as well as check valves.

Table 2.1-8 Intermediate Mainline Valve Locations

Type	Mile Post	Acres	County	State[a]
Motor Operated	19.46	0.05	Phillips	Montana
Check	27.94	0.05	Valley	Montana
Manual	27.94	0.05	Valley	Montana
Motor Operated	31.9	0.05	Valley	Montana
Motor Operated	63.61	0.05	Valley	Montana
Check	72.61	0.05	Valley	Montana
Manual	72.61	0.05	Valley	Montana
Motor Operated	81.94	0.05	Valley	Montana
Check	85.61	0.05	Valley	Montana
Manual	85.61	0.05	Valley	Montana
Motor Operated	87.92	0.05	Valley	Montana
Check	90.65	0.05	McCone	Montana
Manual	90.65	0.05	McCone	Montana
Check	91.75	0.05	McCone	Montana
Manual	91.75	0.05	McCone	Montana
Motor Operated	118.36	0.05	McCone	Montana
Motor Operated	135.02	0.05	McCone	Montana
Motor Operated	170.49	0.05	Dawson	Montana
Motor Operated	179.64	0.05	Dawson	Montana
Motor Operated	197.35	0.05	Dawson	Montana
Check	198.34	0.05	Dawson	Montana
Manual	198.34	0.05	Dawson	Montana
Motor Operated	221.45	0.05	Fallon	Montana
Motor Operated	254.93	0.05	Fallon	Montana
Motor Operated	272.24	0.05	Fallon	Montana
Motor Operated	301.70	0.05	Harding	South Dakota
Check	301.70	0.05	Harding	South Dakota
Motor Operated	319.72	0.05	Harding	South Dakota
Motor Operated	353.89	0.05	Harding	South Dakota
Motor Operated	373.87	0.05	Perkins	South Dakota
Motor Operated	408.91	0.05	Meade	South Dakota
Motor Operated	419.68	0.05	Meade	South Dakota
Motor Operated	436.12	0.05	Haakon	South Dakota
Check	436.12	0.05	Haakon	South Dakota

Type	Mile Post	Acres	County	State[a]
Motor Operated	462.07	0.05	Haakon	South Dakota
Motor Operated	481.09	0.05	Haakon	South Dakota
Motor Operated	517.65	0.05	Jones	South Dakota
Motor Operated	534.11	0.05	Lyman	South Dakota
Motor Operated	568.39	0.05	Tripp	South Dakota
Motor Operated	587.13	0.05	Tripp	South Dakota
Motor Operated	600.98	0.05	Keya Paha	Nebraska
Motor Operated	813.57	0.05	York	Nebraska
Check	813.57	0.05	York	Nebraska
Motor Operated	861.48	0.05	Jefferson	Nebraska

Source: exp Energy Services, Inc. 2012a.

[a] Nebraska IMLVs include only those on the Final EIS portion of the proposed route. The locations of additional IMLVs on the route modification in Nebraska have yet to be finally determined.

Block valves can block oil flow in both directions and divide up the pipeline into smaller segments that can be isolated to minimize and contain the effects of a line rupture. The block valves can be either manually or remotely operated. Check valves are designed to be held open by flowing oil and to close automatically when oil flow stops or is reversed. Each IMLV would be within a fenced site that would be approximately 40 feet by 50 feet. Inspection and maintenance personnel would access the IMLVs through a gate that would be locked when the IMLV site is unoccupied.

Keystone has located remotely operated IMLVs at major river crossings, upstream of sensitive waterbodies, at each pump station, and at other locations in response to U.S. Environmental Protection Agency (USEPA) suggestions, and as required by 49 CFR 195.260, and agreed to in Pipeline Hazardous Material Safety Administration (PHMSA) Special Condition 32 (Appendix B, PHMSA 57 Special Conditions for Keystone XL and Keystone Compared to 49 CFR 195). See Sections 4.3, Water Resources, and Section 4.4, Wetlands, for details on project impacts at major river crossings and other sensitive areas.

Keystone would be able to operate the valves remotely to isolate a section of pipeline in the event of an emergency to minimize environmental impacts if an accidental leak occurs. Mainline valves must be capable of closure at all times. Special Condition 32 also requires that the remotely operated valves have remote power back-up to ensure communications are maintained during inclement weather. Each motor-operated valve station would include a diesel-fired emergency generator and a 132-gallon diesel fuel tank with secondary containment

Due to public and agency concerns over sensitive environmental resources, the U.S. Department of State (the Department) in consultation with PHMSA and USEPA determined that Keystone should commission an engineering analysis by an independent consultant that would review the proposed Project risk assessment and proposed valve placement. The risk analysis is further discussed in Section 4.13, Potential Releases.

2.1.5 Ancillary Facilities

2.1.5.1 Additional Temporary Workspace Areas

TWAs would be needed for short durations for some construction staging areas and where special construction techniques are to be used. These areas may include river, wetland, and road/rail crossings; horizontal directional drilling (HDD) entry and exit points; steep slopes (>20 percent); and rocky soils. The setback distances of TWAs adjacent to wetland and waterbody features would be established on a site-specific basis, consistent with applicable permit requirements and the appropriate procedures listed in the CMRP (Appendix G).The dimensions and acreages of typical additional TWAs are listed in Table 2.1-9.

Table 2.1-9 Dimensions and Acreage of Typical Additional 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 ≥ 50 feet wide	300 x 100[b]	0.7
Waterbody 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	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.

2.1.5.2 Pipe Storage Sites and Contractor Yards

Pipe storage sites, railroad sidings, and contractor yards would be needed for on-site storage of materials to support an efficient construction process and to reduce time and energy required for transport of materials when construction is in progress. Keystone estimated that 40 pipe storage yards and 19 contractor yards would be required for the proposed Project (the exact numbers and locations of these facilities required in Nebraska have not yet been determined). Table 2.1-10 provides the locations and acreages of potential pipe storage yards and contractor yards. Existing public or private roads would be used to access the yards. Pipe storage sites and contractor yards would be used on a temporary basis and would be reclaimed, as appropriate, upon completion of construction.

Table 2.1-10 Locations and Acreages of Proposed Pipe Storage Sites, Railroad Sidings, and Contractor Yards

State	County	Type(s) of Yards	Number of Yards	Combined Acreage
Montana	Dawson, McCone, Valley, Fallon	Contractor Yards	5	161.35
	Roosevelt, Sheridan, Prairie	Rail Sidings	3	60
	Phillips, Dawson, McCone, Valley, Fallon	Pipe Storage Areas	9	283.23
South Dakota	Tripp, Haakon, Jones	Contractor Yards	7	258.25
	Hughes, Lyman, Pennington	Rail Sidings	3	60
	Tripp, Haakon, Jones	Pipe Yard Stockpile Sites	11	346.82
North Dakota	Bowman	Pipe Yard Stockpile Sites	1	56.05
Nebraska	TBD	Contractor Yards	TBD	TBD
	TBD	Rail Sidings	TBD	TBD
	TBD	Pipe Storage Areas	TBD	TBD

Source: exp Energy Services, Inc. 2012a.

Pipe storage sites would be required at 30- to 80-mile intervals and contractor yards would be required at approximately 60-mile intervals. Each pipe storage site would occupy approximately 30 to 40 acres and would typically be located close to railroad sidings and as close to the proposed route as possible. Typical rail sidings would be 20 acres in size and be at existing rail sidings locations. Keystone would not be building any new rail sidings. Keystone would select existing commercial/industrial sites or sites that were used for construction of other projects as preferred sites for the storage sites.

Contractor yards would occupy approximately 30 acres. Suitable sites would need to be level, without structures, and not forested, and also would need to have a minimum of two safe ingress/egress points on all-weather county roads rather than busier state highways for safety reasons. Keystone would comply with all federal, state, and local requirements prior to construction. Where practicable, Keystone would seek out sites that have been previously disturbed. Keystone would work with landowners to obtain a temporary easement for use during the period of construction.

Each pipe storage site would occupy approximately 30 to 40 acres and would typically be located close to railroad sidings. Pipe storage sites and contractor yards would be used on a temporary basis and would be reclaimed, as appropriate, upon completion of construction.

2.1.5.3 Fuel Transfer Stations

Fuel storage sites would be established at approved contractor yards and pipe storage sites. No other fuel stations would be constructed. Gasoline and diesel fuel would be transported daily by fuel trucks from the fuel transfer station to the construction area for equipment fueling. The total fuel storage capacity would vary from yard to yard, depending on daily fuel requirements. Typically, a 2- to 3-day supply of fuel would be maintained in storage, resulting in a maximum volume of approximately 30,000 gallons of fuel at each storage location. Each fuel storage system would consist of the following:

- Temporary, aboveground, 10,000- to 20,000-gallon, skid-mounted tanks and/or 9,500-gallon fuel trailers;
- Rigid steel piping;
- Valves and fittings;
- Dispensing pumps; and
- Secondary containment structures.

The fuel storage system would have a secondary containment structure capable of holding 110 percent of the volume of the fuel storage tanks or fuel trailers. The proposed Project SPCC Plan and the CMRP (see Appendix G) specify that secondary containment would be utilized for fuel storage facilities that are not monitored or attended on a full-time basis. Similar to automotive service stations, there would not be secondary containment facilities for fuel trucks that would be transferring fuel to/from the bulk storage tanks, as these would be attended during all fuel transfer operations. As stated in the SPCC, adequate spill cleanup materials and equipment would be available onsite.

Before receiving or off-loading fuel, all trucks and equipment would be grounded to eliminate static electricity potential. The distributor would connect a petroleum-rated hose from the

delivery tanker to the fill line at the storage facility. The connection between the delivery tanker and the fill line would consist of a cam-loc connection followed by a block valve, rigid steel piping, tank block valve(s), and check valve(s) just upstream of the connection to the tank. Off-loading of fuel would be accomplished by a transfer pump powered by the delivery vehicles. The transfer pump would be a dispensing pump with petroleum-rated hoses with automatic shut-off nozzles. There would be no use of Stage II vapor recovery nozzles for fuel transfer on the proposed Project. The Stage II requirements contained in the 1990 Clean Air Act Amendments pertain only to ozone nonattainment areas. The proposed Project area is not an ozone nonattainment area.[1]

The fuel transfer pump would have an emergency shut-off at the pump and a secondary emergency shut-off at least 100 feet away.

Vehicle maintenance would be performed at the contractor yards or at existing vehicle maintenance and repair shops. As specified in Keystone's CMRP Section 3.0, Spill Prevention and Containment, during vehicle maintenance at the contractor yards, mechanics will place absorbent materials or drip pans under the equipment to prevent petroleum, oil, or other lubricants from reaching the ground. In the event that small quantities of soil become contaminated, contractor personnel will recover and place the contaminated soil in 55-gallon drums. This material will ultimately be disposed in accordance with state and federal regulations. All waste from maintenance activities would be disposed of in accordance with all applicable regulations and permits.

2.1.5.4 Construction Camps

Some areas within Montana, South Dakota, and Nebraska do not have sufficient temporary housing in the vicinity of the proposed route for all construction personnel working in those areas. Temporary work camps would be constructed to meet the housing needs of the construction workforce in these remote locations. As shown in Figure 2.1.5-1, a total of eight temporary construction camps would be established It is currently anticipated that four construction camps would be needed in Montana (McCone, Valley [2], and Fallon counties), three camps would be required in South Dakota (Tripp, Harding, and Meade counties), and one camp would be required in Nebraska (Holt county) (see Appendix H, 2012 Biological Assessment).

The number and size of camps would be determined based on the time available to complete construction and to meet Keystone's commercial commitments. All construction camps would be permitted, constructed, and operated consistent with applicable county, state, and federal regulations. The relevant regulations that would have to be complied with and the permits required for the construction camps are presented in Table 2.1-11.

[1] See http://www.epa.gov/ttn/atw/gasdist/technica.pdf.

Table 2.1-11 Construction Camp Permits and Regulations

State	Permit or Approval	Agency[b]	Submitted by
Montana	Water Main Certified Checklist	MDEQ	Keystone
	Sewer Main Certified Checklist	MDEQ	Keystone
	NOI and SWPPP	MDEQ	Keystone
	Building Permits	MBCB	Camp Contractor
	Driveway Approach Permit	MDT	Camp Contractor
	Work Camp Establishment Plan Review	DPHHS	Camp Contractor
South Dakota	Application for Permit to Discharge Wastewater	DENR	Keystone
	Notice of Intent	DENR	Keystone
	SWPPP	DENR	Keystone
	Temporary Permit to Use Public Waters	DENR	Keystone
	Food License Application	DOH	Camp Contractor
	Application for Highway Access Permit	SD DOT	Keystone
Nebraska	Public Water Supply & Distribution System[a]	NDEQ	Keystone
	Wastewater Collection & Treatment System[a]	NDEQ	Keystone
	NOI and SWPPP	NDEQ	Keystone
	Food License Application	NDHHS	Camp Contractor
	Building Permits	Local	Camp Contractor
	State Fire Marshal	NE SFM	Camp Contractor

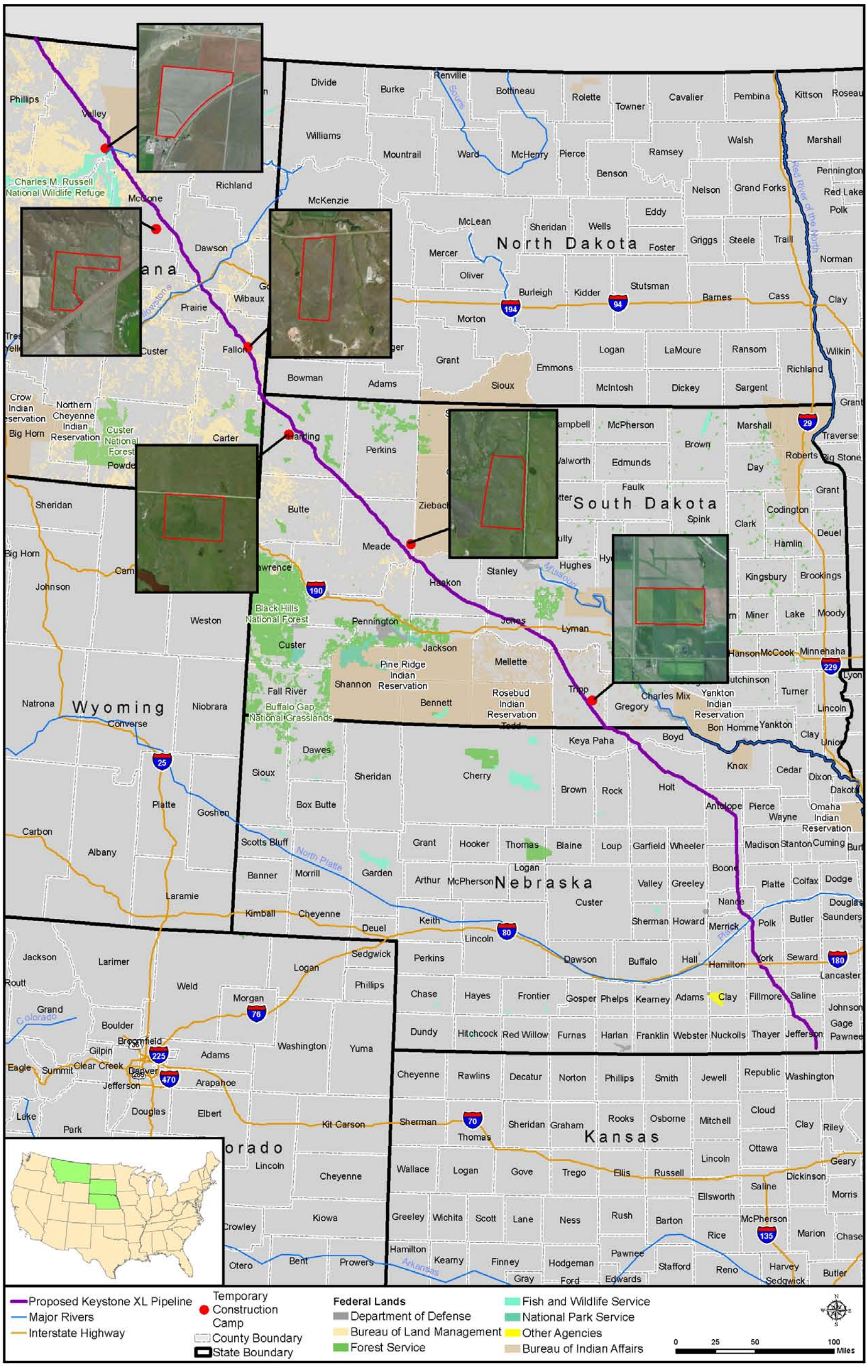
Source: exp Energy Services, Inc. 2012a.

[a] Submittal for approval requires the submission of a design report, plans, and specifications certified by a professional engineer.
[b] MDEQ = Montana Department of Environmental Quality, MBCB = Montana Building Code Bureau; MDT = Montana Department of Transportation, DPHHS = Department of Public Health and Human Services; SD DOT = South Dakota Department of Transportation; NDEQ = Nebraska Department of Environmental Quality; NDHHS = Nebraska Department of Health and Human Services; NE SFM = Nebraska State Fire Marshal; SDDENR = South Dakota Department of Environment and Natural Resources; DOH = Department of Health.

Design of Camps

Each construction camp site would be established on an approximately 80-acre site (the sites could range from 50 acres up to 100 acres with the inclusion of a contractor yard). Of that area, 30 acres would be used as a contractor yard, and approximately 50 acres would be used for housing and administration facilities. The camps would be constructed using modular units and would provide the required infrastructure and systems necessary for complete food service, housing, and personal needs, including a convenience store, recreational and fitness facilities, entertainment rooms and facilities, telecommunications/media rooms, kitchen/dining facilities, laundry facilities, and security units. Each camp would also have a medical infirmary for first aid needs and to provide routine minor medical services for the workers and staff. The contractor managing the camps would be responsible to comply with federal, state, and local laws on all waste disposal. There would also be dedicated medical transport vehicles for both the camp sites and for the construction ROW.

The camps' housing facilities would consist of modular, dormitory-like units that house roughly 28 occupants per unit. The units would have heating and air conditioning systems. The camps would be set up with the housing areas clustered together, with both shared and private wash rooms.



Source: exp Energy Services, Inc. 2012b.

Figure 2.1.5-1 Proposed Temporary Construction Camp

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Each camp would contain 600 beds and 300 recreational vehicle spots. Keystone conservatively intends to permit each camp for 1,000 residents to allow for those instances where there may be more than 1 person in a recreational vehicle. Potable water would be provided by drilling a well where feasible and allowed. If Keystone cannot get a permit from the state to install a water well, water would be hauled to the camp from the nearest permitted municipal supply, as discussed below.

If an adequate supply cannot be obtained from a well, water would be obtained from municipal sources or trucked to each camp. Siting of the camps near existing municipal water sources would be a key consideration in locations currently experiencing water restrictions or drought conditions. A self-contained wastewater treatment facility would be included in each camp except where it is practicable to use a licensed and permitted publically owned treatment works. Wastewater treated on site would undergo primary, secondary, and tertiary treatment consisting of solids removal, bioreactor treatment, membrane filtration, and ultraviolet exposure. Final effluent discharge would be consistent with all applicable regulatory requirements. If a publically owned treatment works is used, Keystone would either pipe or truck wastewater to the treatment facility.

Electricity for the camps would either be generated on-site through diesel-fired generators, or would be provided by local utilities from an interconnection to their distribution system. Keystone would contract with a camp supplier that would provide security 24 hours per day, 7 days per week at each camp. Keystone would work with the supplier to ensure that as many local employees are hired as possible to staff the camps.

Use of Camps

The camps are planned to service the needs of the proposed Project workforce. As a result, the dormitories do not include facilities for families. Most of the workers would be transported to and from the ROW each day by buses. In addition, there would be individual crews and workers that, due to the nature of their work, would be transported to and from job sites by utility trucks or by welding rigs. There would also be support workers such as mechanics, parts and supply staff, and supervisory personnel that would drive to the ROW in separate vehicles.

Based on the current construction schedule, the camps would operate in standby mode during the winter (from December through March or April). Each camp would have sufficient staff to operate and secure the camp and associated systems during that time period.

Decommissioning of Camps

Decommissioning would be accomplished in two stages. First, all infrastructure systems would be removed and either hauled away for reuse, recycled, or disposed of in accordance with regulatory requirements. Each site would then be restored and reclaimed in accordance with permit requirements and the applicable procedures described in Keystone's CMRP (Appendix G).

2.1.6 Access Roads

2.1.6.1 Development of Access Roads

Existing public and private roads would be used to provide access to most of the construction ROW. Paved roads would not likely require improvement or maintenance prior to or during construction. However, the road infrastructure would be inspected prior to construction to ensure that the roads, bridges, and cattle guards would be able to withstand oversized vehicle use during construction. Gravel roads and dirt roads may require maintenance during the construction period due to high use. Road improvements such as blading and filling would generally be restricted to the existing road footprint; however, some roads may require widening in some areas.

To the extent Keystone is required to conduct maintenance of any county roads, it would be done pursuant to an agreement with the applicable county. In the event that oversized or overweight loads would be needed to transport construction materials to the proposed Project work sites, Keystone would submit required permit applications to the appropriate state regulatory agencies.

Approximately 191 temporary access roads would be needed to provide adequate access to the construction sites. Private roads and any new temporary access roads would be used and maintained only with permission of the landowner or the appropriate land management agency. There are currently 48 access roads (private roads) along the Nebraska portion of the proposed route, but additional access roads may be needed. Keystone would also construct short, permanent, access roads from public roads to the pump stations, delivery facilities, and IMLVs. Approximately 21 permanent access roads would be needed in Montana and 17 permanent access roads in South Dakota. The number in Nebraska is still to be determined.

The final locations of new, permanent, access roads would be determined prior to construction. At a minimum, construction of new permanent access roads would require completion of cultural resources and biological surveys and consultations and approvals of the appropriate State Historic Preservation Office and U.S. Fish and Wildlife Service office. Keystone would comply with all federal, state, and local requirements prior to construction. Maintenance of newly created access roads would be the responsibility of Keystone as described below.

The acreages of access roads are included in the listing of lands affected in Table 2.1-6. Access road temporary and permanent disturbance estimates are based on the 30-foot roadway width required to accommodate oversized vehicles. In developing the acreages of disturbance, all non-public roads were conservatively estimated to require upgrades and maintenance during construction.

2.1.6.2 Roadway Maintenance, Repair, and Safety

Keystone would work with state and local road officials, the pipeline construction contractor, and a third-party road consultant to identify routes to be used for moving materials and equipment between storage and work yards to the pipeline, valve, and pump station construction sites. When these routes are mutually agreed upon, the road consultant would document the existing conditions of roads, including a video record. When construction is completed, the same parties would review the road conditions and Keystone would restore the roads to their preconstruction condition or better. Keystone would pay for this restoration.

Keystone would also perform a preliminary evaluation to determine the design-rated capacity of bridges anticipated to be used during construction and would inspect all bridges it intends to use prior to construction and confirm that the capacity of the bridges is adequate for the anticipated weights. An alternate route would be used where the bridges are not adequate to handle the maximum weight. Keystone would also inspect cattle guard crossings prior to their use. If they are determined to be inadequate to handle anticipated construction traffic, Keystone may place mats on crossings, establish an alternate crossing, enhance existing structures, or install new infrastructure with the landowner's approval, dependent upon specific conditions. Keystone would pay for all such actions.

During construction, Keystone and the pipeline contractor would maintain roads used for construction in a condition that is safe for both the public and workforce. Local road officials would be actively engaged in the routine assessment of road conditions.

Keystone would follow all federal, state, and local safety plans and signage as set forth in the various applicable Manuals of Uniform Traffic Control issued by federal, state, or local agencies for streets and highways along the proposed route. This would include compliance with all state and local permits pertaining to road and crossing infrastructure usage.

Keystone would require that each construction contractor submit a road-use plan prior to mobilization, coordinate with the appropriate state and county representatives to develop a mutually acceptable plan, and obtain all necessary road use permits. The road-use plans would identify potential scenarios that may occur during construction based on surrounding land use, known recreational activities, and seasonal influences (such as farming), and would establish measures to reduce or avoid effects to local communities. Keystone would also have inspection personnel monitor road-use activities to ensure that the construction contractors comply with the road-use plans and stipulations of the road.

Some counties in Montana stipulate that a private individual conducting maintenance of a county road becomes liable for the safety of traffic on the road. Where this is required, Keystone has stated it would be done pursuant to an agreement with the applicable county, and such agreements would address potential liability, including appropriate indemnity and insurance provisions. Keystone has the necessary insurance coverage to address such potential liability.

2.1.7 Pipeline System Design and Construction Procedures

Public concern has been expressed about the safety of the proposed Project, the use of industry standards in the design of the proposed Project, and the inspection and monitoring procedures that would be conducted. Prior to construction in Nebraska, Keystone would select, subject to NDEQ approval, and pay for, a public liaison officer to facilitate the exchange of information between Keystone and landowners, local communities, and residents. The purpose of the public liaison officer would be to respond to questions or concerns and to resolve promptly any complaints or problems that may develop as a result of construction. The public liaison officer would report to NDEQ or as otherwise directed by NDEQ. Additionally, South Dakota and Montana have laid out specific requirements for this role under their regulatory processes (South Dakota Public Utilities Commission Permit and the Montana Major Facility Siting Act Certificate, respectively).

The U.S. Department of Transportation's (USDOT) PHMSA is responsible for protecting the American public and the environment by ensuring the safe and secure movement of hazardous

materials to industry and consumers by all transportation modes, including the nation's pipelines. Through PHMSA, USDOT develops and enforces regulations for the safe, reliable, and environmentally sound operation of the nation's 2.3-million-mile pipeline transportation system and the nearly 1 million daily shipments of hazardous materials by land, sea, and air. Within PHMSA, the Office of Pipeline Safety has the safety authority for the nation's natural gas and hazardous liquid pipelines. The proposed Project is included in the latter category.

Keystone would be required to construct, operate, maintain, inspect, and monitor the proposed Project consistent with the PHMSA requirements presented in 49 CFR 195 (Transportation of Hazardous Liquids by Pipeline), as well as relevant industry standards, and applicable state standards. These regulations specify pipeline material and qualification standards, minimum design requirements, and required measures to protect the pipeline from internal, external, and atmospheric corrosion. The regulations are designed to prevent crude oil pipeline accidents and to ensure adequate protection for the public.

Pipelines that carry gasoline, diesel fuel, crude oil, or other hazardous liquids must implement additional safety measures if they cross a particularly sensitive area such as the source for a municipal drinking water supply. Keystone would comply with a set of 57 Special Conditions developed by PHMSA for the proposed Project (see Appendix B, PHMSA 57 Special Conditions). The Department, in consultation with PHMSA, has determined that incorporation of those conditions would result in a proposed Project that would have an improved degree of safety relative to typically constructed domestic oil pipelines and a degree of safety along the entire length of the pipeline system similar to that which is required in high consequence areas (HCAs) as defined in 49 CFR 195.450. These Special Conditions cover four general categories of project activities:

- Material requirements;
- Construction requirements;
- Operations and maintenance; and
- Reporting, records retention, and senior-level certification requirements.

The regulations are designed to help prevent crude oil pipeline accidents and to ensure adequate protection for the public. Section 2.1.7.1, Pipeline Design, presents the major pipeline design considerations of the proposed Project. Nearly all petroleum pipelines in the United States are buried, and Keystone has also proposed to bury the proposed Project pipeline. In addition, the Special Conditions provide more stringent requirements for many of these design factors. In comparison to an aboveground pipeline, burying a pipeline reduces the potential for pipeline damage due to vandalism, sabotage, and the effects of other outside forces, such as vehicle collisions.

Keystone prepared a draft CMRP that is included in Appendix G. That plan describes the construction methods and environmental protection measures that Keystone committed to in order to reduce the potential construction impacts of the proposed Project. The CMRP includes specific techniques or mitigation measures to address sensitive areas such as highly erodible soils, shallow groundwater, and other conditions. If the proposed Project is issued a Presidential Permit, the CMRP would be updated after the Record of Decision is issued to reflect any additional conditions included in the Record of Decision and in other permits issued to Keystone, and to reflect regional construction considerations.

Prior to pipeline construction, Keystone would prepare a Spill Prevention, Control, and Countermeasure Plan to avoid or minimize the potential for harmful spills and leaks during construction. A draft version of the Spill Prevention, Control, and Countermeasure Plan submitted by Keystone is included in Appendix I.

In addition, Keystone would submit a Pipeline Spill Response Plan (PSRP) to PHMSA prior to the initiation of proposed Project operations in accordance with the requirements of 49 CFR 194. The PSRP would describe how spills would be responded to in the event of a leak from the proposed Project resulting from any cause as well as the maximum spill scenario and the procedures that would be in place to deal with the maximum spill. As required by 49 CFR 195.40, Keystone would also prepare and follow a manual of written procedures for conducting normal operations and maintenance activities and handling abnormal operations and emergencies that would include Keystone's Emergency Response Plan (ERP). The PSRP and the ERP are addressed in Section 4.13, Potential Releases. The remainder of this section provides information on the following topics:

- Pipeline Design (Section 2.1.7.1); and
- Pipeline Construction Procedures (Section 2.1.7.2).

Special Pipeline Construction Procedures are provided in Section 2.1.8; Section 2.1.9 provides information on Waterbody Crossings.

2.1.7.1 Pipeline Design

All pipe used for the proposed Project would be required to be in compliance with the pipe design requirements of 49 CFR 195, Subpart C (Design Requirements) and 49 CFR 195.106 (Internal Design Pressure), and the PHMSA 57 Special Conditions. The pipeline would be constructed of high-strength, X70 steel pipe that would be mill-inspected by an authorized owner's inspector and mill-tested to American Petroleum Institute (API) 5L (API 5L[2]) specification requirements. If shipped by rail, the shipment would be made in accordance with the API Recommended Practice 5 Ll specification latest edition; if shipped by barge or marine transport, the shipment would be in accordance with API Recommended Practice 5LW. Additional details on pipeline safety and project design are presented in the following sections and in Section 4.13, Potential Releases.

[2]The API 5L test standard is used to determine the fracture ductility of metal line pipe. Specimens are cut from sections of pipe, soaked at a prescribed temperature, and tested within 10 seconds.

The design parameters for steel pipe would be determined in accordance with the following equation (see 49 CFR 195.106—Internal Design Pressure):

P=(2*S*t/D)*E*F

where:

P=Internal design pressure in psi (kPa[3]) gage

S=Yield strength in pounds per square inch (kPa)

D=Nominal outside diameter of the pipe in inches

t=Nominal wall thickness of the pipe in inches

F=Design factor

E=Seam joint factor

The design factor (F) would be determined as a result of conditions or a combination of conditions such as crossings, fabrications, station piping, and special areas. The design factor of 0.72 would be used for the main line in all areas where normal installation methods and cross country conditions prevail with exceptions to areas as stipulated in the PHMSA Special Condition 14 such as pump station and IMLV facilities. A special permit would be required from PHMSA if the pipeline were to operate using a higher design factor. In this situation, PHMSA permit conditions would provide an equivalent or better level of safety. Line pipe for the proposed Project would be double submerged arc welded in accordance with API 5L Steel Pipe, 44th Edition (TC 2012). Key design parameters applicable to the proposed Project pipeline are listed in Table 2.1-12.

Table 2.1-12 Pipe Design Parameters and Specification

Pipe Design Parameters	Specification
Material code	API 5L-PSL2-44th Edition
Material grade thousand pounds of pressure per square inch (psi) (yield strength)[a]	Grade X70
Maximum pump station discharge	1,308 pounds per square inch gauge (psig)
Maximum Operating Pressure	1,308psig; 1,600 psig[a]
Minimum hydrostatic test pressure	In conformance with Special Conditions 8 and 22, the pipe must be subjected to a mill hydrostatic test pressure of 95% SMYS[b] or greater for 10 seconds and the pre-in service hydrostatic test must be to a pressure producing a hoop stress of a minimum 100% SMYS for mainline pipe and 1.39 times maximum operating pressure for pump stations for 8 continuous hours. The hydrostatic test results from each test must be submitted in electronic format to the applicable PHMSA Director(s) in PHMSA Central.
Joint length (feet)	Nominal 80-foot (double-joint)
Field production welding processes	Mechanized—gas metal; arc welding; manual-shielded metal arc welding.
Pipeline design code	49 CFR Part 195
Outside diameter	36 inches
Line pipe wall thickness ()	0.72 design factor as per 49 CFR 195.106

[3]KPa is a common multiple unit of the Pascal (1 kPa ≡ 1000 Pa).

Pipe Design Parameters	Specification
Standard wall thickness – mainline	0.465 inch
Heavy wall thickness—HCAs including, high population areas, other populated areas, unusually sensitive areas, including drinking water and ecologically sensitive areas, mainline valve and pump station sites.	0.515 inch
Heavy wall thickness—directly downstream of pump stations at lower elevations as determined by steady state and transient hydraulic analysis[a]	0.572 inch
Heavy wall thickness—uncased road and cased railway crossings	0.618 inch
Heavy wall thickness—uncased railway crossings, HDDs[a]	0.748 inch

Source: TC 2012.

[a] The design of the proposed Project pipeline system is based on a maximum 1,308 pounds per square inch gauge (psig) discharge pressure at each pump station. The pump station discharge pressure would be a maximum of 1,308 psig. There would be situations where, due to elevation changes, the hydraulic head created would result in a maximum operating pressure of up to and including 1,600 psig. Suction pressure at the pump stations is generally on the order of 200 psig.
[b] SMYS = specified minimum yield strength.

Keystone has stated that approximately 95 percent of the pipe for the U.S. portion of the proposed Project would be purchased from North American pipe manufacturing facilities and that regardless of the country of origin, it would purchase pipe only from qualified pipe suppliers and trading houses. Qualification includes comprehensive evaluations of manufacturing facilities, extensive technical discussions with the lead quality control and metallurgy personnel, and a clear demonstration that the mills can meet the requirements to produce and test pipe in accordance with Keystone's standards and specifications[4].

To protect against corrosion, an external coating (fusion-bonded epoxy [FBE]) would be applied to the pipeline and all buried facilities, and cathodic protection (CP) would be applied to the pipeline by impressed current. These measures would be provided in compliance with 49 CFR 195, Subpart H (Corrosion Control) and the requirements of 14 of the PHMSA 57 Special Conditions (see Appendix B). CP is a technique used to control the corrosion of a metal surface. The simplest method to apply CP is by connecting the metal to be protected with a piece of another more easily corroded "sacrificial metal" to act as the anode of the electrochemical cell. The sacrificial metal then corrodes instead of the protected metal. CP systems are used to protect a wide range of metallic structures in various environments, from fuel pipelines to home water heaters. In the usual application, a galvanic anode (a piece of a more electrochemically "active" metal) is attached to the vulnerable metal surface where it is exposed to the corrosive liquid. Galvanic anodes are designed and selected to have a more "active" voltage (more negative electrochemical potential) than the metal of the target structure (typically steel).

Pipelines are routinely protected by a coating supplemented with CP. A CP system for a pipeline would consist of a direct current (DC) power source, which is often an alternating current (AC)

[4]Keystone would use TransCanada Pipelines' pipe specifications for the proposed Project where those specifications exceed federal regulations and the PHMSA Special Conditions.

powered rectifier and an anode, or array of anodes, buried in the ground (the anode groundbed). A rectifier is an electrical device that converts AC, which periodically reverses direction, to DC, which flows in only one direction. The process is known as rectification. Rectifiers are often found serving as components of DC power supplies and high-voltage DC power transmission systems. The primary impressed current CP systems would be rectifiers coupled to semi-deep vertical anode beds at each pump station, as well as rectifiers coupled to deep-well anode beds at selected IMLV sites. During operation, the CP system would be monitored and remediation performed to prolong the anode bed and systems. The semi-deep anode beds would be 12-inch-diameter vertical holes spaced 15 feet apart with a bottom hole depth of approximately 45 feet. The deep-well anode bed would be a single 12-inch-diameter vertical hole with a bottom hole depth of approximately 300 feet.

2.1.7.2 Pipeline Construction Procedures

Keystone is a limited partnership, organized under the laws of the State of Delaware. Keystone is the entity that would be responsible for construction of the pipeline if approved. To construct, operate, and maintain the proposed Project, Keystone would need the rights to easements along the entire proposed route. Keystone is responsible for acquiring easement rights from landowners along the route in each state. Easement agreements would list the conditions that both the landowner and Keystone agree to, including financial compensation to the landowners in return for granting easements. Compensation would also be made for loss of use during construction, crop loss, loss of non-renewable or other resources, and restoration of any unavoidable damage to personal property during construction. The Department expects Keystone to negotiate fairly, honestly, and respectfully with landowners when they negotiate an easement. However, those negotiations and final agreements are private business concerns between the landowners and Keystone.

If Keystone obtains all necessary permits and approvals and an easement negotiation cannot be completed in a manner suitable to both parties, Keystone may attempt to use state eminent domain laws to obtain easements needed for pipeline construction, maintenance, and operation. State laws dictate under what circumstances eminent domain may be used and define the eminent domain process within the state. The level of compensation would be determined according to applicable state law. State or local trespass and access laws are applicable along the entire route and therefore along each easement negotiated by Keystone and the landowner or obtained by Keystone through the eminent domain process. The Department has no legal authority over negotiating easement agreements and has no legal status to enforce the conditions of an easement agreement. A landowner who considers Keystone to be out of compliance with an easement agreement would need to discuss the matter with Keystone or local law enforcement officials, or initiate legal consultation.

Once engineering surveys of the ROW centerline and additional TWAs have been finalized, and the acquisition of ROW easements and any necessary acquisitions of property-in-fee have been completed, construction would begin. As proposed, the pipeline would be constructed in 10 spreads (or sequences) of approximately 45 to 120 miles long (see Table 2.1-13). Final spread configurations and the final construction schedule may result in the use of additional spreads or fewer shorter or longer spreads. Figure 2.1.7-1 depicts the approximate location of each spread.

Table 2.1-13 Pipeline Construction Spreads Associated with the Proposed Project

State	Miles by State	County	Spread Number	Location (Mile Post)	Approximate Length of Construction Spread (Miles)
Montana	285.65	Phillips, Valley	Spread 1	0-90	90
		Valley, McCone	Spread 2	90-151.48	61.48
		McCone, Dawson	Spread 3	151.48-197.68	46.2
		Dawson, Prairie, Fallon	Spread 4		
South Dakota	315.29	Harding		197.68-288.63	90.95
		Harding, Butte, Perkins, Meade	Spread 5	288.63-410.75	122.12
		Meade, Pennington	Spread 6		
		Haakon, Jones		410.75-500.44	89.69
		Jones, Lyman, Tripp	Spread 7	500.44-598.86	98.42
		Tripp, Gregory	Spread 8		
Nebraska	274.44	Keya Paha, Boyd, Holt, Antelope		598.86-691.78	92.92
		Antelope, Boone, Nance, Merrick, Polk	Spread 9	691.78-775.67	83.89
		Polk, York, Fillmore, Saline, Jefferson	Spread 10	775.67-875.38	99.71

Source: exp Energy Services, Inc. 2012a.

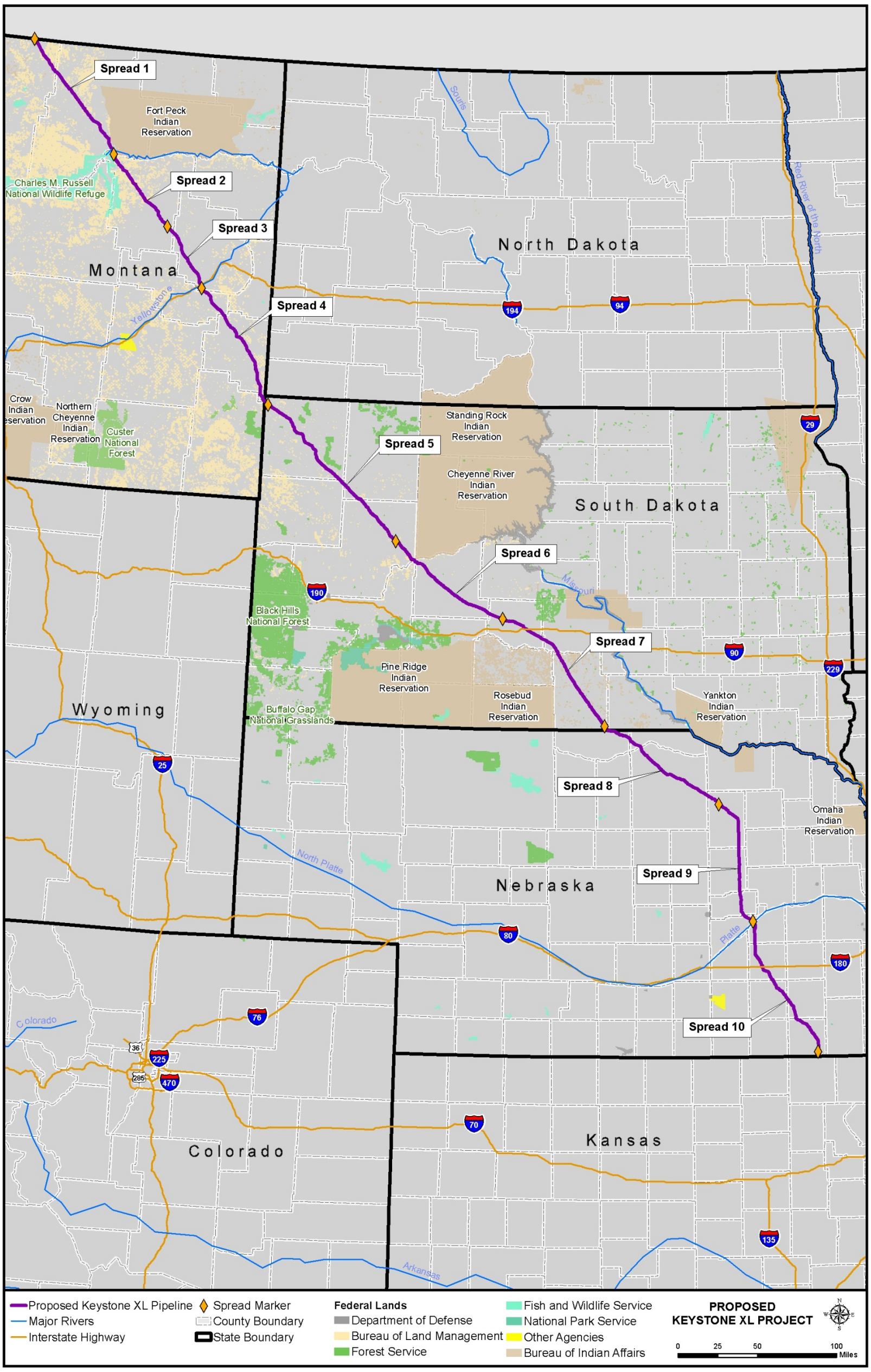
Pipeline Construction Sequence

Figure 2.1.7-2 shows a typical pipeline construction sequence. The design and construction of the pipeline would incorporate each of these steps. Additionally, the proposed Project would include additional construction for access roads, construction work camps, and temporary workspace facilities. All aspects of proposed Project construction are addressed in the remaining sections of this section.

Standard pipeline construction is composed of specific activities, including survey and staking of the ROW, clearing and grading, pipe stringing, bending, trenching, welding, lowering in, backfilling, hydrostatic testing, and cleanup. In addition to standard pipeline construction methods, special construction techniques would be used where warranted by site-specific conditions. These special techniques would be used when constructing across rugged terrain, sensitive areas, waterbodies, wetlands, paved roads, highways, and railroads (see Section 2.1.8, Special Pipeline Construction Procedures).

Construction would be planned to continue into the early winter months for as long as possible without the use of special winter construction techniques. However, as stated in the CMRP (Appendix G), if the proposed Project is authorized and winter construction is necessary to meet construction deadlines, Keystone would consult with the relevant federal, state, and local regulatory agencies to determine what changes may be necessary in permits issued, what additional permits may be required, and to identify the procedures that would have to be incorporated into construction to avoid or minimize environmental impacts. Winter construction plans would be finalized based on those consultations and permit requirements. Normal construction activities would be conducted during daylight hours, with the following exceptions:

- Completion of critical tie-ins on the ROW may occur after daylight hours. Completion requires tie-in welds, non-destructive testing, and sufficient backfill to stabilize the ditch.
- HDD operations may be conducted after daylight hours, if determined by the contractor to be necessary to complete a certain location. In some cases, that work may be required continuously until the work is completed; this may last 24 continuous hours or longer. Such operations may include drilling and pull-back operation, depending upon the site and weather conditions, permit requirements, schedule, crew availability, and other factors. Prior to construction, the presence of residences in proximity to the proposed HDD activities would be determined. HDD activities would be conducted consistent with any applicable local noise ordinances.
- Hydrostatic testing operations may be conducted after daylight hours if determined by the contractor to be necessary to complete a certain location. In some cases, that work may be required continuously until the work is completed; this activity may take place for 24 continuous hours or longer.
- While not anticipated in typical operations, certain work may be required after the end of daylight hours due to weather conditions, for safety, or for other proposed Project requirements.



Source: exp Energy Services, Inc. 2012b.

Figure 2.1.7-1 Construction Spreads

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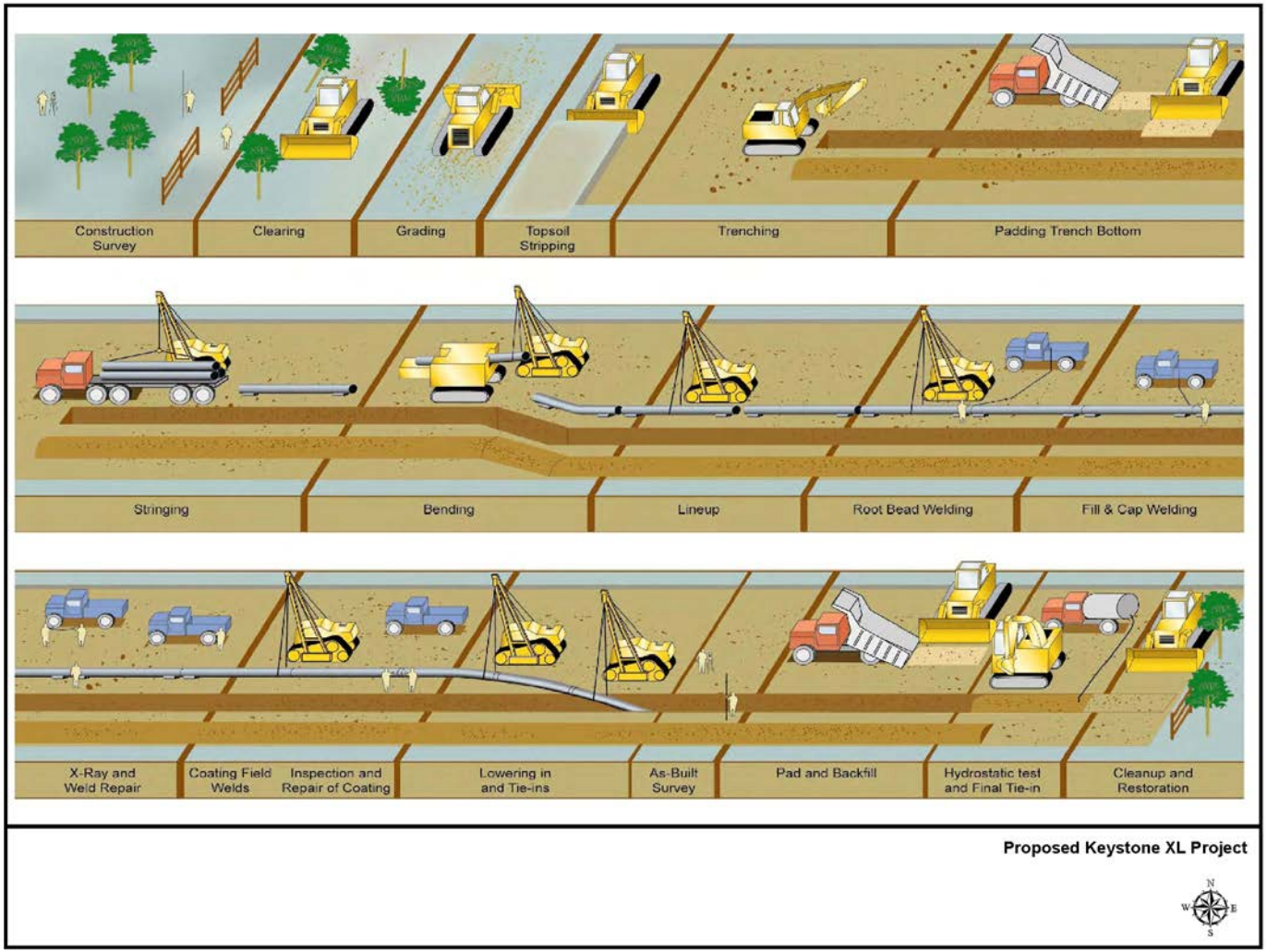


Source: exp Energy Services, Inc. 2012a.

Figure 2.1.7-2 Typical Pipeline Construction Sequence

A list of typical equipment to be used during construction is presented in Table 2.1-14. Actual equipment used would depend on the construction activity and specific equipment owned or leased by the construction contractors selected.

Table 2.1-14 Minimum Equipment Required for Selected Construction Activities

Activity	Minimum Equipment
Clearing and grading	6 D8 dozers 1 - 330 trackhoe (thumb and hoe pack) 6 - 345 trackhoes 2 D8 with ripper attachment 1 - 140 motor grader
Trenching	6 - 345 trackhoes 1 - 345 trackhoe with hammer 4 ditching machines
Stringing, bending, and welding	2 - 345 trackhoes vacuum fitted (1 at pipe yard, 1 at ROW) 1 - D7 tow cat 15 string trucks 2 bending machines 10 - 572 side booms 10 - 583 side booms 6 - automatic welding machines with end-facing machine 8 ultrasonic testing units 1 NDE unit 2 heat rings 4 coating rings 3 sleds with generators
Lowering-in and backfilling	3 - 345 trackhoes (1 equipped with long neck) 5 - 583 side booms 2 padding machines 3 D8 dozers
Tie-ins to the mainline (six tie-in crews per spread; equipment listed if for each crew)	4 welding rigs 7 - 572 side booms 2 ultrasonic testing units 2 heat rings 2 coating rings 1 sled with generators 2 - 345 trackhoes (1 equipped with shaker bucket) 2 - 583 side booms 1 D8 dozer
Cleanup and restoration	6 D8 dozers 3 - 345 backhoes 2 tractors with mulcher spreaders (seed and reclamation)
Equipment deployed for each spread	100 pickup trucks 2 water trucks 2 fuel trucks 7 equipment low-boys 7 flatbed trucks 5 - 2-ton boom trucks

Surveying and Staking

Before construction begins, the construction ROW boundaries and any additional TWAs would be marked to identify the limits of the approved work area. The locations of approved access roads and existing utility lines would be flagged. Wetland boundaries and other environmentally sensitive areas would be marked or fenced for protection. A survey crew would stake the centerline of the trench and any buried utilities along the ROW.

Some landowner fences would be crossed or paralleled by the construction ROW, requiring fence cutting and modifications (see Section 2.1.8.7, Fences and Grazing, for actions to restore the fences after construction is complete). Each fence would be braced and secured before cutting to prevent the fence from weakening or slacking. Openings created in the fences would be temporarily closed when construction crews leave the area to contain livestock. In addition, gaps through natural livestock barriers would be fenced according to landowners or land managers requirements. If livestock are present, temporary gates and fences would be installed.

Clearing, Grading, and Trenching

Prior to or immediately after vegetation removal along slopes leading to wetlands and riparian areas, temporary erosion control measures such as silt fences or straw bales would be installed A fencing crew would install these erosion control silt fences and straw bales. The work area would be cleared of vegetation, including crops and obstacles such as trees, logs, brush, or rocks.

Grading would be performed where necessary to provide a reasonably level work surface or where required by landowners or land managers. Where the ground is relatively flat and does not require grading, rootstock would be left in the ground. More extensive grading would be required in steep slope areas to safely construct the pipeline. Where grading occurs and topsoil is present, topsoil would be removed from the entire area to be graded and stored separately from the subsoil.

A clearing crew would follow the fencing crew and would clear the work area of vegetation (including crops) and obstacles (e.g., trees, logs, brush, rocks). Standard agricultural implements would be used on agricultural lands and standard machinery used in timber clearing would be used in forested lands. The amount of top soil stripping would be determined in consultation with the landowner (based on agricultural use) and the Natural Resources Conservation Service. Full ROW stripping for forested lands would be avoided where practicable. In areas of rocky soils or bedrock, tractor-mounted mechanical rippers or rock trenchers would fracture the rock prior to excavation.

In areas where topsoil segregation would be required, topsoil would be removed up to a maximum depth of 12 inches and segregated. In most areas where soil would be removed from only the trench, topsoil would be piled on the near side of the trench and subsoil on the far side of the trench. A “triple lift” method would be used in certain areas of saline/sodic soils with limited reclamation potential to minimize impacts to agricultural production. This method would involve stockpiling three different soil horizons, including the topsoil horizon. This separation of topsoil from subsoil would allow for proper restoration of the soil during the backfilling process. Where soil is removed from both the trench and the spoil side, topsoil would be stored on the near side of the construction ROW edge, and the subsoil on the spoil side of the trench. In addition, the spoil piles would be spaced to accommodate storm water runoff. Typical soil separation methods are illustrated in Appendix G, CMRP.

Trenching may be carried out before or after stringing, bending, and welding depending upon several factors such as soil characteristics, water table, presence of drain tiles, and weather conditions at the time of construction. Trench excavation would typically be to depths of between7 and 8 feet, with a trench width of approximately 4 to 5 feet. In most areas, there would be a minimum of 4feet of cover over the pipeline after backfilling. The depth of burial would be consistent with PHMSA Special Condition 19: the pipeline should be constructed with soil cover at a minimum depth of 48 inches in all areas, except in consolidated rock; the minimum depth required in consolidated rock areas is 36 inches.

In addition, the depth of burial at waterbodies, ditches, drainages, and other similar features would be 60 inches, except in rocky areas where the minimum burial depth would be 36 to 48 inches. Where major waterbodies are crossed using the HDD method, the depth from the streambed to the top of the pipe would be substantively greater than 60 inches. Depths of cover over the pipe along the proposed route in areas of normal excavation and in rocky excavation areas are listed in Table 2.1-15.

Table 2.1-15 Minimum Pipeline Cover

	Depth Below Ground Surface	
Location	**Normal Excavation**	**Rock Excavation**
Most areas	48	42
All waterbodies	60	42
Dry creeks, ditches, drains, washes, gullies, etc.	60	42
Drainage ditches at public roads and railroads	60	48

Special Condition 19 also requires that Keystone maintain the following depths of cover after construction is completed:

- A depth of cover of 48 inches in cultivated areas and a depth of 42 inches in all other areas.
- In cultivated areas where conditions prevent the maintenance of 48 inches of cover, additional protective measures must be used to alert the public and excavators to the presence of the pipeline. The additional measures include the following:
  - Placing warning tape and additional line-of-sight pipeline markers along the affected pipeline segment; and
  - In areas where threats from chisel plowing or other activities are threats to the pipeline, the top of the pipeline must be installed and maintained at least 1 foot below the deepest penetration above the pipeline, not to be less than 42 inches of cover.

Generally, the crews on each construction spread are synchronized with the welding crews for efficiency. The amount of open trench is minimized to the extent possible.

In rangeland areas used for grazing, construction activities potentially can hinder the movement of livestock if the livestock cannot be relocated temporarily by the owner. Construction activities may also hinder the movement of wildlife. To minimize the impact on livestock and wildlife movements during construction, Keystone would leave hard plugs (short lengths of unexcavated trench) or install soft plugs (areas where the trench is excavated and replaced with minimal

compaction) to allow livestock and wildlife to cross the trench safely. Soft plugs would be constructed with a ramp on each side to provide an avenue of escape for animals that may fall into the trench.

Pipe Stringing, Bending, and Welding

Prior to or following trenching, sections of externally coated pipe approximately 80 feet long (also referred to as "joints") would be transported by truck over public roads and along authorized private access roads to the ROW and placed or "strung" along the ROW. After the pipe sections are strung along the trench and before joints are welded together, individual sections of the pipe would be bent to conform to the contours of the trench by a track-mounted, hydraulic pipe-bending machine. For larger bend angles, fabricated bends may be used.

After the pipe sections are bent, the pipeline joints would be lined up and held in position until welding. The joints would be welded together to create long "strings" that would be placed on temporary supports. All welds would be inspected using non-destructive radiographic, ultrasonic, or other methods that provide an equivalent or better level of safety as those required in 49 CFR Part 195. All aspects of welding, including reporting, would be conducted consistent with the requirements of 49 CFR 195.228 and PHMSA Special Conditions 4, 5, 6, 12, 18, and 20 (Appendix B, PHMSA 57 Special Conditions). Welds that do not meet established specifications would be repaired or removed and replaced. Once the welds are approved, a protective epoxy coating would be applied to the welded joints to inhibit corrosion. The pipeline would then be electronically inspected or "jeeped" for faults or holidays in the epoxy coating and visually inspected for any faults, scratches, or other coating defects. Damage to the coating would be repaired before the pipeline is lowered into the trench.

Lowering In, Backfilling, and Hydrostatic Testing

Prior to lowering the pipe into the trench, the trench would be cleared of rocks and debris that might damage the pipe or the pipe coating. If water has entered the trench, dewatering may be required prior to installation. Discharge of water from dewatering would be accomplished in accordance with applicable discharge permits. On sloped terrain, trench breakers (e.g., stacked sand bags or foam) would be installed in the trench at specified intervals to prevent subsurface water movement along the pipeline.

In some cases sand or gravel padding material may be placed in the bottom of the trench to protect the pipeline from damage during installation. In no case would topsoil be used as a padding material. In areas of rocky soils or bedrock, the bottom of the trench would be padded with borrow material such as sand or gravel. Where rock occurs within the trench perimeter, abrasion resistant coatings or rock shields would be used to protect the pipe prior to installation.

The pipeline would be lowered into the trench and the trench would first be backfilled using the excavated subsoil material. In rocky areas, excavated rock would be used to backfill the trench to the top of the existing bedrock profile. After the initial backfilling, topsoil would be returned to its original position over the trench.

In addition to hydrostatic testing at the pipe mills, the pipeline would be cleaned and hydrostatically tested prior to putting the pipe into service and after backfilling and all construction work that could directly affect the pipe is complete. The testing would be conducted in pipeline sections approximately 30 to 50 miles long. Hydrostatic testing would provide

assurance that the system is capable of withstanding the maximum operating pressure and would be conducted in accordance with the regulatory requirements of 49 CFR Part 195, Subpart E (Pressure Testing) and the stipulations in PHMSA Special Conditions 5, 20, 22, and 23 (Appendix B, PHMSA 57 Special Conditions). The process would be conducted as follows:

- Isolate the pipe section being tested with test manifolds;
- Fill the section with water;
- Pressurize the section to a pressure that would produce a hoop stress of a minimum of 100 percent of the specified minimum yield strength for the mainline pipe and 1.39 times the maximum operating pressure for pump stations; and
- Maintain that pressure for a period of 8 hours. Fabricated assemblies may be tested prior to installation in the trench for a period of 4 hours.

Water for hydrostatic testing would generally be obtained from rivers, streams, irrigation wells, and municipal sources in close proximity to the pipeline and in accordance with federal, state, and local regulations. Keystone would use farm irrigation wells as permitted by the landowner and state.

Intakes would be screened to prevent entrainment of fish and intake and discharge locations would be determined with construction contractors. Generally the pipeline would be hydrostatically tested after backfilling and all construction work that would directly affect the pipe is complete. If leaks are found, they would be repaired and the section of pipe retested until specifications are met. There are no chemicals added to the test water. The water is generally the same quality as the source water since there are no additives to the water. Water used for the testing would then be returned to the source or transferred to another pipe segment for subsequent hydrostatic testing. After hydrostatic testing, the water would be discharged and tested in compliance with the National Pollutant Discharge Elimination System discharge permit requirements. The used hydrostatic test water would be discharged either to the source waterbody within the same water basin or to a suitable upland area near the test discharge. To reduce the velocity of the discharge to upland areas, energy dissipating devices would be employed. Energy dissipation devices that are consistent with best management practice protocols include:

- Splash Pup—A splash pup consists of a piece of large diameter pipe (usually over 20-inch outside diameter) of variable length with both ends partially blocked. The splash pup would be welded perpendicularly to the discharge pipe. As the discharge hits against the inside wall of the pup, the velocity would be rapidly reduced and the water allowed to flow out either end. A variation of the splash pup design, commonly called a diffuser, has capped ends and many holes punched in the pup to diffuse the energy.
- Splash Plate—The splash plate is a quarter section of 36-inch pipe welded to a flat plate and attached to the end of a 6-inch-diameter discharge pipe. The velocity would be reduced by directing the discharge stream into the air as it exits the pipe. This device would also be effective for most overland discharge.
- Plastic Liner—In areas where highly erodible soils exist or in any low-flow drainage channel, it is a common practice to use layers of construction fabric to line the receiving channel for a short distance. A small load of rocks may be used to keep the fabric in place during the

discharge. Additional methods, such as the use of plastic sheeting or other material to prevent scour would be used as necessary to prevent excessive sedimentation during dewatering.

- Straw Bale Dewatering Structure—Straw bale dewatering structures are designed to dissipate and remove sediment from the water being discharged. Straw bale structures could be used alone for on-land discharge of hydrostatic test water or in combination with other energy dissipating devices for high-volume discharges. Dewatering filter bags may be used as alternatives to straw bale dewatering structures.

Hydrostatic test water would not be discharged into state-designated exceptional value waters, waterbodies that provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, or local permitting agencies grant written permission. To avoid impacts from introduced species, no inter-basin transfers (discharge) of hydrostatic test water would occur without specific permitting approval to discharge into an alternative water basin. Discharge lines would be securely supported and tied down at the discharge end to prevent whipping during discharge. Hydrostatic testing is discussed further in the CMRP (Appendix G).

Pipe Geometry Inspection, Final Tie-ins, and Commissioning

After hydrostatic testing is complete, the pipeline would be dewatered and inspected using an electronic caliper (geometry) pig to check for dents or other deformations and where appropriate, pipe sections would be replaced in accordance with the requirements of 49 CFR 195 and the Special Conditions in Appendix B, PHMSA 57 Special Conditions. The final pipeline tie-ins would then be welded and inspected.

After the final tie-ins are completed and inspected, the pipeline would be cleaned and dewatered, and then commissioned through verification of proper installation and function of the pipeline and appurtenant systems, including control and communication equipment, based on the requirements of 49 CFR 195 and the relevant PHMSA Special Conditions. In the final step, the pipeline would be prepared for service by filling the line with crude oil.

Cleanup and Restoration

Cleanup would include removal of construction debris, final contouring, and installation of permanent erosion control features. The cleanup process would begin as soon as possible after backfilling, but the timing would be dependent on weather conditions. Preliminary cleanup would be completed within approximately 20 days after the completion of backfilling assuming appropriate weather conditions prevail (approximately 10 days in residential areas). Removed construction debris would be disposed in existing, permitted disposal facilities in accordance with relevant federal, state, and local regulations.

Reseeding of the ROW would occur as soon as possible after completion of cleanup to stabilize soil. Procedures would depend on weather and soil conditions and would follow recommended rates and seed mixes provided by the landowner, the land management agency, or the Natural Resources Conservation Service. Access to the permanent easement would be restricted using gates, boulders, or other barriers to minimize unauthorized access by all-terrain vehicles, if requested by the landowner. All existing fencing and grazing structures, such as fences, gates, irrigation ditches, cattle guards, and reservoirs would be repaired to preconstruction conditions or better upon completion of construction activities.

Keystone would also restrict access to the permanent easement using gates, boulders, or other barriers to minimize unauthorized access by all-terrain vehicles in wooded areas or other previously unfenced areas if requested by the landowner. Pipeline markers would be installed at road and railroad crossings and other locations (as required by 49 CFR 195) to show the location of the pipeline. Markers would identify the owner of the pipeline and convey emergency contact information. Special markers providing information and guidance to aerial patrol pilots also would be installed. Pipeline markers would be provided for identification of the pipeline location for safety purposes in accordance with the requirements of 49 CFR 195.410 (Line Markers) and PHMSA Special Condition 40 (see Appendix B, PHMSA 57 Special Conditions), including the following:

- Pipeline markers would be installed on both sides of all highways, roads, road ROWs, railroads, and waterbody crossings and in areas where the pipeline is buried less than 48 inches.
- Pipeline markers would be made from industrial strength materials to withstand abrasion from wind and damage from cattle.
- Pipeline markers would be installed at all fences.
- Pipeline markers would be installed along the ROW to provide line-of-sight marking of the pipeline, providing it is practical to do so and consistent with the type of land use, such that it does not hinder the use of the property by the landowner. Pipeline markers would be installed at all angle points, and at intermediate points, where practical, so that from any marker, the adjacent marker in either direction would be visible.
- Consideration would be given to installing additional markers, except where they would interfere with land use (e.g., farming).
- Aerial markers showing identifying numbers would be installed at approximately 5-mile intervals.
- At each MLV site and pump station, signs would be installed and maintained on the perimeter fence where the pipeline enters and exits the fenced area.

Markers would identify the owner of the pipeline and convey emergency contact information. Special markers providing information and guidance to aerial patrol pilots also would be installed. The markers would be maintained during the operating life of the proposed Project.

Post-construction Reclamation Monitoring and Response

The ROW would be inspected after the first growing season to determine the success of revegetation and noxious weed control. Eroded areas would be repaired and areas that were unsuccessfully re-established would be revegetated by Keystone or Keystone would compensate the landowner for reseeding. The CMRP (Appendix G) provides information on revegetation and weed control procedures that Keystone would incorporate into the proposed Project.

2.1.8 Special Pipeline Construction Procedures

Special construction techniques would be used when 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. These

special techniques are described below. Further discussion of impacts and mitigation measures for sensitive areas is provided in Chapter 4, Environmental Consequences.

2.1.8.1 Road, Highway, and Railroad Crossings

Construction across paved roads, highways, and railroads would be in accordance with the requirements of the appropriate road and railroad crossing permits and approvals. In general, all major paved roads, all primary gravel roads, all highways, and all railroads would be crossed by boring beneath the road or railroad, as shown in Figure 2.1.8-1. Boring would result in minimal or no disruption to traffic at road or railroad crossings. Each boring would take 1 to 2 days for most roads and railroads, and 10 days for long crossings such as interstates or 4-lane highways.

Initially, a pit would be excavated on each side of the feature; boring equipment would be placed in the pit and a hole would be bored under the road at least equal to the diameter of the pipe and a prefabricated pipe section would be pulled through the borehole. For long crossings, sections would be welded onto the pipe string before being pulled through the borehole.

If permitted by local regulators and landowners, smaller gravel roads and driveways would likely be crossed using an open-cut method that would typically take between 1 and 2 days to complete. This would require temporary road closures and establishment of detours for traffic. If no reasonable detour is feasible, at least one lane of traffic would be kept open in most cases. Keystone would post signs at these open-cut crossings and would implement traffic control plans to reduce traffic disturbance and protect public safety.

2.1.8.2 Pipeline, Utility, and Other Buried Feature Crossings

Keystone and its pipeline contractors would comply with USDOT regulations, utility agreements, and industry best management practices with respect to utility crossing and separation specifications. To the extent practicable, Keystone would avoid relocating existing electric transmission lines and would use existing distribution lines. Where line relocation cannot be avoided, Keystone would coordinate with the local public power district to temporarily or permanently relocate lines. One-call notification would be made for all utility crossings to identify utilities. Similarly, private landowners would be notified of planned construction activities so that buried features, such as irrigation systems and other waterlines, could be avoided or replaced. Prior to construction, each rancher with a stock watering or irrigation system or other waterlines would be asked to provide the location of any waterlines in the construction area. In the case of existing buried oil or gas pipelines, the owner of the facility would be asked to provide information on the locations of pipes in the construction area. Metallic pipelines would be physically located by a line locating crew prior to excavation.

Unless otherwise specified in a crossing agreement, the contractor would excavate to allow installation of the proposed Project pipeline across the existing pipeline or utility with a minimum clearance of 12 inches. The clearance distance would be filled with sandbags or suitable fill material to maintain the clearance. Backfill of the crossing would be compacted in lifts to ensure continuous support of the existing utility.

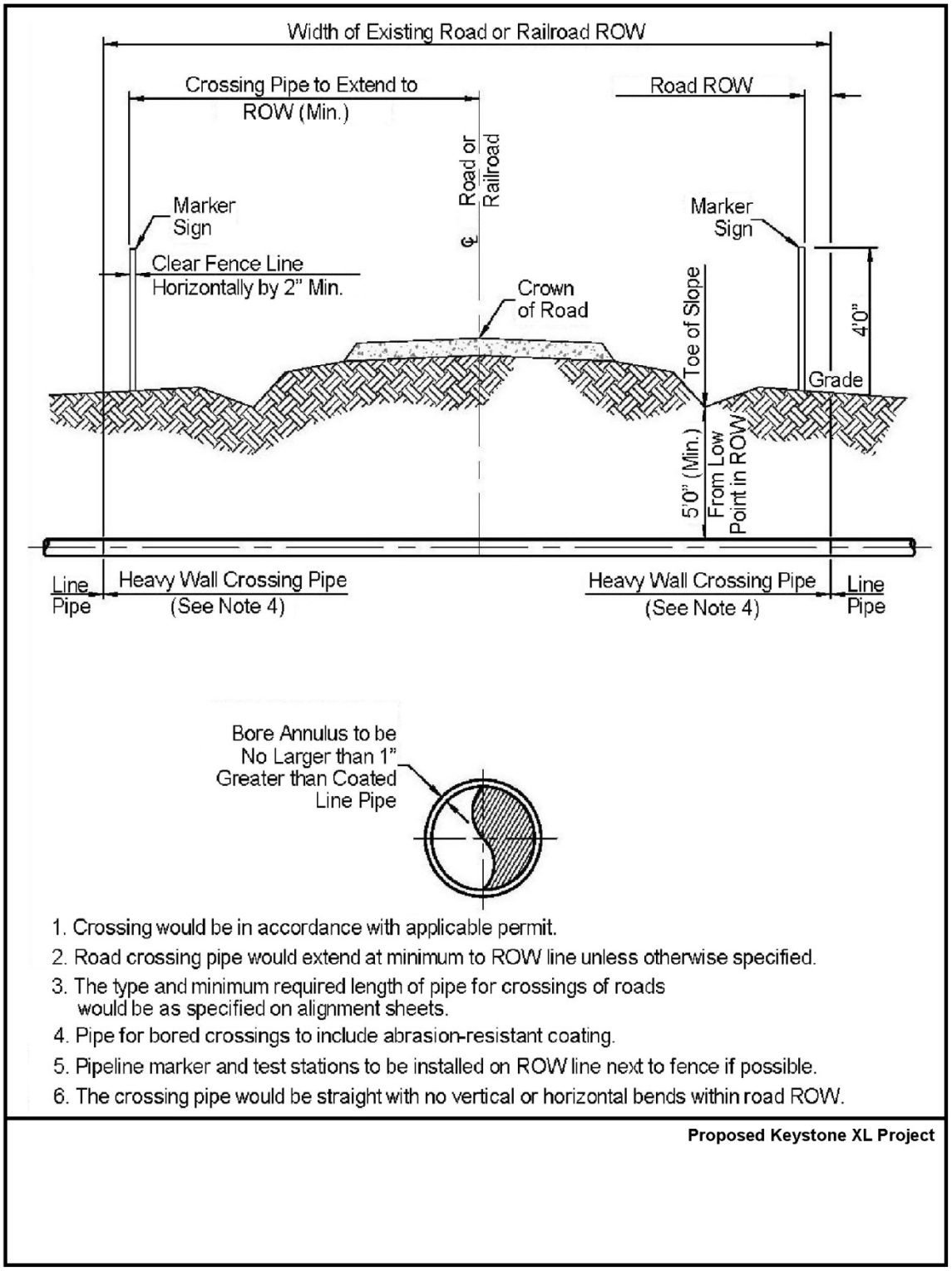


Figure 2.1.8-1 Uncased Road—Railroad Crossing Bore Detail

For some crossings, the owner of the utility or buried feature may require the facility to be excavated and exposed by their own employees prior to the Keystone contractor getting to the location. In those cases, Keystone would work with owners to complete work to the satisfaction of the owner. Where the owner of the utility does not require pre-excavation, generally, the pipeline contractor would locate and expose the utility before excavating the trench.

2.1.8.3 Steep Terrain

Steep slopes traversed by the proposed route would be graded to reduce slope angles, thus allowing safer operation of construction equipment and reducing the degree of pipe bending required. In areas where the pipeline route crosses side slopes, cut-and-fill grading may be employed to obtain a safe working terrace. Keystone would install the pipeline to maintain the required depth of cover of 48 inches in cultivated areas and 42 inches in all other areas, including on side slope cuts and perpendicular slope crossings, except in bedrock areas where the minimum depth would be 36 inches.

Prior to cut-and-fill grading on steep terrain, topsoil would be stripped from the ROW and stockpiled. If soil and slope conditions permit, soil from the high side of the ROW would be excavated and moved to the low side to create a safer and more level working surface. After pipeline installation, soil from the low side of the ROW would be returned to the high side and the contour of the slope would be restored to its pre-construction condition to the degree practicable.

Temporary sediment barriers, such as silt fences and straw bales, would be installed where appropriate to prevent erosion and siltation of wetlands, waterbodies, or other environmentally sensitive areas. During grading, temporary slope breakers consisting of mounded and compacted soil would be installed across the ROW. In the cleanup phase, permanent slope breakers would be installed where appropriate. Section 4.5 of the CMRP (Appendix G) presents additional information on the use of sediment barriers and slope breakers.

After regrading and installation of erosion control devices, seed would be applied to steep slopes and mulch consisting of hay or non-brittle straw would be placed on the ROW, or the ROW would be protected with erosion control geofabrics. MDEQ requires that geofabric mesh size be 2 inches or greater to avoid animal entanglement. Sediment barriers would be maintained across the ROW until permanent vegetation is established. Additional temporary workspaces may be required for storage of graded material and/or topsoil during construction.

2.1.8.4 Unstable Soils

Special construction techniques and environmental protection measures would be applied to areas with unstable soils and to areas with high potential for landslides, erosion, and mass wasting. Construction in these areas could require additional temporary workspace areas.

Topsoil piles would be protected from erosion through matting, mulching, watering, or tackifying (making slightly sticky by applying resin adhesives) to the extent practicable. Photodegradable matting would be placed on steep slopes or areas prone to extreme wind exposure, such as north- or west-facing slopes and ridge tops. Biodegradable pins would be used in place of metal staples to hold the matting in place.

Reseeding would be carried out using native seed mixes that are certified noxious weed-free, if possible. Land imprinting may be employed to create impressions in the soil to reduce erosion,

improve moisture retention, and create micro-sites for seed germination. Keystone would work with landowners to evaluate fencing the ROW from livestock, or alternatively, to provide compensation if a pasture needs to be rested until vegetation can become established.

2.1.8.5 Ripping

In areas where bedrock is within 84 inches (7 feet) of the surface and is expected to be dense or highly stratified, ripping could be required. Ripping would involve tearing up the rock with mechanical excavators. During ripping, Keystone would take extreme care to avoid damage to underground structures, cables, conduits, pipelines, and underground watercourses.

Keystone anticipates that blasting would not be required. If blasting is necessary, Keystone would prepare and file a blasting plan with the appropriate agencies.

2.1.8.6 Construction near Structures

Keystone would prepare site-specific construction plans to address the potential impacts of construction on residential and commercial structures near the construction ROW. Areas containing buildings within 25 feet and 500 feet of the construction ROW are listed in Table 2.1-16. Information on the types of structures present is provided in Section 3.9 (Land Use, Recreation, and Visual Resources). Additional construction and environmental protection measures for structures near the construction ROW are described in the CMRP (Appendix G).

Table 2.1-16 Structures Located Within 25 Feet and 500 Feet of the Construction ROW

State	County	Structures Within 25 Feet of Construction ROW (Number)	Structures Within 500 Feet of Construction ROW (Number)
Montana	Phillips	0	9
	Valley	2	38
	McCone	2	21
	Dawson	3	21
	Prairie	0	3
	Fallon	2	25
South Dakota	Harding	3	19
	Butte	0	0
	Perkins	1	3
	Meade	2	22
	Pennington	0	0
	Haakon	4	26
	Jones	0	3
	Lyman	1	9
	Tripp	4	14
Nebraska	Keya Paha	0	1
	Boyd	0	0
	Holt	0	23
	Antelope	3	53

State	County	Structures Within 25 Feet of Construction ROW (Number)	Structures Within 500 Feet of Construction ROW (Number)
	Boone	0	33
	Nance	0	15
	Merrick	0	8
	Polk	0	19
	York	0	20
	Fillmore	0	7
	Saline	0	14
	Jefferson	0	11

2.1.8.7 Fences and Grazing

Fences would be crossed or paralleled by the construction ROW. Before cutting any fence for pipeline construction, each fence would be braced and secured to prevent the slacking of the fence. To prevent the passage of livestock the opening in the fence would be closed temporarily when construction crews leave the area. All existing fencing and grazing structures, such as fences, gates, irrigation ditches, cattle guards, and reservoirs would be repaired to preconstruction conditions or better upon completion of construction activities. If gaps in natural barriers used for livestock control are created by pipeline construction, the gaps would be fenced according to the landowner's requirements. All existing improvements, such as fences, gates, irrigation ditches, cattle guards, and reservoirs would be maintained during construction and repaired to preconstruction conditions or better upon completion of construction activities.

2.1.9 Waterbody Crossings

In the final design phase of the proposed Project, perennial waterbody crossings would be assessed by qualified personnel with respect to the potential for channel aggradation or degradation and lateral channel migration. The level of assessment for each crossing would vary based on the professional judgment of the qualified design personnel. The pipeline would be installed as necessary to address any hazards identified by the assessment. The pipeline would be installed at the design crossing depth for at least 15 feet beyond the design lateral migration zone, as determined by qualified personnel. The design of the crossings also would include the specification of appropriate stabilization and restoration measures.

The actual crossing method employed at a perennial stream would depend on permit conditions from U.S. Army Corps of Engineers (USACE) and other relevant regulatory agencies, as well as additional conditions that may be imposed by landowners or land managers at the crossing location. Where the HDD method is not used for major waterbody crossings or for waterbody crossings where important fisheries resources could be impacted, a site-specific plan addressing proposed additional construction and impact reduction procedures would be developed (see CMRP, Appendix G). 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. These agencies could require measures to limit unnecessary impacts such as requiring all the non-HDD crossings to be constructed during dry conditions. Additional information on the types of crossing methods proposed for use on the proposed Project is presented in the subsections below.

In addition to the proposed pipeline crossings of waterbodies, there would be temporary equipment bridges installed across many waterways. The actual crossing method employed would depend on any permit conditions from USACE and other relevant regulatory agencies. Prior to the start of clearing along each pipeline construction spread, temporary bridges (e.g., subsoil fill over culverts, timber mats supported by flumes, railcar flatbeds, or flexi-float apparatus) would be installed across all perennial waterbodies to allow construction equipment to cross with reduced disturbance. Clearing crews would be allowed only one pass through the waterbodies prior to temporary bridge construction. All other construction equipment would be required to use the bridges. Waterbodies would be crossed using one of four different open-cut methods or the HDD method. These waterbody crossing methods are described below.

2.1.9.1 Open-Cut Crossing Methods

For most waterbodies to be crossed by the proposed Project, one of the open-cut methods listed below would be used:

- Non-flowing open-cut crossing method (for waterbodies that do not have a perceptible flow at the time of construction);
- Flowing open-cut crossing method;
- Dry-flume open-cut method; or
- Dry dam-and-pump open-cut method.

The trenching, pipeline installation, and backfilling methods used for these types of crossings would be similar to the crossing methods described above.

Non-Flowing Open-Cut Crossing Method

The non-flowing open-cut method would be used for all waterbodies with no visible flow at the time of construction. In the event that intermittent waterbodies are dry or have non-moving water at the time of crossing, Keystone would install the pipeline using this method. Detail 11 of the CMRP (Appendix G) is an illustration of a typical open-cut crossing method for non-flowing waterbodies.

Flowing Open-Cut Crossing Method

If there is flow at the time of construction, the flowing open-cut method would be used and the trench would be excavated through flowing water. If an intermittent waterbody is flowing when crossed, Keystone would install the pipeline using this method. Backhoes operating from one or both banks would excavate the trench within the streambed while water continues to flow through the construction work area (see Detail 12 of Appendix G, CMRP). In wider rivers, in-stream operation of equipment may be necessary. Keystone would trench through the channel, lower in a pipe that is weighted for negative buoyancy, then backfill. The need for negative buoyancy would be determined by detailed design and site-specific considerations at the time of construction. Material excavated from the trench generally would be placed at least 10 feet away from the water's edge unless stream width exceeds the reach of the excavation equipment. Sediment barriers would be installed where necessary to prevent excavated spoil from entering the water. Hard or soft trench plugs would be placed to prevent the flow of water into the upland portions of the trench. After installation, the grade would be restored to pre-construction

condition, topsoil would be replaced (unless saturated conditions exist), and permanent erosion control devices would be installed.

For this crossing type, pipe segments for each crossing would be welded and positioned adjacent to the waterbody. After the trench is excavated, the pipeline segment would be carried, pushed, or pulled across the waterbody and positioned in the trench. The trench would be backfilled with native material or with imported material if required by permits.

Keystone would minimize the time of in-stream construction to reduce impacts to waterbody channel and banks. For minor waterbodies (less than 10 feet wide at the water's edge), the trenching and backfill of the crossing would typically require no more than 24 hours; intermediate waterbodies (10 to 100-feet-wide) would typically require no more than 48 hours. Major waterbodies (more than 100-feet-wide) would be crossed as quickly as possible. It is possible that the time required to accomplish the crossings of major waterbodies could exceed 48 hours.

Dry-Flume Open-Cut Method

Keystone would use the dry-flume method on selected environmentally sensitive waterbodies where technically feasible. To the extent practicable, non-flowing open cut crossings would be the preferred crossing method. The dry-flume method is used for sensitive, relatively narrow waterbodies free of large rocks and bedrock at the trench line and with a relatively straight channel across the construction ROW. Use of this method involves installing dams upstream and downstream of the construction area and installing one or more pipes (flumes) that would extend along the course of the waterbody and through both dams. Stream flow would be carried through the construction area by the flume pipe(s).

Keystone would install flumes with sufficient capacity to transport the maximum flows that could be generated seasonally within the waterbody. The flumes, typically 40 to 60 feet long, would be installed before trenching and aligned to prevent impounding of water upstream of the construction area or to cause back-erosion downstream.

The upstream and downstream ends of the flumes would be incorporated into dams made of sandbags and plastic sheeting (or equivalent material). Upstream dams would be installed first and would funnel stream flow into the flumes. Downstream dams then would be constructed to prevent water from flowing back into the area to be trenched. The flumes would remain in place during pipeline installation, backfilling, and streambank restoration.

Prior to trenching, the area between the dams typically would be dewatered. Backhoes working from one or both banks, or from within the isolated waterbody bed, would excavate the trench across the waterbody and under the flume pipes. Discharge of water from dewatering would be accomplished in accordance with applicable discharge permits. Excavated material would be stockpiled on the upland construction ROW at least 10 feet from the water's edge or in the extra workspaces. Sediment containment devices, such as silt fences and straw bales, would be installed to contain the excavated material and minimize the potential for sediment to migrate into the waterbody.

After the trench is excavated to the proper depth, a prefabricated section of pipe would be positioned and lowered into the trench. The trench then would be backfilled with the excavated material from the stream unless otherwise specified in stream crossing permits. Prior to removing the dams and flume pipes and restoring stream flow, water that accumulated in the construction

area would be pumped into a straw bale structure or similar dewatering device, and the bottom contours of the streambed and the streambanks would be restored as close as practical to pre-construction contours.

Dry Dam-and-Pump Open-Cut Method

As an alternative to the dry-flume crossing method, Keystone could use the dry dam-and-pump method on selected environmentally sensitive waterbodies where practical. The dry dam-and-pump method is similar to the dry-flume method except that pumps and hoses would be used instead of flumes to move water around the construction work area. When using this method, Keystone would initiate pumping while the dams are being installed to prevent interruption of stream flows. Where necessary to prevent scouring of the waterbody bed or adjacent banks, the downstream discharge would be directed into an energy-dissipation device or concrete weight. The pump capacity would be greater than the anticipated flow of the waterbody being crossed. As with the dry-flume method, trenching, pipe installation, and backfilling would be done while water flow is maintained for all but a short reach of the waterbody at the actual crossing location. Once backfilling is completed, the stream banks would be restored and stabilized and the pump hoses would be removed.

Horizontal Directional Drilling Method

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. As currently proposed, the HDD crossing method would be used at the waterbody crossings listed in Table 2.1-17.

Table 2.1-17 Waterbodies Crossed Using the Horizontal Directional Drilling Method

Waterbody	Number of Crossings	Approximate Milepost
Frenchman River	1	25.2
Milk River	1	83.4
Missouri River	1	89.6
Yellowstone River	1	198.0
Little Missouri River	1	295.6
Cheyenne River	1	430.1
Bridger Creek	1	433.6
Bad River	1	486.0
White River	1	541.3
Keya Paha River	1	618.1
Niobrara River	1	626.0
Elk Horn River	1	713.3
Loup River	1	761.6
Platte River	1	775.1

Source: exp Energy Services, Inc. 2012a.

The HDD method could also be used to bore beneath terrestrial areas that contain special resources that require avoidance. Additional HDD crossings could be incorporated into the proposed Project as a result of resource agency, landowner, or land manager concerns, as well as due to construction-related issues.

The HDD method involves drilling a pilot hole under the waterbody and banks, then enlarging the hole through successive ream borings with progressively larger bits until the hole is large enough to accommodate a pre-welded segment of pipe. Throughout the process of drilling and enlarging the hole, a water-bentonite slurry would be circulated to lubricate the drilling tools, remove drill cuttings, and provide stability to the drilled holes. Pipe sections long enough to span the entire crossing would be staged and welded along the construction work area on the opposite side of the waterbody and then pulled through the drilled hole.

The welded drill string would be hydrostatically tested for 4 hours prior to being pulled into place. Depending on the angle of approach of the pipeline alignment to the water crossing, a "false ROW" may need to be cleared on the pull back side to allow pipe placement at the appropriate angle to the waterbody. Keystone has created Site-Specific Waterbody Crossing Plans (Appendix G, CMRP) that describe the procedures to be used at each perennial waterbody crossed using the HDD method. Keystone would use industry standard procedures to ensure pipe and coating integrity are maintained during HDD installations.

During HDD operations, the hole that is reamed to allow the pipeline to be pulled through is much larger than the pipe diameter (approximately a 42-inch-diameter hole or larger for the 36-inch-diameter pipe). As noted above, bentonite drilling mud would be used to reduce friction and provide lubrication and buoyancy for the pipe during the pull back, assuring minimal contact with the walls of the drill hole.[5] An abrasion-resistant overcoat would be applied to the FBE coating on the pipe joints designated for HDDs. This overcoat prevents damage to the corrosion resistant FBE coating as the pipe is pulled through the bored hole. After installation, Keystone would conduct CP and in-line inspection surveys to determine if any damage may have resulted to the pipe coating during the construction process.

There is a potential for HDD frac-outs (accidental releases of pressurized drilling mud from the borehole) to occur during construction. A frac-out could release bentonite drilling mud into the aquatic environment. Bentonite is non-toxic; the released drilling mud would disperse in flowing water or eventually settle in standing water. The proposed minimum depth for HDD pipeline sections is 25 feet below the streambed. In some instances, the pressurized fluids and drilling lubricants used in the HDD process may escape the active bore, migrate through the soils, and come to the surface at or near the construction site, an event commonly known as a frac-out. While the HDD method poses a small risk of frac-out (i.e., release of bentonite-based drilling fluids), potential releases would be contained by best management practices that are described within the HDD Contingency Plans required for drilled crossings and prepared by the pipeline contractor prior to construction. These practices include monitoring of the directional drill, monitoring downstream for evidence of drilling fluids, and mitigation measures to address a frac-out should one occur.

Most leaks of HDD drilling fluids occur near the entry and exit locations for the drill and are quickly contained and cleaned up. Frac-outs that may release drilling fluids into aquatic

[5] See Section 4.3, Water Resources.

environments are difficult to contain primarily because bentonite readily disperses in flowing water and quickly settles in standing water. Further discussion of frac-outs is presented in Section 4.3, Water Resources; Section 4.7, Fisheries; and Section 4.8, Threatened and Endangered Species and Species of Conservation Concern.

2.1.9.2 Wetland Crossings

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. The 110-foot pipeline construction corridor width would be reduced to 85 feet for wetlands in Montana and Nebraska, and 75 feet for wetlands in South Dakota, unless conditions require a wider construction corridor. In instances where the wetland is supersaturated or inundated, the corridor ROW may be increased to ensure safe construction conditions. The operation ROW would be 30 feet in all three states, unless conditions require a wider permanent ROW width.

If wetland soils are not excessively saturated at the time of construction and can support construction equipment without equipment mats, construction would occur in a manner similar to conventional upland cross-country construction techniques. Low ground pressure equipment or conventional equipment supported by pre-fabricated matting would be used in all wetlands. Where wetlands are located at the base of slopes, permanent slope breakers would be constructed across the ROW in upland areas adjacent to the wetland boundary. Temporary sediment barriers would be installed where necessary until revegetation of adjacent upland areas is successful. Additional TWAs would be required on both sides of saturated or inundated wetlands to stage construction, fabricate the pipeline, and store materials. These additional TWAs would be located in upland areas a minimum of 10 feet from the wetland edge. More information is located in the Site-Specific Waterbody Crossing Plans located in the CMRP (Appendix G) with recommended modifications to the CMRP provided in Section 4.4.4, Recommended Additional Mitigation.

Clearing of vegetation in wetlands within the construction corridor would be limited to trees and shrubs, which would be cut flush with the surface of the ground, leaving the root stock in place, and removed from the wetland. Scrub-shrub and forested communities would be allowed to regenerate outside of the maintained operations ROW, and in areas where HDD was used to span open water areas. To avoid excessive disruption of wetland soils and the native seed and rootstock within the wetland soils, stump removal, grading, topsoil segregation, and excavation would be limited to the area immediately over the trench line to the maximum extent practicable. Trench breakers would be installed where necessary to prevent the subsurface drainage of water from wetlands. Trench width may vary in some wetlands to provide an even, safe work area, which depends upon topography, soil moisture content, and groundwater levels. Severe topography may require additional disturbance to create an even safe work area. More saturated soils usually require a wider trench in order to maintain a safe ditch and to avoid unstable trench walls. During clearing, sediment barriers, such as silt fence and staked straw bales, would be installed and maintained on down slopes adjacent to all wetlands and within additional TWAs, as necessary, to minimize the potential for sediment runoff.

Construction equipment working in all wetlands would be limited to the area essential for clearing the ROW, excavating the trench, fabricating and installing the pipeline, backfilling the

trench, and restoring the ROW. In areas where there is no reasonable access to the ROW except through wetlands, non-essential equipment would be allowed to travel through wetlands only if the ground is firm enough or has been stabilized with approved pre-fabricated matting (not timber slash) to avoid rutting. Where wetland soils are supersaturated or inundated, the pipeline could be installed using the push-pull technique. The push-pull installation process would involve stringing and welding the pipeline outside of the wetland, and excavating and backfilling the trench using a backhoe supported by equipment mats or timber riprap. Construction equipment working in all wetlands would be limited to that area essential for clearing the ROW, excavating the trench, fabricating and installing the pipeline, backfilling the trench, and restoring the ROW. In areas where there is no reasonable access to the ROW except through wetlands, non-essential equipment would be allowed to travel through wetlands only if the ground is firm enough or has been stabilized with approved pre-fabricated matting (not timber slash) to avoid rutting. The pipeline segment would be installed in the wetland by equipping it with floats and pushing or pulling it across the water-filled trench. After the pipeline is floated into place, the floats would be removed and the pipeline would sink into place. Most pipes installed in saturated wetlands would be coated with concrete or installed with set-on weights to provide negative buoyancy. The criteria used to determine pipe selection are based on site-specific conditions, ease of implementation, and practicality of implementing the installation method. The preference is set-on weights.

Following installation of the pipeline, subsoils (clays and gravel/cobbles) would be backfilled first followed by the topsoil. Restoration of contours would be accomplished during backfilling. No grading would occur in wetlands and the soil surface would be roughed to enhance seed germination. Soil strata would be restored above the pipeline to replicate original conditions. Topsoil would be replaced to the original ground level leaving no crown over the trench line. Excess excavated material would be removed from the wetland and spread along the upland ROW, placed in a location as requested by a landowner, or disposed of at an existing authorized landfill. Equipment mats, gravel fill, geotextile fabric, and straw mats would be removed from wetlands after backfilling except in the travel lane to allow continued, controlled access through the wetland until the completion of construction. Once revegetation is successful, sediment barriers would be removed from the ROW and disposed of at an existing authorized landfill. In wetlands where no standing water is present, the construction ROW would be seeded to supplement regenerated growth from root stock from original excavation of soils, in accordance with the recommendations of the USACE, local soil conservation authorities, or land management agency.

2.1.9.3 Aboveground and Ancillary Facilities Construction Procedures

Pump Station Construction

Construction at each new pump station and pigging facility would begin with installing sediment control measures, and then the clearing of vegetation and removal of topsoil will take place After that, the site would be graded as necessary to create a level working surface for the movement of construction vehicles and to prepare the area for building foundations. Each pump station would include one electrical equipment shelter (EES), and a variable frequency drive equipment shelter. The EES would include electrical systems, communication, and control equipment. Foundations would be installed for the EES and the pump equipment shelter. The structures to support the pumps, manifolds, pig receiving and pig launching equipment, densitometers (where present),

and associated facilities would then be erected. This would include installation of a block valve into the mainline as well as two MLV block valves: one would be installed on the suction piping of the pumps and one would be installed on the discharge piping of the pumps as required by 49 CFR 195.260.

The crude oil piping, both aboveground and below ground, would be installed and pressure-tested using methods similar to those used for the main pipeline. After successful testing, the piping would be tied into the main pipeline. Piping installed below grade would be coated for corrosion protection as required by 49 CFR 195 Subpart H (Corrosion Control) and the applicable PHMSA special conditions. In addition, all below-grade facilities would be protected by a CP system as required by Subpart H and the applicable PHMSA special conditions. Pumps, controls, and safety devices would be checked and tested to ensure proper system operation and activation of safety mechanisms before being put into service. After hydrostatic testing of the below-grade equipment, the site would be graded and surfaced with gravel and a security fence would be installed around the entire perimeter of each site. Construction activities and storage of construction materials would be confined to each pump station site. Figure 2.1.4-1 (provided previously) shows a typical pump station with pigging facilities. Figure 2.1.9-1shows a typical pump station without pigging facilities.

Mainline Valves and Delivery Sites

MLV construction would occur during mainline pipeline construction. IMLV construction would be carried out concurrently with the construction of the pipeline. Wherever practical, IMLVs would be located near public roads to allow year-round access. If necessary, permanent access roads or approaches would be constructed to each fenced MLV site. The construction sequence would consist of clearing and grading followed by trenching, valve installation, fencing, cleanup, and site restoration.

2.1.10 Construction Schedule, Workforce, and Environmental Inspection

2.1.10.1 Schedule and Workforce

Construction of the proposed Project would begin if Keystone obtains all necessary permits, approvals, and authorizations. As currently planned, the proposed Project would be constructed using 10 spreads of approximately 45 to 120 miles long (see Table 2.1-18). Final spread configurations and the final construction schedule may result in the use of additional spreads or fewer shorter or longer spreads. If Keystone obtains all permits, approvals, and authorizations it anticipates the proposed Project to be placed into service in 2015.

Table 2.1-18 Representative Cross-Country Construction Times Based on Estimates of Schedule

Spread Length	Pre-welding	Welding Time	Post-welding and Clean-up	Total Duration
80 miles	21 days	75 days	49 days	145 days (21 weeks)
90 miles	21 days	84 days	49 days	154 days (22 weeks)
100 miles	21 days	94 days	49 days	164 days (24 weeks)
120 miles	21 days	112 days	49 days	182 days (26 weeks)

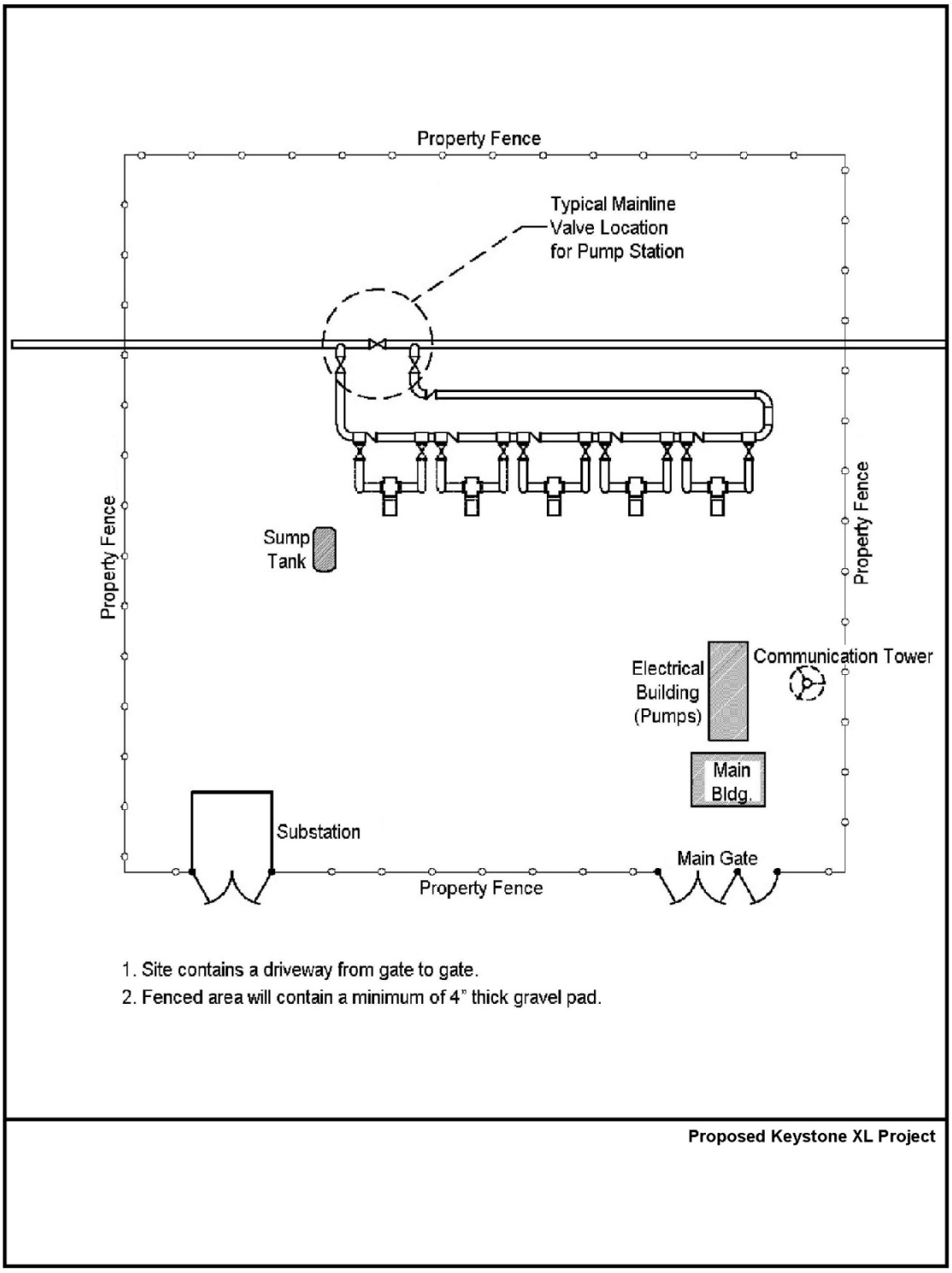


Figure 2.1.9-1 Pump Facility without Pigging

Keystone anticipates a peak workforce of approximately 5,000 to 6,000 construction personnel. These personnel would consist of Keystone employees, contractor employees, construction inspection staff, and environmental inspection staff. All workers would be trained and certified for their specific field of work (e.g., welders would be qualified as required by 49 CFR 195.222 and PHMSA Special Condition 18).

Keystone, through its construction contractors and subcontractors, would attempt to hire temporary construction staff from the local population. Assuming that qualified personnel are available, approximately 10 to 15 percent (50 to 100 people per spread) could be hired from the local workforce for each spread, although this may not be possible in rural areas. This may not be possible in more rural areas and or areas with low unemployment.

Cross-country pipeline construction would typically proceed at a pace of approximately 20 constructed miles per calendar month per spread. Construction would occur in the following approximate sequence:

- Two to three weeks (14 to 21 calendar days) of work on the ROW prior to the start of production welding. Activities would include clearing, grading, stringing, and ditching.
- Production welding at an average rate of 1.25 miles of pipe welded per working day over a 6-day work week (over 7 calendar days), resulting in completion of an average of about 7.5 miles of pipeline per week.
- Seven weeks (49 calendar days) of additional work after completion of production welding. Activities would include nondestructive testing, field joint coating, pipe installation, tie-ins, backfill, ROW clean-up, hydrostatic testing, reseeding, and other ROW reclamation work.

Those time periods and rates of progress were used as the basis for determining the duration of construction activities on the ROW presented in Table 2.1-18 for various spread lengths. Construction in areas with greater congestion or higher population, in industrial areas, or in areas requiring other special construction procedures could result in a slower rate of progress. In addition, approximately 1 month would be required for contractor mobilization before the work is started and 1 month would be required for contractor demobilization after the work is finished.

2.1.10.2 Environmental Inspection

Keystone would use environmental inspectors on each construction spread. The environmental inspectors would review the proposed Project activities daily for compliance with state, federal, and local regulatory requirements and would have the authority to stop specific tasks as approved by the chief inspector. The inspectors would also be able to order corrective action in the event that construction activities violate the provisions of the CMRP, landowner requirements, or any applicable permit requirements.

2.1.11 Operations and Maintenance

The proposed Project would be operated, maintained, monitored, and inspected in accordance with 49 CFR 194 and 195 and other applicable federal and state regulations. Keystone has also agreed to incorporate 57 PHMSA Project-specific special conditions that address proposed Project operation, inspection, and monitoring (see Appendix B, PHMSA 57 Special Conditions). The operational requirements of 49 CFR 195 and the PHMSA Project-specific Special Conditions related to operation of the proposed Project (Appendix B, PHMSA 57 Special

Conditions) would be included in the proposed Project operations, maintenance, and emergencies manual that would be required by 49 CFR 195.402, and they would also be incorporated into Keystone's existing Operations Control Center (OCC) in Calgary, Canada. The remainder of this section addresses normal operation and routine maintenance and abnormal operations.

2.1.11.1 Normal Operations and Routine Maintenance

Keystone would prepare the manuals and written procedures for conducting normal operations, maintenance, inspection, and monitoring activities as required by the PHMSA regulations, particularly as required by 49 CFR 195.402 and in the applicable PHMSA Project-specific special conditions (see Appendix B, PHMSA 57 Special Conditions). This would include development and implementation of an annual Pipeline Maintenance Program to ensure the integrity of the pipeline. The Pipeline Maintenance Program would include valve maintenance, periodic inline inspections, and CP readings to ensure facilities are reliable and in service. Data collected in each year of the program would be incorporated into the decision-making process for the development of the following year's program.

The proposed Project OCC would be manned by experienced and highly trained personnel 24 hours per day, every day of the year in Calgary. In addition, a fully redundant backup OCC would be constructed, operated, and maintained, also in Canada. Primary and backup communications systems would provide real-time information from the pump stations to field personnel. The control center would have highly sophisticated pipeline monitoring systems including a leak detection system capable of identifying abnormal conditions and initiating visual and audible alarms. Automatic shut-down systems would be initiated if a valve starts to shut and all pumps upstream would turn off automatically. All other pipeline situations would require human response.

The proposed Project would include a supervisory control and data acquisition (SCADA) system to constantly monitor the pipeline system. The SCADA system would be installed and operated in accordance with the requirements of 49 CFR 195 and PHMSA Project-specific special conditions 24 through 31 (see Appendix B, PHMSA 57 Special Conditions). SCADA facilities would be located in the OCC and along the pipeline system, and all pump stations and delivery facilities would have communication software that sends data back to the OCC. The pipeline SCADA system would allow the OCC to remotely read IMLV positions, tank levels, and delivery flow and total volume. The OCC personnel would also be able to start and stop pump stations and open and close MLVs. SCADA systems are further discussed in Sections 2.1.11.1, Normal Operations and Routine Maintenance, and 4.13, Potential Releases.

The pipeline ROW would be inspected via aerial and ground surveillance to provide prompt identification of possible encroachments or nearby construction activities, ROW erosion, exposed pipe, or any other conditions that could result in damage to the pipeline. The aerial surveillance of the pipeline ROW would be carried out at least 26 times per year at intervals not to exceed 3 weeks as required by 49 CFR 195.412. Landowners would be encouraged to report any pipeline integrity concerns to Keystone or to PHMSA. IMLVs and MLVs at pump stations would also be inspected. As required by 49 CFR 195.420(b), they would be inspected at intervals not to exceed 7.5 months, but at least twice each calendar year.

PHMSA regulations at 49 CFR 195.450 and Special Condition 14 require that pipeline operators identify areas along the proposed pipeline corridor that would be considered HCAs. While some of these areas need to be defined through sophisticated risk modeling, in general they are specific locales where an accidental spill from a hazardous liquid pipeline could produce significant adverse consequences as described in 49 CFR 195.450.

HCAs include navigable waterways, high population areas, and unusually sensitive areas. Keystone would need to identify the HCAs along the proposed route. Population changes along the route would be monitored throughout pipeline operation and any additional HCAs identified as necessary. Keystone would conduct a pipeline integrity management program in HCAs as required by 49 CFR 195.452 (Pipeline Integrity Management in HCAs).

All maintenance work would be performed in accordance with PHMSA requirements, the applicable PHMSA Special Conditions, and the stipulations in environmental permits issued for the proposed Project. Woody vegetation along the permanent easement would be cleared periodically in order to maintain accessibility for pipeline integrity surveys. Mechanical mowing or cutting would be carried out from time to time as needed along the permanent easement for normal vegetation maintenance. Cultivated crops would be allowed to grow in the permanent easement, but trees would be removed from the permanent ROW in all areas. In areas constructed using the HDD method, trees would be cleared as required on a site specific basis.

Permanent erosion control devices would be monitored to identify any areas requiring repair. The remainder of the ROW would be monitored to identify areas where additional erosion control devices would be necessary to prevent future degradation. The ROW would be monitored to identify any areas where soil productivity has been degraded as a result of pipeline construction. In these areas, reclamation measures would be implemented to rectify the problems.

Operation and maintenance of the proposed pipeline system would typically be accomplished by Keystone personnel. The permanent operational pipeline workforce would comprise about 50 employees strategically located along the length of the pipeline in the United States: 35 Keystone employees plus 15 contractual workers.

2.1.11.2 Abnormal Operations

Keystone would implement Abnormal Operating Procedures in accordance with 49 CFR Section 195.402(d). Those procedures would be developed and documented in a manual as required by 49 CFR 195.402. The manual would include procedures to provide safety when operating design limits have been exceeded. That would include investigating and correcting the cause of unintended closure of valves or shutdowns, increases or decreases in pressure or flow rate outside normal operating limits, loss of communications, operation of any safety device, and any other malfunction of a component, deviation from normal operation, or personnel error which could cause a hazard to persons or property. Procedures would also include checking variations from normal operation after abnormal operation has ended at sufficient critical locations in the system to accomplish the following:

- Assure continued integrity and safe operation;
- Identify variations from normal operation of pressure and flow equipment and controls;
- Notify responsible operator personnel when notice of an abnormal operation is received;

- Review periodically the response of operator personnel to determine the effectiveness of the procedures controlling abnormal operation; and
- Take corrective action where deficiencies are found.

The operations manager on duty would be responsible for executing abnormal operating procedures in the event of any unusual situation.

Pipeline Integrity, Supervisory Control and Data Acquisition, and Leak Detection

The following overlapping and redundant integrity systems and measures would be incorporated into the proposed Project:

- Quality Assurance program for pipe manufacture and pipe coating;
- FBE coating;
- CP;
- Non-destructive testing of 100 percent of the girth welds;
- Hydrostatic testing;
- Periodic internal cleaning and high-resolution in-line inspection;
- Depth of cover exceeding federal standards;
- Periodic aerial surveillance;
- Public awareness program;
- SCADA system; and
- An OCC with complete redundant backup, providing monitoring of the pipeline every 5 seconds, 24 hours per day, every day of the year.

SCADA facilities would be used to remotely monitor and control the pipeline system. This would include a redundant fully functional backup system available for service at all times. Automatic features would be installed as integral components within the SCADA system to ensure operation within prescribed pressure limits. Additional automatic features would be installed at the local pump station level and would provide pipeline pressure protection in the event communications with the SCADA host are interrupted. Software associated with the SCADA monitoring system and volumetric balancing would be used to assist in leak detection during pipeline operations. If pressure indications change, the pipeline controller would immediately evaluate the situation. If a leak is suspected, the ERP would be initiated, as described below. If there is a pipeline segment shutdown due to a suspected leak, operation of the affected segment would not be resumed until the cause of the alarm (e.g., false alarm by instrumentation or a leak) is identified and repaired. In the case of a reportable leak, PHMSA approval would be required to resume operation of the affected segment. A number of complementary leak detection methods and systems would be available within the OCC and would be linked to the SCADA system.

Remote monitoring would consist primarily of monitoring pressure and flow data received from pump stations and valve sites that would be fed back to the OCC by the SCADA system. Software-based volume balance systems would monitor receipt and delivery volumes and would

detect leaks down to approximately 5 percent of pipeline flow rate. Computational Pipeline Monitoring or model-based leak detection systems would separate the pipeline system into smaller segments and would monitor each segment on a mass balance basis. These systems would detect leaks down to a level of approximately 1.5 to 2 percent of the pipeline flow rate. Computer-based, non-real time, accumulated gain/loss volume trending would assist in identifying low rate or seepage leaks below the 1.5 to 2 percent by volume detection thresholds. If any of the software-based leak detection methods indicates that a predetermined loss threshold has been exceeded, an alarm would be sent through SCADA and the Controller would take corrective action. The SCADA system would continuously poll all data on the pipeline at an interval of approximately 5 seconds.

If an accidental leak were to occur, the operator would shut down operating pumping units and close the isolation valves. Once shutdown activities are initiated, it would take approximately 9 minutes to complete the emergency shut-down procedure (shut down operating pumping units) and an additional 3 minutes to close the isolation valves.

In addition to the SCADA and complementary leak detection systems, direct observation methods, including aerial patrols, ground patrols and public and landowner awareness programs, would be implemented to encourage and facilitate the reporting of suspected leaks and events that could suggest a threat to the integrity of the pipeline.

Keystone has committed to keep abreast of the latest developments in external leak detection technologies (above and beyond those already proposed to be implemented, as described) that could be installed along the pipeline at sensitive locations. In Nebraska, Keystone would report to, and discuss with, the Nebraska Department of Environmental Quality (NDEQ) the status of innovation in such pipeline leak detection equipment and the methods on or before January 1, 2014, and at such additional times thereafter until 2024 as the NDEQ shall specifically request, but in no case more frequently than once every three years. A similar leak detection requirement exists in the SDPUC certificate. There is no comparable requirement in Montana.

Emergency Response Procedures

PHMSA requires that pipeline operators prepare and abide by both the PSRP and the ERP for responding to emergencies on their systems. 49 CFR 194 requires that pipeline operators have response plans that ensure resources are available to remove, mitigate, or prevent a discharge from an oil pipeline that could cause substantial or significant harm to the environment, including a worst case discharge. As stated in 49 CFR 194.7(a), a pipeline operator “may not handle, store, or transport oil unless the operator has submitted a response plan meeting requirements of this part,” and as stated in 49 CFR 194.7(b), operators must also operate onshore pipeline facilities in accordance with the approved response plan. In addition, 49 CFR 194.107 requires that the response plan include “procedures and a list of resources for responding, to the maximum extent practicable, to a worst case discharge, and to a substantial threat of such a discharge.”

Keystone would determine the optimal location of spill response equipment, taking into account response times to sensitive areas and receptors. These spill response locations would be reflected in the ERP that would be submitted to PHMSA for review and approval.

Keystone would submit a PSRP to PHMSA prior to initiation of proposed Project operations in accordance with the requirements of 49 CFR 194. The PSRP would describe how spills would be

responded to in the event of a release from the proposed Project resulting from any cause (e.g., corrosion, third-party damage, natural hazards, materials defects, hydraulic surge). The plan would address the maximum spill scenario and the procedures that would be in place to deal with the maximum spill. The PSRP requires PHMSA review and approval; however, there is a 2-year grace period under which operations can proceed, thus allowing PHMSA time to review the document in light of as-built Project conditions and to require incorporation of any needed changes to ensure system safety prior to PHMSA approval.

As required by 49 CFR 195.40, Keystone would also prepare and follow a manual of written procedures for conducting normal operations and maintenance activities and handling abnormal operations and emergencies. This manual would be reviewed by PHMSA at intervals not exceeding 15 months, but at least once each calendar year, and appropriate changes would be made as necessary to ensure that the manual is effective. This manual would be prepared before initial operations of the proposed Project and appropriate sections would be kept at locations where operations and maintenance activities are conducted. The emergency section of this operations and maintenance plan would be prepared by Keystone in a separate document that Keystone refers to as the ERP.

While USEPA has authority under the Clean Water Act and Oil Pollution Act of 1990 with respect to regulation of onshore non-transportation related facilities and USEPA requires the development and submittal of a Facility Response Plan for any such facility, it appears that none of the facilities or activities associated with the proposed Project would be subject to the USEPA regulatory authority, as discussed below. Keystone would therefore be required to develop a PSRP for review and approval by PHMSA and an ERP for review by PHMSA for the proposed Project. PHMSA may request USEPA and U.S. Coast Guard consultation on the response elements of the PSRP. Keystone would share on its own volition portions of the PSRP with community emergency responders along the proposed pipeline corridor to ensure an appropriate level of collaborative emergency response planning. However, based on a PHMSA advisory bulletin issued on November 3, 2010, Keystone would be required to share the ERP with local emergency responders in relevant jurisdictions along the proposed Project corridor. The bulletin notes that operators of gas and hazardous liquid pipeline facilities must make their pipeline ERPs available to local emergency response officials.

While the draft PSRP and the draft ERP for the proposed Project are not yet available, Keystone prepared similar plans for the existing Keystone Pipeline Project. These plans for the proposed Project would have the same general approach as those plans but would have many specific differences, such as the names and contact information for responders along the proposed Project route.

There have been concerns raised about the possibility of a spill comparable to the Kalamazoo spill in Marshall, Michigan, on the proposed Project. There are a number of reasons, discussed below, that this is not anticipated. Nevertheless, Keystone would be prepared to respond to a spill of a similar magnitude and extent of the Marshall, Michigan, incident. Further, the lessons learned from the incident would be incorporated into industry recommendations and guidance.

Keystone would incorporate lessons learned throughout the life of the project in the following ways:

- PHMSA Advisory Bulletins: These items are incorporated in the applicable phase of the Project (e.g., design, construction, or operations) through modification of the Project's

specific design requirements or construction scope of work, or incorporation into Keystone's Integrity Management Plan or Operations Manual.

- NTSB Accident Reports: Keystone reviews these draft and final reports for pertinent findings and incorporates them into design basis or procedures, if applicable.
- Industry Publications: Keystone has representation on all major Standards and Association Committees and incorporates the appropriate feedback into specification revisions for its pipeline assets, including Keystone, as appropriate through the Company's Engineering Standards group.
- PHMSA Special Conditions 25c and 43 are examples of where NTSB accident reports and PHMSA advisory bulletins are incorporated into the Project.

Environmentally, the lessons learned from the Marshall, Michigan, dilbit spill behavior and related response implications include:

- The total volume of dilbit released to a river will not float on water indefinitely and dilbit characteristics, water temperature, and particulate load in the water could result in much of the oil being submerged in the water column.
- Submerged oil can be suspended in the water column, suspended just above the river bed, or intermixed with sediment and trapped in the river bed and shoreline.
- Submerged oil in a flowing water environment introduces additional recovery challenges for responders.
- Response action planning and response equipment to contain and recover submerged oil should be considered.
- Dilbit intermixed with sediment and trapped in the river bed and shoreline may result in a persistent source of oil and dissolved components such as benzene, polycyclic aromatic hydrocarbons, and heavy metals that could be slowly released back to the water column and transported down current.
- Dilbit intermixed with sediment can persist for years.

The pipeline involved in the Marshall, Michigan, incident was constructed in the 1950s. Pipeline standards have evolved and new technologies have resulted in improvements in pipeline safety performance. Pipelines are now constructed with higher quality steel that is stronger and has better fracture resistant properties, helps reduce the impacts of external forces, such as flooding and excavation damage. Improvements in external pipeline coatings, the use of cathodic protection, and mandatory in-line inspection tools have resulted in significant reductions in corrosion-related incidents. TransCanada has not experienced a corrosion-related failure on any of its pipelines that utilize modern FBE coatings. Federal pipeline regulations have evolved over time and pipeline operators are now required to actively manage their pipelines to reduce the possibility of incidents. Operating procedures and leak detection capabilities have improved to more quickly detect leaks, thereby minimizing the amount of crude oil released and reducing subsequent impacts.

Keystone has reviewed the NTSB 2012 Marshall, Michigan Accident Report including the conditions that led to operational failures on the pipeline that resulted in the spill. Keystone would include lessons learned from this spill, including:

- Get big quick: timeliness of a tactical response to an oil spill into water is imperative. While Keystone has stated that it already uses this philosophy, the Kalamazoo spill reinforced this need to respond with as many resources as possible as quickly as possible. To that end, Keystone would strategically store equipment and employ personnel and contractors along the length of the pipeline to ensure a maximum of a 6-hour response time.
- Pre-qualify a large contractor network: Contractors would be used to supplement any response Keystone would make to an oil spill. By ensuring a large pool of trained/skilled contractors along the length of the pipeline have been pre-qualified and contracted with Keystone, the response time would be minimized and resources (equipment and personnel) available are maximized.
- Emergency response planning details need to include source containment: source containment plans including strategies and tactics would be included in the overarching ERP.
- Equipment resources required for sunken and submerged oil: Keystone would further identify equipment resources required to respond to sunken and submerged oil and ensure personnel are appropriately trained on its use. A primary strategy for oil spill response would still be to contain and recover as much oil as possible as quickly as possible to prevent oil from weathering and therefore potentially becoming submerged and sinking. In addition, Keystone already owns and practices the use of containment devices that will prevent downstream migration of submerged and sunken oil such as dams. This type of equipment would be further identified and procured for the proposed Project.

In addition, Keystone would implement its own company standards and the 57 Special Conditions, which include operational requirements. The proposed Project would be constructed to standards that exceed current federal regulatory requirements. In addition to company-specific standards that exceed current federal pipeline safety standards (e.g., typical burial depth of 4 feet of cover rather than the standard 3 feet depth of cover), Keystone has agreed to implement an additional 57 Special Conditions identified in the Final EIS. The Final EIS stated that the implementation of these additional conditions would result in a level of safety equal to or exceeding the current levels as required by federal regulations.

Pipeline conditions along the proposed Project would be continuously monitored 24 hours a day, 7 days a week. The proposed Project would have over 16,000 sensors along its length and multiple, overlapping state-of-the-art leak detection systems.

While flood conditions are not a leading cause of pipeline failures, they can be a threat to pipeline integrity in certain locations. Under federal regulations (49 CFR Part 195), Keystone's Integrity Management Program is required to monitor and reduce risks from various threats, such as outside forces due to flooding. Keystone has evaluated stream crossings to identify those locations where stream scour could affect pipeline integrity. Where there is potential for significant stream scour, Keystone has increased burial depth so stream scour does not pose a threat to pipeline integrity. Additionally, under Special Condition 19, Keystone is required to maintain depth of cover for the life of the Project.

The proposed Project is a modern pipeline built to higher standards than pipelines built in the 1950s. Further, there are a number of operational requirements for the Keystone XL Pipeline that exceed current regulations; consequently, the pipeline is expected to operate at a higher level of safety than other pipelines currently in operation. Finally, Keystone has stated its commitment to the prevention of incidents including using lessons learned from the entire industry to continue to improve its pipeline safety programs.

The publically available portion of the Keystone Oil Pipeline System ERP is included as Appendix I, SPCC and ERP (parts of the ERP and the PSRP are considered confidential by PHMSA and the U.S. Department of Homeland Security). As described in Section 4.13, Potential Releases, the existing Keystone Oil Pipeline Project documents would be used as templates for the plans for the proposed Project. Project-specific information would be inserted into the plans as it becomes available. In addition, response equipment would be procured and strategically positioned along the route, staff would be trained in spill response and the Incident Command System, and emergency services and public officials would be educated on all aspects of the proposed Project and what their roles would be if an accidental leak were to occur. If a spill were to occur, Keystone and its contractors would be responsible for recovery and cleanup. PHMSA would require a certification from Keystone that necessary emergency response equipment is available in the event of an unplanned spill prior to providing Keystone with an authorization to begin operating the proposed Project.

The specific locations of Keystone's emergency responders and equipment would be determined upon conclusion of the pipeline detailed design and described in the PSRP and ERP. Company emergency responders would be placed consistent with industry practice and with applicable regulations, including 49 CFR Parts 194 and 195.The response time to transfer additional resources to a potential leak site would follow an escalating tier system, with initial emergency responders capable of reaching all locations within 6 hours in the event of a spill for high volume areas; the spill response for all other areas is 12 hours. Typically, emergency responders would be based in closer proximity to the following areas:

- Commercially navigable waterways and other water crossings;
- Populated and urbanized areas; and
- Unusually sensitive areas, including drinking water locations, ecological, historical, and archaeological resources.

Keystone contacted first responders along the mainline route as part of its stakeholder outreach program in advance of going into service. On an annual basis, at minimum, awareness information materials are delivered to local level emergency service agencies including fire, police, 911, county emergency managers, and Tribal agencies along the Keystone route. This includes operator information such as pipeline location, product awareness, how to recognize the signs of a leak, how to contact Keystone, and guidelines on how to respond. Keystone regularly partners with the communities in which it operates and supports emergency responder development. This has included donations of fire truck rigging, rope rescue equipment, trailers, and air bag kits. Additionally, Keystone has jointly planned with emergency responders to store equipment in strategic locations to facilitate an effective response. In select cases, Keystone would collaborate with dedicated hazmat teams to determine additional emergency response tactics they may undertake. Additional details can be found in Section 4.13, Potential Releases.

Types of emergency response equipment situated along the pipeline route would include pick-up trucks, one-ton trucks and vans; vacuum trucks; work and safety boats; containment boom; skimmers; pumps, hoses, fittings and valves; generators and extension cords; air compressors; floodlights; communications equipment including cell phones, two way radios, and satellite phones; containment tanks and rubber bladders; expendable supplies including absorbent booms and pads; assorted hand and power tools including shovels, manure forks, sledge hammers, rakes, hand saws, wire cutters, cable cutters, bolt cutters, pliers and chain saws; ropes, chains, screw anchors, clevis pins and other boom connection devices; personnel protective equipment including rubber gloves, chest and hip waders and airborne contaminant detection equipment; and wind socks, signage, air horns, flashlights, megaphones and fluorescent safety vests. Emergency response equipment would be maintained and tested in accordance with manufacturers recommendations. These materials would be stored in a trailer; the locations would be determined once the system design is complete and the analysis of risk finalized Additional equipment, including helicopters, fixed-wing aircraft, all-terrain vehicles, snowmobiles, backhoes, dump trucks, watercraft, bull dozers, and front-end loaders could also be accessed depending upon site-specific circumstances. Other types, numbers, and locations of equipment would be determined upon conclusion of the pipeline detailed design and the completion of the PSRP and the ERP for the proposed Project.

Several federal regulations define the notification requirements and response actions in the case of an accidental release, including the 40 CFR Part 300 (National Oil and Hazardous Substances Pollution Contingency Plan), the Clean Water Act, and Oil Pollution Act of1990.If an accidental spill occurs, Keystone would implement several procedures to mitigate damage, including a line shut down. Other procedures would include immediate dispatch of a first responder to verify the release and secure the site. Simultaneously, an Incident Command System would be implemented and internal and external notifications would take place. The National Response Center would be notified if the spill meets one of the prescribed criteria. Keystone and the National Response Center would also notify other regional and local emergency response agencies as quickly as possible. All of this information would be included in the ERP for the proposed Project.

In the event of a suspected leak or if a spill is reported to the OCC, after verification there would be an emergency pipeline shutdown. Details on the type of verification to be used, what conditions get reported, and what magnitude release would trigger a shutdown are provided in Appendix I, SPCC and ERP**.** This would involve stopping all operating pumping units at all pump stations. The on-call response designate would respond to and verify an incident. Once the OCC notifies the individual and an assessment of the probability and risk is established, field personnel could elect to dispatch other resources as soon as practical. Response efforts would first be directed to preventing or limiting any further contamination of the waterway, once any concerns with respect to health and safety of the responders have been addressed.

A review of PHMSA data related to pipeline accidents indicates that most explosions occur in pipelines that are transporting highly flammable, highly volatile hydrocarbons such as natural gas, liquid propane gas, propane, gasoline, naphtha, or similar products. For an ignition to occur, produced vapors must be above the lower flammability limit of the vapor and sufficient oxygen and an ignition source present. Within a pipeline, oxygen conditions are too low and an ignition source is not present, so an explosion within the pipeline is unlikely.

Oil spills on the ground surface and some releases below grade potentially could ignite. PHMSA data for onshore oil and hazardous material pipelines indicate that only 6 of 2,706 incidents (0.2 percent) that occurred from 1990 through 2009 were attributed to "fire/explosion as a primary cause." Six out of 3,033 incidents were reported as due to the referenced cause. Two out of 1,360 crude oil incidents were reported as due to the reference cause.

A search of the internet for reports of crude oil pipeline explosions suggests that 1) there are very few if any explosions in crude oil pipeline operation that were the result of a failure of the pipeline as a primary cause, and 2) the very few that have occurred are attributable to explosions in ancillary facilities or errors in operations unassociated with crude oil transportation. For example, the recent explosion and fire in the crude oil pipeline/storage tank area in Dalian, China, occurred as a result of an improper desulfurization operation; the primary cause was not the transport of crude oil in the pipeline.

An accidental crude oil spill from the pipeline or at a pump station would likely result in some hydrocarbon vapors, but they would not be in confined spaces and therefore would be unlikely to explode. A fire associated with a release from a crude oil pipeline is relatively rare. In the event of a fire, local emergency responders would execute the roles listed above and more specifically in the PSRP and the ERP, and firefighters would take actions to prevent the crude oil fire from spreading to residential areas.

Remediation

Corrective remedial actions would be dictated by federal, state, and local regulations and enforced by the USEPA, Office of Pipeline Safety, and appropriate state and/or local agencies. Required remedial actions may be large or small, dependent upon a number of factors including state mandated remedial cleanup levels, potential effects to sensitive receptors, the volume and extent of the contamination, whether or not there is a violation of water quality standards, and the magnitude of adverse impacts caused by remedial activities. A large remediation action may include the excavation and removal of contaminated soil or could involve allowing the contaminated soil to recover through natural attenuation or environmental fate processes such as evaporation and biodegradation.

If, during construction, tanks or contamination are found, they would be managed according to federal, state, and/or local regulations. Further, Keystone would make individuals available who are trained in identifying and disposing of hazardous materials during construction.

If there is an accidental release from the proposed Project, Keystone would implement the remedial measures necessary to meet the federal, state, and local standards that are designed to ensure protection of human health and environmental quality. Additional information on remediation is presented in Section 4.13, Potential Releases.

2.1.12 Connected Actions

There are three actions that are separate from the proposed Project that are not part of the Presidential Permit application submitted by Keystone, but are being reviewed as connected

actions[6] pursuant to NEPA. The three connected actions are the Bakken Marketlink Project, the Big Bend to Witten 230-kilovolt (kV) electric transmission line, and electric distribution lines and substations associated with the proposed pump stations.

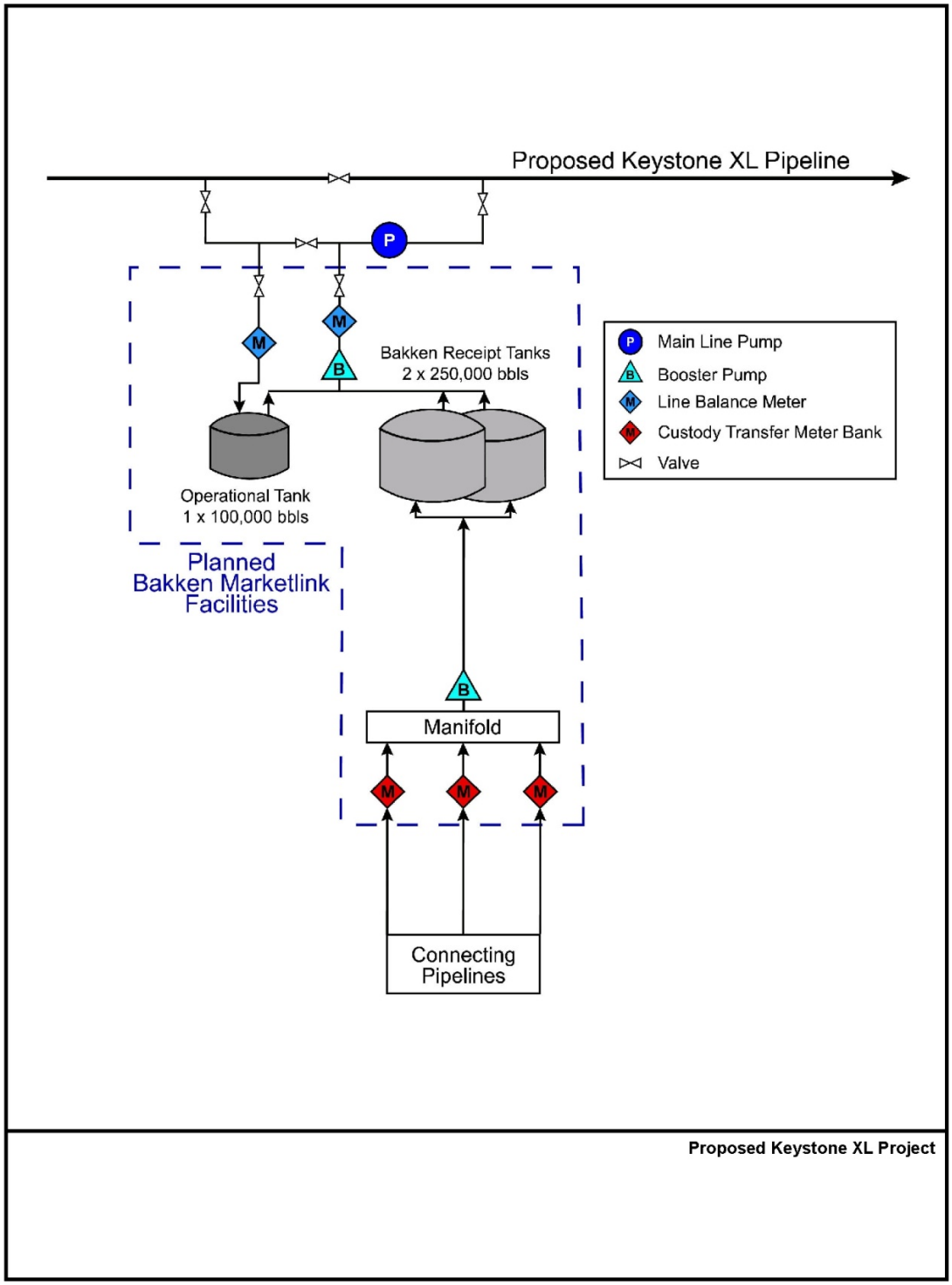
Preliminary information on the design, construction, and operation of these projects is presented below. Although the permit applications for these projects would be reviewed and acted on by other agencies, the potential impacts of these projects have been analyzed in the Supplemental EIS based on currently available information and are addressed within each resource assessed in Chapter 4, Environmental Consequences. However, in some cases only limited information was available on the design, construction, and operation of the projects. The reviews of permit applications by other agencies would include more detailed environmental reviews of the connected actions.

2.1.12.1 Bakken Marketlink Project

Keystone Marketlink, LLC, a wholly owned subsidiary of TransCanada Pipelines Limited, is proposing to construct and operate the Bakken Marketlink Project. It would include construction and operation of facilities within the boundaries of the proposed Keystone XL Cushing tank farm. This location is adjacent to the Cushing Oil Terminal, a key pipeline transportation and crude oil storage hub with over 50 million barrels of storage capacity. Crude oil in the Bakken Marketlink storage tanks at the Cushing tank farm would either be pumped to the Keystone XL pipeline or to other pipelines and tank farms near Cushing. The Cushing tank farm would be near many pipelines, storage facilities, and refineries; the Cushing area is a major crude oil marketing, refining, and pipeline hub that provides shippers with many delivery options and market access. The project would include construction of facilities to provide crude oil transportation service from near Baker, Montana, to the Keystone Cushing Expansion in Kansas. Keystone Marketlink, LLC obtained commitments for transport of approximately 65,000 barrels per day (bpd) of crude oil through the Marketlink Project. The Bakken Marketlink Project could deliver up to 100,000 bpd to the proposed Project depending on ultimate shipper commitments.

The project would consist of piping, booster pumps, meter manifolds, and one 250,000-barrel tank that would be used to accumulate crude from connecting third-party pipelines and terminals and a 100,000-barrel tank that would be used for operational purposes (see Figure 2.1.12-1). Tanks at both locations will be external floating roof tanks. At Cushing there will be crude oil booster pumps located at the facility for transfer of the crude oil from the pipeline to the crude oil storage tanks. All booster pumps are electrically driven. Preliminary design engineering indicates that no combustion equipment (e.g., emergency generator engines) or other add-on control devices (e.g., emergency flares or vapor recovery units) would be constructed at the facility. The facilities would also include a proposed pipeline that would be approximately 5 miles in length, originating south of pump station 14 at a third party tank farm in Fallon County, and extending to the Keystone Bakken Terminal. TransCanada Pipelines Limited Bakken held introductory meetings with State and local permitting agencies in 2011, and also held a meeting for potentially affected landowners along the route. Adjustments in the alignment are possible as a result of civil surveys, further landowner discussions, and permitting. The proposed in service date for the Bakken Marketlink Project is projected to be the first or second quarter of 2015.

[6] Additional relevant information related to connected actions is pending and will be included in this review as part of the Final Supplemental EIS.



Source: exp Energy Services, Inc. 2012b.

Figure 2.1.12-1 Bakken-Marketlink, Baker, MT

2.1.12.2 Big Bend to Witten 230-kV Transmission Line

After receipt of information on the power requirements for the proposed pump stations in South Dakota, Western Area Power Administration (Western) conducted a joint system engineering study to determine system reliability under the proposed loads at full Project electrical energy consumption. Engineering studies determined that a 230-kV transmission line would be required to support voltage requirements for pump stations 20 and 21 in the Witten area when the proposed Project is operating at maximum capacity (Figure 2.1.12-2). To address this requirement, Western proposes to replace the existing Big Bend-Fort Thompson No. 2 230kV Transmission Line Turning Structure located on the south side of the dam, construct a new double circuit 230 kV transmission line for approximately 1 mile south west of the dam, and construct a new Lower Brule Substation. These actions are part of the larger Big Bend to Witten 230 kV Transmission Line Project.

Basin Electric Power Cooperative (BEPC) is proposing to construct and operate a new single circuit 230-kilovolt (kV) transmission line in south-central South Dakota that would extend from a new substation (Lower Brule Substation) south of the Big Bend Dam on Lake Sharpe approximately 74 miles south-southwest to the existing Witten Substation located south of U.S. Highway 18.The approximate 76-mile Big Bend to Witten 230-kV Transmission Project (Project) consists of the aforementioned elements. The new Big Bend to Witten 230 kV transmission line would be built, owned, and operated by BEPC. The Witten Substation would also need to be expanded to accommodate the new switching equipment associated with the Big Bend to Witten 230-kV transmission line (see Appendix J, Basin Electric Big Bend to Witten 230-kV Transmission Project Routing Report)

The Project is located within Lyman and Tripp counties in south-central South Dakota. Approximately 6 miles of the single-circuit transmission line and all of the double-circuit transmission line, as well as Western's Lower Brule Substation, would be constructed on the Lower Brule Indian Reservation (see Figure 2.1.12-2). The proposed Lower Brule Substation would occupy approximately 16 acres of land. The existing Witten Substation would be expanded immediately to the northeast to accommodate the new 230-kV connection. The new part of the substation would have a separate access road and would be separated by a fence from the existing Witten Substation.

BEPC has applied to the U.S. Department of Agriculture's Rural Utility Service (RUS) for financing and proposes to construct and operate the Project to meet existing and future electric power requirements in south central South Dakota. BEPC would interconnect the new transmission line to the existing Western transmission system. Under RUS regulations for implementation of NEPA, an Environmental Assessment with scoping is being prepared to assess potential impacts of the proposed action on the human and natural environment. RUS is responsible for NEPA compliance and related statutes for the proposed Project. Since the Project would be constructed partly on the Lower Brule Indian Reservation, other cooperating agencies may be identified. RUS is the lead agency and Western is participating as the cooperating agency. Figure 2.1.12-2 shows the proposed route and two alternative routes currently under consideration in the Environmental Assessment process.

The proposed Project would transfer power from Western's transmission system near Big Bend Dam to Rosebud Electric Cooperative's Witten Substation, near Witten, South Dakota. It is anticipated that some communication facility additions or enhancements may be necessary for

the Project, including communication towers and buildings at the Lower Brule Substation, Witten Substation, and other intermediate sites.

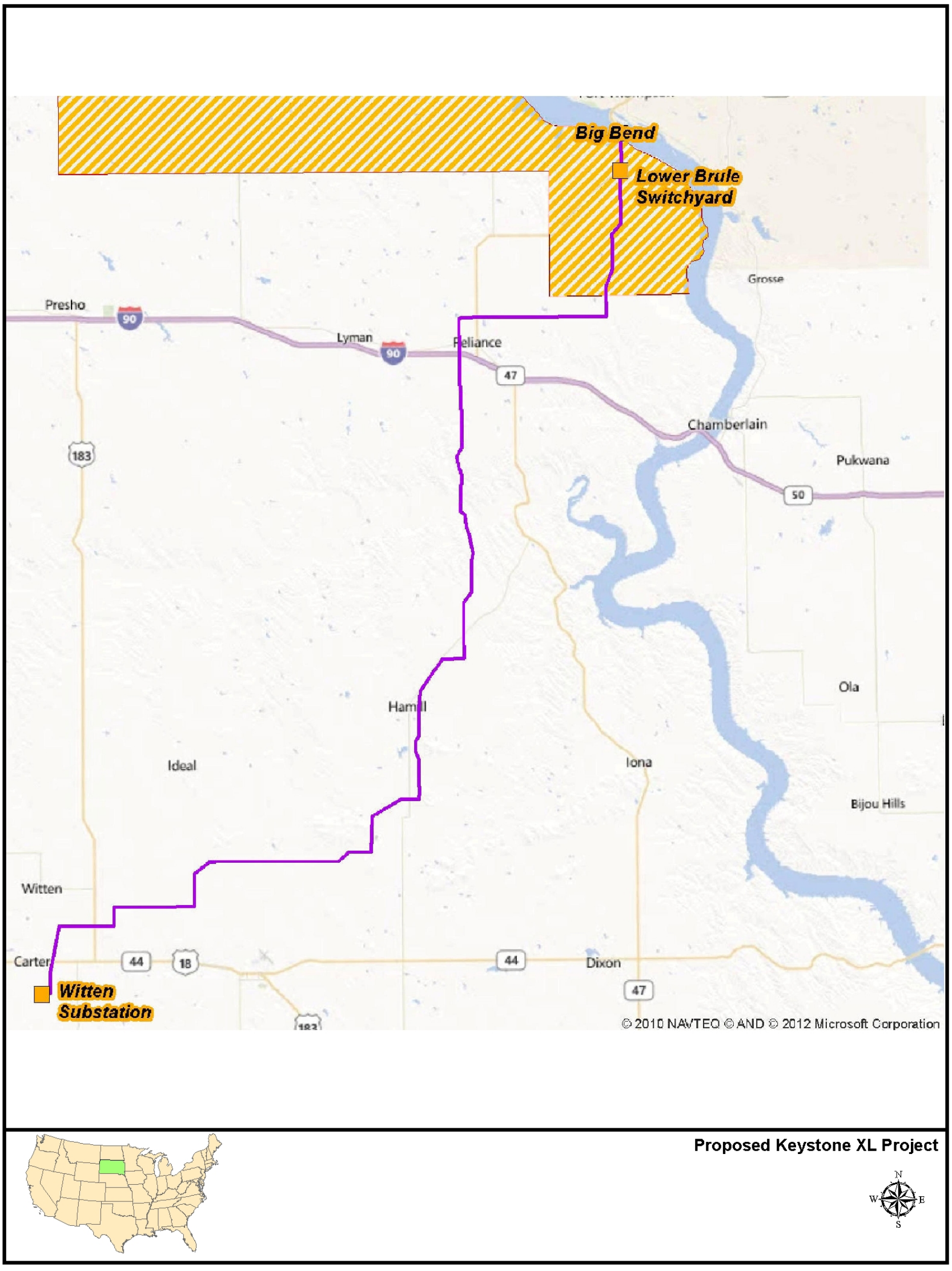
The proposed transmission structures would be steel single-poles and would be designed to support three conductors and an overhead optical ground wire. Tangent structures would be directly embedded into the soil and angle and dead-end structures would be constructed using concrete foundations. No guy wires are proposed. The design criteria for the portion of the line between the Big Bend Dam and the Lower Brule Substation are expected to be similar.

The proposed transmission line would be constructed within a 125-foot-wide ROW. All substation and switchyard work, including the placement of concrete foundations, erecting support structures, construction of control buildings, and the installation of electrical equipment would take place within secured areas. The proposed substation site at Big Bend and the expansion area at Witten would be cleared and leveled. Aggregate would be spread throughout undeveloped areas within the substation sites. Topsoil would be segregated from underlying soils and redistributed on disturbed areas outside the substation security fences. Soil erosion would be minimized during construction using best management practices. Substation components would be hauled to the site on local highways and roads and off-loaded using cranes and similar equipment. Concrete and aggregate from local sources would be hauled to the site by truck.

The impacts of construction and operation of the transmission line alternatives are addressed in Chapter 4, Environmental Consequences. An additional and separate NEPA environmental review of the alternatives to the proposed transmission line would be conducted after the alternative routes are further defined. The design and environmental review of the proposed 230-kV transmission line are on a different schedule than the pipeline system itself. Regional transmission system reliability concerns are not associated with the initial operation of the proposed pipeline pump stations, but only for future operation at the maximum throughput volume of 830,000 bpd.

2.1.12.3 Electrical Distribution Lines and Substations

Multiple private power companies or cooperatives would construct distribution lines to deliver power to 20 pump stations located along the United States length of the pipeline. The private power companies providing the distribution lines are responsible for obtaining the necessary permits, approvals, or authorizations from Federal, state or local governments. These distribution lines range in length from about 0.1-mile to 62 miles in length, average about13 miles long, and are estimated to extend about 377 miles, combined. The distribution lines to service pipeline pump stations would range in capacity from 69 kV to 240 kV, but the majority would have a capacity of 115 kV. Table 2.1-19 lists the electrical power supply requirements for the pump stations and Figures 2.1.1-3 through 2.1.1-5 depict the locations of the distribution lines. Most of the proposed new electrical distribution lines to service pump stations would be 115-kV lines strung a single-pole and/or H-frame wood poles. The poles would typically be about 60- to 80-feet-high with wire span distances of about 250 to 400 feet.



Source: Basin Electric Power Cooperative 2011 (Appendix J, Basin Electric Big Bend to Witten 230-kV Transmission Project Routing Report).

Figure 2.1.12-2 Big Bend to Witten 230-kV Line

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Table 2.1-19 Electrical Power Supply Requirements for Pump Stations

Pump Station No.	Milepost[a]	Transformer Size (Megavolt Amperes)	Kilovolts of Electricity	Estimated Electrical Line Length (miles)	Power Provider
Montana					
PS-09	1.2	20/27/33	115	61.8[b]	Big Flat Electric Cooperative
PS-10	49.3	20/27/33	115	49.1[c]	NorVal Electric Cooperative
PS-11	99.0	20/27/33	230	0.2	NorVal Electric Cooperative
PS-12	151.5	20/27/33	115	3.2	McCone Electric Cooperative
PS-13	203.1	20/27/33	115	15.2	Tongue River Electric Cooperative
PS-14	239.5	20/27/33	115	6.3	Montana-Dakota Utilities Company
South Dakota					
PS-15	288.6	20/27/33	115	24.5	Grand Electric Cooperative
PS-16	337.3	20/27/33	115	40.1	Grand Electric Cooperative
PS-17	391.5	20/27/33	115	10.9	Grand Electric Cooperative
PS-18	444.6	20/27/33	115	25.9	West Central Electric Cooperative
PS-19	500.4	20/27/33	115	20.4	West Central Electric Cooperative
PS-20	550.9	20/27/33	115	17.2	Rosebud Electric Cooperative
PS-21	598.9	20/27/33	115	20.1	Rosebud Electric Cooperative
Nebraska					
PS-22	TBD	20/27/33	115	24	Niobrara Valley Electric
PS-23	TBD	20/27/33	115	36	Loup Valleys Rural PPD
PS-24	TBD	20/27/33	115	9	Southern Power District
PS-25	TBD	20/27/33	69	0.1	Perennial PPD
PS-26	875.3	20/27/33	115	0.5	Norris PPD

Pump Station No.	Milepost[a]	Transformer Size (Megavolt Amperes)	Kilovolts of Electricity	Estimated Electrical Line Length (miles)	Power Provider
Keystone Cushing Extension					
Kansas					
PS-27	49.0*	20/27/33	115	4.6	Clay Center Public Utility
PS-29	144.5*	20/27/33	115	8.9	Westar Energy

[a] Mileposting for each segment of the proposed Project start starts at 0.0 at the northernmost point of each segment and increases in the direction of oil flow.
[b] Extends across approximately 32 miles of Bureau of Land Management land.
[c] Extends across approximately 4.8 miles of Bureau of Land Management land.

To the extent practicable, Keystone would coordinate, and has been coordinating, with the local public power district to minimize potential impacts to landowners resulting from the construction of the new transmission lines to pump stations. These power providers would construct the necessary substations and transformers and would either use existing service lines or construct new service lines to deliver electrical power to the specified point of use. The electrical power providers would be responsible for obtaining the necessary permits, approvals, or authorizations from federal, state, and local governments, except in those instances in Montana, where new service lines less than 10 miles in length would be constructed. Under Montana regulations, these distribution lines are considered "associated facilities" connected with the overall pipeline system. Review and approval under Montana law of the associated facilities occurred as part of the review and approval of Keystone's Major Facility Siting Act application.

In Montana and South Dakota, the following are Western's actions directly related to commercial electrical service for the proposed Project pump stations:

- Bowdoin Substation, Phillips County, Montana: Pump Station 9 would be served by Big Flat Electric Cooperative (Big Flat). The interconnection point would be at a new Western Area Power Administration (Western) owned and operated substation named Bowdoin on its existing Fort Peck-Havre 161-kV line. The new substation would consist of a Western owned three breaker 230-kV ring bus and 115-kV capacitor banks and associated bays. It would also include two Big Flat owned power transformers, high and low side transformer interrupters, and a 115-kV line bay. Big Flat would construct approximately 55 miles of 115-kV transmission line that would connect the new Bowdoin Substation to the existing Math Substation which would directly serve Pump Station 9. Land acquisition for the new Bowdoin Substation would be by BLM withdrawal and would be completed by Keystone.
- Fort Peck Substation, McCone County, Montana: Western would expand its existing Fort Peck substation to serve Norval Electric Cooperative (Norval) who would distribute electrical service to Pump Station 10. The substation expansion would include the construction of a 115-kV breaker bay on the south side of the substation. Land acquisition for the substation expansion would be completed by Western.
- Coal Hill Substation, McCone County, Montana: Western would construct a new 230-kV switching station directly adjacent to Pump Station 11. The new Western owned switchyard would be named Coal Hill, and would be configured in a three breaker ring configuration, with a Norval owned 230/6.9-kV power transformer. Norval would distribute electrical service to Pump Station 11. Keystone would acquire the necessary land and transfer ownership to Western.
- Circle Substation, McCone County, Montana: Western previously converted an existing 115-kV single substation configuration to a main-and-transfer substation configuration to accommodate unplanned load growth unrelated to the proposed Project. At the same time, Western replaced a 115/34.5-kV transformer and installed two 8-MVAR shunt capacitor banks. Western's unrelated substation expansion would accommodate an interconnection point in the 115-kV bus for McCone Electric Cooperative to serve the Pump Station 12 load. No additional land acquisition would be required.
- O'Fallon Substation, Prairie County, Montana: Western would expand their existing O'Fallon Substation and construct a new 115-kV breaker bay to accommodate Tongue River

Electrical Cooperative's service to Pump Station 13. Land acquisition for the substation expansion would be completed by Western.

- Philip Substation, Haakon County, South Dakota: Western's Phillip Substation would require an expansion with a new 115-kV bay addition and two 20 MVAR capacitor banks. The expansion would accommodate West Central Electric Cooperative's service to Pump Station 18. A slight yard expansion onto property already owned by Western accommodated a new 230-kV breaker addition unrelated to the proposed Project, and provided enough room to install the new Central Electric Cooperatives facilities. No additional land acquisition would be required.
- Midland Substation, Haakon County, South Dakota: Western's existing Midland Substation would require expansion for a new 115-kV bay to accommodate West Central Electric Cooperatives service to Pump Station19. Construction of this interconnection would require a small yard expansion to the east. Land acquisition for the substation expansion would be completed by Western.
- Gregory Substation, Gregory County, South Dakota: Western would expand its Gregory Substation with a new 115kV switchyard adjacent to the existing and aging facilities. In order to accommodate Rosebud Electric Cooperative's request for serving Pump Station 2, Western would be required to construct a new six-position main-and-transfer sub, including eight 15-kV power circuit breakers, two 10 MVAR capacitor banks, and take-off structures, reposition the existing 115/12.47 power transformer, and install new control building controls and relays. Land acquisition for the substation expansion would be completed by Western.

Locations of four of the five new pump stations in Nebraska have not yet been finalized, and the details regarding the distribution lines have not yet been determined. It is expected that the siting and construction of these lines would be similar to those in Montana and South Dakota.

In each of the states, the pump stations would have a substation integrated into the general pump station layout. The exact location of each substation cannot be identified at this time because the electrical supply lines would access pump stations from different alignments. Each substation footprint would be approximately 1 to 1.5 acres and is included in the total land size of each pump station. The actual size of a substation would be dictated by the specific design and size requirements of the local power supply company, the capacity of the power supply lines connected to each specific pump station, and the associated equipment. Figures 2.1.4-1 and 2.1.9-1 provide typical layouts for substations and pump stations.

Other electrical power requirements, such as power for MLVs, would be supplied from distribution service drops from adjacent distribution power lines with voltage below 69 kV. Each distribution service drop would typically be less than 200 feet long, and would require the installation of one or two poles and a transformer. The electric utility would typically install a pole-mounted transformer within 200 feet of the valve site location. However, in some cases the electric utility would install the transformer on an existing pole, which would be more than 200 feet from the valve site. The decision on where the transformer pole would be located would generally be based on the most economical installation. For example, MLVs north of the Milk River in Montana would be supplied from transformers on poles along small lines that currently supply power to irrigation systems. Upon completion of the new service drops, the electrical power providers would restore the work area as required, in accordance with local permits.

Preliminary routing for new electrical distribution lines was established in consultation with each utility company. Where practicable, these preliminary routes were along existing county roads, section lines, or field edges, to minimize interference with adjacent agricultural lands. The routes are subject to change as pumping station supply requirements are further reviewed with power providers and in some cases, as a result of environmental review of the routes by the agencies with jurisdiction.

Electromagnetic induction is the production of an electric current across a conductor moving through a magnetic field. This is the way that electric motors, generators, and transformers work. Electromagnetic induction can occur from power lines, which can cause noise, radio, and television interference for people living nearby. This potential interference would be mitigated by siting the power line away from residences (500 feet minimum, if possible) and by routing the power line to reduce interferences. Power line interferences can be reduced in a number of ways by the power provider, including spring washers and specialized clamps to keep hardware tight, and using static conductors at the top of the power line poles to stop lightning. The radio communication systems at the proposed Project facilities would operate on specific frequencies licensed by the Federal Communications Commission to reduce the risk of any interference with radio, television, or any other communication system in the area.

Electric cooperatives (co-ops) in Montana obtain electricity from a variety of sources, including coal-fired power plants, hydroelectric plants, and at wind farms in the area. Many co-ops have service agreements with Western, Bonneville Power Administration, PPL Montana, and BEPC, some of which likely results in electrical energy being transported to Montana from many distant and varied sources. This energy flows primarily across transmission lines owned by Western and NorthWestern Energy to delivery points within the co-ops systems. The energy is delivered to the members/consumers through distribution lines, substations, and other related infrastructure.

As a result, it is not possible to identify the specific facilities or the specific sources of energy that would be used to generate the electricity that would be used at the pump stations and mainline valves in Montana. Each of the co-ops involved has agreed to provide the necessary power and would likely request the additional power from their current providers. Any increase in power generation at the plants providing that power would have to be conducted in compliance with environmental regulations. If additional nonrenewable resources are needed to generate the additional, the provision of those resources would also have to be accomplished consistent with regulatory requirements.

Westar Energy proposes to build two new 115-kV transmission lines in Clay County, Kansas, as part of Westar's agreement to supply two new interconnection points to the Public Utility Commission of Clay Center's electrical system. The interconnections will also support the operation of the proposed Project.

As indicated previously, all distribution lines and substations would be installed and operated by local power providers. This work would include ROW acquisition, ROW clearing, construction, site restoration, cleanup, and obtaining any necessary permits, approvals, or authorizations from federal, state, and local governments. The proposed distribution lines would require a construction ROW and a permanent ROW. For routes not along a road or pipeline, 50 feet of new ROW would be required and the structures would be placed in the center of that easement. Where the line would be adjacent to roads or the proposed Project, a vertical construction would most likely be used, which would require only 30 feet of new ROW. The remaining 20 feet

needed for line clearance would overlap the existing road or pipeline easement. The ROW widths would be 50 feet when not along an existing corridor. Each power provider would develop detailed power line construction procedures to address site specific conditions. In general, construction of the electrical distribution lines would involve the following:

- ROW Acquisition/Easements: The electric power provider would obtain any necessary easements.
- ROW Clearing: Limited clearing would be required along existing roads in native and improved grasslands and croplands. Either tree trimming or tree removal would be conducted to provide adequate clearance between the conductors and underlying vegetation.
- Power Line Construction: Power line poles and associated structures would be delivered on flatbed trucks. Radial arm diggers would typically be used to excavate the required holes. Poles would be either wood or steel and would be directly embedded into the excavated holes using a mobile crane or picker truck where appropriate. Anchors may be required at angles and dead ends.
- Stringing: After the power line poles are in place, conductors (wires) would be strung between them. Pulling or reeling areas would be needed for installation of the conductor wires which would be attached to the poles using porcelain or fiberglass insulators.
- Restoration: After completion of distribution line construction, the disturbed areas would be restored. All litter and other remaining materials would be removed from the construction areas and disposed of in accordance with regulatory requirements. Preconstruction contours would be restored as closely as possible and reseeding would follow landowner requirements.

2.1.13 Proposed Project Decommissioning

2.1.13.1 Proposed Project Life

Keystone used a design life of 50 years to develop the engineering standards for the proposed Project. However, with implementation of the pipeline integrity management plan, the 57 Special Conditions developed by PHMSA (see Appendix B, PHMSA 57 Special Conditions), and an operations and maintenance program as described above, Keystone anticipates that the life of the proposed Project would be much longer. Many other pipeline companies have safely extended the duration of pipeline systems by replacing sections of pipe after finding anomalies and by replacing or upgrading equipment and facilities at pump stations. As a result, it is not possible to identify a specific number of years that the proposed Project may be in service.

2.1.13.2 Decommissioning

PHMSA has requirements that apply to the decommissioning of crude oil pipelines in 49 CFR Section 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.

TransCanada (the parent company of Keystone) would adopt operating procedures to address these requirements for the proposed Project as they have for previous pipeline projects including the existing Keystone Pipeline. TransCanada typically does not abandon large-diameter pipelines but generally idles or deactivates pipe as market conditions dictate. This allows a dormant pipeline to be reactivated or converted to another purpose in the future, subject to applicable regulatory approvals. When a pipeline or a segment of a pipeline is idled or deactivated, the pipe generally is purged of its contents, filed with an inert gas, and left in place with warning signage intact. CP would likely be left functional as would other integrity measures such as periodic inspections under the integrity management plan.

The proposed Project pipeline would traverse approximately 45 miles of federal land under the management and jurisdiction of the Bureau of Land Management (BLM).All of the federal land is in the state of Montana. The portion of the proposed Project that would cross BLM-administered land would be subject to the pipeline decommissioning and abandonment requirements stipulated in the BLM ROW grants and permanent easement permits. These requirements are:

- Boundary adjustments in oil and gas would automatically amend the right-of-way to include that portion of the facility no longer contained within the above. In the event an automatic amendment to this right-of way grant, the prior on-lease/unit conditions of approval of the facility would not be affected even though they would now apply to facilities outside of the lease/unit as a result of a boundary adjustment. Rental fees, if appropriate would be recalculated based on the conditions of this grant and the regulations in effect at the time of an automatic amendment.
- Prior to termination of the right-of-way, the holder would contact the authorized officer to arrange a predetermination conference. This conference would be held to review the termination provisions of the grant.
- Prior to termination of the right-of-way, the holder would contact the authorized officer to arrange a joint inspection of the right-of-way. This inspection would be held to agree to an acceptable termination (and rehabilitation) plan. This plan would include, but is not limited to, removal of facilities, drainage structures, or surface material, recontouring, topsoiling, or seeding. The authorized officer would approve the plan in writing prior to the holder's commencement of any termination activities.

The ROW grant on federal lands under the management of BLM for the proposed Project would have a maximum term not-to-exceed 30 years. For the proposed Project to extend beyond 30 years, the approved ROW grant would require a renewal authorization-certification decision by 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 that would address reclamation of areas disturbed during abandonment would be required.

Decommissioning activities would have to 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 proposed Project decommissioning at the end of the useful life of the proposed Project more than 50 years in the future.

Prior to decommissioning the proposed Project, Keystone would identify the decommissioning procedures it would use along each portion of the route, identify the regulations it would be required to comply with, 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.

It is likely that after decommissioning there would be fewer land use restrictions than during operation of the proposed Project since either the ROW would no longer have strict encroachment limitations for protection of the purged pipeline, or the pipeline may have been removed and there would no longer be limitations of use of the former ROW.

As noted above, PHMSA regulations require that hazardous liquids pipelines be purged of combustibles prior to decommissioning. Therefore the potential for the release of contaminants from the decommissioned pipeline would be negligible.

2.1.14 References

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TransCanada Keystone Pipeline LP (TC). 2012. Application to DOS for a Presidential Permit. May 4, 2012.

2.2 DESCRIPTION OF REASONABLE ALTERNATIVES

2.2.1 Rationale for Considering Alternatives

As noted in Section 1.4, Market Analysis, considerable changes in the crude oil market since the publication of the 2011 Final Environmental Impact Statement (Final EIS) have led to an evaluation of industry actions that have begun and may likely expand to adjust to ongoing constraints in trans-border pipeline capacity. In addition, comments received on the Final EIS regarding industry alternatives to the proposed Project have also led to an in-depth analysis of possible scenarios if the proposed Project is not built. These scenarios are analyzed under the No Action Alternative. Additionally, the Council on Environmental Quality (CEQ) guidelines also indicate that the choice of No Action by a federal agency would result in predictable actions by others, the consequences of the No Action Alternative should be included in the Environmental Impact Statement (EIS) (CEQ 1981).

The following is an overview of these scenarios under the No Action Alternative, including the development that would be necessary to accommodate transportation of crude oil from the Western Canadian Sedimentary Basin (WCSB) and Bakken Formation to replace the proposed Project's volumes if it is not built and if other additional pipeline capacity does not become available. This section also includes detailed discussions of major route variations and other alternatives considered in the Supplemental Environmental Impact Statement (Supplemental EIS).

2.2.2 Overview of Alternatives

In addition to the proposed Project, this Supplemental EIS considers alternatives to the proposed Project, consistent with the requirements of the National Environmental Policy Act (NEPA). Three broad categories of alternatives are considered:

- No Action Alternative (Section 2.2.3)—addresses the Status Quo scenario, as well as potential market responses that could result if the Presidential Permit is denied or the proposed Project is not otherwise implemented;
- Major Pipeline Route Alternatives (Section 2.2.4)—includes other potential pipeline routes for transporting WCSB and Bakken crude oil to Steele City, Nebraska; and
- Other Alternatives Considered (Section 2.2.5)—includes minor route variations, alternative pipeline designs, and alternative sites for aboveground facilities.

For each of these categories of alternatives, this section describes the process for identifying and screening alternatives; the reasonable alternatives identified, if any; and the rationale for eliminating other alternatives considered. This section concludes with the discussion from the Final EIS of the use of alternative forms of energy and energy conservation in the place of the proposed Project.

2.2.3 No Action Alternative

NEPA regulations (40 Code of Federal Regulations [CFR] Part 1502.14[d]) specify that the alternatives analysis in an EIS is to include the alternative of No Action. Under the No Action Alternative, the Department of State (the Department) would deny the Presidential Permit, the proposed Project would not be built (for that or other reasons), and the impacts relating to the proposed Project described in Chapter 4, Environmental Consequences, would not occur. This scenario focuses only on the specific impacts associated with construction and operation of the proposed Project that would not occur, and is referred to as the "Status Quo Scenario" under the No Action Alternative. Analysis of the Status Quo Scenario will serve as a benchmark against which other alternatives will be evaluated.

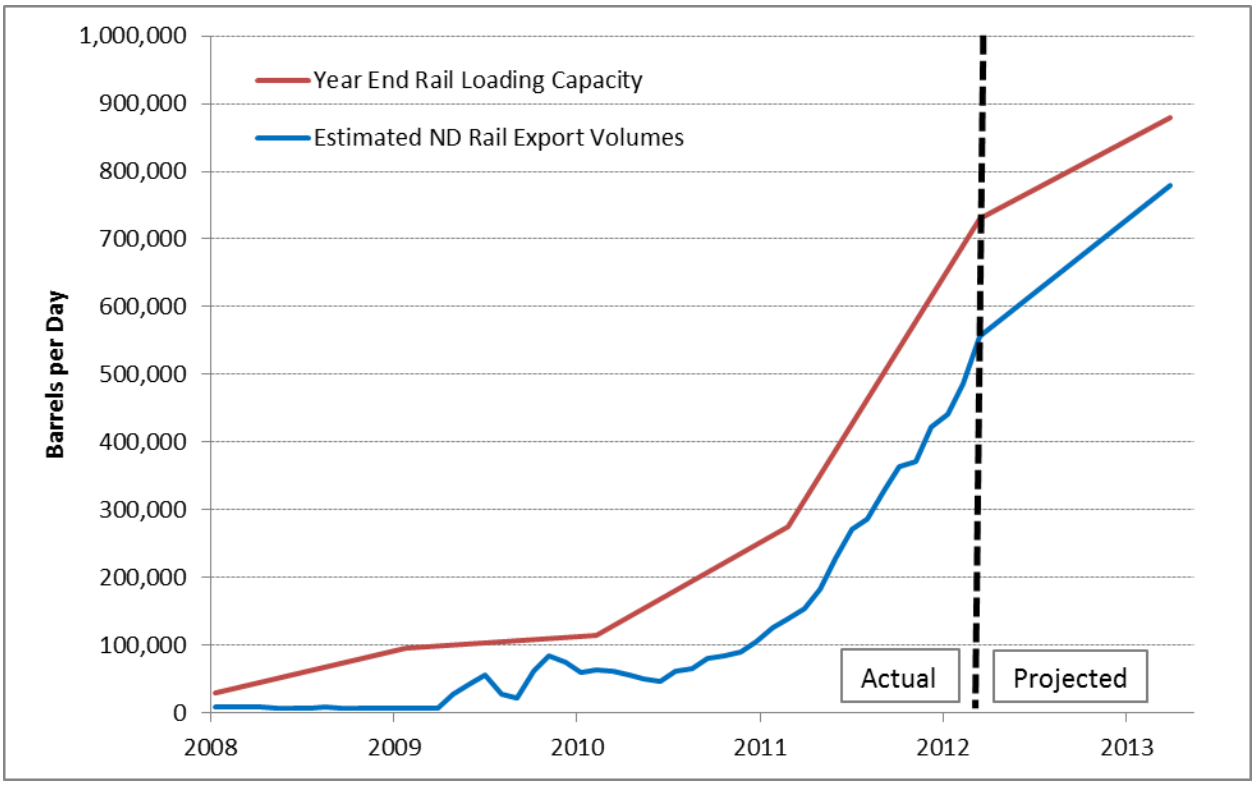
The No Action Alternative does not include consideration of the upstream (production of crude oil in the oil sands) or downstream (refining of crude oil and/or end-use of refined petroleum products). The upstream and downstream activities are not part of the proposed Project. To the extent that they would occur, the effects of those upstream and downstream activities that were affected by the proposed Project would be considered indirect effects, as effects that occur later in time or farther removed in distance (40 CFR 1508.8). However, as noted in Sections 1.4, Market Analysis, and 4.15, Cumulative Effects Assessment, because of broader market dynamics and options for crude oil transport in the North American logistics system, the upstream and downstream activities are unlikely to be substantially different whether or not the proposed Project is constructed.

To summarize, production and disposition of crude oil in North America (and throughout the world) is driven by market forces. There exists demand for heavy crude oil in PADD 3, particularly in the Gulf Coast area[1] refineries. In recent years, refiners in PADD 3 have consistently imported approximately 2.2 million barrels per day (mmbpd) of heavy crude oil (less than 25 degrees American Petroleum Institute [API] gravity). The proposed Project is supported by long-term contracts to deliver approximately 555,000 barrels per day (bpd) to the Gulf Coast area to meet part of that existing market demand. If the proposed Project is not approved, or is otherwise not constructed, the customers who signed those contracts would be expected to seek alternate transportation options to deliver the crude oil that had been committed to the proposed Project to the Gulf Coast area. Those customers would most likely seek other pipelines (if available) because they offer the most economic means of overland transportation of large volumes of crude oil. If other pipelines are not available, those customers would be expected to seek and utilize other modes of transportation, if the increased cost of such transportation does not render it uneconomic to produce and transport the crude oil to market. Section 1.4, Market Analysis, concludes that based on current market conditions and a range of future projected market conditions, it would be economic to ship crude oil by rail and other intermodal options to the Gulf Coast area.

The analysis in the Final EIS had not carried forward other modes of transportation for full analysis as reasonable alternatives largely because of economic practicability; however, developments since then clearly demonstrate that other modes of transportation can be economically utilized. Although the Final EIS noted the significant increase in capacity to transport crude oil using unit trains, particularly in the Bakken area, at that time the new capacity

[1] For the purposes of the Supplemental EIS, the Gulf Coast area includes refineries located in the Houston and Port Arthur area of southeastern Texas as well those in St. James, Louisiana.

was only beginning to be developed. Since the Final EIS was published, however, the volume of crude oil transported by rail out of the Bakken area has more than quadrupled to approximately 500,000 bpd (Figure 2.2.3-1) and could exceed 800,000 bpd by the end of 2013. This rail capacity has been developed because there is not sufficient pipeline capacity to transport the Bakken crude oil to market. The continuing rapid development of the Bakken resource does not appear to have been curtailed because of this lack of pipeline capacity.

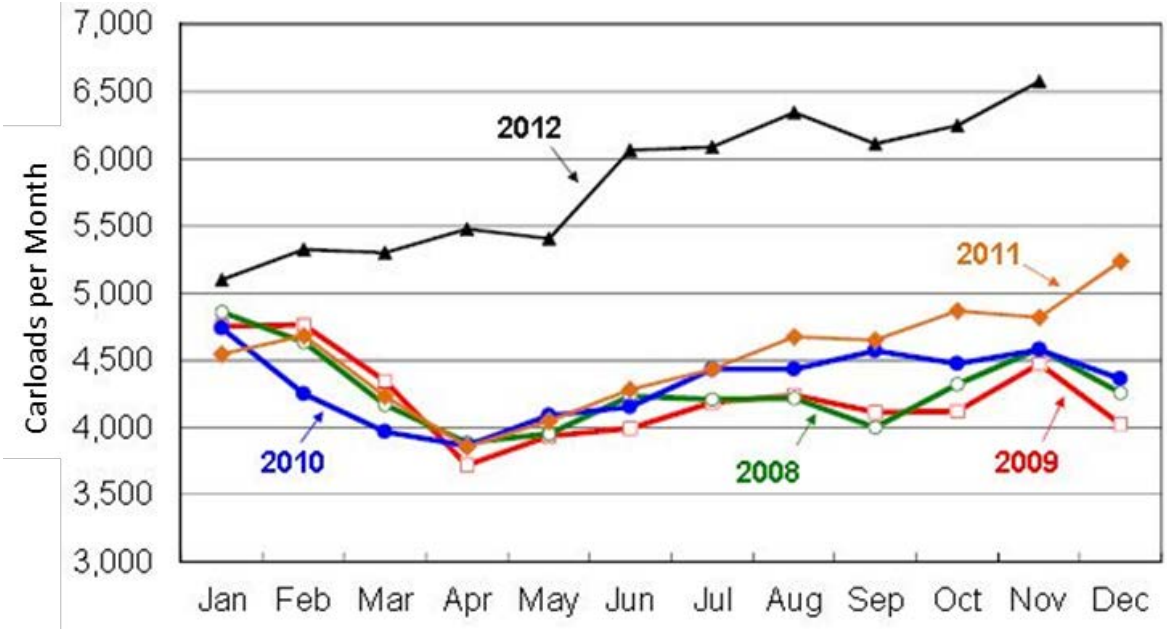


Source: North Dakota Pipeline Authority 2013; Company Reports.
Note: The 2013 estimate of volume of crude oil shipped from the Bakken is based on rail company statements.

Figure 2.2.3-1 Estimated North Dakota Rail Export Volumes, December 2012

The Bakken area has seen the most intensive development of rail transport capacity for crude oil, but this is a phenomenon that is occurring throughout North America, including in the WCSB. An analysis conducted by Hart Energy Consulting of existing, under construction, and announced crude-by-rail projects estimated that by 2016 companies will have constructed rail terminals throughout various United States production areas capable of loading 2.5 mmbpd; and terminals throughout various United States refining areas capable of off-loading 2 mmbpd (Hart 2012). These estimates are from summer 2012 and as indicated in Section 1.4.6.2, they are most likely low. For example, as of the end of 2013, there is an estimated 730,000 bpd of rail off-loading capacity in the Gulf Coast area, and almost 900,000 bpd on the East Coast (Figure 1.4.6-5).

As indicated in Section 1.4, this trend of increased rail transport is also beginning to occur in the WCSB area of Canada in response to pipeline constraints. There are two major rail operators in Canada – Canadian National (CN) and Canadian Pacific. Both of these rail operators are actively promoting crude-by-rail as an option for transporting crude oil out of the WCSB, including the transport of heavy crudes in the form of dilbit, railbit (similar to dilbit but with less diluent added), and raw bitumen without diluent (although this requires insulated rail cars with steam coils) (Figure 2.2.3-2). Current estimates are that more than 120,000 bpd were transported out of the WCSB by rail at the end of 2012. Projections for WCSB crude oil transport by rail to the U.S. Gulf Coast could reach 200,000 bpd or more in 2013 (Hart 2012, Peters and Co. Ltd 2013). Figure 2.2.3-2 shows the increase in carloads of petroleum and petroleum products transported by CN and Canadian Pacific. The increase is attributable almost entirely to crude oil and indicates that by the end of 2012 CN and Canadian Pacific were transporting as much as 200,000 bpd of crude oil.[2]



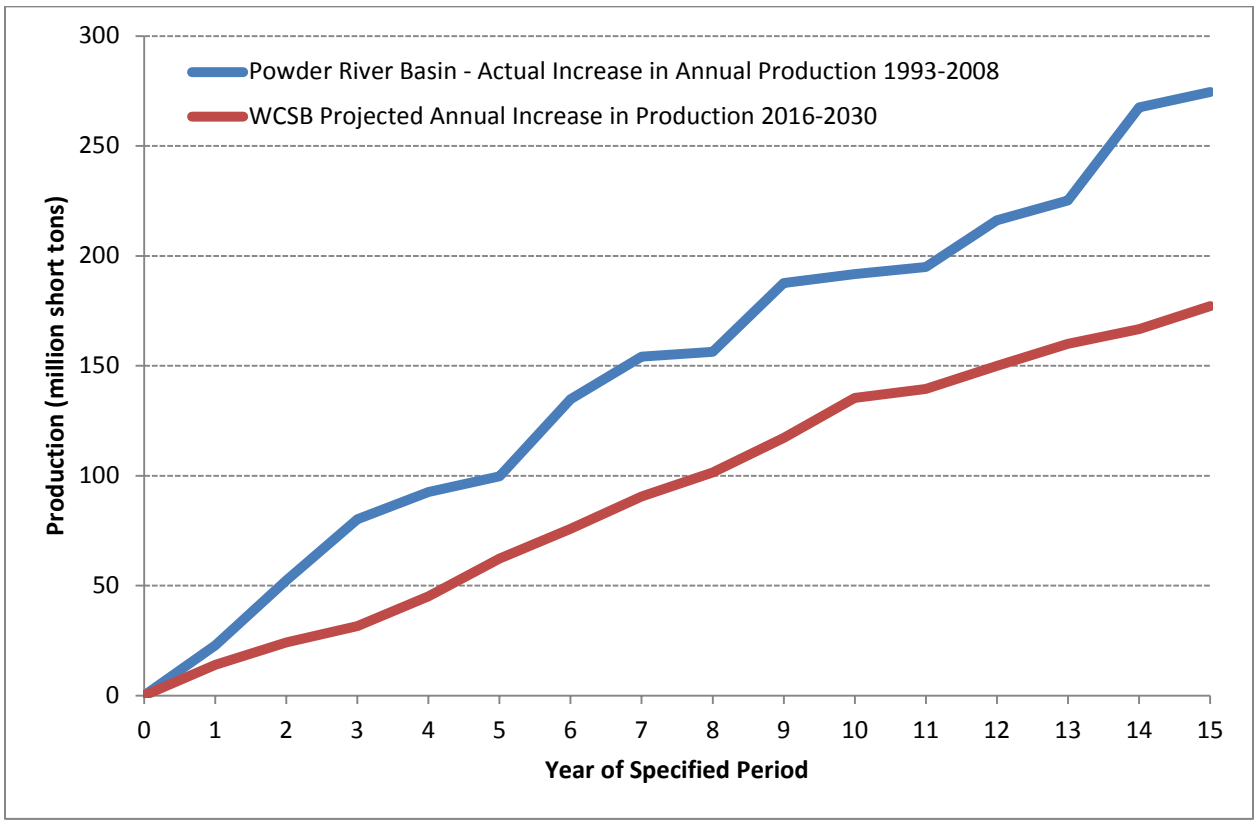
Source: AAR 2012

Figure 2.2.3-2 Actual CN and Canadian Pacific Petroleum Products Transported, Carloads per Month

There is no indication that the rail logistics system would not be able to continue to scale up at this rate over many years if the economics justified it. For example, the rail system was able to expand at an even greater rate, in terms of increased tons hauled per year, to accommodate coal production in the Powder River basin in Wyoming and Montana.3 The Powder River basin produces approximately 40 percent of the nation's coal, over 400 million tons per year, almost

[2] This 200,000 bpd includes the crude oil Canadian Pacific is transporting out of the Bakken in the United States.
[3] The increase in capacity was not without challenges or setbacks, but nonetheless, even with these challenges the described capacity increases were achieved (U.S. Department of Energy 2007).

all of which is transported by rail. The first truly large-scale surface mines in the area began operating in the 1970s. By 1980, approximately 99 tons per year of coal was transported out of the Powder River Basin. By 2008, this had increased to approximately 500 million tons, or an average increase of 14 million tons per year every year for 28 years. On a tonnage basis, this is equivalent to an increase of approximately 240,000 bpd per year, or 6.7 million bpd over 28 years. Figure 2.2.3-3 below compares the annual increase in rail transport of crude oil (expressed in short tons) that would be necessary to accommodate projected WCSB production from 2016 to 2030 to the annual increase in tons of coal hauled from the Powder River Basin from 1993-2008, when the most significant expansion in production occurred. This offers further evidence that the rail system (in terms of track improvements and loading facilities) would be capable of making any necessary capacity increases to accommodate all of the WCSB production, provided the economics justified it.



Source: CAPP 2012; Hellerworx, Inc. 2013

Figure 2.2.3-3 Annual Increases in Rail Transport to Accommodate WSCB Production Compared to Coal

As demonstrated above and in Section 1.4, rail, although still typically more expensive than pipelines for transporting crude oil, can be an attractive transport alternative, particularly where there is inadequate pipeline capacity. Rail also offers the benefits of lower capital costs (as most of the rail infrastructure already exists), shorter time to develop, quicker transit to market, greater flexibility with market destinations, and shorter contract terms (typically 0 to 5 years) (EnSys 2011; Hart 2012).

As other modes of transportation (e.g., tankers and barges) are also being economically utilized to transport such large and growing volumes of crude oil throughout North America, they are being further analyzed as alternatives to transport crude oil from the WCSB and Bakken basins to refinery markets, along with other potential proposed pipelines (e.g., Northern Gateway and Trans Mountain in British Columbia), modifications to existing pipelines (e.g., reversal of flow in the Seaway Pipeline), and construction of a new pipeline (e.g., Flanagan South).

Therefore, the development of alternative methods to transport WCSB and Bakken crude to refinery markets is considered a "predictable action" (CEQ 1981). The discussion below identifies and screens other predictable actions that should be included as scenarios under the No Action Alternative.

2.2.3.1 Identification and Screening of No Action Alternative Scenarios

Several technically feasible scenarios were identified for the transport of WCSB and Bakken crude oil to Gulf Coast area refineries based on existing and otherwise suggested transport measures:

- Rail to Vancouver or Kitimat, British Columbia and tanker to the Gulf Coast area refineries;
- Rail to Prince Rupert, British Columbia and tanker to the Gulf Coast area refineries;
- Rail directly to the Gulf Coast area refineries;
- Rail to the Cushing area and pipeline to the Gulf Coast area refineries;
- Rail to Wood River, Illinois or other Mississippi River ports and then barge to the Gulf Coast area refineries;
- Trucking;
- Existing pipeline system alternatives (i.e., use available capacity in existing pipelines); and
- Other recent crude oil transportation proposals.

In addition to these transport scenarios, other scenarios considered include:

- Use of alternative energy sources; and
- Implementation of energy conservation measures.

The screening of these scenarios took into consideration several factors including transport cost, timing (e.g., could it be implemented within the same general timeframe as the proposed Project), and whether it could transport approximately the same volume of crude oil as currently contracted to be shipped by the proposed Project, and could be scaled up to handle the maximum throughput of the Project. Three scenarios were included for further evaluation:

- The Status Quo Scenario, under which the direct impacts associated with construction and operation of the proposed Project would not occur; this Scenario provides a baseline for comparison with other alternatives;
- Rail/Pipeline Scenario, which could transport the equivalent capacity as the proposed pipeline (i.e., up to 730,000 barrels bpd of WCSB crude oil and up to 100,000 bpd of Bakken crude oil [see Section 2.2.3.2, Rail/Pipeline Scenario]); and
- Rail/Tanker Scenario, which could transport the equivalent capacity as the proposed pipeline (i.e., up to 730,000 bpd of WCSB crude oil and up to 100,000 bpd of Bakken crude oil [see Section 2.2.3.3, Rail/Tanker Scenario]).

The rationale for eliminating the other scenarios is provided in Section 2.2.3.4, Scenarios Considered but Eliminated from Detailed Analysis.

Rail Transport Assumptions

As noted in the market analysis in Section 1.4, in light of potential constraints on pipeline capacity, producers in the Canadian oil sands region and in the Bakken field have begun to use rail to transport crude oil to market. As noted above, approximately 500,000 bpd is currently being shipped out of the Bakken by rail. There are numerous reports of rail loading terminals being constructed in the WCSB, with CN now expected to have 14 operating loading terminals in 2013 (see Section 1.4.5, Crude Oil Transportation). Current estimates are that more than 120,000 bpd were transported out of the WCSB by rail at the end of 2012. Projections for WCSB crude oil transport by rail to the U.S. Gulf Coast could reach 200,000 bpd or more in 2013 (Hart 2012, Peters and Co Ltd. 2013).

For purposes of this analysis, assumptions were required regarding crude oil loading locations; whether the crude oil would be transported as dilbit, synbit, railbit, or bitumen; rail operations (e.g., unit trains); rail routes; and unloading locations. The basis for the assumptions used in this analysis is described below, but it is important to note that these are simplifying assumptions. In reality, and as current trends have indicated, the market is likely to develop multiple solutions (e.g., multiple loading locations, forms of crude oil shipped, train sizes, routes, and destinations). The scenarios presented here are intended to be a reasonable representation of likely rail transport of WCSB crude oil, but do not imply that these scenarios are the only, or necessarily the best, rail options.

Loading Locations

While Hardisty, Alberta is the starting point for the proposed Project, other potential crude-by-rail terminal locations were considered. Hardisty was not selected because it is only served by one of the Canadian Class I railroads in the WCSB region. Fort McMurray and Cold Lake, Alberta were eliminated because they were not as centrally located. It is possible that constraints in future pipeline capacity could make these locations more attractive to on-loading rail facility (so-called midstream) developers, and there are reports of facilities being expanded and new facilities being constructed in those areas.

Lloydminster, Saskatchewan and Edmonton are more central crude oil hubs and are served by both Canadian Class I railroads. Lloydminster was selected as the representative point of origin to develop this scenario because Canadian Pacific Railway System (CPRS) currently has a crude

oil loading terminal at Lloydminster (CPRS 2012), and CN also serves Lloydminster. Lloydminster is relatively close to Hardisty (about 68 miles) and is about the same rail distance to the destination markets as Hardisty (Figure 2.2.3-2). Edmonton is approximately twice the distance from Hardisty. Epping, North Dakota was selected as a representative point of origin for transporting Bakken crude oil since it is one of the locations with an existing rail terminal is already servicing that location.

It is assumed that crude oil currently under contract through the proposed Project would be delivered to Lloydminster and Epping through similar means as it would have been to Hardisty and Baker, Montana. As a result, delivery to the points of origin is not included in the scope of this analysis. There are no Class I rail[4] routes that serve both Lloydminster and Epping, so two separate rail scenarios have been proposed.

Form of Crude Oil Transported

Crude oil from the WCSB can be transported by rail as dilbit, railbit, or undiluted bitumen. Dilbit can be transported in standard rail tank cars. The railbit and undiluted bitumen require insulated rail cars with steam coils for reheating the bitumen at the destination terminal. Recent announcements indicate that at least 60 percent of the rail tank cars now being manufactured are of the insulated/coiled type (Torq 2012). Based on that percentage, there are expected to be 28,000 new insulated/coiled rail cars capable of hauling approximately 800,000 bpd of bitumen/railbit/dilbit to the U.S. Gulf Coast available by the end of 2014. As noted in Section 1.4 there are at least 8 oil sands producers that are currently transporting WCSB heavy crude by rail and have publically announced plans to transport increasing amounts of it by rail in 2013 (see Table 1.4-9). This indicates that shippers should have a choice in the form they ship crude oil and that they are already making plans to utilize the rail option at scale.

While it is assumed to be more expensive to ship bitumen on a per barrel basis because it requires insulated/steam coiled railcars and less bitumen can be loaded into each rail car because of weight restrictions, the ultimate delivery to the refineries is 100 percent of the crude oil produced in the WCSB, rather than a blend with lighter hydrocarbon diluents that the WCSB producers have to purchase to make bitumen into dilbit. Removal of the need for diluent would reduce the volume required for transport by the roughly 30 percent of volume of diluent used in the dilbit production or 20 percent of volume of diluent used in railbit production. The benefit of transporting bitumen is that fewer barrels would be handled, and there would be no need to transport diluent into Canada for blending the volume of bitumen shipped by rail into dilbit. Based on this, the EnSys Energy and Systems, Inc. (EnSys) No Expansion Update (EnSys 2011) had calculated that the net shipping cost per barrel of bitumen by rail could be similar to the pipeline shipping costs for dilbit.

Even though the rail costs per barrel of bitumen may be much higher in some instances than those in EnSys (EnSys 2011), some producers may still be able to receive a better price per barrel by shipping bitumen by rail to the Gulf Coast rather than shipping it to Edmonton or Hardisty, where they are receiving significantly discounted prices. The producer can receive

[4] A Class I railroad in the United States is a large freight railroad company, as classified based on operating revenue. The Surface Transportation Board (STB) defines a Class I railroad in the United States as "having annual carrier operating revenues of $250 million or more." (STB 2012)

much higher netback prices per barrel of bitumen by accessing better prices on the U.S. Gulf Coast, backhauling diluent from the U.S. Gulf Coast, and shipping fewer total barrels of product.

While shipping raw bitumen may have cost advantages, there are other logistical concerns that include the following:

- Rail congestion issues in the Gulf Coast area could cause delays and reduced reliability in the delivery of bitumen by rail directly to the refineries;
- Space constraints at refineries on the Gulf Coast area to accommodate large daily rail shipments of raw bitumen, including the necessary rail off-loading facilities on site.

One alternative to rail shipment of bitumen directly to the refineries would be to ship bitumen by rail to a U.S. Gulf Coast port facility for onward delivery by barge. There are several projects under construction that would implement this option. There can be some logistical challenges to scaling up to the full capacity of the proposed Project with this alternative as well. Most barges would require some modifications in order to keep raw bitumen liquid (e.g., insulation, modification of heating system and heating coils) and possibly retrofitting of vapor recovery equipment (EnSys 2011). Further, barge receipt of raw bitumen may constrain dock operations, especially if the refineries are still receiving crude oil shipments from other sources (e.g., Mexico, Venezuela).

Because of these logistical concerns associated with scaling up the bitumen or railbit by rail scenario to the full capacity of the proposed Project, it has been assumed for purposes of this analysis that the WCSB crude oil would be transported as dilbit, while recognizing that some portion of the crude oil would likely be transported as bitumen or railbit.

Rail Operations

All rail movements were assumed to occur in unit trains. A unit train transports all of its cargo from a single starting point to a single end point with no intermediate stops or storage, generally on one bill of lading. This provides shippers with an economy of scale, minimizes delays, and increases reliability. For the purposes of the analysis in this Supplemental EIS, the unit trains are assumed to be 100 railcars in length.[5] The railcars remain together as one unit train and cycle back and forth between the origin and destination, loaded and empty. Unit trains are delivered empty to the rail loading terminal, loaded and delivered back to the rail carrier within 24 hours. At destination, the loaded trains are delivered to the terminal and unloaded; the empty trains are delivered back to the rail carrier within 24 hours. Some crude oil unit train terminals can load or unload a 100 car unit train in 12 hours.

Rail Routes and Unloading Destinations

The rationale for the specific rail routes and unloading locations proposed for the Rail/Pipeline and Rail/Tanker scenarios are described below in the description of each scenario.

2.2.3.2 Rail/Pipeline Scenario

Under this scenario, the WCSB crude would be transported to Gulf Coast area refineries via the following modes and routes (see Figure 2.2.3-2):

[5] The number of rail cars in unit trains transporting crude oil may vary. BNSF recently announced that it was considering units trains of 118 cars. Coal unit trains can be up to 150 cars long.

- Loaded onto rail in Lloydminster, Saskatchewan, and transported approximately 1,900 miles (using CPRS and Burlington Northern Santa Fe [BNSF] Railway) or approximately 2,000 miles (using CN and Union Pacific [UP] routing) along existing rail lines via common carrier railroads to new rail terminals at Stroud, Oklahoma. Stroud was selected as the destination rail terminal because, currently, there are no railroads that go all the way to Cushing. These representative routes are used for analysis purposes only;
- Transferred to new oil storage facilities and pipeline at Stroud, Oklahoma, and transported via a new pipeline approximately 17 miles to the existing oil terminal at Cushing, Oklahoma. Crude oil is currently being shipped by this method, but it is assumed that additional pipeline capacity would be needed to accommodate the added volume of crude oil; and
- Transferred by existing pipelines from Cushing approximately 533 miles to the Gulf Coast area for refining.

The Bakken crude would be transported via the following modes and routes (see Figure 2.2.3-5):

- Loaded onto rail at Epping, North Dakota,[6] and transported approximately 1,347 miles to new rail terminals with storage tanks at Stroud, Oklahoma, via common carrier railroad (assumed to be the same terminals identified for the WCSB crude);
- Transferred to existing oil storage facilities at Stroud, Oklahoma, and transported via a new pipeline approximately 17 miles to the existing oil terminal at Cushing, Oklahoma; and
- Transferred by existing pipeline approximately 533 miles from Cushing, Oklahoma, to the Gulf Coast area for refining.

These proposed routes would use existing rail and pipeline infrastructure to the extent possible, but would require construction of the following new facilities, as shown in Table 2.2-1. The loading and unloading terminals would probably be sited near the railroad mainline. The terminals could be clustered near existing terminals, or spread out in the vicinity of Epping, Stroud, or Lloydminster. Representative sites were identified for these new terminals for purposes of this analysis.

Lloydminster Loading Terminal

Thirteen unit trains per day would be needed to transport up to 730,000 bpd throughput from Lloydminster to Stroud. A new rail terminal located near the mainline would have the capacity to load two 100-car unit trains per day. Based on the proposed throughput and the terminal capability, seven new terminal sites would need to be constructed at Lloydminster to load up to 730,000 bpd. Each terminal would occupy about 500 acres.[7] The terminal would include a loop track (25,000 to 30,000 feet per terminal); oil storage tanks (four 75,000 barrel tanks per site); and other infrastructure typically required for loading and unloading crude oil. Figure 2.2.3-6 is an example existing loading terminal in North Dakota representative of the type of facility that would be needed.

[6] The Epping area currently has one operating rail on-loading facility. For the purposes of analysis, because of future expected expansion of exports from the Bakken field, at least one addition terminal would be needed.
[7] This acreage was used for analysis purposes based on other typical facilities in the region. The exact dimensions of future facilities may differ.

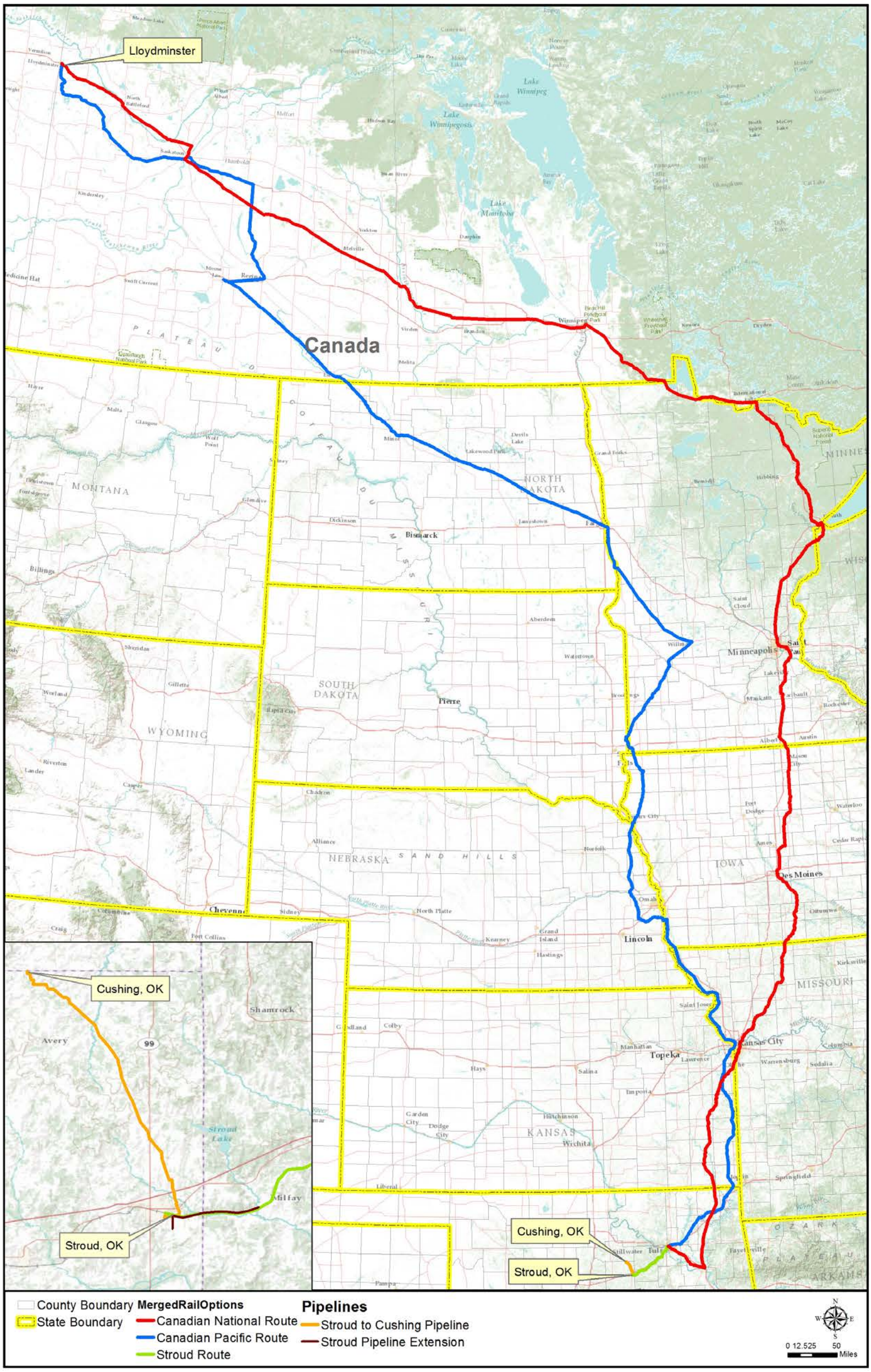


Figure 2.2.3-4 Rail Route Scenarios between Canada and the United States

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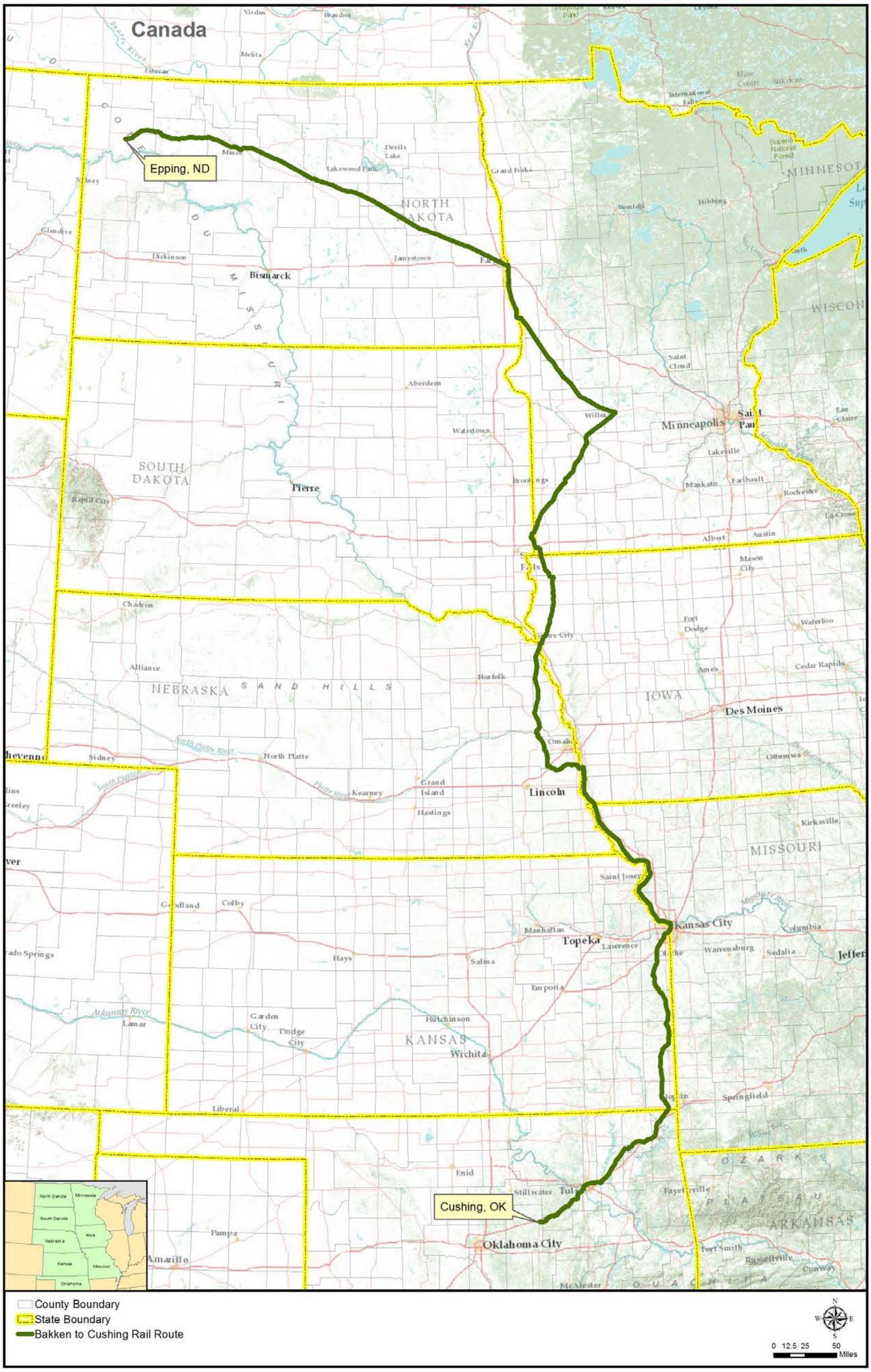

Figure 2.2.3-5 Bakken to Cushing Route

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Table 2.2-1 Crude Oil by Rail to Oklahoma/Pipeline to Gulf Coast Area Scenario: New Construction and Specifications

	Lloydminster, Saskatchewan	Epping, North Dakota	Stroud and Cushing, Oklahoma
Throughput (bpd)	up to 730,000 bpd WCSB	up to 100,000 bpd Bakken	up to 730,000 bpd WCSB; up to 100,000 bpd Bakken
Unit Train[a] Terminal Sites Needed	7 new sites; 2 unit train loadings per day/site	1 new site; 1-2 train loadings per day/site	7 new terminal sites; 2 train off-loadings per day/site for WCSB 1 off-loading/day for Bakken at existing site
Storage Needs	(4) 75,000 barrel tanks per site	(4) 75,000 barrel tanks	(4) 75,000 barrel tanks per site at Stroud (11) 75,000 barrel storage tanks at Cushing
Number of Trains	13 unit trains per day	1 to 2 unit trains per day	14-15 unit trains per day (WCSB + Bakken)
Total New Track (mainly within terminal)	175,000 to 210,000 feet for 7 terminals	25,000 to 30,000 feet	175,000 to 210,000 feet for 7 terminals
Terminal Acreage	3,500 (500 acres per terminal site x 7)	500 acres	3,500 acres
New Pipeline Needed	None	None	17-mile Stroud to Cushing pipeline
Total Acreage for New Terminals and Pipeline (approximate)	**Terminals: 3,500 acres**	**Terminal: 500 acres**	**Terminals: 3,500 acres** **Pipeline:103 acres (permanent) 227 acres (temporary)** **Total: 3,603 acres**
	Total Acres for Scenario	**7,603 acres**	

[a] A unit train transports all of its cargo from a single starting point to a single end point with no intermediate stops or storage. This provides shippers with an economy of scale. For the purposes of the analysis in this Supplemental EIS, the unit trains would be 100 railcars in length.

Source: Wilson & Company

Figure 2.2.3-6 Typical Rail Loading Facility in North Dakota

Loop track construction would include the following:

- Rail bed construction—a rail bed would be constructed upon which the ballast[8], rail ties, and rail would then be laid. Rail bed construction would require clearing, excavating earth and rock on potentially previously undisturbed land, and removing and stockpiling topsoil, where needed. Construction could require both cuts and fills.
- Track construction—in-place track construction would consist of placing ties, rail, and ballast on top of the rail bed. The track could be constructed on site or skeleton track panels could be constructed off-site and transported to the site.
- Construction staging areas—the proposed loop and terminal site could require construction staging areas to store material, weld sections of the rail line, and otherwise support construction activities. Staging areas would be identified before construction began.

Additional considerations for the Lloydminster Loading Terminal would include the following:

- Associated facilities—these would include buildings, maintenance equipment, security, and safety equipment.
- Associated pipelines—railcars would on-load from local storage tanks. A short pipeline from the temporary storage to the terminal would be needed at each new terminal location.
- Power requirements—it was assumed that each terminal would require 5 megawatts of electrical power. Power requirements would include new transmission lines to each new on-loading terminal.

[8] Ballast is the rock base used in railroad beds.

Epping Loading Terminal

Bakken crude currently moves in unit train quantities to both the Gulf Coast area and to Stroud, Oklahoma. There are multiple terminals in North Dakota that could load unit-train quantities of Bakken crude. Rangeland Energy's terminal at Epping, North Dakota, is representative of an origination terminal. This terminal loads 100-car unit trains of Bakken crude today. It is served by BNSF, one of the two largest Class I railroads serving the western United States (Rangeland Energy 2012). Under this scenario, a new loading terminal would be constructed in the Epping vicinity to transport up to 100,000 bpd of Bakken crude oil. Also, while the existing Stroud facility has the capacity to transport up to 100,000 bpd of Bakken crude to Cushing, it is assumed for analysis purposes that a new facility plus a 17-mile pipeline to Cushing would be needed to accommodate the anticipated increases in crude deliveries.

Stroud Off-loading and Storage Terminal

Cushing, Oklahoma does not have rail service, but rail service is available in Stroud, 17 miles away. WCSB crude would need to be transported by rail to Stroud, and then from Stroud by new and existing pipelines to Cushing (from Cushing it would be transported to the Gulf Coast area via existing pipelines). An existing Stroud pipeline operated by EOG Resources is connected to the Stillwater Central Railroad; however, its capacity is limited to 90,000 bpd. To accommodate WCSB crude, new off-loading terminals would need to be constructed in the Stroud vicinity, and new pipelines built to transfer the WCSB crude from Stroud into the existing storage infrastructure in Cushing. The off-loading facilities would need the same basic capacity as the on-loading terminals (seven new terminals with the capacity to off-load two 100-car unit trains per day) and would need the following terminal components:

- Sufficient track to hold three-plus unit trains at any time (loop track not necessary for off-loading terminals).
- Approximately 500-acres in land acquisition per terminal to handle unit trains, storage, and ancillary facilities. Seven terminals would require about 3,500 acres of land.
- Four 75,000-barrel tanks at each terminal to receive the crude from the railcars, and store crude for shipment into the pipeline to Cushing. For example, unit trains may be unloading WCSB into Tanks 1 and 3 while Tanks 2 and 4 are loading product into the pipeline to Cushing. The next unit trains would unload into Tanks 2 and 4 while Tanks 1 and 3 are switched to pump into the pipeline.
- Under this scenario, one new pipeline would be required from Stroud to Cushing. A number of midstream companies own storage tanks in Cushing, and they are the likely parties that may invest in rail off-loading terminals. These parties would presumably want the off-loading terminals connected to their own storage tanks in Cushing, and this could lead to more than one pipeline being built. However, for analysis purposes, only one pipeline has been considered. The pipeline would require a permanent right-of-way (ROW) of about 103 acres, with up to 227 acres needed during construction.
- Supporting infrastructure (buildings, maintenance equipment, security, and safety equipment).
- For the purposes of this analysis, it is assumed that the power requirements would include new transmission lines to each new off-loading terminal.

Rail and Pipeline Cost Assumptions

Capital costs were estimated based on cost information for terminals recently completed or currently under construction and on assumptions regarding storage and track unit costs (Table 2.2-2). Costs for individual terminals were multiplied by the number of terminals at each; costs for transmission lines and pipelines (Stroud) were added.

Table 2.2-2 Estimated Cost of New Facilities and Estimated Jobs Created for Crude by Rail/Pipeline Option

Estimates	Rail Terminal at Lloydminster	Rail Terminal at Stroud	Epping Facility (for Bakken crude)
Capital Costs	$650,000,000	$700,000,000	$110,000,000
Construction Jobs	1,900	2,240	320
Peak Employment	1,650	1,980	320
Construction Period (weeks)	106	106	52
Operations Costs (annual)	$49,000,000	$49,000,000	$7,000,000
Operations Jobs	50	50	15

Construction jobs were estimated using expenditure/direct job ratios obtained from other projects. The main reference was the Enbridge Northern Gateway project and adjustments were made for portions of expenditures with rail tracks (Alaska Department of Transportation and Public Facilities 2011), pipelines (as noted in the Final EIS), and transmission lines (Montana Department of Labor 2010). The base ratio used is 1.98 construction jobs per million dollars of capital expenditures, with up to 9.3 construction jobs per million dollars for rail track construction. Jobs would not be full-time equivalents and could be full- or part-time jobs. Peak employment and the length of the construction period were based on an assumed 52-week construction schedule for each terminal. For analysis purposes, a 9-week interval between the start of construction of each successive terminal was assumed at facilities with multiple terminals. Estimated delivery costs under this scenario are described in Table 2.2-3 below.

Table 2.2-3 Rail Costs from Lloydminster, SK to Stroud, OK, and Bakken Crude Oil from Epping, ND to Stroud, OK

	Cost $/barrel		
	CN-UP-SLWC[a]	Canadian Pacific-BNSF-SLWC[b]	BNSF-SLWC
Loading railcars	1.00	1.00	1.00
Rail Lloydminster, SK- Stroud, OK	10.00	10.75	--
Rail Epping, ND – Stroud, OK	--	--	4.75
Railcar lease	1.10	1.00	0.75
Transfer costs - railcars to storage tanks	1.00	1.00	1.00
Total	**13.00**	**13.75**	**7.50**

[a] Canadian Northern-Union Pacific-Stillwater Central Railroad
[b] Canadian Pacific-BNSF-Stillwater Central Railroad

2.2.3.3 Rail/Tanker Scenario

As noted above under the Rail/Pipeline Scenario and in Section 1.4, Market Analysis, producers in the Canadian oil sands and in the Bakken have begun to use alternative methods to transport their product to refineries. A second likely transportation method would include transporting crude oil by rail from Alberta to a western Canadian port. From there, the crude oil could be exported via tankers and delivered to various destinations.

Tankers are fully capable of carrying heavy WCSB crudes (as well as lighter crudes) in the form of dilbit and as undiluted bitumen. Transport of dilbit on a tanker is no different from transporting any conventional heavy crude oil and does not require special equipment. Tankers generally have steam heaters so they could carry dilbit with no modifications needed, but would require upgraded heating systems and tank insulation to transport bitumen. While not on a large scale, tanker movements of up to 15,000 bpd of WCSB crude have moved in recent years from the Westridge dock (Trans Mountain pipeline) in Vancouver via tanker to the U.S. Gulf Coast.

If cross-border pipeline capacity into the United States was constrained, moving WCSB crudes from Pacific ports in volume to the U.S. Gulf Coast could become attractive, but would require construction of new or expansion of existing port facilities.[9] Using heavy crude as a basis, a present day movement via Trans Mountain to Vancouver and thence on a Panamax tanker via the Panama Canal to Houston would have a total freight cost (pipeline tariff plus tanker freight and Panama toll) of around $8.50-9.50/barrel (bbl). Recognizing that Kinder Morgan plans to enable future shipment in larger Suezmax tankers, and that the Panama Canal Authority is expanding the Canal to take tankers of that size, the rate using a Suezmax would be approximately $1/bbl lower. These rates compare to approximately $8/bbl to move heavy crude via pipeline from Hardisty to Houston. Thus, while in normal markets, a tanker movement from Western Canada would be somewhat more costly than via pipeline, in a scenario where ability to move WCSB crudes by pipeline to the U.S. Gulf Coast were constrained, refiners in the U.S. Gulf Coast could opt for tanker transport.

There are several pipelines proposed for transporting WCSB crude oil to the Pacific, including Trans Mountain to Vancouver and Northern Gateway and Northern Leg to Kitimat. These pipelines have been controversial and are encountering significant opposition. It is uncertain whether such projects ultimately will be approved. The option of transporting WCSB crude oil to the Pacific via pipeline is described in more detail in Section 2.2.3.4. As discussed above, rail may offer a viable alternative for transporting crude oil to ports in Vancouver, Kitimat, and Prince Rupert in British Columbia, , as all of these ports are served by Class 1 rail carriers.[10]

There have also been proposals for the transport of WCSB crude oil to the Canadian east coast by converting existing natural gas pipelines to carry crude oil, rail, [11] and/or tankers via the St. Lawrence Seaway. These options appear to be a bit more speculative and would incur logistical challenges and potentially permitting issues. For example, the option of tanker transport would be constrained to a maximum tanker size of 45,000 ton capacity by size restrictions along the

[9] Nexen Inc. is exploring moving oil by rail to Prince Rupert, B.C. to export crude onto tankers for delivery to Asia markets (Vanderklippe 2013).
[10] There are also rail to marine tanker transloading facilities on the U.S. West Coast that are served by Class 1 railroads and that could receive Canadian crudes.
[11] The Irving oil refinery in Saint John, NB is reportedly receiving crude by rail from the Bakken and Western Canada.

St. Lawrence Seaway system. These options would clearly be more expensive, relative to the other scenarios discussed in this section, if the ultimate destination for the crude oil is the U.S. Gulf Coast.

Because of the uncertainty associated with whether these proposed pipelines will be approved, and when, rail transport of crude oil to Prince Rupert and onward transport via tanker to the Gulf Coast area refineries was selected for the Rail/Tanker Scenario. WCSB would be transported as follows (see Figure 2.2.3-7):

- Loaded onto rail in Lloydminster and transported to Prince Rupert, British Columbia;
- Transferred to a new/expanded marine terminal at Prince Rupert; and
- Shipped via Suezmax vessels to the Gulf Coast area (Houston/Port Arthur) through the Panama Canal.

It should be noted, however, that if WCSB crude oil reaches a Pacific port, regardless of whether by rail or by pipeline, the economics for movement via tanker would favor shipping the oil to Asia rather than the Gulf Coast area. The cost of transporting crude oil via tanker from Prince Rupert to Houston and Port Arthur is estimated to be approximately $4.70/bbl, whereas the transport cost via tanker from Prince Rupert to refinery ports in Asia (e.g., Ulsan, South Korea and Dalian, China), is estimated to be only approximately $1.70 and $2.00/bbl, respectively. The lower transport cost to Asia versus the Gulf Coast area is attributable to shorter trip duration (30 to 37 days to Asia versus about 45 days to the Gulf Coast area), avoiding the Panama Canal toll (about $0.70/bbl), and being able to use a larger tanker because it would not be constrained by the Panama Canal (a VLCC tanker to China would have a capacity of almost 2 million bbl versus a Suezmax tanker to the Gulf Coast area with a capacity of about 884,000 bbl). The EnSys (EnSys 2010) report indicated that if the option was available to export crude from the West Coast of Canada to Asia, it would be utilized.[12]

Although the main market for tanker shipments of crude oil from Pacific ports would likely be Asia, EnSys (EnSys 2011) notes that, especially if cross-border pipeline capacity into the United States were constrained, moving WCSB crudes in volume to the U.S. Gulf Coast could also become attractive. This analysis focuses on crude oil delivery via rail to Prince Rupert and tanker to the Gulf Coast area. This scenario is described below.

Crude Oil by Rail from Hardisty/Lloydminster to Prince Rupert, British Columbia

WCSB crude delivered to Lloydminster would be stored and loaded onto railcars at the new rail terminals and transported using existing rail to a new off-loading rail terminal and an expanded marine terminal in Prince Rupert, British Columbia (see Table 2.2-4 for an overview of new construction requirements for all facilities under this scenario).

[12] Further, Ensys (EnSys 2011) notes that it is evident that there are active efforts at the government level in Canada to access Asian markets, which are seen by the government as vital to Canada's ability to exploit its oil and gas resources.

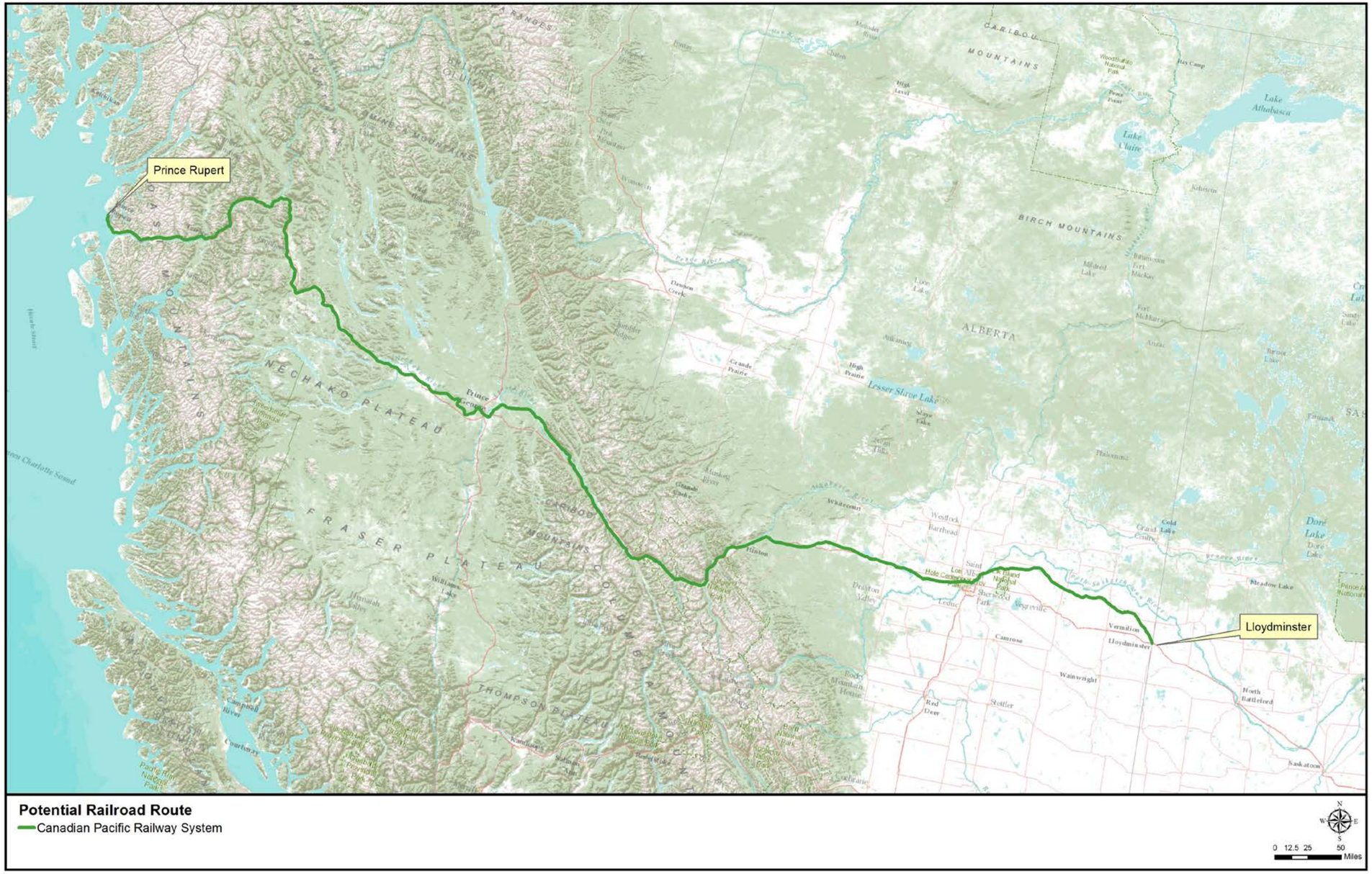

Figure 2.2.3-7 Rail Route from Lloydminster to Prince Rupert

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Table 2.2-4 Crude Oil by Rail to Prince Rupert/Tanker to Gulf Coast Area Scenario: New Construction and Specifications

	Lloydminster, Saskatchewan	**Prince Rupert, British Columbia**	**Epping, North Dakota**	**Stroud and Cushing, Oklahoma**
Throughput (bpd)	Up to 730,000 bpd WCSB	Up to 730,000 bpd WCSB	Up to 100,000 bpd Bakken	Up to 100,000 bpd Bakken
Unit Train Terminal Sites Needed	7 new sites (7 x 500 acres each); 2 trains per day/site	7 new sites; 2 trains per day/site	1 new site; 1-2 trains/day	1 new terminal site (Stroud); 1-2 trains/day
Storage Needs	(4) 75,000 barrel tanks per site	Rail Terminal: (4) 75,000 bbl tanks; Marine terminal: (14) 496,000 bbl tanks; 7 million barrel total storage	(4) 75,000 barrel tanks per site	2 (75,000 barrel tanks)
Number of Trains	13 unit trains per day	13 unit trains/day	1 to 2 unit trains/day	1-2 unit trains/day
Total New Track (within terminals)	175,000 to 210,000 feet for 7 terminals	175,000 to 210,000 feet or 7 terminals	25,000 to 30,000 feet	None
Pipeline Needed	None[a]	15 miles connecting off-loading terminals to marine terminal.	None	17 miles Stroud to Cushing
Total Acreage for New Terminals and Pipelines	**Total: 3,500 acres**	**Marine: 1,200 acres** **Rail Facility: 3,500 acres** **Total: 4,700 acres**	**Terminal: 500 acres**	**Terminal: 500 acres** **Pipeline: 103 acres (permanent)** **227 acres (temporary)**
Total Acres for Scenario		**9,303 acres**		

[a] The locations of these pipelines cannot be determined at this time.

The new facilities in Lloydminster and Prince Rupert would include the following:

- Seven new loading terminals at Lloydminster to load up to 730,000 bpd of WCSB crude. The specifications of these terminals would be the same as those discussed under the Rail/Pipeline Scenario (see Section 2.2.3.2).
- Seven new off-loading rail terminals at Prince Rupert. The specifications of these terminals would be the same as those discussed under the Rail/Pipeline Scenario.
- Storage. The storage tanks at Prince Rupert would total just under 7,000,000 barrels (14 tanks, each with 496,000 barrels of capacity), and would be designed to handle volumes shipped on Suezmax vessels (1 million barrel cargo). Suezmax tankers were used for the analysis because they are the largest vessels that can traverse the Panama Canal.

The proposed Northern Gateway terminal at Kitimat, British Columbia was used as a surrogate to estimate the marine facilities needed at Prince Rupert. The Northern Gateway facility is designed to handle about 525,000 bpd of crude delivered by pipeline for loading on vessels to the West Coast and Asia. In addition, it is designed to receive about 193,000 bpd of diluent (a very light oil obtained from natural gas production) from cargoes arriving by water and discharging into storage at the terminal and moving back to Alberta via a parallel pipeline. The total volume of about 718,000 bpd approximates the volume of WCSB heavy crude oil that would be loaded at Prince Rupert.

New facilities in Prince Rupert would consist of a large rail terminal complex, most likely on the mainland, where off-loaded crude oil would be stored until it could be loaded onto tankers, and an expanded port. The entire facility would cover 4,700 acres, including 3,500 acres for storage and off-loading/on-loading facilities at the rail terminal and approximately 1,200 acres of land at the expanded port (Table 2.2-5).

Table 2.2-5 Terminal Facility Acreage

Project Component	Estimated Area (acres)
Tank terminal	550
Security fence/windbreak area for terminal	650
Total	**1, 200**

The new tank terminal construction would consist of the following:

- Fourteen petroleum storage tanks (11 oil and three condensate);
- A security fence to encompass the tank terminal;
- A 180-foot-wide firebreak area around the outside perimeter of the terminal;
- Electrical supply and distribution (this terminal would be serviced by the Texada Island Reactor substation); and
- Buildings (control center and civil infrastructure including roads).

Prince Rupert Facilities Construction and Operation

The dock portion of the facility would be expanded to accommodate two tanker berths. A utility berth would also be needed to handle large crude oil tankers. Among other things, the following facilities and equipment would be needed:

- A loading platform with gangway tower;
- Access trestles and catwalks;
- Berthing and mooring structures; and
- Spill containment equipment.

The berths would be equipped to load tankers of the size and dimensions specified in Table 2.2-6. Based on using Suezmax vessels through the Panama Canal, the Prince Rupert Marine Loading Facility would expect about 430 vessels per year loading crude oil. These tankers can hold 145,000 deadweight tonnage (DWT) of heavy Canadian crude, or about 986,000 barrels. However, to transit the Panama Canal, they would need to be light-loaded to 130,000 DWT, or about 884,000 barrels. The facility would likely be designed similarly to the proposed Northern Gateway marine terminal in Kitimat, British Columbia (in scale and general design). It may ultimately be desirable to move even greater volumes off the west coast of Canada, or there may be options to load larger or smaller vessels based on world freight market conditions, and that flexibility would likely be in the marine terminal design.

Table 2.2-6 Suezmax Tanker Dimensions and Capacities

Length (meters)	274
Beam (meters)	48
Loaded Draft (meters)	17
Deadweight Tonnage	160,000
Fuels Transport	Oil/Condensate

It was assumed that the entire Marine Loading Facility at Prince Rupert would require 5 megawatts of electric power.

When a large Suezmax vessel arrives off the coast of Houston, it must be loaded onto a smaller vessel that can navigate the Houston Ship Channel and to Port Arthur refinery docks (due to draft restrictions). This process is known in the industry as *lightering*. The charge for lightering is about $200,000. The Panama Canal and lightering charges are the primary additional charges over and above the charter cost charged by the ship owner.

Rail/Tanker Scenarios Cost Assumptions

The estimated cost of the voyage from Prince Rupert to Houston and Port Arthur is estimated at $4.71 per barrel and $4.69 per barrel, respectively, for the Suezmax option (see Table 2.2-7). This analysis also examined fully loading the Suezmax vessel to 986,000 barrels and shipping through the Straits of Magellan (Cape Horn); however, this option is about 66 percent more expensive (about $7.10 per barrel) despite the absence of Panama Canal fees. This is due primarily to a much longer transit time (97 days versus 44).

Table 2.2-7 Rail/Tanker Costs from the Lloydminster, Saskatchewan, to the Gulf Coast Area via the Panama Canal[a]

Activity	Cost $/barrel
Loading railcars at Lloydminster, Saskatchewan	1.50
Rail: Lloydminster- Prince Rupert	7.00-9.00
Railcar lease	0.69
Transfer costs - railcars to storage tanks	1.50
Tanker Cost	4.70
Total	**15.39-17.39[b]**

[a] Does not include Panama Canal Charge or lightering costs.
[b] Does not include costs to ship Bakken crude oil which is estimated at $7.48/barrel. See Table 2.2-3.

This analysis excludes the costs of collecting the crude from the surrounding oil sands fields at Lloydminster to remain consistent to the proposed Project pipeline costs. Given the proximity of production operations to both the pipeline and rail origins, it is reasonable to assume that the collection costs would be similar.

2.2.3.4 Scenarios Considered but Eliminated from Detailed Analysis

The following scenarios under the No Action Alternative were considered, but were not analyzed in detail.

Rail or Pipeline to Vancouver or Kitimat, British Columbia and Tanker to Gulf Coast Area Scenario

Under this option, WCSB would be shipped by existing railways or new pipelines from the Hardisty region to Vancouver or Kitimat, British Columbia for shipment by marine transport through the expanded Panama Canal and delivery to Gulf Coast area refiners. This option considers moving up to 730,000 bpd of heavy crude to the Port of Vancouver and then to the marine docks at the Westridge marine terminal in Vancouver or the port in Kitimat. Under this option, crude oil could move either via rail or by a new pipeline from the Hardisty region.

Currently, Kinder Morgan is planning an expansion of the existing Trans Mountain pipeline originating at Edmonton, increasing its capacity from 300,000 bpd (current) to up to 890,000 bpd (planned for operations in 2017). The Trans Mountain pipeline runs into Vancouver via the existing Burnaby terminal over to the Westridge dock for loading heavy crude onto vessels. The pipeline has sufficient commitment from shippers to proceed with engineering and permitting processes. Kinder Morgan indicates that the project would significantly increase tanker traffic from about 5 to 34 cargoes per month, or up to about 400 cargoes per year (Trans Mountain January 10, 2013). The increased marine traffic is due to increased volume to be shipped, and lack of sufficient channel draft to load larger vessels.

The substantial increase in tanker traffic from the proposed Kinder Morgan expansion has raised safety and environmental concerns. Moving additional volumes of crude oil from the proposed Project into the Vancouver market by either a new pipeline or rail would result in 400 or more additional vessels loading at Vancouver each year and would require considerably more storage to be built than the current Kinder Morgan operations. The expansion of storage capacity, potential rail off-loading facilities and logistics, and increased marine traffic may make this

option logistically challenging in a relatively compressed and populated geographical area. Moreover, even if a separate pipeline from Hardisty could be planned, mapped, engineered, designed, and permitted starting today, it would likely not be available as an option until well after the proposed Project's planned start date. As a result of the logistical challenges in increasing the amounts of heavy Canadian grades of crude oil coming into the Vancouver/Burnaby region over and above the volumes from the Kinder Morgan expansion, this option was deemed to be less viable than movements from Kitimat and Prince Rupert and was eliminated from detailed analysis.

Enbridge is proposing to construct the Northern Gateway pipeline, which would transport up to 525,000 bpd of crude oil 1,177 km from Bruderheim, Alberta, to the Port of Kitimat, British Columbia. The port would be improved with two dedicated ship berths and 14 storage tanks for crude oil and condensate. Enbridge intends for the pipeline to be operational around 2017. A regulatory application was submitted in 2010, which is undergoing an independent review process led by the Canadian National Energy Board and the Canadian Environmental Assessment Agency. The pipeline would traverse First Nation traditional lands and important salmon habitat. The project has been controversial and has encountered opposition from some First Nation bands and other organizations. Opposition to the project remains strong as evidenced by media reports of the January 2013 public hearings in Vancouver on the permit application. It remains uncertain at this time if the project would receive permits and be constructed, and therefore the option of moving additional crude to Kitimat was eliminated from detailed analysis.

Rail Directly to the Gulf Coast Area Scenario

Under this option, WCSB crude would be transported by rail directly to refineries or storage facilities in the Port Arthur/Houston region. It is assumed that a network of off-loading facilities that could supply crude to multiple refineries would need to be built to accommodate the amount of WCSB crude oil that would be delivered on a daily basis. This scenario would have the crude directly transported from Hardisty to specific off-loading sites in Texas, rather than using the proposed pipeline system. This scenario faces more logistical challenges that may make it more difficult to scale up to the full capacity of the proposed Project. There is considerable industrial development in this region, in particular, around the refineries along the Houston Ship channel, which are large processors of imported heavy crude (Shell Deer Park, Houston Refining LLC, etc.). Accordingly, it may be a logistical challenge to develop rail unloading facilities for the 13 to 14 daily unit trains of heavy crude oil with connections to storage and refineries.

Nonetheless, the option of direct rail transport of crude oil to Gulf Coast area refineries is viable, and as indicated in Figure 1.4.6-5 there are several unit train off-loading facilities in the Houston/Port Arthur area. Because this option of direct rail transport to the refineries may face several logistical challenges relative to the proposed Rail/Pipeline Scenario, this option was eliminated from further consideration. However, it is important to note that these are simplifying assumptions for this analysis. In reality, and as current trends have indicated, the market is likely to develop multiple solutions (e.g., multiple loading locations, forms of crude oil shipped, train sizes, routes, and destinations). The scenarios presented here are intended to be a reasonable representation of likely rail transport of WCSB crude oil, but do not imply that these scenarios are the only, or necessarily the best, rail options.

Rail/Barge Scenario (Rail from Lloydminster, Saskatchewan to Wood River, Illinois, and Barge to the Gulf Coast Area via the Mississippi River)

Under this option, WCSB crude would be shipped by rail for delivery to the Wood River, Illinois, port facility for transfer to river barges for transit down to the Gulf Coast area. Figure 2.2.3-8 shows the rail route from the Hardisty area to Wood River. There are reports of several companies pursuing rail to barge options for delivery to the U.S. Gulf Coast. This option entails rail costs that are similar to the rail costs to Cushing, but with a much more expensive and logistically challenging subsequent delivery to the Gulf Coast area refiners.

The costs to ship WCSB crude by barge from Wood River, Illinois, to the New Orleans market would be in the $4-$6 per barrel range. The additional cost to move through the Intracoastal Waterway to Port Arthur and Houston could increase this by an additional $1-$2 per barrel, making the increase $5-$8 higher per barrel. On this basis, the cost would appear to be significantly higher relative to pipeline (the cost via pipeline from Cushing would be about $2.35 per barrel compared to much higher barging costs from Wood River, Illinois). Moreover, movement on the Mississippi River can be affected by weather and river conditions. During summer 2012, the river was too shallow due to drought conditions on the lower Mississippi and barge traffic was held up a number of days; at other times, spring floods have affected marine movements. In addition, assuming only the heavy crude (and not the Bakken light crude) is moved by barge, the up to 730,000 bpd would require approximately thirteen 60,000-barrel barges to leave Wood River every day, along with a similar number of empty tows that would head north every day (for an estimated 12 day transit time). Table 2.2-8 shows the rail and barge-related costs of the Rail/Barge Scenario. The rail route to Wood River is shown on Figure 2.2.3-8.

Table 2.2-8 Rail/Barge Costs from Hardisty, Alberta to the Gulf Coast Area

	Approximate Cost $/barrel
Loading railcars at Lloydminster, Saskatchewan	1.00
Rail Lloydminster – Port Arthur, Texas via CPRS – St. Paul Minnesota via Union Pacific	8.50
Railcar lease	1.00
Transfer costs – railcars to barge	1.00
Barge Wood River, Illinois – Port Arthur	5.00-7.00
Total	**16.50-18.50**

Because of these increased costs and logistical challenges, although some companies will employ this option, because of the difficulty in scaling up to the full capacity of the proposed Project and because it would not be an improvement over the Rail/Pipeline Scenario, it was eliminated from detailed analysis discussed in Section 2.2.3.2, Rail/Pipeline Scenario. Other barge options were also considered including the ports of St. Paul, Minnesota; Calumet, Illinois; and Catoosa, Oklahoma, but these all faced the same economic and logistical challenges as Wood River.

Figure 2.2.3-8 Rail Route from Hardisty Region to Wood River, Illinois

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Trucking Scenario

The option of trucking WCSB to the Gulf Coast area was considered, but was eliminated from detailed analysis for a variety of reasons, including safety (trucking is 87 times more likely to cause fatal injuries than pipelines during transportation of crude oil), it would increase congestion in cities and along highways (there would need to be about 3,300 trucks per day hauling the crude oil from the WCSB), it would emit large amounts of greenhouse gases and other pollutants, and would use significant amounts of fuel.

Existing Transboundary Pipeline Scenario

There are four major pipeline systems that transport Canadian crude oil across the United States border. These include the Kinder Morgan Trans Mountain system (about 300,000 bpd capacity, to both Vancouver and Puget Sound refiners and some export), the Kinder Morgan Express pipeline (282,000 bpd capacity), the existing Keystone pipeline (590,000 bpd capacity), and the large Enbridge system (about 2.5 mmbpd total capacity). The status of each of these lines is described below.

- The existing Trans Mountain pipeline, which can access U.S. Puget Sound refiners in Washington State, operates fully loaded and is typically over-nominated (meaning shippers would transport more if the capacity existed).
- The Kinder Morgan Platte/Express pipeline from Hardisty, Alberta, to Wood River, Illinois. The Express pipeline from Hardisty to Guernsey, Wyoming, has about 282,000 bpd capacity and is underutilized by about 100,000 bpd, but this is because of the capacity limits on the Platte pipeline from Guernsey to Wood River, Illinois. Kinder Morgan is in the process of converting an existing natural gas pipeline and constructing new pipeline segments that would provide pipeline transport capacity for 230,000 bpd from Guernsey to Cushing, Oklahoma. The stated purpose of this project is to accommodate additional production of Bakken crude. But if market conditions warranted it, the new pipeline could also provide a transport pathway for WCSB crude, which could allow the cross-border Express pipeline to be more fully utilized.
- The existing TransCanada Keystone line (not the proposed Project) from Hardisty to Steele City, Nebraska, with pipeline interconnections to both Wood River, Illinois and Cushing, Oklahoma initiated operation in late 2010 with a capacity of 590,000 bpd. Data from the Canadian Association of Petroleum Producers (CAPP 2012) indicate that, as of December 2011, the existing Keystone pipeline was transporting almost 500,000 bpd.
- The Enbridge system is the largest cross-border pipeline system with mainline capacity of 2.5 mmbpd. As noted in the Final EIS, the existing Enbridge system is near its current capacity, and has been increasing both its capacity and throughput to reach United States and Eastern Canadian markets. Enbridge's existing plans will increase utilization of its mainlines from Edmonton and Hardisty by constructing Eastern Canada pipeline expansions, reversing existing lines (moving primarily Bakken and lighter western Canadian crudes into Sarnia, Ontario and north to Montreal, Quebec), and upgrading existing pipelines (ICC 2012).

As was noted in the Final EIS, there are limited southbound pipeline connections to transfer crude oil from PADD 2 to PADD 3. Currently, only approximately 100,000 bpd of crude oil (originating from the WCSB) are delivered from PADD 2 to PADD 3 via the ExxonMobil

Pegasus pipeline. Similar to other developments in rail transport, new pipeline capacity is being added in response to the new crude oil supplies coming from the WCSB, Bakken, and other new crude oil production areas in North America.

Enbridge is proceeding with expansion, reversal, and upgrading projects, as well as construction of new pipelines that would provide additional capacity to deliver WCSB and Bakken crudes to the Gulf Coast area. Unlike the proposed Project, these are a series of projects on the existing Enbridge system. The status of those projects is described briefly in the following paragraphs and is based on information drawn from press releases, investor materials, and state regulatory filings.

Currently, the Enbridge Mainline/Lakehead system has the capacity to deliver approximately 2.5 mmbpd of crude oil across the border from Canada to Superior, Wisconsin, with pipelines providing onward delivery to the Chicago area, eastward into PADD 2, and back into Eastern Canada. Enbridge is pursuing several projects that would make connections from this pipeline system to the Gulf Coast area.

From Superior, Wisconsin to Flanagan, Illinois, there is line 61 (called the Southern Access project when under construction). This is a 42-inch diameter pipeline with a current capacity of 400,000 bpd, but, according to Enbridge investor materials (Enbridge 2012d), it can be expanded to transport up to 1.2 mmbpd with the addition of more pumping capacity (Enbridge is currently planning an expansion of capacity on Line 61).

From Flanagan, Illinois to Cushing, Oklahoma, Enbridge is seeking regulatory approval[13] to construct a new, 36-inch diameter pipeline in the same ROW as the existing Spearhead pipeline, which has a capacity of 195,000 barrels per day. The new pipeline would have an initial capacity of approximately 600,000 bpd, and could be expanded to approximately 800,000 bpd with the addition of pumping capacity. According to regulatory filings, 70 percent of Enbridge's existing easements for the Spearhead pipeline provide rights to install additional pipelines, which means that Enbridge only needs to negotiate new easements, or seek eminent domain if necessary (and if approved by the Illinois Commerce Commission), along 30 percent of the proposed Flanagan South pipeline route. Enbridge estimates an in-service date of mid-2014.

The final connection from Cushing, Oklahoma to the Gulf Coast area could be made either by the recently reversed Seaway pipeline, and a to-be-constructed Seaway twin pipeline, or (theoretically) by the TransCanada Gulf Coast project. The Seaway pipeline is operated by the Seaway Crude Pipeline Company LLC, a 50/50 joint venture between Enbridge and Enterprise Product Partners L.P. It consists of an existing pipeline that had transported crude oil and petroleum products from Houston to Cushing. Because of the glut of crude oil in Cushing, and the shift in North American crude oil production patterns, the pipeline was substantially underutilized. In response, the owners reversed the flow of the pipeline (its first deliveries of crude oil to Houston occurred in June 2012), and announced they would increase capacity on that existing pipeline, as well as construct another, 30-inch pipeline in the same ROW. Upon completion of these projects, the Seaway pipelines would have the capacity to transport up to

[13] Since the proposed project is an interstate crude oil pipeline that does not cross an international border, there is no general federal permitting authority. Enbridge has applied to the Illinois Commerce Commission for a "Certificate of Good Standing." Such a certificate is necessary for a pipeline company to make use of eminent domain proceedings in Illinois. There are no similar permitting requirements in Missouri, or Oklahoma.

850,000 bpd from Cushing to the Gulf Coast area,[14] with an expected completion date of mid-2014. Enbridge (Enbridge 2012b, 2012c, 2012d) has also stated that the Seaway twin pipeline could be expanded up to 600,000 bpd.

If these various Enbridge projects and joint ventures were completed, those pipelines would have the ultimate capacity (if pumping improvements were implemented) to transport up to approximately 1 mmbpd of additional crude oil from Superior, Wisconsin to the Gulf Coast area. The total transport distance from Hardisty to the Gulf Coast area through the Enbridge projects and joint ventures would be approximately 750 miles longer than through the proposed Project and the Gulf Coast project.[15] However, most of the potential capacity on the Enbridge system is not available for the crude oil with long-term contracts on the proposed Project (over 500,000 bpd for delivery from the WCSB to the Gulf Coast area; 155,000 bpd from the WCSB to Cushing to be transferred from existing Keystone pipeline; and 65,000 bpd from the Bakken) because these projects are supported by their own long-term contractual commitments.

In its regulatory filings and investor materials, Enbridge has made several statements about long-term contractual commitments from shippers for these various projects. It was reported in press reports that for most of 2012 the existing Spearhead pipeline has been at capacity and/or that shippers have wanted to transport crude oil in excess of its capacity (Clark 2012; Campbell 2012). In the Illinois Commerce Commission (ICC 2012) filings for Flanagan South, Enbridge has stated that it had commitments for "about 90 percent of the initial capacity of the Flanagan South Pipeline on terms that range from 10 to 20 years of transport." They have characterized this as fully contracted, "apart from the mandatory 10 percent minimum required by the Federal Energy Regulatory Commission" (Enbridge 2012b) This would mean that of the 600,000 bpd initial capacity, approximately 540,000 bpd is already committed. Enbridge (Enbridge 2012a) has also stated that for the Seaway pipeline system, it has five and ten year commitments to transport crude originating in Cushing, as well as 10, 15, and 20-year commitments for volumes originating in Flanagan, and that these commitments are for "substantially all of the initial [850,000 bpd] capacity of the Seaway System."

It is likely that if the proposed Project were not constructed, the shippers that had the long-term contractual commitments would first seek other pipeline transport before resorting to other modes of transportation. Some portion of the volumes committed to the proposed Project could likely be transferred to the Enbridge system if the planned expansions occurred; however, even if the pipelines discussed installed the necessary additional pumping capacity to reach their top-line design capacity, they would not have enough spare capacity to accommodate the volume of crude oil committed under long-term contracts to the proposed Project.

The 2010 Keystone XL Assessment Final Report (EnSys 2010) and the Keystone XL Assessment-No Expansion Update (EnSys 2011) paid considerable attention to export capabilities of existing and proposed pipeline systems. As noted in that report, and detailed above, the existing pipelines TransMountain, Express/Platte, and the existing Keystone have

[14] Enbridge has also announced it will construct a pipeline from Houston to Port Arthur, Texas. This means it would have pipeline connections to the same two main delivery areas (Houston and Port Arthur) that crude oil transported on the proposed project would be subsequently delivered to.

[15] The distance estimate for the Enbridge system and joint venture (total distance approximately 2,627 miles) is based on the company's Pipeline System Configuration map, and information about the Seaway pipeline project. The distance estimate for TransCanada's proposed project and Gulf Coast extension (total distance 1,960 miles) is drawn from this document, and the final EIS.

limited capacity to accept additional volumes of crude oil, certainly not in the types of volumes contractually committed to the proposed Project. Each of those three pipelines either does not deliver to Cushing or the Gulf Coast area (TransMountain, Express/Platte), or does not traverse the Bakken in the area of Baker, Montana. Because of these capacity and geographic constraints, none are considered viable alternatives, although, as described in the EnSys report (EnSys 2010) if there were long-term constraints on new pipeline construction, those pipelines may be able to accept some additional volumes of crude oil. EnSys identified the possibility that other pipelines could be constructed to connect PADDs 2 and 3, and that these interstate pipelines face fewer regulatory requirements than cross-border pipelines.

While some additional transboundary and interstate pipeline capacity is available or has recently been proposed, that capacity is being added to meet additional demand for transport, as evidenced by separate long term contractual commitments. The capacity of those additional pipelines that is not committed under long term contractual agreements would not accommodate all of the crude oil contracted to the proposed Project. Given these shortcomings, relying on other projects instead of the proposed Project to meet demand was not considered reasonable and was, therefore, eliminated from detailed analysis in the Supplemental EIS.

Other Recent Crude Oil Transportation Proposals

During the fall 2012, industry spokespeople have announced proposals that would use other options to transport both WCSB and Bakken crude oil to refiners on the Canadian and United States east coast (Financial Post 2012a). Another proposal would include expansion of existing rail capacity and facilities to haul WCSB to Hudson Bay for loading onto oil tankers to ship to refiners (Financial Post 2012b). This proposal, however, would only be operational between July and October due to sea ice in the Arctic Ocean, although its operations could be extended through the use of icebreakers. BNSF Railway announced plans to expand rail capacity to transport Bakken crude oil by 1 mmbpd out of the Williston Basin (Bismarck Tribune 2012). TransCanada is investigating whether to convert an existing natural gas pipeline to transport up to 1 mmbpd of WCSB to refineries on Canada's East Coast (Platts 2012). Finally, BP has applied for an export license from the U.S Department of Commerce to ship Bakken crude oil from North Dakota and Montana to Canadian refiners who would use it instead of more expensive light crude from Europe (Campbell 2012). If implemented, these options would expand takeaway capabilities of WCSB and Bakken crude while requiring little new infrastructure.

Use of Alternative Energy Sources and Energy Conservation

The Final EIS discussed and analyzed alternatives in place of crude oil from the WCSB, including different energy sources and energy conservation. These options were reconsidered in the development of this Supplemental EIS and are incorporated for reference (See Sec. 4.1.1 of the Final EIS).

Many commenters (on the Draft EIS) suggested that the use of alternative sources of energy and conservation of energy would either: (1) eliminate the need for the proposed Project or alternatives to the proposed Project, or (2) reduce the market need for heavy crude oil to the extent that smaller scale projects could meet short- and long-term energy needs.

The market demand for crude oil, including the market demand for heavy crude oil by refineries in PADD 3 (see Section 1.4, Market Analysis, for a discussion of the Petroleum Administration for Defense Districts), is driven primarily by the demand for transportation fuels. Based on

Energy Information Agency (EIA) statistics (EIA 2010a, 2010b), approximately 78 percent of the refined product produced by PADD 3 refineries in 2009 was used for transportation fuel. The percentages of total production from PADD 3 refineries in 2009 for transportation uses in the EIA statistics are listed below:

- Finished motor gasoline—42.9 percent;
- Distillate fuel oil – 24.9 percent (distillate production for all uses was 28 percent of total refinery production. Distillate fuel oil for transportation only was 89 percent of total distillate production, or 24.9 percent of total production);
- Kerosene-type jet fuel—9.3 percent;
- Residual fuel oil—1.0 percent (residual production for all uses was 4.1 percent of total refinery production. Residual fuel oil for transportation only was approximately 25 percent of total residual fuel production, or approximately 1.0 percent of total production); and
- Finished aviation gasoline—0.1 percent.

The remaining 22 percent of PADD 3 refinery production in 2009 consisted primarily of specialized products (e.g., liquefied refinery gases, kerosene, and naphtha for feedstock).

The remainder of this section addresses (1) how the use of alternative fuels and energy conservation would affect market demand for refined products sold by PADD 3 refineries, and therefore addresses the effect on market demand for crude oil by those refineries, and (2) whether or not the use of alternative fuels and energy conservation would result in a sufficient reduction of market demand for crude oil in PADD 3 to justify selection of the No Action Alternative as the preferred alternative. Although most refined products sold by PADD 3 refineries are used in transportation, the assessment of the impact of using alternative fuels and energy conservation was also addressed for refined products that are not used for transportation. Alternative fuels and energy conservation are addressed in the following subsections:

- Use of Alternative Fuels and Energy Conservation in Transportation;
- Use of Alternative Energy Sources in Place of Distillate Fuel Oil for Non-Transportation Uses;
- Use of Alternative Energy Sources in Place of Residual Fuel Oil for Non-Transportation-Related Uses; and
- Use of Alternative Energy Sources in Place of Other Non-Transportation-Related Refined Products.

Use of Alternative Fuel and Energy Conservation in Transportation

Worldwide demand for crude oil is generally projected to grow over the next 25 years unless countries, including developing economies where the majority of the growth is projected to occur, take substantial steps to address climate change. But even if there is a worldwide decline in crude oil consumption, projections indicate that there will be an increase in consumption of crude oil from unconventional sources, primarily from the Canadian oil sands, over the next several decades (EIA 2012; IEA 2012). As discussed in Section 1.4, Market Analysis, in the United States, the overall demand for crude oil is projected to decline over the next 25 years (EIA 2012; IEA 2012).

Two general questions have been raised relevant to the No Action Alternative and adoption of policies that would address climate change by reducing demand for crude oil:

- Would a reduction in United States demand for crude oil eliminate the need for the proposed Project; and
- Would proceeding with the proposed Project alter market conditions such that there would be less rapid adoption of fuel efficiency, alternate fuels, or other measures that would reduce the demand for crude oil?

Outlooks for world and United States demand for crude oil indicate that even if there were a substantial reduction in United States consumption of crude oil (and/or relatively flat world-wide consumption), the market demand in PADD 3 that is driving the development of the proposed Project would likely remain. Also, as explained below, it does not appear that the proposed Project would have enough of an impact on refined fuel prices to alter the market incentives for more widespread adoption of fuel-efficient vehicles, or deployment of alternate fuels (including vehicle electrification).

In early 2010, the U.S. Environmental Protection Agency (EPA 2010) prepared a report examining technically feasible measures that could reduce consumption of crude oil that is refined to produce transportation fuel. The findings of this EPA report were relied upon to construct the low-demand outlook modeled in the EnSys (EnSys 2010) report. The results of the economic modeling were that the low-demand outlook had little impact on the projected demand for oil sands crudes in the United States and little impact on the total production from oil sands throughout the study timeframe. In the EIA, total production in the oil sands was projected to be approximately 4.42 million bpd in 2030, and with the low-demand outlook, the production was projected to be approximately 4.23 million bpd in 2030. Projected Canadian production numbers range from 5.3 to 5.6 million bpd in 2025 in EIA 2012, and 2011. United States projections for total liquids demand are similar in both the EIA 2012 and 2010 low-demand outlook (Figure 1.4.4-1 – U.S. Product Demand Total Liquids, Section 1.4).

As explained in Section 1.4, Market Analysis, there have been several substantial changes to the crude oil market since the EnSys analysis was prepared. In the medium to long-term, the EIA 2012 outlook falls in between the two outlooks modeled in EnSys 2010. The EnSys 2010 analysis indicated that production in the oil sands was not sensitive to reductions in United States crude oil demand. This is broadly consistent with the results of the most recent report from the EIA (see EIA 2013 Memo, Appendix C). This is also broadly consistent with the recent IEA reports, which have not indicated that declining United States demand or increased production would decrease production in the oil sands. In the three most recent IEA reports (2010, 2011, and 2012) United States crude oil demand in 2035 in the New Policies scenario has been in decline in each year: 14.9, 14.5, to 12.6 mmbpd. The decline from 2011 to 2012 is attributable to the new U.S. CAFÉ standards adopted in 2012. Projected production from the oil sands in 2035 has remained relatively constant at 4.2, 4.5, and 4.3 mmbpd through those forecasts, despite declining overall United States demand.

The IEA reports also address energy demand and production in three world-wide policy scenarios. Differences in oil sands production between these different scenarios give an indication of how substantial changes in worldwide policies and energy could impact oil sands production:

- The Current Policies Scenario, which assumed no change from policies in place in mid-2010;
- The New Policies Scenario, which assumed that countries act on their announced policy commitments and plans to address climate change; and
- The 450 Scenario, which sets out an energy pathway with the goal of limiting the global increase in temperature to 2°C by limiting concentration of greenhouse gases in the atmosphere to around 450 parts per million of carbon dioxide (CO_2).

The impact of the three policy scenarios on world-wide crude oil consumption in 2035 is substantial. Compared to the world-wide total oil production (crude oil, natural gas liquids, and unconventional oil) of 83.3 million bpd in 2009, IEA (IEA 2012) projected the following levels of consumption in 2035:

- Current Policies Scenario – 108.5 million bpd;
- New Policies Scenario – 99.7 million bpd; and
- 450 Scenario – 79 million bpd.

The policy scenarios also have a substantial impact on projected consumption of oil-sands-derived crude oil in 2035:

- Current Policies Scenario – 4.8 million bpd;
- New Policies Scenario 4.3 million bpd; and
- 450 Scenario – 3.4 million bpd.

Although the different scenarios had substantial impacts on projections of total oil sands production in 2035, the projected consumption in each of these scenarios represents a substantial increase from 2011 consumption of approximately 1.6 million bpd oil sands-derived crude oil (CAPP 2012). The difference in consumption of the oil sands-derived crude oil among the different scenarios is largely attributable to the differing world oil price in each scenario (the 450 Scenario's substantially reduced demand for crude oil would result in reduced world oil prices), and the additional expense attributed to the oil sands projects that would be necessary to mitigate their relatively higher greenhouse gas emissions (IEA [IEA 2010] assumed a carbon price of $60 per ton in the New Policies Scenario and $120 per ton in the 450 Scenario).

Based on the analysis in Section 1.4, Market Analysis, in the EnSys (EnSys 2010) report and in the analyses of policies and market-drivers that would lead to a reduction in the volume of crude oil refined to produce transportation fuel, it appears unlikely that the proposed Project would have enough of an impact on the prices of refined fuel to impact market drivers related to wider adoption of alternative fuels or more energy efficient vehicles. In a recent report examining economic implications of different policies to reduce CO_2 emissions or petroleum imports, Morrow et al. (Morrow 2010) stated:

> A fundamental insight from this study is that if one wishes to reduce U.S. CO_2 emissions or net petroleum imports from the transportation sector, the costs of driving must be significantly higher than they currently are today. Increasing the cost of driving with higher fuel costs (or other operating fees) will be required to motivate deployment of fuel economy improving technologies in conventional vehicles, accelerate penetration of high-fuel economy vehicles into the existing fleet, and reduce vehicle-miles traveled.

Two of the scenarios examined in Morrow et al. (Morrow 2010) focused on policies that would directly increase the cost of transport fuels. One scenario included carbon pricing in a cap-and-trade plan, which lead to a projected increase of $0.24 in the cost per gallon in 2020 and an increase of $0.46 per gallon in 2030. The second scenario included a direct fuel tax, which led to projected increases to the cost of gasoline of $1.42 per gallon in 2020 and $3.27 per gallon in 2030. The analysis considered how fuel price influenced increases in fuel efficiency (through increased purchases of more fuel efficient vehicles, hybrid vehicles, and electric vehicles) and reducing the projected increases in vehicle miles traveled. The report concluded that the carbon tax scenario had a marginal impact on Green House Gas emissions from transportation. Imposing the transportation tax on fuel stimulated slightly larger improvements in fuel economy of new conventional vehicles than were projected to be achieved through imposition of only corporate average fuel economy (CAFE) standards. In contrast, the EnSys (EnSys 2010) analysis stated the following:

> within each demand outlook, U.S. total [refined] product supply costs are insensitive to pipeline scenario, varying by less than 0.1 percent in any scenario where normal pipeline expansion is allowed.

The scenarios that included the proposed Project resulted in small reductions in product supply costs in PADD 3 (less than $0.10 per barrel), that would amount to approximately a ¼-cent impact on the price of a gallon of gasoline. The scenario with the largest variation in refined product supply costs was the No Expansion Scenario, which led to a 0.6 percent reduction in costs of total refined products in 2030 versus the scenario for the proposed Project because of the artificial discount in crude oil prices obtained from the shut-in of WCSB crude oil supply. As noted in Section 1.4, there is growing evidence that if pipeline capacity is constrained, non-pipeline modes of transport, particularly rail, are capable of economically delivering volumes of WCSB heavy crude oils to the Gulf Coast in excess of the capacity of the propose Project. This indicates, along with the updated analysis of supply and demand in Section 1.4, that whether the proposed Project is constructed is unlikely to have a significant long-term impact on heavy crude supplies on the U.S. Gulf Coast. There is no information indicating that whether WCSB heavy crude oils were delivered to the U.S. Gulf Coast via rail, via other pipelines, or via proposed Project could have a significant enough impact on refined product prices to be in the range of the price increases discussed in the Morrow (Morrow 2010) study.

It is reasonable to infer based market analysis in Section 1.4, when viewed in combination with the results from the Morrow et al. (Morrow 2010) study, that the proposed Project's likely impact on finished transportation fuel prices would not be large enough to influence market behavior in development of more fuel efficient vehicles, alternative transportation fuels (including electrification of the vehicle fleet), or total vehicle miles traveled. The Morrow et al. (Morrow 2010) report concluded that increases in gasoline prices due to a carbon tax would be orders of magnitude greater than likely price impacts of the proposed Project (a $0.42 increase in the cost of a gallon of gasoline in 2030 in the carbon tax scenario) and would only reduce light duty fuel efficiency and light duty total vehicle miles traveled by approximately 1 percent in 2030.

The above factors indicate that even if the United States, and/or countries around the world, adopt more aggressive policies that would reduce the consumption of crude oil (including those necessary to achieve a trajectory towards stabilizing CO_2 concentrations in the atmosphere in

line with the 2 degree global goal), there is likely to be a market demand for substantial increases in the volume in crude oil derived from the oil sands over the next 20 to 25 years.

As there would still be a demand for oil sands-derived crude oil, use of alternative energy sources and energy conservation in meeting needs for transportation fuel have not been carried forward for further analysis as an alternative to the proposed Project.

Use of Alternative Energy Sources and Conservation in Place of Distillate Fuel Oil for Non-Transportation-Related Uses

Non-transportation uses of distillate fuel oil include space heating and electrical power generation, and represented approximately 3.1 percent of the production of PADD 3 refineries in 2009 (EIA 2010a, 2010b). The distillate fuel oil was sold for use in the following categories listed by EIA (EIA 2010b):

- Oil company
- Industrial use
- Commercial
- Electrical power
- Residential

For the *oil company* category, it is likely that the distillate fuel oil was used primarily for heating purposes. As a result, natural gas would be a likely alternative fuel in most cases and it is possible that, in the future, many facilities could be retrofitted to accommodate natural gas as a replacement fuel. This category accounted for about 0.2 percent of the total refinery output of PADD 3 refineries. Commercial and industrial use categories were also most likely used primarily for heating purposes. These two categories combined constituted approximately 0.2 percent of the total refinery production from PADD 3. Distillate fuel oil in the residential category would likely be exclusively used for heating, and represents about 0.001 percent of the total production from PADD 3 refineries.

For each of these categories, both natural gas and biofuels (e.g., fuel from municipal solid wastes, wood, and other biomass [e.g., biodiesel from cooking oil]) are potential alternative fuels for heating purposes. However, conversion of heating units to burn natural gas or biofuels would require substantial investments by the users, and it is unlikely that a majority of users would convert their heating units in the near term. In any case, the total volume of distillate fuel oil used for heating was only about 0.4 percent of the total PADD 3 refinery output in 2009. Assuming complete replacement of the distillate fuel oil used for heating by alternative fuels, there would be only a negligible reduction in the market demand for crude oil used by PADD 3 refineries. Similarly, conservation of energy for heating purposes would result in only negligible decreases in refinery output and would have very little effect on the crude oil needs of PADD 3 refineries.

The use of distillate fuel oil produced by PADD 3 refineries for the generation of electrical power represents about 0.01 percent of the total output of PADD 3 refineries. Electrical generation currently fueled by residual fuel from PADD 3 refineries could be generated in a variety of other ways, including natural gas-fired generators, wind farms, solar panels, tidal projects, hydroelectric projects, geothermal sources, nuclear power plants, and energy or fuel from municipal solid wastes, wood, and other biomass. However, use of non-transportation-

related residual fuel for electrical power generation in 2009 was a negligible portion of the total output of PADD 3 refineries. With a complete replacement of this distillate fuel oil by alternative fuels to generate electrical power there would therefore be a negligible reduction in the crude oil market demand of PADD 3 refineries and there would be essentially no effect on the current and future crude oil needs of those refineries.

Use of Alternative Energy Sources in Place of Residual Fuel Oil for Non-Transportation-Related Uses

Residual fuel oil is used for the production of electric power, space heating, marine transportation, and various industrial purposes. Approximately 3.1 percent of total PADD 3 refinery production was used for electrical power generation, heating, and industrial uses (EIA 2010a, 2010b). The amount of fuel required for those uses could be reduced with conservation, and for some uses, alternative fuels could replace the residual fuel oil. However, as for distillate fuel oil, the actual volume represents a small portion of the total production of PADD 3 refineries and the use of alternative fuels and conservation would have a negligible effect on the market demand for crude oil in PADD 3.

Use of Alternative Energy Sources in Place of Other Non-Transportation-Related Refined Products

As noted above, approximately 78 percent of the output of refineries in PADD 2 in 2009 was used for transportation purposes. The remaining 22 percent of PADD 3 refinery production consisted primarily of specialized products, including liquefied refinery gases, kerosene, naphtha for feedstock, other oils for feedstock, special naphtha products, lubricants, waxes, petroleum coke, asphalt, road oil, still gas, and miscellaneous products. The three largest production streams, as a percentage of total production, were the following:

- Petroleum coke (5.9 percent) – grades of coke produced in delayed or fluid cokers that may be recovered as relatively pure carbon;
- Liquefied refinery gases (5.2 percent) – this includes ethane/ethylene, propane/propylene, normal butane/butylene, and isobutane/isobutylene; and
- Still gas (4.6 percent) – still gas is used as a refinery fuel and a petrochemical feedstock.

These three categories accounted for nearly 16 percent of total PADD 3 production. For the most part, these three specialty products (as well the other specialty products produced by PADD 3 refineries) cannot be produced using alternative fuels and have not been further considered in this assessment of alternative energy sources. It is possible that conservation could reduce the need for some of these products (e.g., liquefied refinery gases) but that reduction in use would result in a negligible decrease in the market demand for crude oil in PADD 3.

2.2.4 Major Pipeline Route Alternatives

The Department considered potential alternative pipeline routes to assess whether or not there are route alternatives that would avoid or reduce impacts to environmentally sensitive resources as compared to the proposed Project, while also meeting the Project Purpose. Based on a review of practicable routes and comments received from agencies and the public during scoping and

the previous EIS process, the route alternatives identified and considered by the Department include:

- Keystone XL 2011 Steele City Segment Alternative (2011 Steele City Alternative)
- I-90 Corridor Alternative
- Express-Platte Alternative
- Steele City Segment - A1A Alternative
- Keystone Corridor Alternative
  - Option 1: Proposed Border Crossing
  - Option 2: Existing Keystone Pipeline Border Crossing
- Western Alternative (To Cushing)

A map showing the major route alternatives considered is presented in Figure 2.2.4-1

In addition to these major route alternatives, options to the proposed Project route in Nebraska have also been assessed. The Nebraska Route Options are relatively short variances (between 12 and 32 miles) of Keystone's proposed route within Nebraska. The primary purpose of these route options is to identify a route that avoids the Nebraska Department of Environmental Quality (NDEQ)-identified Sand Hills Region without an unacceptable increase in other environmental impacts.

These route options have specific objectives separate from the proposed Project Purpose as defined in Section 1.3, Purpose and Need, and were evaluated in detail by Keystone in consultation with the NDEQ. Because the evaluation focus for these route options is somewhat different compared to the major route alternatives, the Nebraska Route Options are discussed separately at the end of the evaluation of the Major Route Variations section.

2.2.4.1 Screening of Reasonable Major Route Alternatives

The subsections below describe the two-phase screening process the Department applied to the major route alternatives considered in this evaluation. The initial screening of major route alternatives considered the following criteria:

- Project Purpose—to be considered reasonable, an alternative must be able to provide reliable transport of up to approximately 730,000 bpd of WCSB crude oil and up to approximately 100,000 bpd of Bakken crude oil;
- Pipeline Length—pipeline length was considered a relative measure of reliability, environmental impact, and construction/operational costs.

As described in detail in Section 4.13, Potential Releases, and Appendix K, Historical Pipeline Incident Analysis, the potential for pipeline incidents is calculated as a function of actual recorded incidents, overall length, and the number of associated facilities or portions of facilities. This relationship between length and associated facilities and incident risk frequency is widely recognized by the pipeline industry (Center for Chemical Process Safety [CCPS] 1989 and International Association of Oil and Gas Producers [OGP] 2010). As stated in: *Guidelines for Chemical Process Quantitative Risk Analysis* (CCPS 1989), "The frequency of each incident is

equal to the sum of the failure frequencies of all of the individual components whose failure is included in that representative incident." The OGP (OGP 2010) Risk Assessment Data Directory describes the function of *Parts Count* when conducting risk modeling. The Parts Count is used to calculate the total release frequency of a group of equipment items. These items can include but would not be limited to pumps, flanges, valves, and instrument connections. The release frequency of the group is the sum of the parts.

Phase I Results Summary

Based on the Phase I screening summarized in Table 2.2-9, the following alternatives were eliminated from further consideration:

- Keystone Corridor Alternative
  - Option 1: Proposed Border Crossing
  - Option 2: Existing Keystone Pipeline Border Crossing
- Express-Platte Route Alternative
- Western Alternative

A brief description of each alternative and the rationale for eliminating each of these alternatives is presented below.

Keystone Corridor Alternative

Several commenters have suggested that the proposed Project follow a route that would parallel the entire existing Keystone Oil Pipeline in the United States as a way to reduce potential environmental impacts. In response, the Department investigated two route options that would parallel the existing Keystone pipeline in the United States. These options are discussed below and shown on Figure 2.2.4-1.

Both options assume that the proposed pipeline construction corridor would occupy up to 25 feet of the existing 50-foot Keystone pipeline ROW. New construction impacts would be limited to an area 85 feet outside of the existing ROW (i.e., 85 feet outside of the existing ROW plus 25 feet within the ROW totals to the typical 110-foot-wide pipeline construction easement). Permanent new impacts would be limited to an area 25 feet outside of the existing ROW. The combined new permanent ROW would be 75 feet wide.

Neither route variation would be located near the proposed Bakken Marketlink onramp for domestic crude oil from Williston Basin in North Dakota and Montana. This onramp is where this crude would be delivered into the proposed pipeline and is a condition to Montana's current approval of the proposed route through the state. To satisfy the Project's Purpose and Keystone's current contracts for up to 100,000 bpd of crude from the Bakken, a new way of delivering this crude would need to be combined to either option.

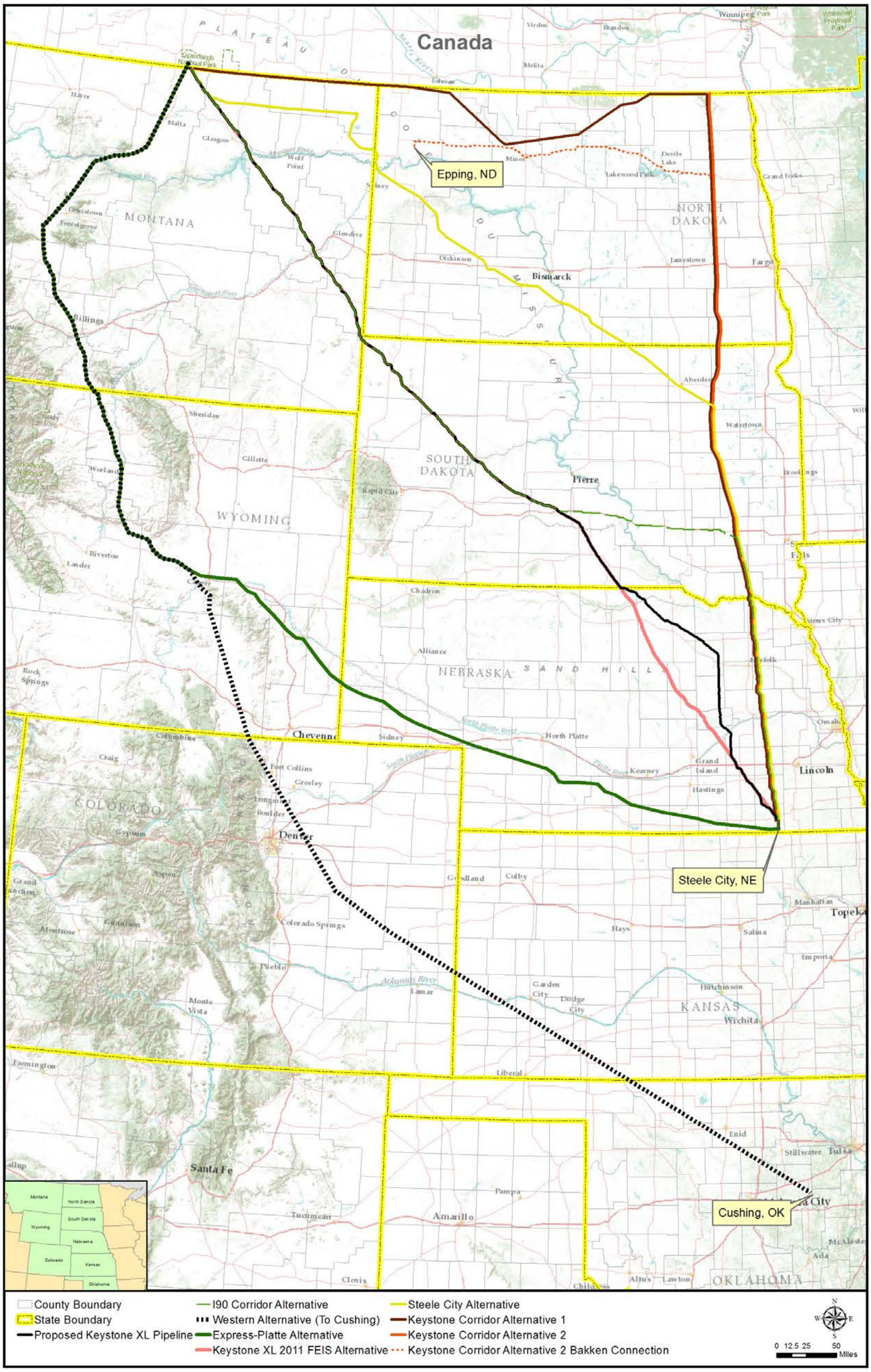

Figure 2.2.4-1 Major Route Alternatives

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Table 2.2-9 Phase I Alternatives Screening

Alternatives[a]	End point	Meets Primary P&N[b]	Meets Secondary P&N[c]	Requires Reroute in Canada (other than proposed border crossing)[d]	Availability	Reliability[g]	Length of Transport (Miles) in U.S.	Total Length U.S. and Canada	Estimated Number of Aboveground Facilities Required (U.S.)[h]	Length Co-located within Existing Corridor (miles)	Affected Land Area (Acres) Construction	Affected Land Area (Acres) Permanent
Route Alternatives												
Keystone's Proposed Project Route August 2012	Steele City NE	Yes	Yes	No	Yes	Yes	875	1,107	59	0	11,667	5,303
Keystone XL 2011 Steele City Segment Alternative	Steele City NE	Yes	Yes	No	Yes	Yes	854	1,086	56	0	11,387	5,176
Western Alternative (to Cushing)	Cushing OK	Yes	No	No	Yes	Yes	1,277	1,509	81	0	17,027	7,739
I-90 Corridor Alternative [e]	Steele City NE	Yes	Yes	No	Yes	Yes	927	1,159	90	254	12,360	4,818*
Express-Platte Alternative [f]	Steele City NE	Yes	No	No	Yes	Yes	1,049	1,281	69	0	13,987	6,358
Steele City Segment - A1A Alternative	Steele City NE	Yes	Yes	No	Yes	Yes	936	1,168	61	368	12,480	4,667*
Keystone Corridor Option 1	Steele City NE	Yes	Yes	No	Yes	Yes	1,092	1,324	72	640	12,621	4,679*
Keystone Corridor Option 2	Steele City NE	Yes	No	Yes	Yes	Yes	640	1,409	42	640	6,594	1,939*

[a] Route alternatives from the international border between Saskatchewan, Canada, and the United States in Phillips County, Montana near the unincorporated community of Morgan to existing Cushing Oil Terminal at Cushing Oklahoma; distribution via existing or under construction pipeline networks to customers in the U.S. Gulf Coast region.
[b] Uninterrupted Transport up to 730,000 bpd of WCSB crude oil across the Canadian border to the existing Cushing Oil Terminal at Cushing Oklahoma through a connection to Keystone's existing Cushing extension pipeline at Steele City, Nebraska. P&N = purpose and need.
[c] Uninterrupted Transport up to 100,000 bpd of transport Bakken crude oil through a connection with the Bakken Marketlink Project at Baker Montana from the Williston Basin in North Dakota and Montana to the Cushing Oil Terminal at Cushing Oklahoma through a connection to Keystone's existing Cushing extension pipeline at Steele City, Nebraska. Alternatives that would not meet this component of the Project Purpose and Need included those alternative routes that were more than 20 miles from existing Williston Basin crude oil infrastructure.
[d] The Canadian government has approved and permitted a route from Hardesty to the proposed border crossing. A new border crossing location would require new routing, approvals, and permits in Canada.
[e] The pipeline for the I-90 Corridor Alternative would not be installed within the existing highway ROW since the South Dakota Department of Transportation does not allow pipelines to be installed longitudinally within the I-90 ROW, although it does allow pipelines to cross the I-90 ROW.
[f] The alternative assumes that the proposed Keystone XL pipeline would be located adjacent to but not within the existing Express-Platte pipeline easement. This corridor is controlled by a different oil transmission company and business and engineering details of the existing corridor are not known. Transmission pipeline easement is often held by companies as potential future expansion, and easement agreements, safety and engineering requirements may not allow co-locating an additional pipeline.
[g] As a baseline for comparison to intermodal alternatives.
[h] Includes pump stations, main line valves and densitometer facilities. Assumes that pig launcher and receiver facilities will be located entirely within pump station facilities. Does not include access roads. Does not include additional pump stations on the existing Cushing Extension pipeline. The number of facilities for the Proposed Project, 2011 Steele City Alternative, and the I-90 Alternative based on preliminary engineering analysis, other alternatives estimated at 0.066 facilities per mile.
*For the purpose of this screening it is assumed that this Alternative could be collocated with the existing Keystone Pipeline. The permanent Corridor (50 feet) ROW would occupy 25 feet of the existing Keystone Pipeline ROW. ((Total Miles of new ROW X 5280 X 50)/43563)+((Total m\Miles of co-located ROW X5280X25 ft of new permanent ROW)/43560)

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Keystone Corridor Alternative Option 1 Proposed Border Crossing

The Keystone Corridor Alternative Option 1 would extend eastward approximately 463 miles across Montana and North Dakota from the proposed border crossing at Morgan, Montana to the existing Keystone pipeline corridor near the Canadian border at Pembina, North Dakota (Figure 2.2.4-1). The eastward leg of Option 1 from Morgan, Montana to the existing Keystone pipeline ROW would divert southeast and northeast along the route to avoid major national wildlife refuges and several smaller refuges as well as the Turtle Mountain Indian Reservation, which are present near the northern border of North Dakota. Near Pembina, Option 1 would turn southward, paralleling the existing Keystone Oil Pipeline for about 640 miles to the proposed Project terminus at Steele City, Nebraska.

The nearest major hub for Bakken crude to Keystone Corridor Alternative Option 1 would be Epping, North Dakota approximately 60 miles south of this alternative route.

As summarized in Table 2.2-9, the Keystone Corridor Alternative Option 1 was removed from further consider for the following reasons:

- The Keystone Corridor Option 1 is approximately 218 miles longer than the proposed route with associated reliability, environmental, and construction/operational cost impacts;
- An additional pipeline with a minimum length of 70 miles would be required to access Bakken crude at Epping, North Dakota, to the south of this alternative; and
- Approximately 72 aboveground facilities would be required to support this alternative compared to 59 for the proposed route.

Keystone Corridor Option 2 Existing Keystone Pipeline Border Crossing

Keystone Corridor Alternative Option 2 would follow the existing Keystone pipeline corridor over its entire length of approximately 1,409 miles from Hardisty, Alberta to Steele City, Nebraska (Figure 2.2.4-1). Option 2 would parallel the approximately 769-mile Canadian portion of the existing Keystone Oil Pipeline from Hardisty, Alberta to the international border crossing near Haskett, Manitoba and Pembina, North Dakota. A new Presidential Permit application would be required for the proposed pipeline to cross the border at this location. This option would then parallel the existing pipeline for 640 miles through North Dakota, South Dakota, and Nebraska.

As currently proposed, the approved pipeline route in Canada from Hardisty, Alberta to Morgan, Montana is approximately 329 miles. Keystone Corridor Alternative Option 2 would require an additional 440 miles of new pipeline in Canada and new permits for the entire 769-mile Canadian portion of Option 2.

As summarized in Table 2.2-9, Keystone Corridor Alternative Option 2 was removed from further consideration for the following reasons:

- This alternative is approximately 303 miles longer than the total length of the proposed route in Canada and the United States (1,106 miles) with associated reliability, environmental, and construction/operational cost impacts;

- An additional pipeline at least 350 miles in length would be required to access Bakken crude at Epping, North Dakota; and
- Approximately 42 aboveground facilities would be required for this alternative compared to 59 for the proposed route.

Express-Platte Alternative

The United States portion of the Express-Platte Alternative would be approximately 1,085 miles long from the proposed border crossing near Morgan, Montana to Steele City, Nebraska. As shown on Figure 2.2.4-1, the Express-Platte Alternative would travel from the border crossing southwest for approximately 200 miles to the existing Express-Platte pipeline ROW. The alternative would then follow parallel and adjacent to the existing Express-Platte pipeline ROW approximately 895 miles to the proposed Project terminus at Steele City, Nebraska. It is assumed that Express-Platte would not allow Keystone to co-locate within any part of its ROW due to liability, maintenance, and future expansion considerations.

The Express-Platte Alternative would not be located near the proposed Bakken Marketlink Project onramp for domestic crude oil from Williston Basin in North Dakota and Montana. This onramp is a condition of Montana's current approval of Keystone's proposed route with the state. To satisfy the Purpose and Need and Keystone's current contracts for up to 100,000 bpd of crude from the Bakken, a new method for delivering this crude would need to be combined with this alternative.

As summarized in Table 2.2-9, the Express-Platte Alternative was removed from further consideration for the following reasons:

- The Express-Platte Alternative would be approximately 211 miles longer in the United States than the proposed route with associated reliability, environmental, and construction/operational cost impacts;
- An additional new pipeline at least 160 miles in length would be required to access Bakken crude at Baker, Montana; and
- Approximately 69 aboveground facilities would be required for this route variation compared to 59 for the proposed route.

Western Route Alternative

The Western Route Alternative would enter the United States at the proposed border crossing near Morgan, Montana and extend through Montana, Wyoming, Colorado, Kansas, and Oklahoma, bypassing the existing Keystone Cushing Extension pipeline and connecting at the Cushing Oil Terminal in Oklahoma (Figure 2.2.4-1). The Western Route Alternative would be approximately 1,277 miles long and would parallel adjacent to the existing Express-Platte System corridor for approximately 350 miles. As noted previously, it is assumed that Express-Platte would not allow Keystone to collocate within any part of its ROW due to liability, maintenance, and future expansion considerations. To satisfy the Purpose and Need and Keystone's current contracts for up to 100,000 bpd of crude from the Bakken, a new delivery method would need to be connected to this alternative.

As summarized in Table 2.2-9, the Western route variation was removed from further consideration for the following reasons:

- The Western Route Alternative would be approximately 211 miles longer in the United States than the proposed route with associated reliability, environmental, and construction/operational cost impacts;
- An additional pipeline approximately 160 miles in length would be required to access Bakken crude at Baker, Montana; and
- Approximately 81 aboveground facilities would be required for this route variation compared to 59 for the proposed route.

Phase II Screening

The three major route alternatives that remained after the Phase I screening were reviewed through a Phase II screening to identify those alternative routes that warranted consideration as reasonable alternatives as compared to the proposed route (see Table 2.2-10).

The three alternatives that were carried through to Phase II screening include:

- 2011 Steele City Alternative;
- I-90 Corridor Alternative; and
- Steele City Segment - A1A Alternative.

The Phase II screening used a desktop data review of the following conditions and sensitive environmental features to compare these alternatives:

- Length of route (miles);
- Approximate acres affected by construction of the project (typical 110 ft construction ROW)
- Federal lands crossed (miles);
- Principal aquifers crossed (miles);
- Native American lands crossed (miles);
- Total wetlands crossed (miles);
- U.S. Fish and Wildlife Service (USFWS) critical habitat for threatened and endangered species crossed (miles);
- Known cultural resource sites (listed on National Register of Historic Places) within 500 ft of proposed pipeline;
- Number of waterbodies crossed; and
- Soils designated as highly erodible by wind crossed (miles).

In Phase II screening, route alternatives were evaluated to identify those alternatives that have a greater impact to the features identified above or those features that had a greater effect on project constructability when compared to the proposed route. If routes that had these increased impacts did not have some offsetting advantage, they were eliminated from further consideration and not carried forward in the Supplemental EIS.

Table 2.2-10 Phase II Detailed Screening Summary

Feature	Keystone's Proposed Alternative (August 2012)	2011 Steele City Alternative	I-90 Corridor	Steele City Segment-A1A Alternative
Length of route in the United States (miles)	875	854	927	936
Approximate Acres Affected by Construction of the Pipeline Project (acres) [a]	11,667	11,387	12,360	12,480
Approximate Acres Affected by Maintenance of the Permanent Pipeline ROW (acres) [b]	5,303	5,176	4,818*	4,667
Federal Lands Crossed (miles)[c]	50	50	52	32
Principal Aquifers Crossed (miles) (includes glacial)[d]	597	598	565	724
Native American Lands Crossed (miles)[e]	0	0	0	0
Total Wetlands Crossed (miles)[f]	3	8	4	20
FWS Critical Habitat for Threatened & Endangered Species Crossed (miles)[g]	0	0	0	2
Known Cultural Resource Sites (listed on National Historic Database) within 500feet of Proposed Pipeline[h]	0	0	1	0
Number of Waterbodies Crossed[i]	62	60	61	65
Soils Designated as Highly Wind-Erodible Crossed (miles)[i,j]	9	78	2	4

[a] (Length of route (mi)*5280ft*110 ft)/43,560.
[b] (Length of route (mi)*5280ft*50 ft)/43,560.
[c] Lands owned or administered by the government of the United States.
[d] Length of route crossing principal aquifers as defined by U.S. Geological Survey.
[e] Length of route crossing areas with boundaries established by treaty, statute, and (or) executive or court order, recognized by the federal government as territory in which American Indian tribes have primary governmental authority.
[f] Length of route crossing National Wetlands Inventory classes: Freshwater Emergent Wetland, Freshwater Forested/Shrub Wetland, and Other Non-Open Water Wetlands.
[g] USFWS Critical Habitat for Threatened & Endangered Species. The Critical Habitat portal is an online service for information regarding Threatened and Endangered Species final Critical Habitat designation across the United States. Not all of the critical habitat data designated by the USFWS are available.
[h] Google Earth data provided by the National Park Service showing properties listed on the National Register of Historic Places.
[i] U.S. National Atlas Water Feature Areas (2012): aqueducts, canals, dams, intracoastal waterways, rivers, and streams.
[j] Based on soil classification of Wind Erodibility Group (NRCS 2012) values of 1-2 being Highly Erodible (STATSGO soil characteristics for the conterminous United States).
*For the purpose of this screening it is assumed that this Alternative could be collocated with the existing Keystone Pipeline. The permanent Corridor (50 ft) ROW would occupy 25 ft of the existing Keystone Pipeline ROW. ((Total Miles of new ROW X 5280 X 50)/43563)+((Total m\Miles of co-located ROW X5280X25 ft of new permanent ROW)/43560)

Phase II Results Summary

Based on the results of the Phase II screening described above and summarized in Table 2.2-10, the Department selected the 2011 Steele City Alternative and I-90 Corridor Alternative to be carried forward through the Supplemental EIS for analysis (see Figure 2.2.4-2). The Phase II screening eliminated the Steele City Segment-AIA Alternative from further analysis for the reasons discussed below.

2.2.4.2 Steele City Segment-A1A Alternative

The Steele City Segment A1A Alternative is approximately 936 miles long from the border crossing near Morgan, Montana to Steele City, Nebraska. As shown on Figure 2.2.4-1, the Steele City Alternative would be parallel and adjacent to the existing Northern Border Pipeline ROW from the border crossing for approximately 41 miles. At this point, the Steele City Alternative route would divert north away from the Northern Border pipeline to avoid the Fort Peck Indian Reservation in Montana.

The deviation would have a total length of approximately 149 miles. Beginning in central Valley County, Montana the route would extend to the east along a path that would be north of the Standing Rock Indian Reservation. It would then turn south to pass to the east of the Standing Rock Indian Reservation in Sheridan County until crossing into Roosevelt County, Montana, where it would extend to the southeast and cross into Williams County, North Dakota, where it would rejoin the Northern Border Pipeline ROW.

From this location, the Steele City Segment A1A Alternative would travel parallel and adjacent to the Northern Border pipeline ROW for approximately 365 miles to a point where the Northern Border Pipeline intersects with the existing Keystone pipeline. The Steele City Segment A1A Alternative would then turn south and parallel the existing Keystone Pipeline for approximately 381 miles to Steele City, Nebraska. It is assumed that the Northern Border pipeline would not allow Keystone to collocate within any part of its ROW due to liability, maintenance, and future expansion considerations.

The Steele City Segment A1A Alternative would not be located near the proposed Bakken Marketlink Project onramp for domestic crude oil from Williston Basin in North Dakota and Montana. This onramp is a condition of Montana's current approval of Keystone's proposed route with the State. To satisfy the Purpose and Need and Keystone's current contracts to transport up to 100,000 bpd of crude from the Bakken, a new delivery method would need to be combined with this alternative.

As summarized in Table 2.2-10, the Steele City Segment A1A Alternative was removed from further consideration for the following reasons.

- The Steele City Segment A1A Alternative is approximately 80 miles longer than the Proposed Alternative;
- An additional pipeline at least 30 miles in length would be required to access Bakken crude at Epping, North Dakota; and
- Based on the Phase II screening summarized in Table 2.2-10 the Steele City A1A Alternative has no offsetting environmental advantage relative to Keystone's proposed alternative to warrant further assessment.

2.2.4.3 2011 Steele City Alternative

The 2011 Steele City Alternative considered in this Supplemental EIS is identical to the Steele City Segment-B pipeline route that was considered as part of the overall proposed route in the Final EIS. This alternative assumes that Keystone would construct, operate, maintain, inspect, and monitor a single 36-inch pipeline system that would transport crude oil from its existing facilities in Hardisty, Alberta, Canada, and from proposed facilities in Baker, Montana, for delivery to Steele City, Nebraska.

This section provides an overview of the 2011 Steele City Alternative, associated aboveground facilities, connected actions, and a baseline impact comparison to Keystone's proposed route.

In examining the Keystone XL 2011 Steele City Segment, the Department assumed that the typical engineering design specifications, construction procedures, operations, maintenance, and decommissioning would be identical to those presented in the description of the proposed Project in Section 2.1, Overview of the Proposed Project. Specific mitigation or site-specific construction and operation procedures would vary according to differences in the routes and specific conditions on those routes.

The 2011 Steele City Alternative was originally proposed by Keystone as the shortest practical route from the United States/Canada border near Morgan, Montana to existing oil facilities at Steele City, Nebraska with a total pipeline length of approximately 854 miles (see Table 2.2-10). The temporary construction ROW would have a nominal width of 110 feet, and the permanent operating easement would be 50 feet wide. The estimated surface impacts associated with this alternative are presented in Table 2.2-10.

As shown on Figure 2.2.4-2, this alternative would follow Keystone's current proposed Project route from the Canadian border milepost (MP 0) south to approximately MP 204 where it would connect with the proposed Bakken Marketlink Project onramp at the same location as the proposed Project. It would then continue to approximately MP 615 in northern Nebraska near the border with South Dakota. At that location, the 2011 Steele City Alternative would divert from the current proposed Project and would continue southeasterly for another 239 miles to the southern terminus at Steele City, Nebraska. From approximately MP 635 to MP 713, the 2011 Steele City Alternative would cross the NDEQ-identified Sand Hills Region.

Aboveground Facilities

The 2011 Steele City Alternative would require approximately 155 associated aboveground facilities, including 18 pump stations, one densitometer site, 57 intermediate mainline valves (MLVs), and 80 access roads. Pig launchers and receivers, as defined in Section 2.1, Overview of the Proposed Project, would be located completely within the boundaries of the pump stations. The densitometer facility would be located just upstream (north) of the southernmost pump station near Steele City, Nebraska. A summary of these facilities by state is presented in Table 2.2-11.

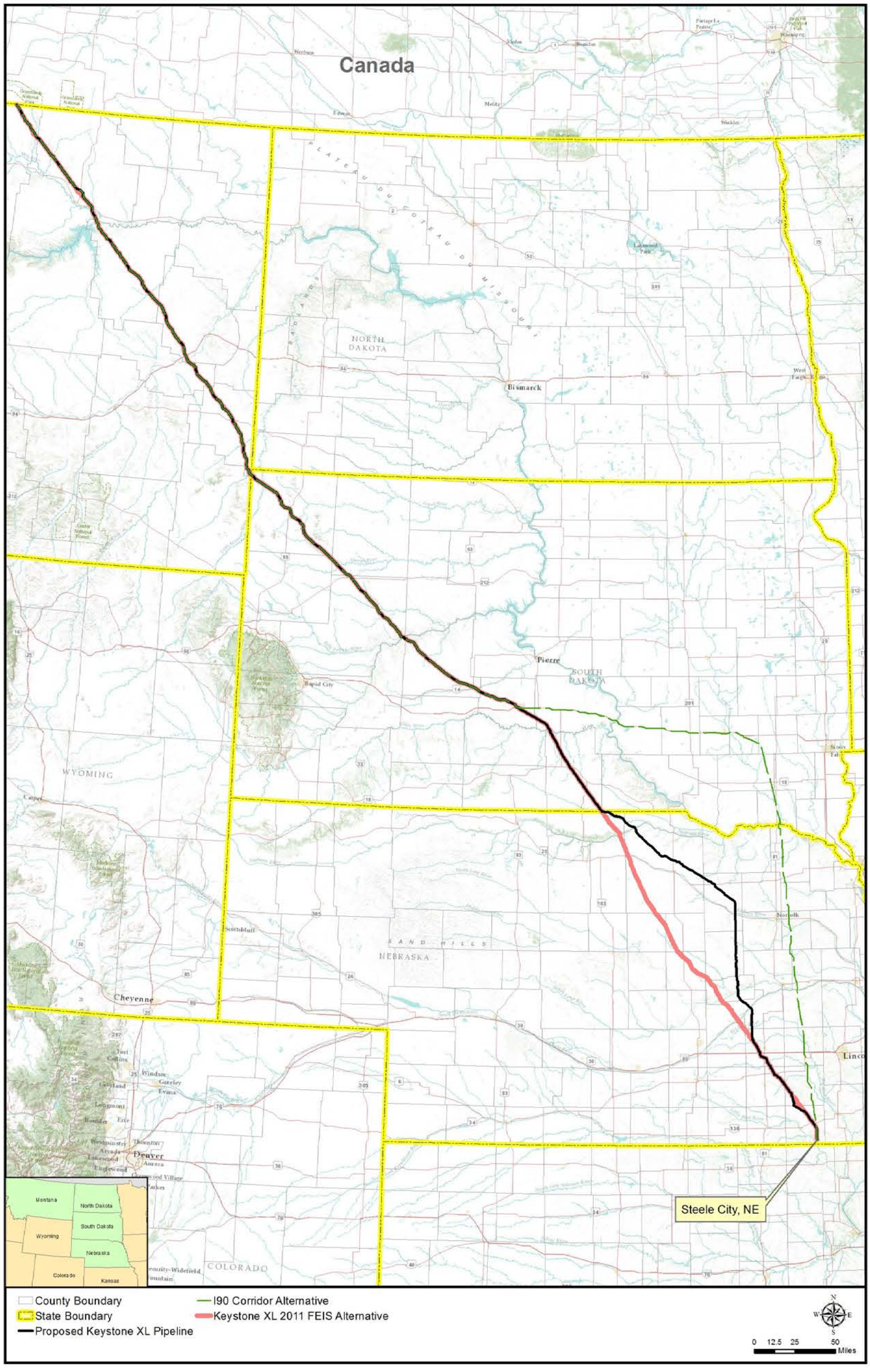

Figure 2.2.4-2 Detailed Screening Alternatives

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Table 2.2-11 Keystone XL 2011 Final EIS Alternate Ancillary Facilities by State

State	Ancillary Facilities
Montana	6 New Pump Stations 21 MLVs 50 Access Roads
South Dakota	7 New Pump Stations 17 Intermediate MLVs 18 Access Roads
Nebraska	5 New Pump Stations 19 Intermediate MLVs 12 Access Roads 1 Densitometer Facility

Connected Actions

The 2011 Steele City Alternative would require the same three connected actions as the proposed Project:

- Bakken Marketlink Project
- Big Bend to Witten 230-kV Transmission Line
- Electrical Distribution Lines and Substations

2.2.4.4 I-90 Corridor Alternative

This section provides an overview of the I-90 Corridor Alternative pipeline route; associated aboveground facilities; connected actions; and a baseline impact comparison to Keystone's proposed route (see Figure 2.2.4-2). The I-90 Corridor Alternative assumes that Keystone would construct, operate, maintain, inspect, and monitor a single 36-inch pipeline system that would transport up to 830,000 bpd of crude oil from its existing facilities in Hardesty, Alberta, Canada and from proposed facilities in Baker, Montana for delivery to Steele City, Nebraska. In examining the I-90 Corridor Alternative, the Department assumes that the typical engineering design specifications, construction procedures, operations, maintenance, and decommissioning would be identical to those presented in the description of the proposed Project in Section 2.1, Overview of the Proposed Project.

The I-90 Corridor Alternative was identified in the Final EIS for the previous Keystone XL proposed route as an alternative that would avoid crossing the NDEQ-identified Sand Hills Region and would reduce the length of pipeline crossing the Northern High Plains Aquifer (NHPAQ) system, which includes the Ogallala formation. This alternative was developed largely in response to comments received during that EIS process, expressing concerns regarding the risk of spills to the NHPAQ system and suggestions that overall impacts might be reduced by avoiding this formation and using a portion of the existing Keystone pipeline ROW.

The I-90 Corridor Alternative would be approximately 927 miles in length from the United States/Canada border to Steele City, Nebraska. The temporary construction ROW would have a nominal width of 110 feet; the permanent operating easement would be 50 feet wide. As shown on Figure 2.2.4-2, the I-90 Corridor Alternative would follow Keystone's currently proposed Project route from the Canadian Border (MP 0) south through the state of Montana into South Dakota to approximately MP 516, where the proposed pipeline route intersects Interstate 90 (I-90). This alternative pipeline route would divert from the proposed Project route at this location.

In South Dakota, pipelines are allowed to cross the I-90 ROW, but are not allowed to be installed parallel to the roadway within the highway easement (South Dakota Administrative Code 70:04:05.01:01 Construction and Maintenance of Utility Facilities within Interstate Right-of-Way). As a result of this policy, this route alternative would travel eastward, adjacent and parallel to the southern side of the I-90 corridor, for approximately 144 miles (approximately 2 miles west of Alexandria, South Dakota). It is assumed that the I-90 Corridor Alternative would diverge from the I-90 ROW to avoid towns adjacent to I-90, such as Oacoma and Mitchell, South Dakota.

Near Alexandria, South Dakota, the I-90 Corridor Alternative intersects an existing corridor shared by the BNSF railroad line and State Highway 262 (BNSF/262). From this location, the I-90 Corridor Alternative would travel southeast away from I-90, parallel and adjacent to the BNSF/262 corridor for approximately 13 miles to just east of Emery, South Dakota. At this point, the I-90 Corridor Alternative would intersect the existing Keystone Oil Pipeline Project ROW. The I-90 Corridor Alternative would then parallel the west side of the existing Keystone Oil Pipeline Project ROW for approximately 254 miles to Steele City, Nebraska.

The I-90 Corridor Alternative ROW would share up to 25 feet of the existing Keystone easement where these routes are parallel and adjacent for approximately 254 miles. In this segment of the I-90 Corridor Alternative, the 110-foot-wide temporary construction corridor would impact 85 feet outside of Keystone's existing maintained pipeline easement; the new permanent easement would extend 25 feet from the edge of Keystone's existing 50-foot-wide easement.

Just south of the town of Chamberlain, South Dakota, the I-90 Corridor Alternative route crosses Lake Francis Case. This lake is a reservoir along the Missouri River formed by Fort Randall Dam located approximately 90 miles downstream of the potential crossing. The pipeline would remain parallel to the southern side of I-90 for the lake crossing. The lake is approximately 4,100 feet wide at this location. An aerial view of the lake crossing location is shown on Figure 2.2.4-3.

This would be a complex crossing and site-specific studies would be required to validate the feasibility of crossing at this location. Based on a desktop review of the crossing conditions, the proposed crossing would approach the practical limits for horizontal directional drill methods of a 36-inch pipeline (approximately 6,000 feet). As a result, for the purposes of this evaluation, it is assumed that a wet-cut crossing method using barges and bottom dredging may be the preferred method to cross Lake Francis Case at this location.

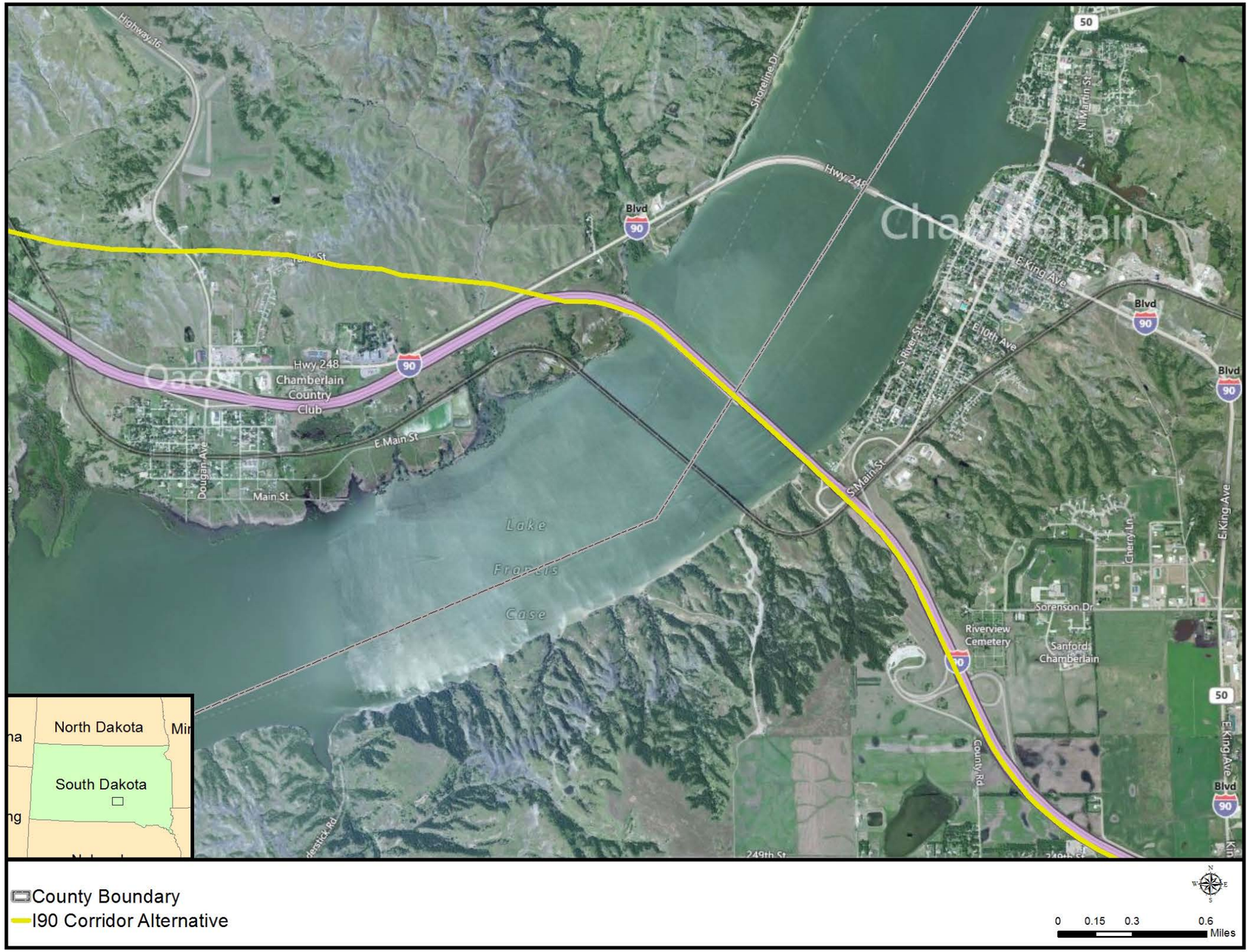

Figure 2.2.4-3 I-90 Corridor Alternative

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Aboveground Facilities

The I-90 Corridor Alternative would require approximately 172 aboveground facilities, including 19 pump stations, one densitometer site, 70 intermediate MLVs, and 82 access roads. Pig launchers and receivers would be located completely within the boundaries of the pump stations or delivery facilities. The densitometer facility would be located just upstream (north) of the southernmost pump station near Steele City, Nebraska. A summary of these facilities by state is presented in Table 2.2-12.

Table 2.2-12 I-90 Corridor Alternative Estimated Aboveground Facilities by State

State	Ancillary Facilities
Montana	6 New Pump Stations 21 Intermediate MLVs 50 Access Roads
South Dakota	9 New Pump Stations 34 Intermediate MLVs 22 Access Roads
Nebraska	4 New Pump Stations 15 Intermediate MLVs 10 Access Roads 1 Densitometer Facility

Connected Actions

The I-90 Corridor Alternative would require the same three connected actions as the proposed action:

- Bakken Marketlink Project
- Big Bend to Witten 230-kV Transmission Line
- Electrical Distribution Lines and Substations

Nebraska Route Options

Concurrent with the draft Supplemental EIS process, the NDEQ is conducting a separate analysis under state law of the newly proposed route in Nebraska. The Department is cooperating with the NDEQ pursuant to a Memorandum of Understanding signed in May 2012.

To specifically address agency and public comments related to the Keystone's proposed 2010 route through the NDEQ-identified Sand Hills Region of Nebraska, NDEQ developed a map identifying the boundaries of the Sand Hill geomorphology within Nebraska (NDEQ 2011). Based on NDEQ's map, Keystone developed eight route options (A-I) through three corridors intended to avoid impacts to the NDEQ-identified Sand Hills Region without an unacceptable increase in other environmental impacts. These route options are relatively short variance routes (between 12 and 32 miles each) that all divert east around the NDEQ-identified Sand Hills Region from the proposed Keystone XL route presented in the Final EIS.

From this analysis, Keystone identified a combination of the proposed segments A, E, and I that together formed the preferred route to avoid the NDEQ-identified Sand Hills Region in Nebraska. Keystone's analysis of these Nebraska route options was documented in an April 2012 report submitted to NDEQ for review (exp Energy Services Inc. 2012). NDEQ requested that Keystone consider revisions to the proposed A-E-I reroute to further avoid highly erodible soils and provide additional aquifer protection. Keystone revised its Nebraska reroute to address the NDEQ comments and submitted a revised report to NDEQ on September 5, 2012, documenting the proposed final route design in Nebraska (exp Energy Services Inc. 2012).

Subsequent to the revised Nebraska route design report submitted to NDEQ, on September 7, 2012, Keystone submitted a detailed environmental resource report to the Department to support the April 2012 Presidential Permit application. The resource report includes the Nebraska reroute as Keystone's proposed route through Nebraska. In addition to the NDEQ-identified Sand Hills Region, the proposed Project route would avoid areas in Keya Paha County identified by the NDEQ that have soil and topographic characteristics similar to the NDEQ-identified Sand Hills Region, and it avoids or moves further away from wellhead protection areas for the Villages of Clarks and Western. The Nebraska reroute as currently proposed will be carried forward for analysis in the Supplemental EIS as a component of Keystone's proposed route, and other Nebraska route options are not carried forward for analysis.

2.2.5 Other Alternatives Considered

2.2.5.1 Route Variations

In addition to major route alternatives, the proposed variations to the proposed Project were reviewed. Variations are relatively short deviations from a proposed route that are developed in response to landowner requests; to avoid or minimize construction impacts to localized, specific resources such as cultural resource sites, wetlands, recreational lands, or residences; or to minimize constructability issues such as shallow bedrock, difficult waterbody crossings, or steep terrain.

Each of the three states crossed by the proposed Project pipeline (Montana, South Dakota, and Nebraska) has incorporated minor route variations into the conditions for its approval of the proposed route. These variations were identified in the TransCanada Keystone XL Pipeline Project, Environmental Report (exp Energy Services Inc. 2012). The variations have been adopted by Keystone and are included in the detailed description of the proposed Project in Section 2.1, Overview of the Proposed Project.

2.2.5.2 Alternative Pipeline Design

In response to public comments, the Department considered two alternative pipeline designs: an aboveground pipeline and an alternative using smaller-diameter pipe. These two alternatives are addressed in the following sections.

Aboveground Pipeline

Although it is technically feasible to construct the proposed Project pipeline aboveground in most areas along the proposed Project route, there are many disadvantages to an aboveground pipeline that need to be considered. An aboveground pipeline is far more vulnerable to damage due to vandalism, sabotage, and the effects of other outside forces, such as vehicle collisions.

Furthermore, there has been increased concern about homeland security over the past decade, and burying the pipeline provides a higher level of security (Government Accountability Office [GAO] 2010).

In addition to safety and security issues, an aboveground pipeline would be more susceptible to the effects of ambient temperature, wind, and other storm events. Construction of an aboveground pipeline would also require exposing the pipeline above rivers (e.g., hung from a bridge or constructed as a special pipeline span) and roadways, where it would be vulnerable during bridge maintenance and accessible to those intent on damaging the pipeline.

Nearly all petroleum transmission pipelines in the United States are buried. As stated in Section 2.1.7, Pipeline System Design and Construction Procedures, the proposed Project would be constructed, operated, maintained, inspected, and monitored consistent with the Pipeline Hazardous Material Safety Administration (PHMSA) requirements presented in 49 CFR 195, relevant industry standards, applicable state standards, and a set of proposed Project-specific Special Conditions developed by PHMSA and incorporated into the proposed Project design, operations, maintenance, and monitoring commitments.

There are examples of successful aboveground pipelines including 466 miles of the Trans-Alaska pipeline. In addition, inspection and leak detection for aboveground pipelines can be more efficient and emergency response more rapid.

Based on review and in consultation with PHMSA, it has been determined that due to the safety and security concerns of an aboveground pipeline, it is not a reasonable alternative for the proposed Project, and it was not considered further in the Supplemental EIS.

Smaller-Diameter Pipe

As noted in Section 2.1, Overview of the Proposed Project, the proposed Project purpose is to transport a maximum capacity of 830,000 bpd of crude oil to satisfy existing commitments and future market demand. A pipeline system with a pipe diameter of less than the Project's proposed 36-inch-diameter would have lower throughput capacities and would not be capable of providing the volume of crude necessary to meet the proposed Project purpose.

The recommended work safety and construction requirements, including the construction ROW width for a small30-inch diameter, long-distance transportation pipelines are the same as those of the proposed 36-inch-diameter pipe (INGAA 1999). The working ROW dimensions of pipeline construction are primarily related to the size of construction vehicles and the need for working space near the pipeline trench.

The proposed pipeline is sized to efficiently meet the contracted volume of crude oil of 500,000 bpd with a maximum capacity of 830,000 bpd with increased pumping capacity. While there are limitations to the ultimate capacity of throughput based on pipeline diameter, the operational throughput is a combined function of pipeline diameter, pipeline operating pressure, and crude oil flow velocity. Therefore, to achieve a throughput that would meet the purpose of the proposed Project, a smaller-diameter pipeline would have to operate at higher pressures and flow velocities, and, for the delivery capacity proposed, the pressures and velocities required for a smaller diameter would not be consistent with PHMSA safety regulations, which limit maximum pipeline pressure.

Even if a special exception would be approved by PHMSA to increase pressure and velocity, it is unlikely that a 30-inch-diameter pipeline would be capable of transporting the volumes proposed for transport in the proposed Project. As of February 2011, Keystone had firm contract commitments to transport 500,000 bpd of crude oil to the oil terminal at Cushing, Oklahoma. If a smaller-diameter pipeline were installed, it would likely be necessary to install an additional pipeline to meet those initial commitments.

As a result of these findings, the Department has determined that the use of a smaller-diameter pipe for the proposed Project is not a reasonable alternative, and installing more than one smaller-diameter pipe to meet the purpose of and need for the proposed Project would not offer an overall environmental advantage over the proposed Project design. Therefore, this alternative was eliminated from further consideration.

2.2.6 Summary

Based on the analysis described above, the Department has identified the following as reasonable alternatives to the proposed Project for inclusion and evaluation in the Supplemental EIS. A preferred alternative will not be put forth in the Draft Supplemental EIS but will be identified if appropriate in the Final Supplemental EIS or the Record of Decision.

- No Action Alternative, including the following options:
  - Status Quo Option (i.e., no change in WCSB or Bakken crude oil production or transport methods);
  - Rail/Pipeline Option:
    - WCSB Crude—Rail from Lloydminster, Saskatchewan to Stroud, Oklahoma; then pipeline to Cushing, Oklahoma for onward delivery to the Gulf Coast area; and
    - Bakken Crude—Rail from Epping, North Dakota to Stroud, Oklahoma; then pipeline to Cushing, Oklahoma for onward delivery to the Gulf Coast area.
  - Rail/Tanker Option:
    - WCSB Crude—Rail from Lloydminster, Saskatchewan to Prince Rupert, British Columbia, then tanker through the Panama Canal to the Gulf Coast area; and
    - Bakken Crude—Rail from Epping, North Dakota to Stroud, Oklahoma; then pipeline to Cushing, Oklahoma for onward delivery to the Gulf Coast area.
- 2011 Steele City Alternative; and
- I-90 Corridor Alternative.

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3.0 AFFECTED ENVIRONMENT

This chapter provides a description of those portions of the environment that would be affected by the proposed Project and its connected actions from the border crossing near Morgan, Montana, to Steele City, Nebraska. The states that would be affected are Montana, North Dakota, South Dakota, Kansas, and Nebraska.

The information provided in this chapter is used in the assessment of impacts from the proposed Project as described in Chapter 4, Environmental Consequences. The level of detail in the description of each resource in this chapter corresponds to the magnitude of the direct, indirect, or cumulative impacts of the proposed Project. Discussions of the affected environment and impacts from alternatives to the proposed Project are found in Chapter 5, Alternatives.

As noted in Section 5.1, No Action Alternatives, the U.S. Department of State (Department) reviewed the analysis of the portion of the proposed Project in Canada conducted by the National Energy Board of Canada. In so doing, the Department was guided by Executive Order 12114 (Environmental Effects Abroad of Major Federal Actions). Consistent with Executive Order 12114, the Department did not conduct an assessment of the potential impacts of the Canadian portion of the proposed Project or include a description of the affected environment in Canada.

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3.1 GEOLOGY

3.1.1 Introduction

This section discusses geological resources in the proposed Project area. The description of geological resources is based on information provided in the 2011 Final Environmental Impact Statement (Final EIS) as well as new circumstances or information relevant to environmental concerns that have become available since the publication of the Final EIS, including the proposed reroute in Nebraska. The information that is provided here builds on the information provided in the Final EIS and in many instances replicates that information with relatively minor changes and updates. Other information is entirely new or substantially altered from that presented in the Final EIS. Specifically, the following information, data, methods, and/or analyses have been substantially updated in this section from the 2011 document:

- Revised information is presented regarding physiographic ecoregions crossed in Nebraska, as well as the number of miles crossed with potential for fossil-bearing geologic formations, fossil fuel and mineral resources, and geologic hazards;
- Additional details pertaining to geologic hazards have been documented, including information about frost line, epicenters of earthquakes relative to the proposed route, and potential for subsidence due to presence of karst geology; and
- Results of supplemental paleontological field surveys and reports conducted in 2011 and 2012 in Montana and South Dakota have been added to tables in Section 3.1.2.2.

3.1.2 Environmental Setting

3.1.2.1 Geological Resources

Montana

The proposed Project route would enter the United States at Morgan, Montana, and would traverse the Great Plains physiographic province (Fenneman 1928), which is characterized by badlands, buttes, and mesas, and includes the Black Hills mountain range. In northern Montana, the route would cross the Glaciated Missouri Plateau, which is covered in glacial deposits and represents the southern-most extent of the last ice age. In the vicinity of Circle, Montana, the proposed Project route enters the Unglaciated Missouri Plateau. Surface elevations across the proposed Project route in Montana average around 3,000 feet above mean sea level (amsl). The frost line across the proposed Project route in Montana averages between 5 to 5.7 feet below ground surface (bgs) (NOAA 1978). The route would cross six U.S. Environmental Protection Agency (USEPA) Level IV Ecoregions, each with a distinct physical geography (Omernik 2009). Table 3.1-1 presents the regional geographic characteristics within Montana.

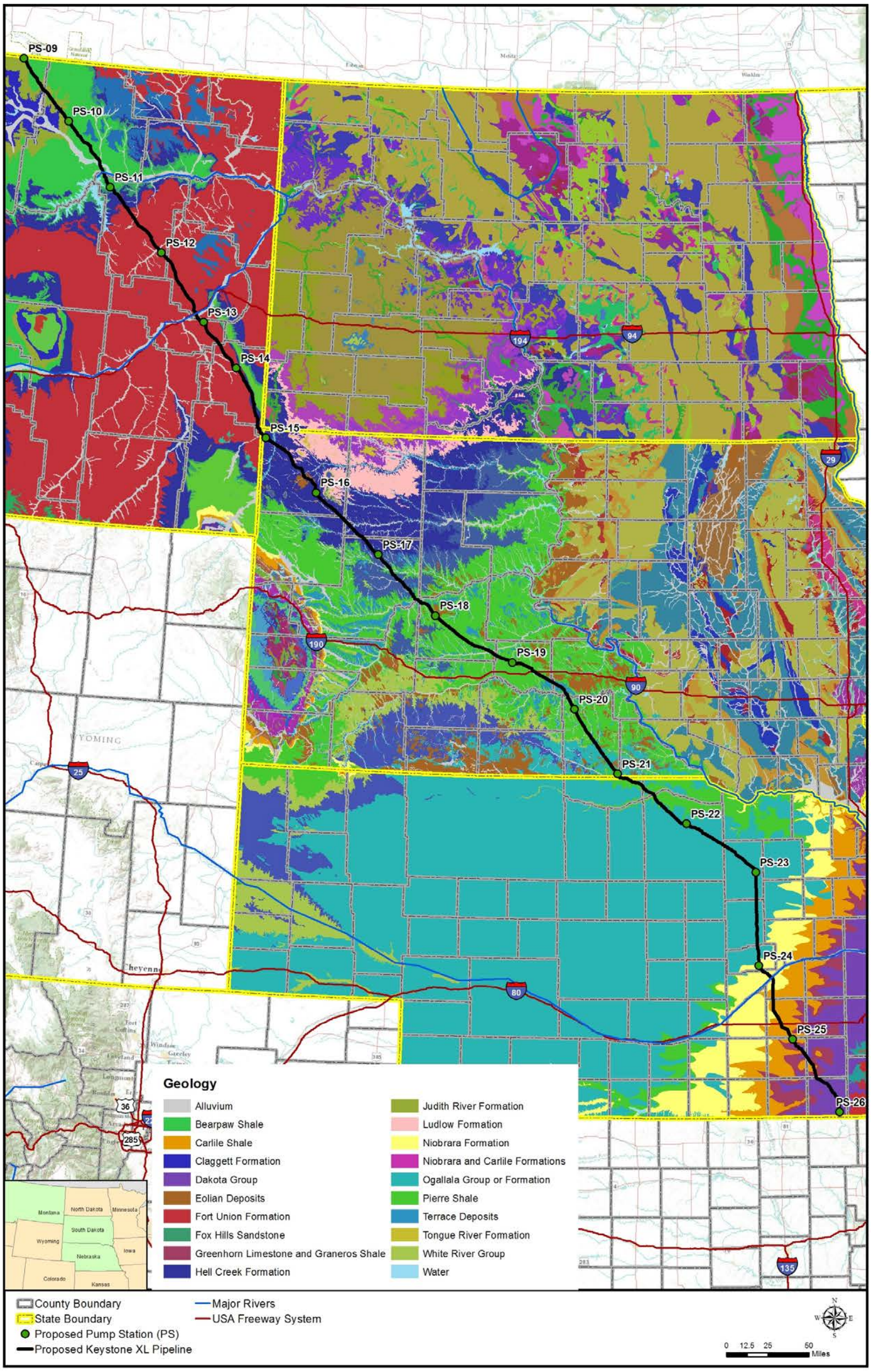
Table 3.1-1 Physiographic Characteristics of Ecoregions Crossed in Montana by the Proposed Project Route

MP Range	Physiographic Description	Elevation Range (ft[a] amsl)	Local Relief (ft)	Surface Geology	Bedrock Geology
Northwestern Glaciated Plains—Southern River Breaks[b]					
0–8	Glaciated, undulating to strongly sloping topography containing bouldery knolls, gravelly ridges, kettle lakes, and wetlands. Prominent end moraine.	2,300–3,600	50–375	Quaternary drift.	Cretaceous Bearpaw/Pierre Shale, Judith River Formation.
Northwestern Glaciated Plains—Glaciated Northern Grasslands[b]					
8–90, 110–119	Glaciated, dissected, rolling to strongly rolling drift plains.	1,990–4,000	50–600	Quaternary glacial drift deposits.	Cretaceous Bearpaw Shale, Judith River Formation, Claggett Formation, Hell Creek Formation, Fox Hills Formation, Tongue River Member of Fort Union Formation, and Flaxville Gravels.
Northwestern Great Plains—River Breaks[b]					
90–109, 194–200	Unglaciated, rugged, very highly dissected terrain adjacent to rivers.	1,900–3,450	200–500	Erodible, clayey soils; gravelly soils on slopes.	Tongue River, Lebo, Slope, and Tullock members of the Tertiary Fort Union Formation, Hell Creek Formation, Fox Hills Sandstone, and Pierre Shale.
Northwestern Great Plains—Central Grassland[b]					
109–110, 119–133, 200–248	Unglaciated, dissected rolling plains containing buttes. Areas of gravel, clinker, and salt flats. Streams are intermittent.	2,200–5,000	125–600	Quaternary terrace deposits and alluvium along channels.	Tertiary Fort Union, Hell Creek Formation, Pierre Shale.
Northwestern Great Plains—Missouri Plateau[b]					
133–194	Unglaciated rolling hills and gravel-covered benches. Some areas are subject to wind erosion.	2,000–3,550	50–500	Quaternary terrace deposits.	Tongue River and Slope members of the Tertiary Fort Union Formation, Tertiary Flaxville Gravels.
Northwestern Great Plains—Sagebrush Steppe[b]					
284–285	Unglaciated, level to rolling plains. Landscape contains buttes, badlands, scoria mounds, and salt pans.	2,300–4,200	50–600	Quaternary alluvium along channels. Upper Cretaceous sandstone and shale.	Colorado Group, Pierre Shale, Hell Creek Formation, Fox Hills Sandstone, and Fort Union Formation.

Source: Omernik 2009.

[a] feet (ft)
[b] EPA Level III-IV Ecoregion name.

Geological surface materials (see Figure 3.1.2-1) are composed of Quaternary alluvium, colluvium, and glacial till that consist of sand, gravel, and clay. Bedrock consists of Tertiary (Fort Union Formation) and Late Cretaceous-aged (Hell Creek/Fox Hills Formation, Bearpaw Formation/Pierre Shale, Judith River Formation, and Claggett Shale) rocks.



Source: USDA 2007.

Figure 3.1.2-1 Surface Geology of Proposed Project Route

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The Judith River Formation (approximately 16 miles crossed between Milepost [MP] 1 and MP 45) consists of sandstone, siltstone, mudstone, shale, and coal. The Claggett Shale (MP 39 to MP 41) consists of shale and siltstone with beds of bentonite, and the Bearpaw/Pierre Shale (approximately58 miles crossed between MP 4 and MP 90) consists of bentonitic mudstone and shale. The proposed Project route crosses the Ludlow, Tongue River, Lebo, and Tullock members of this formation. The Tongue River and Tullock members also contain thin coal beds. The Hell Creek/Fox Hills Formation (approximately 40 miles crossed between MP 91 and MP 116 and between MP 256 and MP 275) forms badland topography and consists of shale, mudstone, and lenticular coal beds. The Fort Union Formation (approximately 138 miles crossed between MP 113 and MP 286) consists primarily of sandstone, siltstone, mudstone, carbonaceous shale, and lignite. In eastern Montana, the proposed Project route would cross a major structural feature, the Williston Basin (Peterson and MacCary 1987). Regionally, the Williston Basin is a structural basin that contains sedimentary bedrock to an approximate depth of 15,000 feet bgs.

South Dakota

The proposed Pipeline route in South Dakota is located in the Unglaciated Missouri Plateau within the Great Plains physiographic province. Surface elevations range from 3,000 feet amsl in northwest South Dakota to 1,800 feet amsl in the White River Valley. The frost line across the proposed Project route in South Dakota averages between 5 to 5.7 feet bgs (NOAA 1978). The route would cross eight USEPA Level IV Ecoregions, each with a distinct physiography (Bryce et al. 1996). Table 3.1-2 presents regional physiographic characteristics in South Dakota.

Table 3.1-2 Physiographic Characteristics of Ecoregions Crossed in South Dakota by the Proposed Route

MP Range	Physiographic Description	Elevation Range (ft amsl)	Local Relief (ft)	Surface Geology	Bedrock Geology
Northwestern Great Plains—Sagebrush Steppe[a]					
285–340	Unglaciated, level to rolling plains. Landscape contains buttes, badlands, scoria mounds, and salt pans.	3,000–3,475	50–350	Quaternary alluvium along channels. Upper Cretaceous sandstone and shale.	Ludlow Member of Fort Union Formation, Hell Creek Formation and Pierre Shale.
Northwestern Great Plains—Moreau Prairie[a]					
340–390	Unglaciated, level to rolling plains. Landscape contains buttes, badlands, and salt pans.	2,100–3,200	120–250	Upper Cretaceous sandstone and shale.	Hell Creek Formation.
Northwestern Great Plains—Missouri Plateau[a]					
390–420	Unglaciated, moderately dissected level to rolling plains. Contains sandstone buttes.	1,750–3,300	50–500	Tertiary sandstone, shale, and coal.	Fox Hills Formation.
Northwestern Great Plains—Subhumid Pierre Shale Plains[a]					
435–480, 493–498, 500–540, 550–575	Unglaciated, undulating plain. Terrain contains incised, steep-sided stream channels.	1,700–2,800	50–500	Cretaceous shale.	Pierre Shale.

MP Range	Physiographic Description	Elevation Range (ft amsl)	Local Relief (ft)	Surface Geology	Bedrock Geology
Northwestern Great Plains—River Breaks[a]					
420–435, 480–493, 498–500, 540–550	Unglaciated, highly dissected hills, and uplands. Ecoregion borders major rivers, and alluvial plains.	1,300–2,700	200–500	Cretaceous shale.	Pierre Shale.
Northwestern Great Plains—Keya Paha Tablelands[a]					
575–580	Unglaciated, level to rolling sandy plains. Topography is dissected near streams.	2,250–3,600	20–800	Aeolian and alluvial sand and silt.	Ogallala Formation.
Northwestern Glaciated Plains—Ponca Plains[a]					
580–595	Unglaciated, level to gently rolling plains. Topography formed by stream drainage (preglacial).	1,900–2,350	80–140	Miocene soft sandstone and cretaceous shale.	Pierre Shale.
Northwestern Glaciated Plains—Southern River Breaks[a]					
595- 601	Unglaciated dissected hills and canyons. Topography contains slopes of high relief bordering major rivers and alluvial plains.	1,250–2,000	250–700	Cretaceous shale.	Pierre Shale.

Source: Bryce et al. 1996.

[a] EPA Level III-IV Ecoregion name.

Surficial geological materials (see Figure 3.1.2-1) are composed of Quaternary alluvium, colluvium, alluvial terraces, and aeolian deposits. The majority of bedrock in South Dakota consists of Upper Cretaceous rocks (Hell Creek/Fox Hills Formation, Pierre Shale), while Tertiary-aged rocks (Ogallala Group and Ludlow Member of the Fort Union Formation) are present beneath the proposed Project route in the southern portion of South Dakota. The Ludlow Member of the Fort Union Formation (less than 1 mile between MP 285 and 286) consists primarily of sandstone, siltstone, mudstone, carbonaceous shale, and lignite. The Hell Creek/Fox Hills Formation (MP 285 to MP 420) forms badland topography and consists of shale, mudstone, and lenticular coal beds. The Pierre Shale (MP 403 to MP 575) consists of bentonitic mudstone and shale. The Ogallala Group (MP 575 to 593) consists of well-to-poorly consolidated sandstone and conglomerate with occasional bentonite layers.

The proposed Project route would cross several major structural features in South Dakota. The Williston Basin covers northwest South Dakota and eastern Montana, as stated above (Peterson and MacCary 1987). South of the Williston Basin, the Sioux Arch is a buried ridge that extends east to west from Minnesota through southeast South Dakota (Gries 1996). South of the White River, the proposed pipeline route would cross into the Salina Basin, a sedimentary basin that underlies southern South Dakota and the majority of eastern Nebraska.

Nebraska

The majority of the proposed Project route in Nebraska lies in the High Plains portion of the Great Plains Physiographic Province. Surface elevations range from 2,200 feet amsl in northern Nebraska to 1,750 feet amsl at the Kansas state line. The frost line across the proposed Project route in Nebraska averages between 4-5 feet bgs in the northern portion of the state, and between

3-4 feet bgs in the southern portion of the state (NOAA 1978). The proposed Project route would cross nine USEPA Level IV Ecoregions, each with a distinct physiography (Chapman et al. 2001). Regional physiographic characteristics in Nebraska are presented in detail in Table 3.1-3. Geological surface materials (see Figure 3.1.2-1) consist of Tertiary-aged Ogallala Group (approximately 133 miles crossed between MP 601 and MP 760) and Cretaceous sedimentary rocks (Pierre Shale, Niobrara Formation, Carlisle Shale, Greenhorn Limestone and Graneros Shale, and Dakota Group). The Pierre Shale (approximately 26 miles crossed between MP 605 to MP 640) is exposed in Northern Nebraska and is composed of fissile clay shale, claystone, shaly sandstone, and sandy shale. This formation is prone to slumping and is especially weak where layers of volcanic ash are present. The Niobrara Formation (approximately 27 miles crossed between MP 760 and MP 801), Carlisle Shale (approximately 42 miles crossed between MP 783 and MP 845), and Greenhorn Limestone and Graneros Shale (approximately 13 miles crossed between MP 820 to MP 847) contain varying amounts of limestone that potentially contain karst formations, causing surface subsidence. The Dakota Group (approximately 35 miles crossed between MP 823 to MP 875) consists of sandstone and shale.

Table 3.1-3 Physiographic Characteristics of Ecoregions Crossed in Nebraska by the Proposed Project Route

MP Range	Physiographic Description	Elevation Range (ft amsl)	Local Relief (ft)	Surface Geology	Bedrock Geology
Northwestern Glaciated Plains—Southern River Breaks[a]					
601- 619	Unglaciated dissected hills and canyons. Topography contains slopes of high relief bordering major rivers and alluvial plains.	1,250–2,000	250–700	Cretaceous shale.	Pierre Shale.
Northwestern Great Plains—Keya Paha Tablelands[a]					
619- 625	Unglaciated, level to rolling sandy plains. Topography is dissected near streams; contains isolated gravelly buttes	1,900–2,400	20–400	Aeolian and alluvial sand and silt.	Ogallala Sandstone.
Northwestern Great Plains—Niobrara River Breaks[a]					
625–627	Unglaciated, dissected canyons. Contains slopes of high relief adjacent to river.	1,700–2,700	200–600	Sandy residuum.	Miocene soft sandstone over Pierre Shale.
Northwestern Glaciated Plains, Holt Tablelands[a]					
627–698	Unglaciated. Tablelands with directed slopes.	1,500–2,000	50–475	Eolian sand, alluvial sand and gravel, and lacustrine sand and silt.	Ogallala Sandstone.
Western Corn Belt Plains, Transitional Sandy Plain[a]					
698- 715	Level to rolling plains.	1,400-2,000	5-150	Alluvial sand, gravel and lacustrine silt and sediments.	Ogallala Sandstone.
Western Corn Belt Plains, Northeastern Nebraska Loess Hills[a]					
715- 734	Glaciated. Rolling low hills. Perennial streams.	1,100-1,900	100-300	Calcareous loess.	Ogallala Sandstone.

MP Range	Physiographic Description	Elevation Range (ft amsl)	Local Relief (ft)	Surface Geology	Bedrock Geology
Central Great Plains—Central Nebraska Loess Plains[a]					
734- 762	Rolling dissected plains with deep layer of loess. Contains perennial and intermittent streams.	1,600–3,100	50–275	Calcareous loess, alluvial sand, gravel, and lacustrine sand and silt.	Ogallala Sandstone.
Central Great Plains—Platte River Valley[a]					
762 778	Flat, wide alluvial valley. Contains shallow, interlacing streams on a sandy bed.	1,300–2,900	2–75	Alluvial, sand, silt, clay, and gravel deposits.	Quaternary and Tertiary unconsolidated sand and gravel.
Central Great Plains—Rainwater Basin Plains[a]					
778–875	Flat to gently rolling loess covered plains. Historical rainwater basins and wetlands.	1,300–2,400	5–100	Loess and mixed loess and sandy alluvium.	Ogallala Sandstone, Niobrara Formation, and Carlisle Shale.

Source: Chapman et al. 2001.

[a] EPA Level III-IV Ecoregion name.

Kansas

In Kansas, two new pump stations would be constructed along the Cushing Extension of the previously permitted TransCanada Keystone Pipeline, LP (Keystone) pipeline. These pump stations (Pump Station 27 and Pump Station 29) are located in Clay and Butler counties at Cushing Extension MP 49.7 and MP 144.5, respectively. The Flint Hills Ecoregion contains outcrops of Permian sedimentary rocks. Elevations in this area range from 1,150 to 1,400 feet amsl. Surficial materials in the vicinity of the Clay County pump station include thick deposits of loess (greater than 30 feet) (Frye and Leonard 1952). In the vicinity of the Butler County pump station, surficial deposits consist of alluvium, colluvium, and cherty gravels in upland areas (KGS 1999). Karst is not present in either of these locations (Davies et al. 1984).

North Dakota

During construction activities, a pipe yard stockpile site would be needed for on-site storage of pipes in North Dakota. The yard would be located in Bowman County. Geological surface materials in this area consist of the Tongue River Member of the Fort Union Formation and, to a lesser extent, the Niobrara and Carlile Formations. The pipe yard and rail siding are existing facilities that were previously built for other users and would be used by the proposed Project for the purpose of equipment and materials storage. The area consists primarily of sandstones, shales, and coal beds.

3.1.2.2 Paleontological Resources

Paleontological resources (fossils) are physical remains of floral and faunal species that have mineralized into or have left impressions in solid rock. The study of fossils across geological time and the evolutionary relationships between taxonomies are important elements of paleontological science. Due to the possibility of finding fossils in both surface geologic deposits, as well as in bedrock deposits of the units located along the proposed pipeline route, the

potential for the disturbance of paleontological resources during pipeline construction was evaluated (Murphey et al. 2010).

3.1.2.3 Potential Fossil-Bearing Geologic Formations

The Potential Fossil Yield Classification (PFYC) system is a survey tool developed by the Bureau of Land Management (BLM) that classifies the fossil-bearing potential of geological formations from very low (Class 1) to very high (Class 5) (BLM 1998, 2007, 2008). The PFYC system provides a baseline for predicting, assessing, and mitigating paleontological resources. The PFYC system and other BLM field survey and monitoring procedures were used to help identify the potential for the presence of important paleontological resources that could be vulnerable to disturbance from construction activities (BLM 1998, 2007, 2008).

As reported by Keystone, Montana geological formations that are designated as PFYC Class 4 (high) or PFYC Class 5 (very high) include the following:

- Judith River Formation (sporadically between MP 3.0 to MP 46.5) for vertebrates;
- Hell Creek Formation (sporadically between MP 93 to MP 117) for plants, vertebrates, and invertebrates;
- Tullock Member of the Fort Union Formation (sporadically between MP 106.8 to MP 128.0) for invertebrates and vertebrates;
- Lebo Member of the Fort Union Formation (sporadically between MP 119.7 to MP 129.0) for mammals;
- Tongue River Member of the Fort Union Formation (MP 129.0 to MP 200.9; MP 203.6 to MP 240.7) for plants, mammals, and mollusks; and
- Ludlow Member of the Fort Union Formation (occurs sporadically between MP 200.9 to MP 285) for mammals.

As reported by Keystone, South Dakota geological formations that are designated as PFYC Class 4 (high) or PFYC Class 5 (very high) include the following:

- Ludlow Member of the Fort Union Formation (MP 285 to MP 286) for mammals, plants, and invertebrates, and
- Hell Creek Formation (MP 285 to MP 390) for reptiles (including dinosaurs) and mammals.

At the time of this report, no field survey reports were available to verify PFYC designations in Nebraska. However, based on the PFYC system, the following formations in Nebraska have fossil potential and are designated as PFYC Class 3 (moderate or unknown), 3a (moderate potential), and 5 (very high); there were no formations along the proposed pipeline route designated 4 (high):

- Upper Cretaceous Pierre Shale (Classes 3a and 5), Niobrara (Class 5), Carlisle (Class 3), Greenhorn Limestone (Classes 3 and 5), and Graneros Shale Formations (Classes 3 and 5) (sporadically between MP 604 to MP 846) for plants, trace fossils, ammonites, gastropods, bivalves, mosasaurs, fish, mollusks, sea turtles, plesiosaurs, pterosaurs, and sharks;

- Tertiary (Miocene and Pliocene) Ogallala Group (Class 5) (occurs sporadically from MP 610 to MP 759) for horses, rhinoceroses, proboscideans, mammoths, and other ruminants. Pleistocene unconsolidated sediments also contain mammoth fossil potential; and
- Lower Cretaceous Dakota Group (Class 3) (occurs sporadically from MP 822 to MP 875) for invertebrates (mollusks, insects), flowering plants, and rare vertebrates (fragmentary dinosaurs and fish).

Field Surveys

The approach undertaken to evaluate paleontological resources was dependent upon the requirements of individual state regulatory bodies. In Montana, South Dakota, and Nebraska, paleontological research was performed using museum records and current U.S. Geological Survey (USGS) information. In Montana and South Dakota, field surveys were also conducted along the proposed Project route, potential reroutes, access roads, and at proposed ancillary facility locations (e.g., access roads, pump stations, and construction camps) on federal, state, and privately owned lands where site access was available, to identify the presence of exposed and visible surface fossils and potentially fossiliferous outcrops of bedrock. Montana and South Dakota have specific regulatory requirements involving paleontological resources, and required field surveys were conducted in 2008 and 2010 following BLM guidelines (BLM 2007, 2008). Additional field surveys were conducted in 2011 and 2012 in Montana and South Dakota to assess the minor route modifications to the proposed pipeline in these two states. Reports of the field studies conducted in 2012 are pending. A paleontological analysis of the proposed pipeline route in Nebraska is ongoing. Field surveys for Nebraska are proposed and are tentatively scheduled to begin Fall 2012/Spring 2013.

Paleontological resources identified during surveys along the proposed Project corridor were classified using BLM guidelines as follows:

- Significant Fossil Localities (SFL) are those localities containing specimens that are field identifiable, of outstanding preservation, or otherwise scientifically significant.
- Non-significant Fossil Occurrences (NFO) are those localities that typically consist of highly weathered or unidentifiable bone or tooth fragments, unidentifiable plant fossils, fossils of common occurrence (such as turtle shell), or fragments of silicified wood.

Montana surveys were conducted consistent with existing BLM and State of Montana regulations and Montana Department of Environmental Quality requirements using BLM guidelines (BLM 2007, 2008). Prior to field surveys, background research was completed at the Montana State Historic Preservation Office to identify potential surface exposures of fossiliferous formations. The field methodology consisted of pedestrian surveys of PFYC 4/5 geologic units along the proposed Project right-of-way (ROW) on BLM and state lands and on private lands where access was granted. PFYC 3 geologic units were spot-checked. In PFYC 1 and 2 areas, geologic maps and aerials were used to identify potential fossil-bearing rock outcrops. The survey area generally included a 300-foot-wide corridor (150 feet on either side of centerline). The access road survey area included a 100-foot-wide corridor (50 feet on either side of centerline). The survey area buffer for the ancillary facilities (e.g., access roads, pump stations, and construction camps) was variable, depending on the facility. A total of 30.9 acres of PFYC Class 3 geologic units and 97.4 acres of PFYC Class 5 geologic units were included in the survey in Montana. An additional 42.8 acres of PFYC Class 2 geologic units were surveyed

because these represent areas that had to be walked in order to reach PFYC Classes 3 through 5 units (SWCA 2012).

South Dakota surveys were conducted consistent with South Dakota Public Utilities Commission and South Dakota State Land Commission requirements using BLM guidelines (BLM 2007, 2008). Prior to field surveys, background research was completed at the South Dakota Museum of Geology and at the South Dakota School of Mines and Technology to determine any surface exposure of potentially fossiliferous formations. The field methodology consisted of pedestrian surveys of PFYC 4/5 geologic units along the proposed Project ROW on BLM and state lands and on private lands where access was granted. PFYC 3 geologic units were spot-checked. In PFYC 1 and 2 areas, geologic maps and aerials were used to identify potential fossil bearing-rock outcrops. Table 3.1-4 identifies field surveys conducted in Montana and South Dakota.

Table 3.1-4 Paleontological Surveys and Reports

Date of Report	Date(s) of Survey	State	Title
October 28, 2008	July 14-22, 2008; August 15-26, 2008	Montana	Paleontological Assessment of BLM Lands along the Steele City Segment of the Keystone XL Project, Montana
May 26, 2009	July 14-22, 2008; August 15-26, 2008	Montana	Paleontological Assessment of BLM Lands along the Steele City Segment of the Keystone XL Project, Montana: Addendum 1
April 23, 2010	July 14-22, 2008; August 15-26, 2008	Montana	Paleontological Assessment of BLM Lands along the Steele City Segment of the Keystone XL Project, Montana: Addendum 2
September 20, 2010	May 17, 2010–August 27, 2010	Montana	Paleontological Survey Report: BLM Lands along Steele City Segment of the Keystone XL Project, Montana: Addendum 3
September 20, 2010	May 17, 2010–August 27, 2010	Montana	Paleontological Survey Report: State Lands along Steele City Segment of the Keystone XL Project, Montana
September 20, 2010	May 17, 2010–August 27, 2010	Montana	Paleontological Survey Report: Private Lands along Steele City Segment of the Keystone XL Project, Montana
March 2, 2012	June 9-23; July 7-12; October 4-13	Montana	Paleontological Survey Report: Federal Lands along the Keystone XL Project, Montana
March 2, 2012	June 9-23; July 7-12; October 4-13	Montana	Paleontological Survey Report: Private Lands along the Keystone XL Project, Montana: Addendum 1
March 2, 2012	June 9-23; July 7-12; October 4-13	Montana	Paleontological Survey Report: State and County Lands along the Keystone XL Project, Montana
TBD	June 28, 2012–August 8, 2012	Montana	Titles Pending Report Completion
April 23, 2010	None given	South Dakota	Paleontological Assessment of BLM Lands along the Steele City Segment of the Keystone XL Project, South Dakota
April 23, 2010	September 9-22, 2009, September 28, 2009–October 3, 2009	South Dakota	Paleontological Assessment of State Lands along the Steele City Segment of the Keystone XL Project, South Dakota
September 3, 2010	Through June 25, 2010	South Dakota	Paleontological Survey Report: State Lands along Steele City Segment of the Keystone XL Project, South Dakota

Date of Report	Date(s) of Survey	State	Title
September 3, 2010	Through July 10, 2010	South Dakota	Paleontological Survey Report: Private Lands along Steele City Segment of the Keystone XL Project, South Dakota-Volume 1
September 3, 2010	Through July 10, 2010	South Dakota	Paleontological Survey Report: Private Lands along Steele City Segment of the Keystone XL Project, South Dakota-Volume 2
November 22, 2010	August 5-November 6, 2010	South Dakota	Paleontological Survey Report Addendum: State and Harding Lands along the Keystone XL Project, South Dakota
November 22, 2010	August 5-November 6, 2010	South Dakota	Paleontological Survey Report Addendum: Private Lands along the Keystone XL Project, South Dakota
March 2, 2012	June 20, 2011	South Dakota	Paleontological Survey Report: BLM Lands along the Keystone XL Project, South Dakota: Addendum 1
March 2, 2012	June 7-20, 2011; October 15-26, 2011	South Dakota	Paleontological Survey Report: Private Lands along the Keystone XL Project, South Dakota: Addendum 3
March 2, 2012	June 7-20, 2011; October 15-16, 2011	South Dakota	Paleontological Survey Report: State and County Lands along the Keystone XL Project, South Dakota: Addendum 2
To be determined	June 28, 2012 – July 31, 2012	South Dakota	Titles Pending Report Completion

There is a possibility of finding fossils in both surface geologic deposits, as well as in bedrock deposits of the units located along the proposed Pipeline route in Nebraska. All of the surface deposits along the alignment are from the Quaternary Period, the most recent of the Cenozoic Era. As indicated above, paleontological surveys are scheduled to begin in the Fall 2012/Spring 2013 and are not available. If the results of the surveys become available during the preparation of the Final SEIS, they would be incorporated in final report.

Field Survey Results

The paleontological surveys identified 27 SFL and 40 NFO sites in Montana and four SFL and 21 NFO sites in South Dakota (Table 3.1-5). Information is pending on sites in Nebraska and will be included in the Final Supplemental EIS, as available.

Table 3.1-5 Paleontological Resources Identified Along Proposed Project Corridor in Montana and South Dakota

State	Ownership	Parcel	Fossil Type	SFL/NFO	Geology	Recommendation[c]
MT[a]	State	ML-MT-VA-00190	Vertebrate, Invertebrate	SFL	Claggett	Monitor
MT	State	ML-MT-MC-00158	Plant	SFL	Fort Union	Monitor
MT	BLM	ML-MT-MC-00010	Invertebrate	SFL	Bear Paw	Monitor
MT	BLM	PS09-MT-PH10160	Vertebrate	SFL	Judith River	Avoidance
MT	BLM	ML-MT-MC-00010	Invertebrate	SFL	Bearpaw	Spot-check
MT	BLM	ML-MT-MC-00010	Invertebrate	SFL	Bearpaw	Spot-check
MT	BLM	ML-VT-VA-00155	Vertebrate	SFL	Judith River	Monitor
MT	BLM	ML-MT-MC-00010	Invertebrate	SFL	Bearpaw	Spot-check

State	Ownership	Parcel	Fossil Type	SFL/NFO	Geology	Recommendation[c]
MT	BLM	ML-MT-MC-00233	Vertebrate	SFL	Hell Creek	Monitor
MT	BLM	ML-MT-MC-00233	Vertebrate	SFL	Hell Creek	Monitor
MT	BLM	ML-MT-MC-00233	Vertebrate	SFL	Hell Creek	Monitor
MT	BLM	ML-MT-MC-00233	Vertebrate	SFL	Hell Creek	Monitor
MT	BLM	ML-MT-MC-00233	Vertebrate	SFL	Hell Creek	Monitor
MT	BLM	ML-MT-MC-00233	Vertebrate	SFL	Hell Creek	Monitor
MT	BLM	ML-MT-MC-00233	Vertebrate	SFL	Hell Creek	Monitor
MT	BLM	ML-MT-MC-00233	Vertebrate	SFL	Hell Creek	Monitor
MT	BLM	ML-MT-MC-00233	Vertebrate	SFL	Hell Creek	Monitor
MT	BLM	ML-MT-MC-00233	Vertebrate	SFL	Hell Creek	Monitor
MT	BLM	ML-MT-MC-00260	Vertebrate	SFL	Fort Union	Monitor
MT	BLM	Ml-MT-PR-00140	Vertebrate	SFL	Fort Union	Monitor
MT	Private	ML-MT-MC00100	Vertebrate	SFL	Hell Creek	Avoidance
MT	Private	ML-MT-MC-00100	Vertebrate	SFL	Hell Creek	Surface collect & monitor
MT	Private	ML-MT-MC-00100	Vertebrate	SFL	Hell Creek	Surface collect & monitor
MT	Private	ML-MT-MC-00195	Vertebrate	SFL	Hell Creek	Surface collect & monitor
MT	Private	ML-MT-MC-00400	Plant	SFL	Fort Union	Monitor
MT	Private	ML-MT-FA-00560	Vertebrate	SFL	Fort Union	Surface collect & monitor
MT	Private	MTV16-MT-FA-00040	Vertebrate	SFL	Hell Creek	Avoidance
MT	BLM	ML-MT-PH_00120	Invertebrate	NFO	Bear Paw	Monitor
MT	BLM	ML-MT-PH-00145	Invertebrate	NFO	Bear Paw	Monitor
MT	BLM	ML-MT-VA-00265	Invertebrate	NFO	Bear Paw	Monitor
MT	BLM	ML-MT-MC-00142	Vertebrate	NFO	Hell Creek	Monitor
MT	BLM	ML-MT-MC-00010	Invertebrate	NFO	Bear Paw	Monitor
MT	BLM	ML-MT-MC-00010	Invertebrate	NFO	Bear Paw	Spot-check
MT	BLM	PS09-MT-PH-10100	Invertebrate	NFO	Claggett	Spot-check
MT	BLM	ML-MT-MC-00010	Vertebrate	NFO	Fort Union	Monitor
MT	BLM	ML-MT-PR-165	Plant	NFO	Bearpaw	Monitor
MT	BLM	ML-MT-PH-00105	Invertebrate	NFO	Bearpaw	Spot-check
MT	BLM	ML-MT-PH-00105	Invertebrate	NFO	Bearpaw	Spot-check
MT	BLM	ML-MT-PH-00105	Invertebrate	NFO	Bearpaw	Spot-check
MT	BLM	ML-MT-VA-00135	Invertebrate	NFO	Bearpaw	Spot-check
MT	BLM	ML-MT-VA-00135	Invertebrate	NFO	Bearpaw	Spot-check
MT	BLM	ML-MT-VA-00155	Invertebrate	NFO	Judith River	Monitor
MT	BLM	ML-MT-VA-00185	Plant	NFO	Judith River	Monitor
MT	BLM	ML-MT-VA-00355	Invertebrate	NFO	Bearpaw	Spot-check
MT	BLM	ML-MT-VA-00355	Invertebrate	NFO	Bearpaw	Spot-check
MT	BLM	ML-MT-VA-00355	Invertebrate	NFO	Bearpaw	Spot-check
MT	BLM	ML-MT-MC00010	Invertebrate	NFO	Bearpaw	Spot-check
MT	BLM	ML-MT-MC00010	Invertebrate	NFO	Bearpaw	Spot-check
MT	BLM	ML-MT-MC00010	Invertebrate	NFO	Bearpaw	Spot-check
MT	BLM	ML-MT-MC00010	Invertebrate	NFO	Bearpaw	Spot-check
MT	BLM	ML-MC-MC-00233	Vertebrate	NFO	Hell Creek	Monitor
MT	BLM	ML-MC-MC-00233	Vertebrate	NFO	Hell Creek	Monitor
MT	BLM	ML-MC-MC-00233	Vertebrate	NFO	Hell Creek	Monitor
MT	BLM	ML-MC-MC-00233	Vertebrate	NFO	Hell Creek	Monitor

State	Ownership	Parcel	Fossil Type	SFL/NFO	Geology	Recommendation[c]
MT	BLM	ML-MT-MC-00260	Vertebrate	NFO	Fort Union	Monitor
MT	BLM	ML-MT-MC-00260	Vertebrate, Plant	NFO	Hell Creek	Monitor
MT	Private	MTV1-MT-MC-00320	Vertebrate	NFO	Judith River	Monitor
MT	Private	MTV1-MT-PH-00310	Invertebrate	NFO	Claggett	Monitor
MT	Private	ML-MT-VA-00015	Invertebrate	NFO	Judith River	Monitor
MT	Private	ML-MT-MC-00100	Plant	NFO	Hell Creek	Monitor
MT	Private	ML-MT-MC-00109	Vertebrate	NFO	Hell Creek	Monitor
MT	Private	ML-MT-MC-00106	Plant	NFO	Hell Creek	Monitor
MT	Private	ML-MT-MC-00100	Vertebrate	NFO	Hell Creek	Monitor
MT	Private	ML-MT-FA-00040	Plant	NFO	Fort Union	Monitor
MT	Private	ML-MT-FA-00720	Vertebrate	NFO	Hell Creek	Monitor
MT	Private	Ml-MT-FA-00730	Vertebrate	NFO	Hell Creek	Monitor
MT	Private	ML-MT-PR-00070	Plant	NFO	Fort Union	Monitor
MT	BLM	080720-GEK-01	Vertebrate	SFL	Fort Union	Not Available
MT	Private	100602-MHM-01	Plant, Vertebrate	SFL	Hell Creek	Not Available
MT	Private	100602-SLJ-01	Vertebrate	SFL	Hell Creek	Not Available
MT	State of Montana	100605-WLS-01	Plant	SFL	Fort Union	Not Available
MT	Private	100607-WLS-01	Plant	SFL	Fort Union	Not Available
MT	Private	100609-AMS-01	Vertebrate	SFL	Fort Union	Not Available
MT	BLM	100824-AMS-02	Invertebrate	NFO	Bearpaw	Not Available
MT	Private	F1-100602-01	Plant	NFO	Hell Creek	Not Available
MT	Private	F1-100603-01	Vertebrate	NFO	Hell Creek	Not Available
MT	Private	F1-100603-02	Plant	NFO	Hell Creek	Not Available
MT	BLM	F1-100604-01	Vertebrate	NFO	Hell Creek	Not Available
MT	Private	F1-100715-01	Plant	NFO	Fort Union	Not Available
MT	BLM	F13-090826-01	Invertebrate	NFO	Claggett	Not Available
MT	BLM	F2-080714-01	Invertebrate	NFO	Bearpaw	Not Available
MT	BLM	F2-080714-03	Invertebrate	NFO	Bearpaw	Not Available
MT	BLM	F2-080716-01	Invertebrate	NFO	Bearpaw	Not Available
MT	BLM	F2-080716-02	Invertebrate	NFO	Bearpaw	Not Available
MT	BLM	F2-080716-03	Invertebrate	NFO	Bearpaw	Not Available
MT	Private	F5-110609-01	Plant	NFO	Fort Union	Not Available
MT	Private	F5-110610-01	Plant	NFO	Fort Union	Not Available
MT	Private	F5-120706-01	Plant	NFO	Fort Union	Not Available
MT	Private	F5-120731-01	Invertebrate	NFO	Pierre	Not Available
MT	Private	F5-120731-02	Invertebrate	NFO	Pierre	Not Available
MT	Private	F5-120801-01	Invertebrate	NFO	Pierre	Not Available
MT	BLM	080715-GEK-01	Vertebrate	SFL	Judith River	Not Available
MT	BLM	080717-GEK-01	Invertebrate	SFL	Bearpaw	Not Available
MT	BLM	080718-GEK-01	Vertebrate	SFL	Hell Creek	Not Available
MT	BLM	080718-GEK-02	Vertebrate	SFL	Hell Creek	Not Available
MT	BLM	080718-GEK-03	Vertebrate	SFL	Hell Creek	Not Available
MT	BLM	080718-GEK-04	Vertebrate	SFL	Hell Creek	Not Available
MT	BLM	080718-LSB-01	Vertebrate	SFL	Hell Creek	Not Available
MT	BLM	080718-PCM-01	Vertebrate	SFL	Hell Creek	Not Available
MT	BLM	080718-PCM-02	Vertebrate	SFL	Hell Creek	Not Available

State	Ownership	Parcel	Fossil Type	SFL/NFO	Geology	Recommendation[c]
MT	BLM	080718-PCM-03	Vertebrate	SFL	Hell Creek	Not Available
MT	BLM	080719-LSB-01	Vertebrate	SFL	Hell Creek	Not Available
MT	BLM	080722-GEK-01	Vertebrate	SFL	Hell Creek	Not Available
MT	BLM	080722-GEK-02	Vertebrate	SFL	Hell Creek	Not Available
MT	BLM	080818-GEK-01	Plant, Vertebrate	SFL	Hell Creek	Not Available
MT	BLM	080818-GEK-02	Vertebrate	SFL	Hell Creek	Not Available
MT	BLM	080821-PCM-01	Invertebrate	SFL	Bearpaw	Not Available
MT	BLM	090508-WLS-01	Invertebrate	SFL	Bearpaw	Not Available
MT	BLM	090826-PCM-01	Vertebrate	SFL	Judith River	Not Available
MT	State of Montana	100522-GEK-01	Invertebrate, Vertebrate	SFL	Claggett	Not Available
MT	Private	100602-SLJ-02	Vertebrate	SFL	Hell Creek	Not Available
MT	Private	100605-SLJ-01	Vertebrate	SFL	Hell Creek	Not Available
MT	Private	100609-AMS-02	Vertebrate	SFL	Hell Creek	Not Available
MT	Private	F1-100519-01	Vertebrate	NFO	Judith River	Not Available
MT	Private	F1-100521-01	Invertebrate	NFO	Claggett	Not Available
MT	Private	F1-100521-02	Trace	NFO	Judith River	Not Available
MT	BLM	F1-100528-01	Invertebrate	NFO	Bearpaw	Not Available
MT	Private	F1-100528-02	Invertebrate	NFO	Bearpaw	Not Available
MT	BLM	F1-100529-01	Invertebrate	NFO	Bearpaw	Not Available
MT	Private	F1-100603-03	Vertebrate	NFO	Hell Creek	Not Available
MT	Private	F1-100720-01	Vertebrate	NFO	Hell Creek	Not Available
MT	Private	F1-100720-02	Vertebrate	NFO	Hell Creek	Not Available
MT	Private	F1-100819-01	Plant	NFO	Fort Union	Not Available
MT	BLM	F1-100824-01	Invertebrate	NFO	Bearpaw	Not Available
MT	USDI BLM	F1-111006-01	Invertebrate	NFO	Bearpaw	Not Available
MT	USDI Fish and Wildlife Service	F1-111006-02	Invertebrate	NFO	Bearpaw	Not Available
MT	USDI Fish and Wildlife Service	F1-111006-03	Vertebrate	NFO	Bearpaw	Not Available
MT	Fallon County	F1-111013-01	Invertebrate	NFO	Fort Union	Not Available
MT	BLM	F13-090827-01	Invertebrate	NFO	Bearpaw	Not Available
MT	BLM	F2-080714-02	Invertebrate	NFO	Bearpaw	Not Available
MT	BLM	F2-080715-01	Invertebrate	NFO	Bearpaw	Not Available
MT	BLM	F2-080715-02	Invertebrate	NFO	Bearpaw	Not Available
MT	BLM	F2-080715-03	Invertebrate	NFO	Judith River	Not Available
MT	BLM	F2-080715-04	Plant	NFO	Judith River	Not Available
MT	BLM	F2-080717-01	Invertebrate	NFO	Bearpaw	Not Available
MT	BLM	F2-080717-02	Invertebrate	NFO	Bearpaw	Not Available
MT	BLM	F2-080717-03	Invertebrate	NFO	Bearpaw	Not Available
MT	BLM	F2-080717-04	Invertebrate	NFO	Bearpaw	Not Available
MT	BLM	F2-080718-01	Vertebrate	NFO	Hell Creek	Not Available

State	Ownership	Parcel	Fossil Type	SFL/NFO	Geology	Recommendation[c]
MT	BLM	F2-080718-02	Vertebrate	NFO	Hell Creek	Not Available
MT	BLM	F2-080718-03	Vertebrate	NFO	Hell Creek	Not Available
MT	BLM	F2-080719-01	Vertebrate	NFO	Fort Union	Not Available
MT	BLM	F2-080719-02	Vertebrate	NFO	Hell Creek	Not Available
MT	BLM	F2-080722-01	Vertebrate	NFO	Hell Creek	Not Available
MT	BLM	F2-080818-01	Plant	NFO	Hell Creek	Not Available
MT	BLM	F2-080818-02	Vertebrate	NFO	Hell Creek	Not Available
MT	BLM	F2-080818-03	Vertebrate	NFO	Hell Creek	Not Available
MT	BLM	F3-080816-01	Vertebrate	NFO	Judith River	Not Available
MT	BLM	F3-080816-02	Vertebrate	NFO	Judith River	Not Available
MT	BLM	F3-080816-03	Vertebrate	NFO	Judith River	Not Available
MT	BLM	F3-080816-04	Vertebrate	NFO	Judith River	Not Available
MT	BLM	F3-080817-01	Invertebrate	NFO	Claggett	Not Available
MT	Private	F5-120629-01	Invertebrate	NFO	Judith River	Not Available
MT	Private	F5-120728-01	Invertebrate	NFO	Fort Union	Not Available
MT	Private	F5-120801-02	Invertebrate	NFO	Pierre	Not Available
MT	BLM	F9-090507-01	Vertebrate	NFO	Bearpaw	Not Available
SD[b]	Private	ML-SD-ME-00150	Vertebrate	SFL	Hell Creek	Surface collect & monitor
SD	Private	CAR-041	Vertebrate	SFL	Hell Creek	Surface Collect & monitor
SD	Private	CAR-041	Vertebrate	SFL	Hell Creek	Surface collect & monitor
SD	Private	ML-SD-PE-00360	Vertebrate	SFL	Hell Creek	Surface collect & monitor
SD	Private	CAR-048A	Vertebrate	NFO	Hell Creek	Monitor
SD	Private	CAR-048A	Vertebrate	NFO	Hell Creek	Monitor
SD	Private	ML-SD-ME-00230	Vertebrate	NFO	Hell Creek	Monitor
SD	Private	CAR-041	Vertebrate	NFO	Hell Creek	Monitor
SD	Private	CAR-041	Plant	NFO	Hell Creek	Monitor
SD	Private	CAR-041	Vertebrate	NFO	Hell Creek	Monitor
SD	Private	ML-SD-HA-01780	Vertebrate	NFO	Hell Creek	Monitor
SD	Private	ML-SD-HA-01780	Vertebrate	NFO	Hell Creek	Monitor
SD	Private	ML-SD-PE-00430	Vertebrate	NFO	Hell Creek	Monitor
SD	Private	ML-SD-PE-00360	Vertebrate, Plant	NFO	Hell Creek	Monitor
SD	Private	ML-SD-HK-11767	Invertebrate	NFO	Pierre Shale	Monitor
SD	Private	ML-SD-JO-10060	Invertebrate	NFO	Pierre Shale	Monitor
SD	Private	ML-SD-TR-11630	Vertebrate, Trace	NFO	Ogallala	Monitor
SD	State	PS-15	Plant	NFO	Fort Union	Monitor
SD	State	ML-SD-HA-13020	Vertebrate	NFO	Hell Creek	Monitor
SD	State	ML-SD-HA-13020	Vertebrate	NFO	Hell Creek	Monitor
SD	State	ML-SD-PE-00410	Vertebrate, Plant	NFO	Hell Creek	Monitor
SD	State	ML-SD-PE-00410	Vertebrate	NFO	Hell Creek	Monitor

State	Ownership	Parcel	Fossil Type	SFL/NFO	Geology	Recommendation[c]
SD	State	ML-SD-PE-00330	Vertebrate	NFO	Hell Creek	Monitor
SD	State	ML-SD-PE-00330	Vertebrate	NFO	Hell Creek	Monitor
SD	State	ML-SD-PE-00330	Vertebrate	NFO	Hell Creek	Monitor
SD	State	ML-SD-HA-02400	Vertebrate	NFO	Hell Creek	Monitor
SD	State	ML-SD-HA-02870	Vertebrate	NFO	Hell Creek	Monitor
SD	State	ML-SD-HA-03310	Vertebrate	NFO	Hell Creek	Monitor
SD	State	PS15-SD-HA-00335	Vertebrate	NFO	Hell Creek	Monitor
SD	State	PS16-SD-HA-10012	Plant	NFO	Hell Creek	Monitor
SD	State	PS16-SD-HA-10012	Vertebrate	NFO	Hell Creek	Monitor
SD	State	PS16-SD-HA-10014	Vertebrate	NFO	Hell Creek	Monitor
SD	Private	090910-BHIA-006	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	090910-BHIA-007	Plant, Vertebrate	NFO	Hell Creek	Not Available
SD	Private	090910-BHIB-002	Plant, Vertebrate	NFO	Hell Creek	Not Available
SD	Private	090917-BHIB-001	Vertebrate	SFL	Hell Creek	Not Available
SD	Private	100526-SML-01	Vertebrate	SFL	Hell Creek	Not Available
SD	Private	F0-100514-01	Vertebrate	NFO	Hell Creek	Not Available
SD	South Dakota School and Public Lands	F0-100526-04	Vertebrate	NFO	Hell Creek	Not Available
SD	Harding County	F0-101028-01	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	F0-101101-01	Vertebrate	NFO	Hell Creek	Not Available
SD	State of South Dakota	F0-101101-02	Vertebrate	NFO	Hell Creek	Not Available
SD	State of South Dakota	F1-090922-01	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	F4-110617-01	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	F6-120712-01	Vertebrate, Plant	NFO	Hell Creek	Not Available
SD	Private	F6-120712-02	Vertebrate, Plant	NFO	Hell Creek	Not Available
SD	Private	090909-BHIA-001	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	090909-BHIA-002	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	090909-BHIB-001	Vertebrate	SFL	Hell Creek	Not Available
SD	Private	090909-BHIB-002	Vertebrate	NFO	Quaternary	Not Available
SD	Private	090909-BHIB-003	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	090910-BHIB-003	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	090910-BHIB-004	Vertebrate	SFL	Hell Creek	Not Available
SD	Private	090911-BHIB-001	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	090911-BHIB-002	Vertebrate	SFL	Hell Creek	Not Available
SD	Private	090912-BHIA-011	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	090912-BHIA-012	Vertebrate	SFL	Hell Creek	Not Available
SD	Private	090912-BHIA-013	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	090930-LSB-01	Vertebrate	SFL	Hell Creek	Not Available
SD	Private	090930-LSB-02	Vertebrate	SFL	Hell Creek	Not Available
SD	Private	090930-LSB-03	Vertebrate	SFL	Hell Creek	Not Available
SD	Private	100515-DAH-01	Vertebrate	SFL	Hell Creek	Not Available

State	Ownership	Parcel	Fossil Type	SFL/NFO	Geology	Recommendation[c]
SD	Private	101104-TWT-01	Plant, Vertebrate	SFL	Hell Creek	Not Available
SD	Private	101105-TWT-01	Vertebrate	SFL	Hell Creek	Not Available
SD	Private	101105-TWT-02	Vertebrate	SFL	Hell Creek	Not Available
SD	Private	F0-100514-02	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	F0-100515-01	Vertebrate	NFO	Hell Creek	Not Available
SD	Harding County	F0-100517-01	Plant	NFO	Hell Creek	Not Available
SD	Private	F0-100518-01	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	F0-100519-03	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	F0-100519-04	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	F0-100522-01	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	F0-100605-01	Invertebrate	NFO	Pierre	Not Available
SD	Private	F0-100607-01	Invertebrate	NFO	Pierre	Not Available
SD	Private	F0-100622-01	Vertebrate	NFO	Ogallala	Not Available
SD	Private	F0-101103-01	Plant	NFO	Hell Creek	Not Available
SD	Private	F3-090930-01	Plant, Vertebrate	NFO	Hell Creek	Not Available
SD	Private	F3-090930-02	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	F3-090930-03	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	F3-090930-04	Vertebrate	NFO	Hell Creek	Not Available
SD	Private	F3-090930-05	Vertebrate	SFL	Hell Creek	Not Available
SD	Private	F4-110617-02	Plant	NFO	Hell Creek	Not Available
SD	Private	F4-110712-01	Vertebrate	SFL	Hell Creek	Not Available
SD	Private	F6-120629-01	Invertebrate	NFO	Pierre	Not Available
SD	Private	F6-120629-02	Invertebrate	NFO	Pierre	Not Available
SD	Private	F6-120705-01	Invertebrate	NFO	Pierre	Not Available
SD	Private	F6-120705-02	Invertebrate	NFO	Pierre	Not Available
SD	Private	F6-120713-01	Plant	NFO	Hell Creek	Not Available
SD	Private	090912-BHIA-014	Vertebrate	SFL	Hell Creek	Not Available

[a] Montana (MT)
[b] South Dakota (SD)
[c] Monitor—refers to the monitoring of excavations during construction to identify the presence of completely buried subsurface fossils; Spot-check—refers to the periodic on-site spot-checking of impacts to significant fossils during construction activities; Avoidance—refers to the complete avoidance of disturbance to the fossil-bearing unit of potential impact.

3.1.2.4 Fossil Fuel and Mineral and Resources

Montana

In the proposed Project area, oil, natural gas, and coal comprise the major fossil fuel resources (Montana Bureau of Mines and Geology 1963). There are nine oil and gas producing wells within one-quarter mile (1,320 feet) of the proposed ROW (Appendix L, Oil and Gas Wells Within 1320 ft of Proposed Right-of-Way). These Bakken crude oil wells are associated with the Williston Basin. The proposed Project route spans the Williston Basin through much of the state of Montana. The proposed Project route does not cross any coal (lignite) mines.

Sand, gravel, and bentonite are the principal mineral resources mined near the proposed Project route (Montana Bureau of Mines and Geology/USGS 2004), although the proposed Project route would not cross any aggregate mines. In the past, bentonite has been mined and processed south of the proposed Project route near Glasgow; however, bentonite is not currently being mined or processed in the proposed Project area (Montana Bureau of Mines and Geology/USGS 2004).

South Dakota

In the proposed Project area, sand and gravel comprise the major mineral resources, although little active mining is occurring (South Dakota Geological Survey/USGS 2005). One gravel pit is present approximately 0.5 miles from the proposed Project route, northeast of MP 554. The proposed pipeline route would traverse the Buffalo Field, an oil and gas producing area in Hardin County. Fifteen oil and gas producing wells are located within one-quarter mile of the proposed ROW (Appendix L, Oil and Gas Wells Within 1320 ft of Proposed Right-of-Way).

The proposed pipeline route would not cross any known coal mines. The proposed pipeline route would cross approximately 2 miles of coal-bearing formations (Fort Union Formation and Hell Creek Formation), but the potential for mining of these formations is low. According to the South Dakota State Historical Society, coal mining has never been a major industry in the state (South Dakota State Historical Society 2012).

Nebraska

There are no known active oil, natural gas, or coal mining operations along the proposed pipeline route in Nebraska. The main mineral resource in the proposed Project area is aggregate (sand and gravel) used for road and building construction. There are five active sand and/or gravel mining operations within 1 mile of the proposed Project route, which are situated in Keya Paha, Holt, and Jefferson counties. In southern Nebraska, near the proposed Project route, shales and clays have been mined for producing bricks. Near Tobias in Salina County, limestone has been mined for agricultural lime.

3.1.2.5 Geologic Hazards

At certain locations along the proposed Project route, seismic hazards and the potential for landslides, land subsidence, or flooding are possible.

Seismic Hazards

Seismic hazards include faults, seismicity, and ground motion hazards. Collectively, these three phenomena are associated with seismic hazard risk. Faults are defined as a fracture along which blocks of earth materials on either side of the fault have moved relative to each other. An active fault is one in which movement has taken place within the last 10,000 years (USGS 2008b). Seismicity refers to the intensity and the geographic and historical distribution of earthquakes. Ground motion hazards are defined as movement of the earth's surface as a result of earthquakes (USGS 2008a). According to the Federal Emergency Management Agency (FEMA) earthquake hazard zone maps, the entire proposed Project area is located in a low-risk earthquake zone. Historic earthquake activity in the vicinity of the proposed Project route was also reviewed using USGS's National Earthquake Information Center online database search. Records were available from 1973 to the present time. A map showing significant earthquakes occurring in the vicinity of the project area between 1973 and 2012 is provided as Figure 3.1.2-2. Based on this map of significant earthquakes, the majority of the epicenters in the immediate vicinity of the proposed pipeline route have historically been between 25 and 100 miles away from the proposed pipeline route. In general, for the largest magnitude earthquakes experienced in this part of the Western United States, significant impacts have historically been felt within a 120 mile radius. Shocks may be felt up to 200 miles away (USGS 2012).

Minor faults are present in the vicinity of the proposed pipeline route. In Montana, the Brockton-Froid Fault is mapped in the Weldon-Brockton fault zone approximately 50 miles east of the proposed Project route in Roosevelt County, just north of Culbertson, Montana (Wheeler 1999). Based on exploration and field data, there is no indication that this is an active fault (Wheeler 1999). Eastern Montana historically contains little earthquake activity. From 1973 to 2007, 14 earthquakes have been recorded in the eastern half of Montana with magnitudes 4.1 or less (USGS 2008b). Eight of these earthquakes are in the vicinity of the proposed Project area, as depicted on Figure 3.1.2-2. In South Dakota, 30 earthquakes with magnitudes 4.3 or less have been recorded since 1973 (USGS 2008b). None of the earthquakes occurred along or adjacent to the proposed Project route.

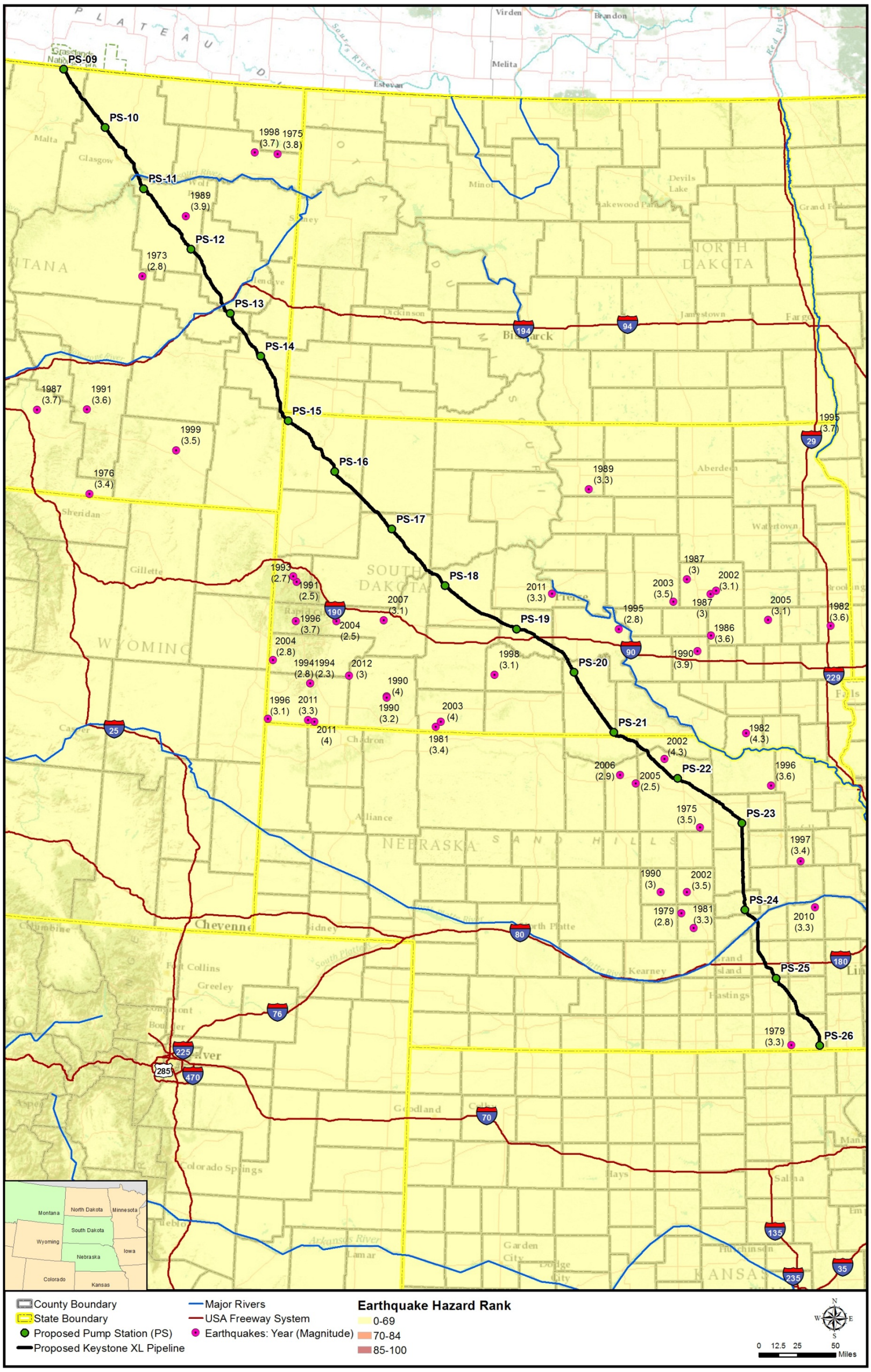
In the proposed Project area of eastern Nebraska, 12 earthquakes have been recorded since 1973, with magnitudes ranging from 2.5 to 4.3 (USGS 2012). These earthquakes are believed to be associated with either the Humboldt fault zone or deep-seated faults in the Salinas Basin. There are no active surficial faults along the proposed Project route; therefore, a low seismic hazard risk is anticipated (Crone and Wheeler 2000, USGS 2006).

Landslides

According to the classification of landslide slope movements, the widely accepted terms describing landslides include fall, topple, slide, spread, and flow. These slide classifications can be further modified with the descriptive terms *extremely rapid, very rapid, rapid, moderate, slow, very slow, and extremely slow* (Turner and Schuster 1996). The potential for an extremely rapid to rapid slide to occur is increased in areas that contain steep slopes (>20 percent grade); however, only approximately 4 miles of the terrain crossed by the proposed Project route contain steep slopes. Most of these steep sections are less than 0.1 mile in length and correspond to stream crossing locations. For this reason, it is unlikely that steep slopes would be the cause of any extremely rapid to rapid landslides in the vicinity of the proposed Pipeline route.

Landslides typically occur on steep terrain during conditions of partial or total soil saturation, or during seismic shaking. Given the low likelihood of a significant seismic event along the proposed Pipeline route, the earthquake-induced landslide potential is low.

Stream erosion and undercutting or undermining topography during the construction of roads or other structures can also cause instability leading to increased landslide potential. FEMA developed a landscape hazard ranking system (LSHR) that relies on existing data for swelling clays, landslide incidence, landslide susceptibility, and land subsidence. Using these criteria, the LSHR places landscapes into three general risk categories: low hazard, medium hazard, and high hazard. Areas along the proposed Project route that are within the FEMA LSHR high general risk category are summarized by state in Table 3.1-6.



Sources: FEMA, USGS Earthquake Hazards Program.

Figure 3.1.2-2 Seismic Hazards

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Table 3.1-6 Locations within LSHR High-Risk Category along the Proposed Project Corridor

State	Start (MP)	End (MP)	Length (miles)
Montana	0.2	25.5	25.3
Montana	25.5	89.2	63.7
Montana	89.2	102.0	12.8
South Dakota	308.3	313.5	5.2
South Dakota	355.6	358.1	2.5
South Dakota	358.1	370.9	12.8
South Dakota	389.5	425.9	36.4
South Dakota	425.9	426.3	0.4
South Dakota	426.3	485.1	58.8
South Dakota	485.1	525.2	40.1
South Dakota	525.2	537.1	11.9
South Dakota	537.1	571.5	34.4
Nebraska	601.5	605.3	3.8
Nebraska	606.8	637.5	30.7
Total			338.8

Sources: USGS 2009; PHMSA-NPMS 2007.

Low, medium, and high hazard areas are depicted on Figure 3.1.2-3. According to this ranking system, a total of 338.8 miles of the terrain crossed by the proposed Project have a high hazard risk for landslide potential due to erosion or undercutting.

In addition to steep terrain, certain formations are susceptible to increased landslide potential due to the makeup of the soil and/or geological materials. Along the proposed Project route, the Claggett, Bearpaw, Pierre Shale, Fort Union shales, and Hell Creek Formation may contain appreciable amounts of bentonite. Bentonite is soft, plastic, light-colored clay that expands when exposed to water and may cause soil and/or geologic formations to become unstable. Cretaceous and Tertiary rocks in the Missouri River Plateau have the potential for slumping due to high clay content. Along the proposed Project route, potentially unstable soils or geologic formations are present at the Missouri River, Willow Creek, Keya Paha River, and Niobrara River crossings. Additionally, the Montana Department of Environmental Quality has expressed concern about areas where slopes greater than 15 percent occur overlying Cretaceous shales. There are approximately 5 miles of sloping areas greater than 15 percent along the proposed Project route in Montana; roughly 0.6 miles in Phillips County; 1.7 miles in Valley County; 2.2 miles in McCone County; and 0.5 miles in Fallon County.

In summary, the following conditions that provide some potential for landslides are present along the proposed Pipeline route:

- Steep slopes (>20% grade)—low potential;
- Earthquake-induced landslide—low potential;
- Stream erosion and undercutting topography—low, medium, and high hazard areas are present along the proposed Project route; and
- Soil and geological makeup—potentially unstable soils or geologic formations are present at four river crossings along the proposed Project route.

Subsidence

Subsidence hazards along the proposed Pipeline route would most likely be caused by the presence of karst geology. National karst maps were reviewed to determine areas of potential karst terrain along the proposed Project area. The potential karst terrain was defined as fissures, tubes, and caves generally less than 1,000 feet long and less than 50 feet in vertical extent in gently dipping to flat-lying beds or carbonate rock beneath an overburden of noncarbonate material 10 to 200 feet thick (USGS-US National Atlas 2009). The National Atlas indicates that limestone areas with potential for karst features exist in Nebraska (see Table 3.1-7); however, because there are no appreciable limestone areas in Nebraska, it is unlikely that karst features would be encountered. Further, a professor at the University of Nebraska-Lincoln has unequivocally stated that there is an absence of karst geology in the state; while there are enlarged joints in Pennsylvanian and Cretaceous limestones, no caves, sinkholes, or other similar features exist. Therefore, there would be no karst features that might provide a hazard to the proposed Project in Nebraska (Joeckel 2012).

Table 3.1-7 Limestone Areas Crossed by the Proposed Project Corridor with the Potential for Karst Features

Location	Start (MP)	End (MP)	Length (miles)
Nance County, NE	759	767	8.0
Merrick County, NE	767	775	8.0
Polk County, NE	775	781	6.0
Polk County, NE	788	789	1.0
York County, NE	789	801	12.0
Proposed Project Total			**35.0**

Source: USGS—US National Atlas 2009.

Floods

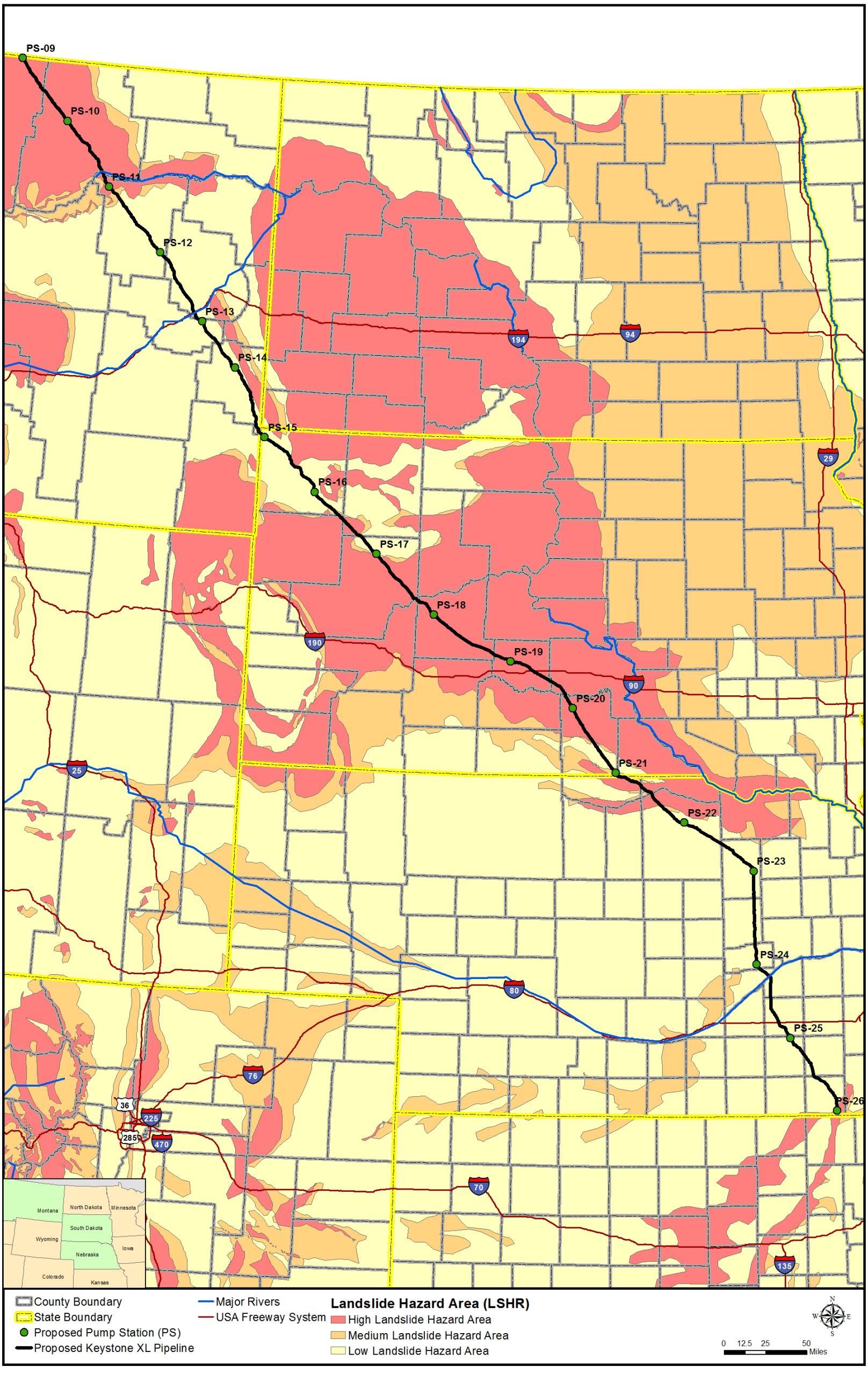
In general, seasonal flooding occurs in areas where the proposed Pipeline would cross active stream and river channels. In addition, the proposed Pipeline route could be subject to flash flooding in channels or intermittent drainages. Areas along the proposed Pipeline route that are classified by FEMA as being in a high flood risk category include Montana (23 miles); South Dakota (23 miles), and Nebraska (17 miles) (see Figure 3.1.2-4).

3.1.3 Connected Actions

This section describes the baseline conditions for geological, paleontological, fossil fuel, and mineral resources, as well as geologic hazards, affected by actions connected to the proposed Project.

3.1.3.1 Bakken Marketlink Project

The Bakken Marketlink Project would involve the construction of on-ramp facilities in Fallon County, Montana, including an approximately 5-mile-long pipeline, metering systems, three new storage tanks near Baker, Montana, and two new storage tanks within the boundaries of the proposed Cushing, Oklahoma tank farm. Geological surface materials and resources encountered within a 5-mile radius of the proposed pipeline route are similar to those described in Section 3.1.2.1, Geological Resources.



Source: FEMA.

Figure 3.1.2-3 Landslide Hazard Areas

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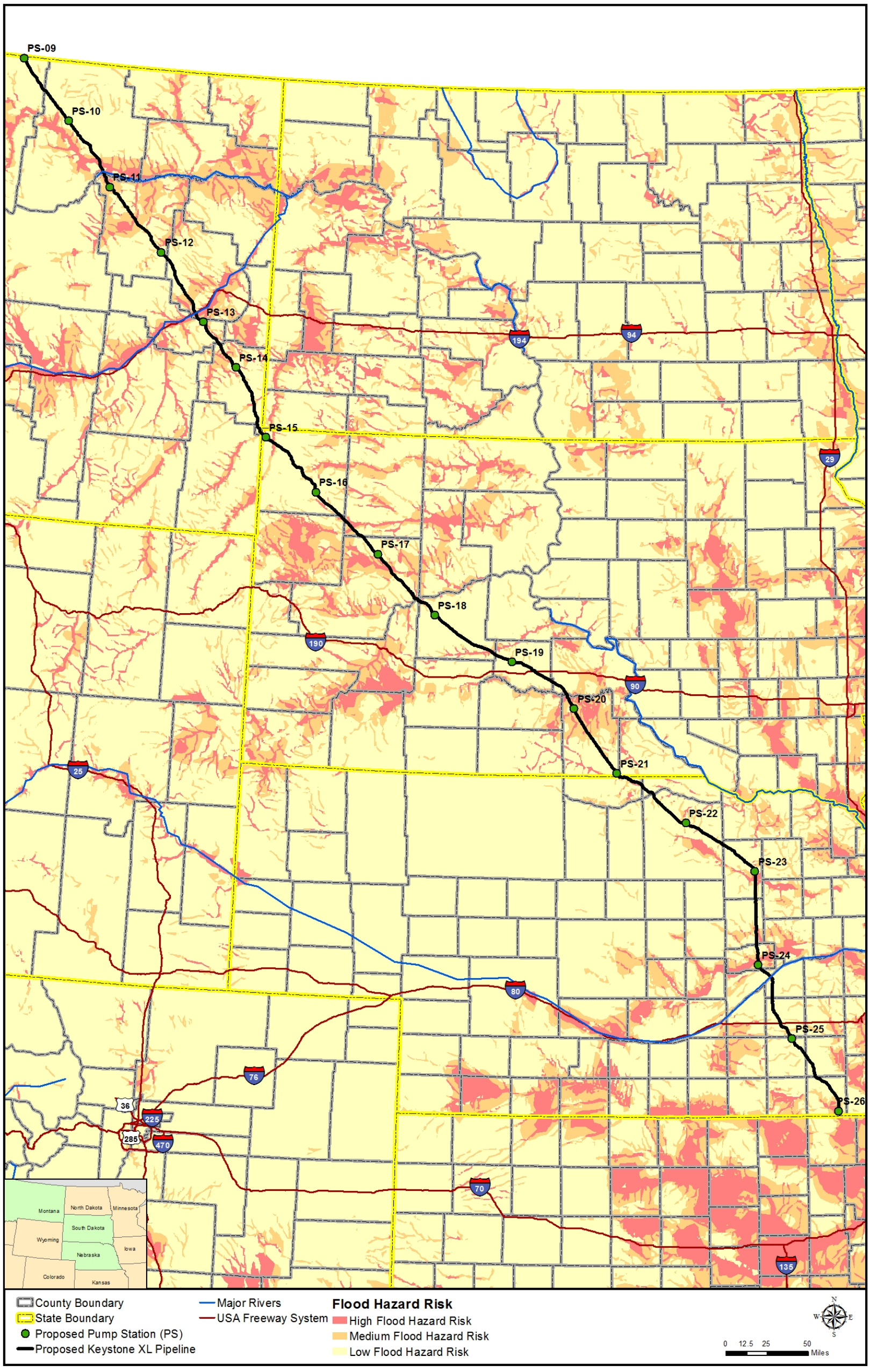

Source: FEMA.

Figure 3.1.2-4 Flood Hazard Areas

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Similar to the proposed pipeline route itself, the Bakken Marketlink Project would cross a major structural feature, the Williston Basin, which is a structural basin that contains approximately 15,000-foot-deep sedimentary rock. The majority of the connected Project would be located within the Fort Union Formation, which consists primarily of sandstone, siltstone, mudstone, carbonaceous shale, and lignite. The Fort Union Formation is known to contain PFYC Class 4 and 5 fossil-bearing members. The potential for geologic hazards in this vicinity is generally low, with the exception of an increased risk of landslides towards the outer reaches of the 5-mile-long Bakken Marketlink pipeline (see Figure 3.1.2-3).

3.1.3.2 Big Bend to Witten 230-kV Transmission Line

The Western Area Power Administration determined that a 230-kilovolt (kV) transmission line approximately 70 miles long would be required to ensure system reliability within the Western Area Power Administration power grid given the power requirements for Pump Stations 20 and 21 in the Witten, South Dakota area. Geological surface materials in the vicinity of the Big Bend to Witten line consist of eolian deposits and terrace deposits, as well as the Ogallala Formation and Pierre Shale. No PFYC Class 4 or PFYC Class 5 paleontological resources were identified via field surveys along the proposed route adjacent to the Big Bend to Witten line. This connected Project is not expected to disturb high fossil-bearing formations. Similarly, the connected Project is not expected to cross areas with fossil fuel or mineral resources, or any active mine operations. The potential for seismic activity and geologic hazards such as landslides, land subsidence, or flooding is similar in nature to that found along the proposed route in south-central South Dakota. The potential for geologic hazards is generally low in south-central South Dakota.

3.1.3.3 Electrical Distribution Lines and Substations

The proposed Project would require electrical service from local power providers for pump stations and other aboveground facilities in Montana, South Dakota, and Nebraska. In Montana, approximately 136 miles of new 115-kV electrical distribution lines would be required to be constructed along with approximately 159 miles in South Dakota. Although the precise locations of pump stations and transmission lines in Nebraska have not yet been determined, the total estimated length of distribution lines in Nebraska is 70 miles. In Kansas, approximately 14 miles of distribution lines would be constructed. In general, the transmission lines would be constructed in the vicinity of the proposed route. As such, the same geological resources and hazards discussed previously for the pipeline route are expected to be encountered along the transmission lines (see Sections 3.1.2.1, Geological Resources; 3.1.2.2, Paleontological Resources; 3.1.2.3, Potential Fossil-Bearing Geologic Formations; and 3.1.2.4, Fossil Fuel and Mineral Resources).

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3.2 SOILS

3.2.1 Introduction

This section discusses the soils resources in the proposed Project area. The description of the soils resources is based on information provided in the 2011 Final Environmental Impact Statement (Final EIS) as well as new circumstances or information relevant to environmental concerns that have become available since the publication of the Final EIS, including the proposed reroute in Nebraska. The information that is provided here builds on the information provided in the Final EIS and, in many instances, replicates that information with relatively minor changes and updates. Other information is entirely new or substantially altered from that presented in the Final EIS. Specifically, the following information, data, methods, and/or analyses have been substantially updated in this section from the 2011 document:

- The number of miles of soil types crossed with specific characteristics has been updated; and
- The approximate acreage of impacted soil types with specific characteristic has been updated.

3.2.2 Environmental Setting

Soil characteristics present along the proposed Project route are identified and evaluated using information from the Natural Resources Conservation Service Soil Survey Geographic database (U.S. Department of Agriculture [USDA] 1932). The evaluation focused on soil characteristics of particular interest to the proposed pipeline construction. The following soil characteristics were evaluated:

- Highly erodible soils—these are prone to high rates of erosion when exposed to wind or water by removal of vegetation.
- Prime farmland soils—these have combinations of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if they are treated and managed according to acceptable farming methods. Undeveloped land with high crop production potential may be classified as prime farmland.
- Hydric soils—these are "formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (Federal Register, July 13, 1994). These soils under normal conditions are saturated for a sufficient period of time during the growing season to support the growth of hydrophytic vegetation (USDA 2006).
- Compaction-prone soils—these include surface clay loam or soils of finer textures in somewhat poor to very poor drainage classes.
- Stony/rocky soils—these have a cobbly, stony, bouldery, gravelly, or shaly modifier to the textural class; or comprise more than 5 percent stones larger than 3 inches in the surface layer.
- Shallow-bedrock soils—these are typically defined as soils that have bedrock within 60 inches of the soil surface. However, for the purpose of the proposed Project, shallow-bedrock

soils are defined as those containing bedrock within 80 inches of the surface, because trenching typically would be done to that depth.

- Drought-prone soils—these include coarse-textured soils (sandy loams and coarser) that are moderately well to excessively drained.

Tables 3.2-1 and 3.2-2 summarize the approximate miles of pipeline right-of-way, by state, that would cross soils exhibiting these characteristics. The tables include the approximate acreage of soils containing these characteristics that would be disturbed by the proposed Project. More detail is provided in Appendix M, Soil Summary for Montana, South Dakota, and Nebraska [Appendix G-1, TransCanada DOS ER PDF Public Package Final 090712 Report], including a table listing soil associations from the NRCS Soil Survey Geographic database by milepost along the proposed Project route.

3.2.2.1 Montana

The proposed Project route in northern Montana would be located within the Northern Great Plains Spring Wheat Land Resource Region (USDA 2006). This region is characterized by glacially deposited till and lacustrine deposits. Soil profiles typically contain thick, dark topsoils that may contain bentonite (smectitic mineralogy). Soils are generally very deep, well-drained, and loamy or clayey. Small areas of alluvial deposits are present along rivers and drainageways and shale is exposed in some uplands. In northern Montana, soils generally are formed in glacial till. From McCone County to Fallon County along the proposed Project route (east central Montana), soils are formed on eroded plateaus and terraces. These soils are shallow to very deep, well-drained, and clayey or loamy. Some soils in this area have high bentonite contents and have saline or sodic chemical properties. In east-central Montana, the proposed pipeline route would lie within the Western Great Plains Range and Irrigated Land Resource Region (USDA 2006). This region consists of an elevated piedmont plain that is dissected by rivers and contains steep-sided buttes and badlands. Soil types vary from deep organic soils to shallow soils with thin topsoil thickness. In Montana, prime farmland soils occupy approximately 22 percent of the proposed pipeline route. The average freeze-free period is between 120 and 165 days.

3.2.2.2 South Dakota

The proposed Project route in South Dakota would be located within the Western Great Plains Range and Irrigated Land Resource Region (USDA 2006). In northwestern South Dakota, soils are shallow to very deep, well-drained, and loamy or clayey. To the southeast through Meade County, soils are shallow to very deep, somewhat excessively drained to moderately well-drained, and loamy or clayey. In southern South Dakota, from Hakkon County to Tripp County, areas of smectitic clays are present that have shrink-swell potential and may cause significant problems for roads and structural foundations. From central Tripp County to the state line, these clayey soils contain thick, dark, organically enriched layers of topsoil. Beginning at approximately Milepost (MP) 572, transitional aeolian sandy soils are present that generally consist of aeolian sands, sandy alluvium, and lesser amounts of loess and glacial outwash. In southern Tripp County to the state line, soils grade into deep, sandy deposits that are similar to the Nebraska Department of Environmental Quality (NDEQ)-defined Sand Hills Region soils in Nebraska. In South Dakota, prime farmland soils occupy approximately 35 percent of the proposed pipeline route. The average freeze-free period is between 135 and 165 days.

Table 3.2-1 Approximate Miles[a] of Soils with Specific Characteristics Crossed by the Proposed Project Route

State	Total Miles Affected[b]	Highly Erodible (Wind)	Highly Erodible (Water)	Prime Farmland	Hydric	Compaction-Prone	Stony/ Rocky	Shallow Bedrock	Drought-prone
Montana	285.7	5.2	111.8	63.1	1.5	235.9	32.1	4.0	21.0
South Dakota	315.3	16.7	104.8	110.2	5.1	253.4	9.0	1.0	65.9
Nebraska	274.4	44.3	158.9	175.9	47.1	136.8	32.5	0.3	41.0
Kansas	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
North Dakota	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**875.4**	**66.2**	**375.5**	**349.2**	**53.6**	**626.1**	**73.7**	**5.3**	**127.9**

[a] Rounded to nearest tenth of a mile.
[b] Total miles affected, which include non-sensitive and sensitive soils and other substrates.

Table 3.2-2 Approximate Acreage[a] of Soils with Specific Characteristics Crossed by the Proposed Project Route[b]

State	Total Acres Affected	Highly Erodible (Wind)	Highly Erodible (Water)	Prime Farmland	Hydric	Compaction-Prone	Stony/ Rocky	Shallow Bedrock	Drought-prone
Montana	3,808.7	68.8	1,490.5	841.5	19.9	3,145.2	428.1	52.7	279.3
South Dakota	4,203.9	222.8	1,397.6	1,468.9	67.7	3,379.1	120.4	13.9	878.5
Nebraska	3,659.2	590.5	2,118.1	2,346.0	627.6	1,823.4	433.9	3.6	547.0
Kansas	15.0	0.0	1.0	14.0	0	15.0	2.0	6.0	0.0
North Dakota	56.1	0.0	56.0	44.9	0.0	0.0	0.0	0.0	0.0
Total	**11,742.8**	**882.1**	**5,063.3**	**4,715.3**	**715.2**	**8,362.7**	**984.4**	**76.1**	**1,704.9**

[a] Rounded to nearest tenth of an acre.
[b] Based on a total of 110-foot-wide right-of-way for a 36-inch pipeline, and including the two pump stations in Kansas, and pipe yard in North Dakota. Acreage does not account for disturbance associated with power lines, pipe stockpile sites, rail sidings, contractor yards, or construction camps (for acreage affected by these ancillary facilities see Table 2.1-6. Individual soils may occur in more than one characteristic class. Discrepancies in total mileage are due to rounding.

3.2.2.3 Nebraska

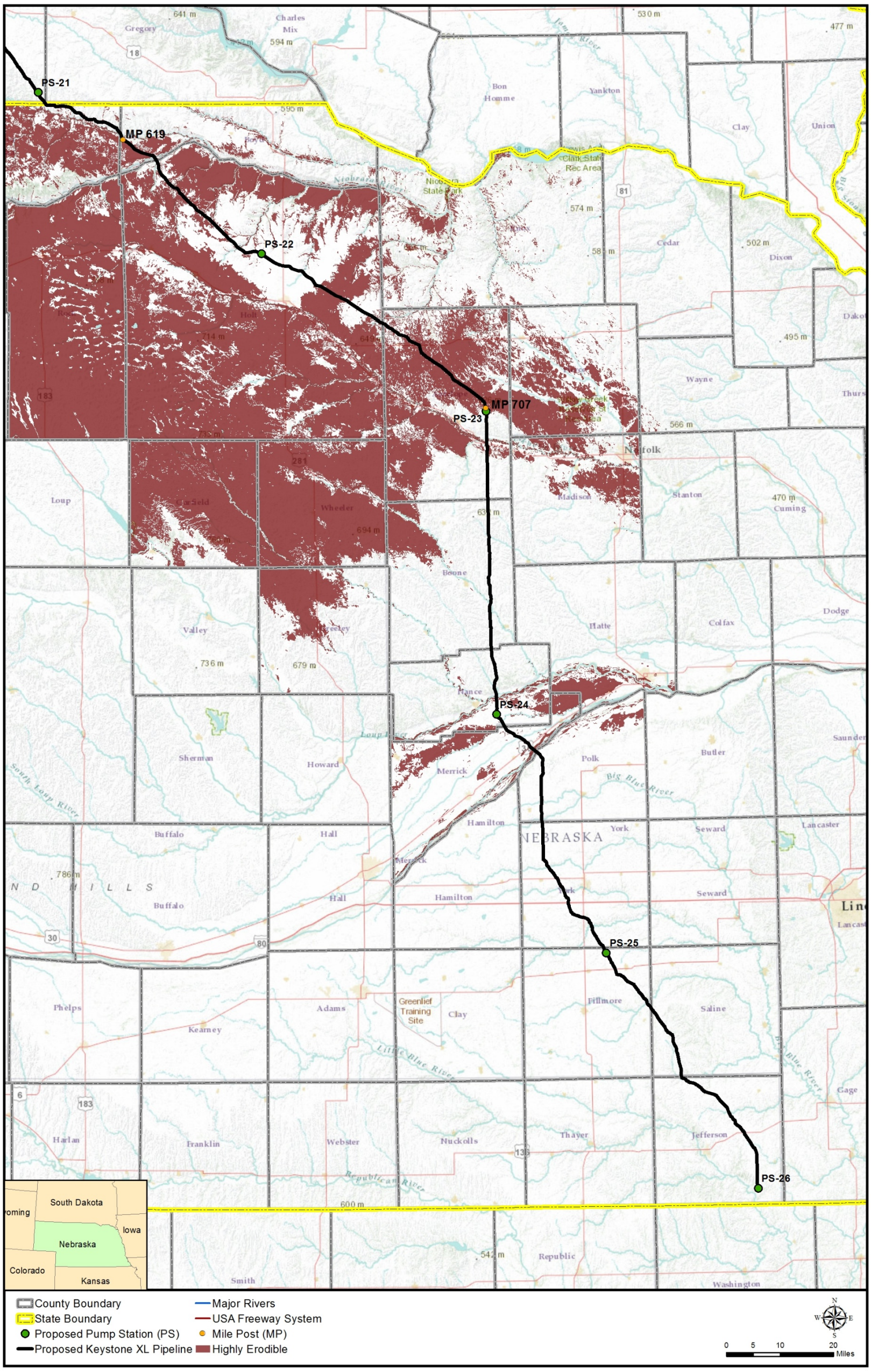
The proposed Project route in northern Nebraska would be located within the Western Great Plains Range and Irrigated Land Resource Region (USDA 2006). This region is characterized by a nearly level to gently rolling fluvial plain. Keya Paha, Boyd, and Holt counties lie within the Dakota-Nebraska Eroded Tableland Resource Area. These soils are generally sandy, very deep, and excessively drained to somewhat poorly drained. Also, within Holt and Boyd counties in the Tableland Resource Area, there are soils types that are silty or sandy loam soils.

In Antelope and Boone counties, the proposed Project route would encompass the Central Feed Grains and Livestock Land Resource Region. This area is further classified as the Loess Uplands Resource Area, with soils consisting of deep loess deposits that are susceptible to erosion if unvegetated. In the northern section of Antelope County, the soils are sandy loams that are frequently layered with very fine-grained ash layers that are susceptible to erosion by rain and wind. In Nance and Merrick counties, the proposed Project route would cross the Central Nebraska Loess Hills and the Central Loess Plains Resource Areas (Central Great Plains Winter Wheat and Range Land Resource Region). These areas feature soils consisting of deep loess with some organic enrichment.

South of the Platte River, the proposed Project route would cross flat to rolling loess-covered plains of the Rainwater Basin Plains, one of the largest concentrations of natural wetlands found in Nebraska. Many of the wetlands were drained for cultivation, with much of the area pivot irrigated to help provide a fertile area for crops. The soils are largely silty loams with fine sands in both flooded and rarely flooded areas. Glacial till is scattered throughout the area south of the Platte River and is encountered along the southern section of the proposed pipeline route.

In northern Nebraska, the proposed Project route, from approximately MP 619 to MP 707 in Boyd, Holt, and Antelope counties, would enter an area where the soils tend to be highly susceptible to erosion by wind and often exhibit characteristics of the NDEQ-defined Sand Hills Region (i.e., fragile soils [see Figure 3.2.2-1]). These soils consist of aeolian fine sands, loamy fine sands, or sandy alluvium, and are generally deep, well-to-excessively drained, and nearly level to moderately steep on uplands and streams terraces. The sandy soils typical of the NDEQ-defined Sand Hills Region have a high infiltration rate and high permeability; however, the fine-grained loess deposits further to the east can be as thick as 200 feet and can locally restrict water flow where fractures are absent (Stanton and Qi 2007, Johnson 1960).

Where the vegetative cover has been disturbed or removed without restoration, severe wind erosion associated with the prevailing northwesterly winds may create steep-sided, irregular, or conical depressions referred to as “blowouts.” Blowouts are most commonly associated with fence lines, windmills, and other features where cattle create trackways that allow the initiation of wind funneling (Wedin 2011). Two blowouts identified in the vicinity of the proposed Project route include a blowout in Keya Paha County, located approximately 6.5 miles from MP 611, southwest of the proposed pipeline route, and a blowout in Holt County, located approximately 1.6 miles from MP 634, south of the proposed pipeline route.



Source: USDA 2007.

Figure 3.2.2-1 Highly Wind Erodible Soils

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In this region, the most erosive months of the year are March, April, and May and the least erosive months are June, July, and August (Wedin 2011). In the spring months, sustained winds of 111 miles per hour with gusts of nearly double that velocity can occur (Stubbendieck et al. 1989). The proposed Project route would cross approximately 48 miles of highly wind erodible soils in Nebraska (see Table 3.2-1). In Nebraska, prime farmland soils occupy approximately 64 percent of the pipeline route. The average freeze free period is between 160 and 180 days.

3.2.2.4 Kansas

Two new pump stations would be located in Clay and Butler counties at MP 49.7 and MP 144.5, respectively, as part of the proposed Project. Shallow soils of the Hedville series are present in these areas. These soils are loamy soils that developed from the erosion of weathered non-calcareous sandstone. In Kansas, the average period where temperatures are above freezing is between 170 and 190 days.

3.2.2.5 North Dakota

During construction activities, a pipe yard and rail siding would be needed for on-site storage of pipes in North Dakota. The yard would be located in Bowman County in a flat and upland landscape area. The soils found in the area include the Belfield, Stady, and Stady-Lehr soil series. These soils are deep, well to moderately well drained soils that derived from material that consists of clayey or loamy alluvium from sedimentary rock. The shrink-swell potential of these soils is low.

3.2.3 Connected Actions

3.2.3.1 Bakken Marketlink Project

The Bakken Marketlink Project would include an approximately 5-mile-long pipeline, metering systems, three new storage tanks near Baker, Montana, and two new storage tanks within the boundaries of the proposed Cushing tank farm. TransCanada Keystone Pipeline, LP (Keystone) reported that the property proposed for the Bakken Marketlink facilities near Pump Station 14 is currently used as pastureland and hayfields. A survey of the property indicated that there were no waterbodies or wetlands on the property. The soils found in the proposed Project area include the Kremlin soil series. The Kremlin series consist of deep, well drained, and moderately permeable loamy soils that are in alluvial fans, stream terraces, and sedimentary plains.

3.2.3.2 Big Bend to Witten 230-kV Transmission Line

To meet the requirements of two new pump stations in Witten, South Dakota, a new 230-kV transmission line approximately 76 miles long would need to be added to the existing grid system to ensure system reliability. The soils found along the proposed transmission line route consist of two soil associations, the Millbor-Lakoma and the Sansarc-Opal. The Millboro-Lakoma association consists of deep to moderately deep, nearly level to strongly sloping, and well drained soils that are typically clayey. The Sansarc-Opal association consists of shallow to moderately deep, strongly sloping to steep and well drained clayey soils.

3.2.3.3 Electrical Distribution Lines and Substations

The proposed Project would require electrical service from local power providers for pump stations and other aboveground facilities in Montana, South Dakota, and Nebraska. In Montana, approximately 136 miles of new 115-kV electrical distribution lines would need to be constructed; in South Dakota, approximately 159 miles would need to be constructed; and in Nebraska, approximately 70 miles would be constructed. The precise locations of pump stations and distribution lines in Nebraska have not been determined. In Kansas, approximately 14 miles of distribution lines would be built. In general, the transmission lines would be constructed in the vicinity of the proposed Project route; as such, the same soil conditions discussed previously for Montana and South Dakota are expected to be encountered along the transmission line routes (see Sections 3.2.2.1, Montana, and 3.2.2.2, South Dakota).

3.2.4 References

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3.3 WATER RESOURCES

3.3.1 Introduction

This section discusses Water Resources in the proposed Project area. The description of Water Resources is based on information provided in the 2011 Final Environmental Impact Statement (Final EIS) as well as new circumstances or information relevant to environmental concerns that have become available since the publication of the Final EIS, including the proposed major reroute in Nebraska and numerous minor (less than one mile) reroutes in Montana and South Dakota. The information that is provided here builds on the information provided in the Final EIS and in many instances replicates that information with relatively minor changes and updates. Other information is entirely new or substantially altered from that presented in the Final EIS. Specifically, the following information, data, methods, and/or analyses have been substantially updated in this section from the 2011 document:

- Well data (depth, hydrogeology, and water quality) near the proposed Project area in Montana and South Dakota was added;
- Major proposed Project rerouting in much of Nebraska necessitated new data collection and analysis including wells locations, water depths, water quality, and hydrogeologic (aquifer) analysis;
- The number and type of stream crossings and stream crossing methods have changed due to changes in the proposed Project route as well as updated field survey information provided by TransCanada Keystone Pipeline, LP (Keystone). The stream crossing assessment was comprised of a desktop analysis based on National Hydrologic Dataset (NHD) information and supplemented by Keystone field survey descriptions where available;
- Based on the limitations of the data used in the desktop analysis, the intermittent and ephemeral stream categories were combined and assessed as intermittent streams, and no distinction between these categories was maintained;
- State and federally designated or mapped floodplain areas were assessed in Montana, South Dakota, and Nebraska from publicly available map data. Not all counties along the proposed Project route are mapped. Project locations that intersected mapped floodplains were listed; and
- Floodplains for the Cheyenne, Little Missouri, and Bad River in South Dakota were identified in a desktop analysis that included effective floodplain areas regardless of designation.

3.3.2 Groundwater

3.3.2.1 Hydrogeologic Setting

Groundwater resources are a primary source of irrigation and potable water along much of the proposed pipeline route. Several primary groundwater aquifers and aquifer groups underlie the proposed Project area including the following:

- Alluvial aquifers
- Northern High Plains Aquifer (NHPAQ)
- Great Plains Aquifer (GPA)
- Western Interior Plains Aquifer (WIPA)
- Northern Great Plains Aquifer System (NGPAS)

Each of these aquifers is described in the following subsections. To establish a context and better understanding of the specific conditions along the proposed pipeline route, the regional large-scale groundwater conditions and interactions of these aquifers and aquifer groups are described (see Figure 3.3.2-1).

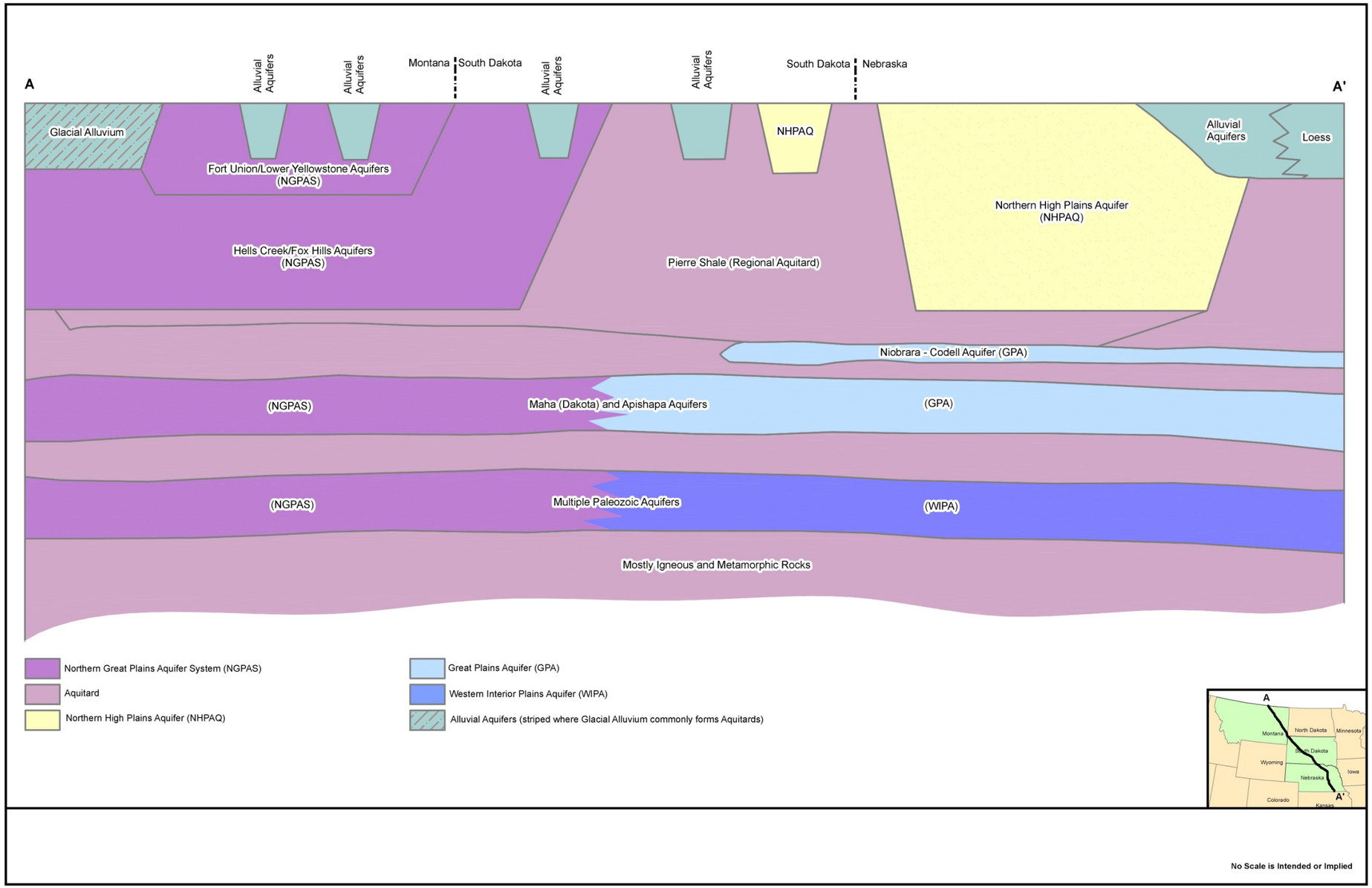
Alluvial Aquifers

Alluvial aquifers along the proposed pipeline typically consist of sediments deposited in stream valleys. In some areas of Nebraska crossed by the proposed Project route, the alluvial aquifer deposits also include aeolian (dune and sheet deposits) sands and loess (windblown silt deposits). These unconsolidated deposits range from a few feet to hundreds of feet thick. They are typically related to continental glaciation deposits in the northern and extreme southern portions of the proposed pipeline area through Montana, South Dakota, and Nebraska, and are typically reworked sediments derived from local formations throughout the pipeline's central portion (Miller and Appel 1997, University of Nebraska 1998).

Groundwater in the alluvial aquifers is characteristically shallow (less than 50 feet below ground surface [bgs]) and often unconfined. Wells completed in the alluvial deposits in the proposed pipeline area are typically less than 100 feet deep and have yields that range from one to several thousand gallons per minute (gpm) (Whitehead 1996). As would be expected given the range of observed well yields, the aquifer characteristics that measure the amount of groundwater and how easily it flows (transmissivity, storativity, and hydraulic conductivity[1]) of these deposits vary widely across the region as well as locally. Unconsolidated alluvial aquifers are a primary source of groundwater for irrigation, domestic, commercial, and/or industrial use throughout much of the proposed Project area.

The proposed Project would include two proposed pump stations in Kansas, both situated upon alluvial aquifers. The pump station in Clay County is located within the alluvium of the Republican River, and the pump station in Butler County is situated on alluvium associated with the East Branch of the Whitewater River.

[1] Hydraulic conductivity: A velocity measure of rate of fluid flow through a porous soil or rock material under a hydraulic gradient (slope of fluid surface) of distances of 1 vertical:1 horizontal.
Transmissivity: A volumetric measure of the rate of horizontal groundwater flow through an aquifer, generally equal to the product of the aquifer hydraulic conductivity and the aquifer saturated thickness.
Storativity: A volumetric measure of the rate of groundwater extraction from an aquifer corresponding to a given decrease in the fluid level within the aquifer per unit area of the aquifer.



Source: Whitehead 1996, Miller and Appel 1997.

Figure 3.3.2-1 Schematic Hydrogeologic Cross-Section along Proposed Pipeline Route

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The stream valley alluvial aquifers in eastern Kansas consist mostly of Holocene and Pleistocene sand and gravel deposits with an average thickness of 90 to 100 feet, but locally can be as much as 160 feet thick. The saturated thickness within these alluvial aquifers is typically 50 to 80 feet, and aquifer conditions are usually unconfined. Well yields of up to 3,000 gpm are reported from stream valley alluvial aquifers in Kansas, and transmissivity values range from 8,000 to 80,000 square feet per day (Whitehead 1996).

Northern High Plains Aquifer

The NHPAQ extends across portions of eight states from southern South Dakota to the Texas panhandle, and is an important groundwater resource across nearly the entire overlying area. The NHPAQ stores approximately 3.25 billion acre-feet of groundwater, and provides water to over 170,000 wells. The NHPAQ in the vicinity of the proposed Project consists of Tertiary rocks of the Ogallala Formation, Arikaree Group, and Brule Formation, as well as overlying and associated alluvial sediments. The Ogallala Formation is present beneath portions of the proposed pipeline area in southern South Dakota and Nebraska where the formation is primarily underlain by the Pierre Shale, a regional confining layer. The Arikaree Group and Brule Formation are not present directly beneath the proposed pipeline area. In southern South Dakota and Nebraska, the NHPAQ system is typically described to include groundwater-bearing Quaternary and recent aeolian, fluvial, and glacial alluvium overlying and adjacent to the Ogallala Formation; therefore, descriptions of the NHPAQ conditions overlap somewhat with the alluvial aquifers described above (Gutentag et al. 1984).

The Ogallala Formation consists primarily of unconsolidated to semi-consolidated gravel, sand, silt, and clay deposited by an extensive network of easterly flowing rivers and streams that drained the ancestral Rocky Mountains. Depth to groundwater in the Ogallala Formation in the proposed pipeline area ranges from near the surface to greater than 200 feet bgs. Thickness of the water-bearing units in this formation can be up to 900 feet or more, but are typically much thinner in the formation's easternmost portions crossed by the proposed pipeline route, where saturated thicknesses of more than 300 feet are uncommon. Thousands of miles of pipeline carrying crude and refined products traverse though out the region where the Ogalalla Aquifer is present. Pipelines installed within the last 10 to 15 years are all generally constructed and operated under similar regulatory and engineering procedures and design as would be required of the proposed pipeline.

Typical recharge rates to the Ogallala Formation and associated alluvial aquifers range from 0.5 to 5 inches per year along the proposed pipeline route, with the highest recharge rates in the areas of the aquifer associated with the Sand Hills Unit. Groundwater generally flows toward the east at an average of 1 foot per day (Gutentag et al. 1984). Transmissivity of the Ogallala Formation in the proposed pipeline area typically ranges from approximately 2,000 to 10,000 square feet per day (University of Nebraska 1998).

Where present, the Ogallala Formation and associated alluvial aquifers are a primary source of groundwater for agricultural, domestic, commercial/industrial, and potable use along much of the proposed pipeline area in southern South Dakota and Nebraska.

Great Plains Aquifer

The GPA consists of sedimentary rocks deposited in the Cretaceous Period across much of Nebraska, Kansas, Colorado, and smaller parts of New Mexico, Oklahoma, Texas, South

Dakota, and Wyoming (Miller and Appel 1997). The two primary sub-units of the aquifer are the Maha and Apishapa aquifers, which both consist of loosely cemented, fine- to medium-grained sandstone separated by a shale confining unit. A less extensive aquifer system, the Niobrara/Codell aquifer sub-unit, is present in the study area and is stratigraphically within the GPA. Along the proposed pipeline route, the GPA lies underneath the NHPAQ, including the Ogallala formation (Figure 3.3.2-1).

Of the two primary sub-units, only the Maha aquifer (Dakota Sandstone) is present beneath the proposed pipeline area across southern South Dakota and Nebraska. Rocks and conditions that correlate to both aquifer sub-units are present beneath the proposed pipeline area north of the Nebraska-South Dakota border. Across that area, however, the depth to water, high dissolved solids content (salinity), and other water quality issues typically make the aquifer sub-units unsuitable for irrigation or potable use. Also within Nebraska, much of the GPA has limited use because of high salinity, except where the formations that compose the aquifer are near the surface in the eastern portion of the state.

The thickness of the Maha aquifer sub-unit is approximately 600 feet beneath Keya Paha County, Nebraska, and generally decreases along the pipeline route to less than 200 feet in thickness at Steele City, Nebraska (Miller and Appel 1997). Depth to the top of the Maha is reported as 1,000 feet bgs or less along the proposed pipeline area; the Dakota Sandstone is near the surface in the southern portion of the route in Nebraska, but typically covered with alluvium. Transmissivity of the Maha aquifer beneath the proposed pipeline area is estimated to range from greater than 1,000 to over 10,000 square feet per day.

The Niobrara/Codell aquifer sub-unit is a regional groundwater aquifer that stratigraphically falls within the GPA system and is present across much of Nebraska and southern South Dakota. The aquifer is present in Late Cretaceous sandy chalk, limestone, shale, and sandstone rocks overlying the Maha aquifer sub-unit. Water quality in this aquifer is generally better than the underlying Maha, but is still somewhat saline across much of the aquifer extent. In scattered areas where water quality is good, however, the aquifer is used as a minor source of domestic, municipal, and irrigation water (Korus and Joeckel 2011).

Recharge of the GPA across most of the proposed pipeline area in Nebraska may be from groundwater in the overlying Ogallala Formation; however, in the areas of downward hydraulic gradient between the Ogallala and the GPA that the proposed pipeline route would cross, the GPA is typically saline and not used for groundwater withdrawal (Miller and Appel 1997). Additionally, most of the NHPAQ in the area is underlain by the Pierre Shale, which forms an aquitard that limits hydraulic connectivity between the NHPAQ and GPA across most of the area where the two aquifers are present along the proposed pipeline area.

Where the GPA is present beneath the proposed pipeline area, no wells were identified that extract groundwater from this aquifer within 1 mile of the proposed pipeline centerline based on a review of available water well logs for Nebraska and South Dakota.

Western Interior Plains Aquifer

The WIPA consists of Mississippian to Cambrian Age dolomite, limestone, and sandstone across most of Kansas, eastern Nebraska, and parts of Missouri (Miller and Appel 1997). In eastern Montana and South Dakota, this sequence grades laterally into the NGPAS and is typically deeply buried and contains very saline water, except in areas where uplift brings the formations

close to the surface, such as the vicinity of the Black Hills. There are no such uplift areas present within the proposed Project area, and the WIPA lies underneath the GPA (Figure 3.3.2-1).

Along the pipeline route in eastern Nebraska, the aquifer thickness is approximately 1,500 feet at Steele City, Nebraska, generally decreasing to the north and pinching out a few miles south of the South Dakota border in Keya Paha County (Miller and Appel 1997). Little, if any, water is withdrawn from the WIPA in Nebraska in the vicinity of the proposed pipeline area because the aquifer is deeply buried (at least several hundred feet bgs) and very saline (Korus and Joeckel 2011).

Where the WIPA is present beneath the proposed Project area, no wells that extract groundwater from this aquifer were identified within 1 mile of the proposed pipeline centerline. In addition, the WIPA is separated from the overlying GPA by aquitards that limit hydraulic connectivity between the WIPA and GPA across the proposed pipeline area.

Northern Great Plains Aquifer System

The NGPAS in eastern Montana, northern Wyoming, western North Dakota, and northwestern South Dakota consists of early Cenozoic, Mesozoic, and Paleozoic rocks, some of which, further to the southeast, are subdivided into the GPA and WIPA (Whitehead 1996). This aquifer system also includes Tertiary and Late Cretaceous rocks that do not have correlative aquifer units in southern South Dakota and Nebraska. Although several separate aquifers and intervening aquitards are present within the NGPAS, the separate aquifers share similar conditions and exhibit at least some degree of hydraulic connectivity on a local and regional scale.

The Tertiary and Late Cretaceous formations that are included in the NGPAS (Fort Union Group, Hell Creek Formation, and Fox Hills Sandstone) are present at or near the surface across most of the proposed pipeline area through northwestern South Dakota and Montana (Whitehead 1996). Beneath these Tertiary formations and exposed at the surface along the eastern and western periphery of those rocks units, Early Cretaceous rocks of the Inyan Kara Group, the next deepest primary aquifer in the NGPAS, are present. Paleozoic rocks containing aquifers similar to or directly correlated to those in the WIPA are present beneath the Inyan Kara Group; however, these rocks do not approach the surface in the vicinity of the proposed pipeline area.

The thickness of the rock units comprising the NGPAS are tens of thousands of feet thick in aggregate, and individual water-bearing units can be several thousand feet thick. For example, the Fort Union Formation is up to 3,600 feet thick in the Powder River Basin. Similarly, aquitard units between the aquifer units are of variable thickness and are commonly absent in some areas.

Regional groundwater recharge into the NGPAS is typically from water infiltration at higher altitudes, roughly horizontal down the dip of the aquifers, and then upward into overlying aquifer units (Whitehead 1996). Local recharge does occur through precipitation migration into Tertiary rocks and downward into the underlying older aquifers. Groundwater in the aquifer system typically moves from the highest elevations in the southern and western portions of the system toward the northeast in the Williston Basin (western North Dakota) and to the north in the Powder River Basin (northeastern Wyoming and southeastern Montana). Net groundwater flow between aquifer units is typically upward across the NGPAS. Groundwater quality is commonly slightly to very saline in the aquifer system's Early Cretaceous portions, and is commonly at least slightly saline in the Late Cretaceous and Tertiary aquifers. The salinity in these aquifers is related to recharge from the underlying saline Paleozoic aquifer units.

Although the salinity in the groundwater from the uppermost NGPAS aquifer units makes the groundwater unsuitable for irrigation, the Tertiary and Late Cretaceous aquifers are commonly used for livestock watering and domestic and municipal water supply in western North Dakota and eastern Montana, including areas in the vicinity of the proposed pipeline (Whitehead 1996).

Regarding the planned pipe yard in Bowman County, North Dakota, groundwater is located within the Lower Tertiary Fort Union Formation, which consists of sandstone and shale beds within interbedded coal in some areas. This unit is part of the NGPAS, and extends into Montana where the proposed Project crosses the unit. Wells extracting groundwater from this unit in North Dakota are typically greater than 300 feet deep and yield up to 100 gallons per minute (Whitehead 1996).

3.3.2.2 Proposed Pipeline Area Hydrogeologic Conditions

This section includes a summary of the shallow groundwater encountered along the proposed pipeline area, followed by a more detailed summary of specific hydrogeologic conditions and major aquifers encountered along the pipeline area organized by state, including the following descriptions:

- Key aquifers;
- Nearby public water supply wells and private water wells;
- Depth to groundwater; and
- Water quality.

Deeper aquifers are excluded from evaluation except in areas where there may be potential groundwater quality impacts to those aquifers from pipeline construction or operation. The proposed pipeline area does not cross any sole-source aquifers, as designated by U.S. Environmental Protection Agency (USEPA) Region 8 (USEPA 2012). The NHPAQ in the vicinity of the proposed Project includes the Ogallala Formation and overlying and adjacent alluvial sediments. In total, the NHPAQ stores approximately 3.25 billion acre-feet of water, 66 percent of which is within Nebraska. Groundwater from the aquifer is extensively extracted for potable use, irrigation, livestock watering, and industrial use, including in the vicinity of the proposed Project (Gutentag et al. 1984). Water bearing zones less than 50 feet bgs were identified where possible by examining available well data obtained from each state for wells situated along the proposed pipeline area. These data typically include static water level and depth of wells within 1 mile of the proposed pipeline centerline. The results of this evaluation are presented in Table 3.3-1.

Table 3.3-1 Water-Bearing Zones Less than 50 Feet Below Ground Surface Beneath the Proposed Pipeline Right-of-Way

State/County	Approximate Milepost or Range[a]	Approximate Depth to Groundwater (feet bgs[b])	Formation/Aquifer	Regional Aquifer Group[d]
Montana				
Phillips	2	8	Cretaceous Bearpaw Shale	NGPAS
Phillips	6	0	Cretaceous Bearpaw Shale	NGPAS

State/County	Approximate Milepost or Range[a]	Approximate Depth to Groundwater (feet bgs[b])	Formation/Aquifer	Regional Aquifer Group[d]
Phillips/Valley	25-26	<50	Frenchman Creek alluvium	AA
Valley	27	0-45	Late-Cretaceous Judith River Formation	NGPAS
Valley	38-41	0-9	Rock Creek glacial/alluvial sediments	AA
Valley	47	6	Late-Cretaceous Judith River Formation	NGPAS
Valley	55-57	40-43	Late-Cretaceous Bearpaw Shale and Buggy Creek alluvium	NGPAS
Valley	66-72	7-63	Cherry Creek glacial/alluvial sediments	AA
Valley	77-85	10-40	Porcupine Creek and Milk River alluvium	AA
Valley	88	7-22	Milk River/Missouri River alluvial sediments	AA
McCone	94	15	Late-Cretaceous Fox Hills Formation	NGPAS
McCone	99	26	Late-Cretaceous Hell Creek Formation	NGPAS
McCone	109	0	Late-Cretaceous Hell Creek Formation	NGPAS
McCone	119	20-30	Fort Union sands and Flying V Creek alluvium	NGPAS/AA
McCone	122-123	<50	Figure Eight Creek alluvium	AA
McCone	133-153	10-45	Fort Union sands; Redwater River alluvium; Buffalo Springs Creek alluvium; glacial drift	NGPAS/AA
Dawson	159-160	10-50	Fort Union sands	NGPAS
Dawson	166-180	10-45	Clear Creek alluvium	AA
Dawson	186-195	4-38	Clear Creek alluvium; Yellowstone River alluvium	AA
Prairie	201-205	0-15	Cabin Creek alluvium	AA
Prairie	209-214	18-40	Alluvium of merging creeks	AA
Fallon	227	<50	Dry Fork Creek alluvium	AA
Fallon	231-234	0	Glacial drift/alluvium	AA
Fallon	235-238	18-45	River alluvium of Dry Creek and its tributaries	AA
Fallon	242-250	5-26	Sandstone Creek and Butte Creek alluvium	AA
Fallon	257-262	0-37	Hidden Water Creek; Little Beaver Creek alluvium	AA
Fallon	264-272	0	Mud Creek and Soda Creek alluvium	AA
Fallon	275-279	0	North and South Coal Bank Creek alluvium	AA
Fallon	281-282	<50	Box Elder Creek alluvium	AA
South Dakota				
Harding	289-290	<50	Shaw Creek alluvium	AA
Harding	291-292	<50	Little Missouri River alluvium	AA
Harding	298-301	<50	Various creeks -alluvium	AA
Harding	304-306	<50	Jones Creek alluvium	AA

State/County	Approximate Milepost or Range[a]	Approximate Depth to Groundwater (feet bgs[b])	Formation/Aquifer	Regional Aquifer Group[d]
Harding	317-319	15-40	South Fork Grand River alluvium	AA
Harding	322-324	<50	Buffalo Creek/Clarks Fork Creek alluvium	AA
Harding	329	<50	West Squaw Creek alluvium	AA
Harding	339	20	Red Butte Creek alluvium	AA
Harding/Butte	351-355	<50	North Fork Moreau River alluvium	AA
Meade	380-387	15-45	Tertiary or alluvial	NGPAS/AA
Meade	390-394	25	Tertiary or alluvial	NGPAS/AA
Meade	399	18	Sulphur Creek alluvium	AA
Meade	403-404	14-44	Spring Creek alluvium	AA
Meade	407-408	14	Red Owl Creek alluvium	AA
Meade	411	3	Narcelle Creek alluvium	AA
Meade	425	5	Cheyenne River alluvium	AA
Pennington/ Haakon	432-437	<50	Alluvial	AA
Haakon	442	12	Alluvial	AA
Haakon	475	37	Alluvial	AA
Haakon	478-481	14-25	Bad River alluvium	AA
Jones	518-519	6	Alluvial	AA
Lyman	535-536	6	White River alluvium	AA
Tripp	539	23	Ogallala Formation	NHPAQ
Tripp	561-564	3-9	Ogallala Formation	NHPAQ
Tripp	570 -595	6-25	Ogallala Formation	NHPAQ
Nebraska				
North Central Tableland Groundwater Region[c]				
Keya Paha	614-617	20-50	Keya Paha River alluvium	AA
Boyd	617-622	20-50	Keya Paha River alluvium	AA
Boyd	623-626	20-50	Various creeks—alluvial	AA
Holt	626-627	20-50	Various creeks—alluvial	AA
Holt	628-632	20-50	Tablelands alluvium	NHPAQ/AA
Holt	632-633	10-15	Various creeks—alluvial	AA
Holt	633	15-20	Various creeks—alluvial	AA
Holt	633-634	20-50	Tablelands alluvium	NHPAQ/AA
Holt	634.5	15-20	Tablelands alluvium	NHPAQ/AA
Holt	635.5-637	20-50	Tablelands alluvium	NHPAQ/AA
Holt	637-638	20-50	Tablelands alluvium	NHPAQ/AA
Holt	638.5	15-20	Tablelands alluvium	NHPAQ/AA
Holt	638.5-641	10-15	Tablelands alluvium	NHPAQ/AA
Holt	641.5	15-20	Tablelands alluvium	NHPAQ/AA
Holt	641.5-650	20-50	Tablelands alluvium	NHPAQ/AA
North Central Tableland/Sand Hills Groundwater Region[c]				
Holt	651	20-50	Tablelands alluvium	NHPAQ/AA
Sand Hills Groundwater Region[c]				
Holt	651.5-655	20-50	Tablelands alluvium	NHPAQ/AA
Holt	655-657	20-50	Tablelands alluvium	NHPAQ/AA

State/County	Approximate Milepost or Range[a]	Approximate Depth to Groundwater (feet bgs[b])	Formation/Aquifer	Regional Aquifer Group[d]
Holt	657-658	20-50	Tablelands alluvium	NHPAQ/AA
Holt	658.5	15-20	Tablelands alluvium	NHPAQ/AA
Holt	658.5-659	15-20	Tablelands alluvium	NHPAQ/AA
Holt	659.5	15-20	Tablelands alluvium	NHPAQ/AA
Holt	659.5-660	20-50	Tablelands alluvium	NHPAQ/AA
Holt	660-661	20-50	Tablelands alluvium	NHPAQ/AA
Holt	661-663	20-50	Tablelands alluvium	NHPAQ/AA
Holt	663-665	20-50	Various creeks - alluvial	AA
Holt	665-666	20-50	Various creeks - alluvial	AA
Holt	666-667	15-20	Tablelands alluvium	NHPAQ/AA
Holt	667.5	20-50	Tablelands alluvium	NHPAQ/AA
Holt	667.5-672	20-50	Tablelands alluvium	NHPAQ/AA
Holt	676-677	20-50	Tablelands alluvium	NHPAQ/AA
Antelope	680-682	20-50	Tablelands alluvium	NHPAQ/AA
East Central Dissected Plains Groundwater Region[c]				
Antelope	710-718	20-50	Tablelands alluvium/Elk Horn River alluvium	NHPAQ/AA
Boone	742-745	20-50	Various creeks—alluvial	AA
Boone	745-746	20-50	Tablelands alluvium	NHPAQ/AA
Boone	747-749	20-50	Tablelands alluvium/various creeks alluvium	NHPAQ/AA
Platte River Valley Groundwater Region[c]				
Nance	761-762	20-50	Loup River alluvium	AA
Nance	762-763	15-20	Loup River alluvium/various river alluvium	AA
Nance	763-765	5-10	Loup/Platte River alluvium	AA
Nance	765-766	5-10	Loup/Platte River alluvium	AA
Nance	766.5	10-15	Loup/Platte River alluvium	AA
Nance	767	5-10	Loup/Platte River alluvium	AA
Merrick	767.5	5-10	Loup/Platte River alluvium	AA
Merrick	767.5-771.5	10-15	Loup/Platte River alluvium	AA
Merrick	771.5-774	5-10	Loup/Platte River alluvium	AA
Merrick	774-775	10-15	Platte River alluvium	AA
Polk	775.5	10-15	Platte River alluvium	AA
Polk	778	20-50	Platte River alluvium	AA
Southeast Nebraska Glacial Drift Groundwater Region[c]				
Saline	840-844	20-50	Glacial drift alluvium	AA

Source: Based on available well data from NDNR 2012, SDDENR 2012a, and Montana Bureau of Mines and Geology 2012.

[a] Mileposts for the Project start at 0.0 at the Canada/Montana border, and increase toward the south along the pipeline route.
[b] bgs = below ground surface.
[c] State Groundwater Regions from University of Nebraska 1998.
[d] AA = Alluvial aquifer; NHPAQ = Northern High Plains Aquifer; NGPAS = Northern Great Plains Aquifer System.

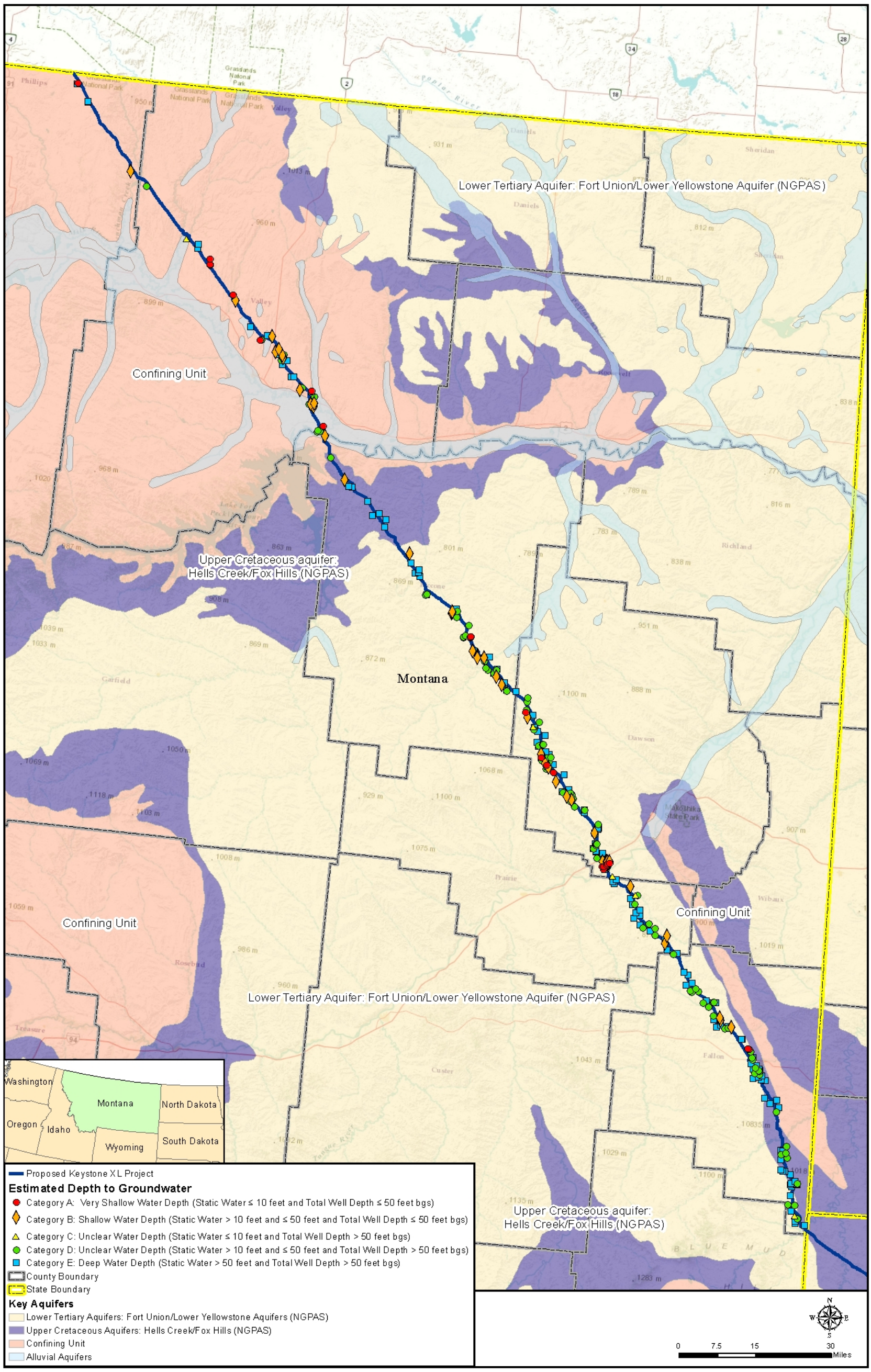
Information on groundwater occurrence, depth to groundwater, and groundwater use (wells) along the proposed pipeline area has been collected and summarized in this section to provide context for understanding potential impacts to groundwater quality that may occur during the construction and operation phases of the proposed pipeline. The analysis of local aquifer and groundwater use along the proposed pipeline area includes information on the likely occurrence of relatively shallow potable groundwater and water wells within 1 mile of the proposed pipeline centerline. This information was compiled using publicly available and searchable databases maintained by water resource agencies within each of the affected states.

The databases were searched for domestic, irrigation, and public water supply well data. The analysis of impacts on water supplies for human consumption also applies to water intakes for industrial and municipal use. Data accessed included well location, well total depth, and depth to first water (if available) or static water level. Because the screened intervals of the wells are not typically recorded in the well data obtained from the states, it is not possible in all cases to correlate static water level to likely depth to first water. In other words, it could not be determined whether the aquifers tapped by the individual wells are confined or unconfined. To provide the most conservative well data evaluation, groundwater in each of the aquifers intercepted by the wells is considered present under unconfined conditions; therefore, depth to water measured in the wells is assumed to be equal to the depth of first water.

Water well data compiled within 1 mile of the proposed pipeline centerline are shown in Figures 3.3.2-2, 3.3.2-3, and 3.3.2-4, respectively. Given the available data limitations and variations in data quality from state to state, the following five general categories that relate well depth and reported water levels (first water or static water level) to likely water depth were created. Water wells without recorded total depths or depth to water were excluded for use in generating the following categories:

- Category A: Very shallow water depth likely with reported water level less than or equal to 10 feet bgs and total well depth less than or equal to 50 feet bgs;
- Category B: Shallow water depth likely with reported water level between 10 and 50 feet bgs and total well depth less than or equal to 50 feet bgs;
- Category C: Water depth unclear, but potentially very shallow because reported water level is less than or equal to 10 feet bgs and total well depth is greater than 50 feet bgs (reported water level could indicate very shallow water depth if well screened in upper 50 feet or deep water depth if well screened at deeper interval under artesian conditions);
- Category D: Water depth unclear, but potentially shallow because reported water level is between 10 and 50 feet bgs and total well depth is greater than 50 feet bgs (reported water level could indicate shallow water depth if well screened in upper 50 feet or deep water depth if well screened at deeper interval under artesian conditions); and
- Category E: Deep water depth likely with reported water level greater than 50 feet bgs and total well depth greater than 50 feet bgs.

The following subsections present, by state, more detailed information on key shallow aquifers that the proposed pipeline area would cross, a summary of wells near the proposed pipeline area, additional information on depth to groundwater, and a summary of water quality in the shallow aquifers.



Source: Montana Bureau of Mines and Geology 2012.

Figure 3.3.2-2 Montana Water Wells Within 1 Mile of Proposed Pipeline Route

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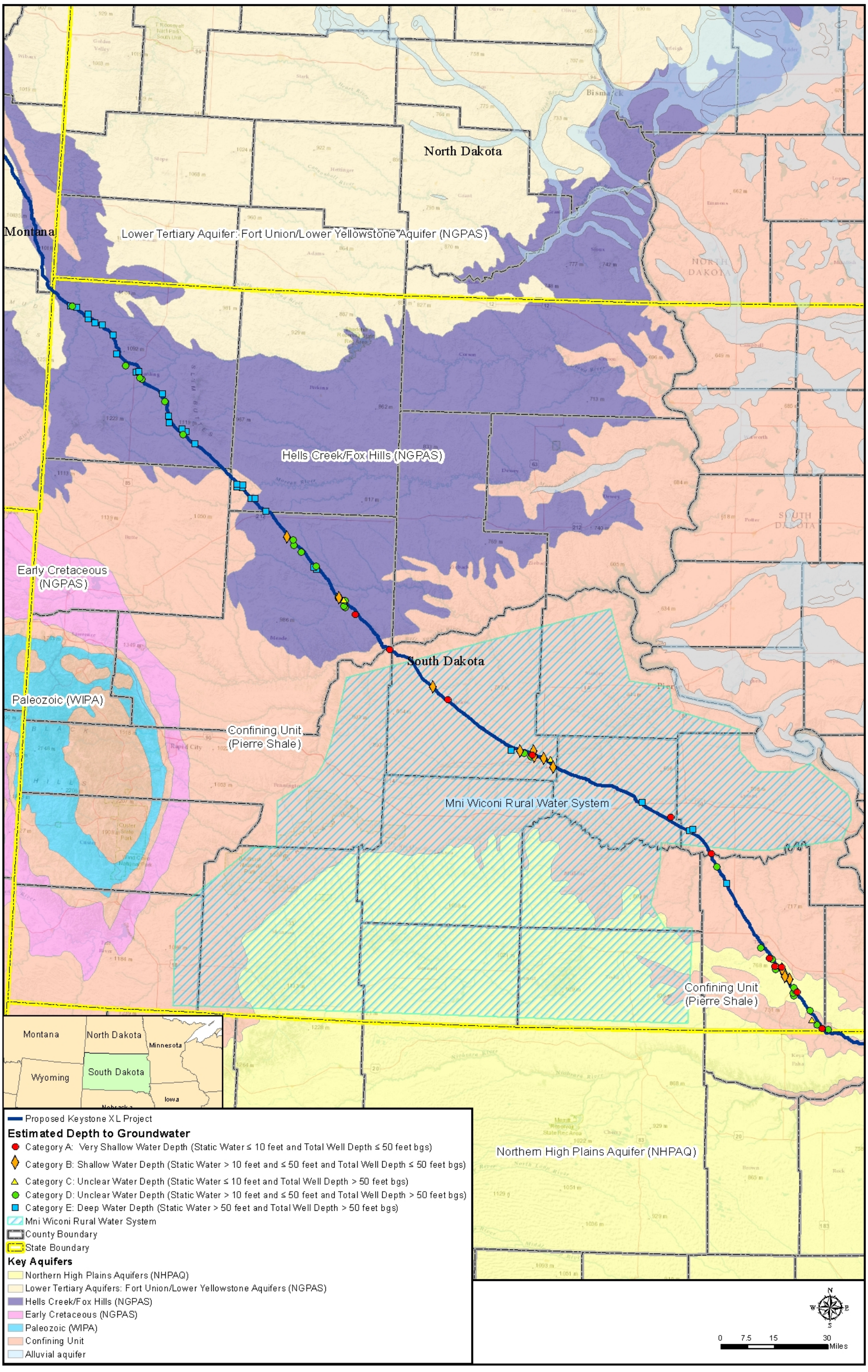

Source: SDDENR 2012a.

Figure 3.3.2-3 South Dakota Water Wells Within 1 Mile of Proposed Pipeline Route

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Source: Nebraska Department of Natural Resources 2012a.

Figure 3.3.2-4 Nebraska Water Wells Within 1 Mile of Proposed Pipeline Route

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Montana

Key Aquifers

The bedrock aquifers beneath the proposed pipeline area in Montana are part of the NGPAS (Whitehead 1996). Along the pipeline area in Montana, most aquifers used for water supply consist of unconsolidated fluvial and/or glacial alluvial aquifers, and Tertiary- and Late Cretaceous-aged aquifers of the NGPAS. Figure 3.3.2-2 shows the distribution of these aquifers in the pipeline area of Montana.

In Phillips and Valley counties in northern Montana, up to 100 feet of relatively impermeable glacial till acts as a confining layer above the Cretaceous-aged Bearpaw Shale, Judith River Formation, and Clagett Formation (Whitehead 1996). Well data indicate groundwater in the Bearpaw Shale, where present, is typically shallow-to-moderate depth (0 to 45 feet bgs) and no information regarding well yields is presented. The water table in the Judith River Formation is present at approximately 150 to 500 feet bgs in this area and wells from the formation typically yield 5 to 20 gpm. Additionally, the glacial till contains local permeable zones of coarse glacial outwash less than 50 feet bgs that provide irrigation water. Most groundwater use in Valley County comes from shallow alluvial aquifers along major river drainages such as the Milk River and Missouri River (Whitehead 1996).

In McCone County, the proposed pipeline area crosses the Late Cretaceous Hells Creek/Fox Hills aquifer and the Tertiary Fort Union aquifer. Permeable sandstones of the Hells Creek/Fox Hills aquifer yield 5 to 20 gpm; most wells are drilled to depths of 150 to 500 feet bgs (Whitehead 1996). The Tertiary Fort Union aquifer consists of interbedded sandstones, mudstones, shale, and coal seams. Water-bearing zones are found in the sandstone layers and the aquifer is confined in most areas. Well yields are typically 15 to 25 gpm; most wells are drilled to depths of 50 to 300 feet bgs (Lobmeyer 1985); water depths typically range from 100 to 150 feet bgs (Swenson and Durum 1955).

Beneath the proposed pipeline area in Dawson, Prairie, and Fallon counties lies the Lower Yellowstone aquifer system which contains groundwater in the Tertiary Fort Union Formation. The Lower Yellowstone aquifer system is a shallow bedrock aquifer that is used as a groundwater resource in these three counties. The Yellowstone River contains abundant alluvial material along its banks, which contain shallow aquifers within the unconsolidated alluvium that are often used for water supply. Well yields in these shallow alluvial aquifers along the Yellowstone River range from 50 to 500 gpm (LaRocque 1966). Additionally, shallow alluvial aquifers are also present at stream crossings including Clear Creek, Cracker Box/Timber Creek, Cabin Creek, Sandstone Creek, and Butte Creek.

Nearby Public Water Supply Wells and Private Water Wells

No public water supply (PWS) wells or source water protection areas (SWPA) are located within 1 mile of the proposed pipeline area in Montana. A total of six private water wells are located within approximately 100 feet of the proposed pipeline area within McCone, Dawson, Prairie, and Fallon counties. All identified wells within 1 mile of the proposed Project area in Montana are included on Figure 3.3.2-2.

Depth to Groundwater

Depths to groundwater reported on well logs for well locations within 1 mile of the proposed pipeline area in Montana are provided in Figure 3.3.2-2. The number of wells within 1 mile of the proposed pipeline by groundwater depth category is as follows:

- Category A (very shallow)—23
- Category B (shallow)—52
- Category C (unclear but potentially very shallow)—7
- Category D (unclear but potentially shallow)—106
- Category E (deep)—138

Water Quality

Available water quality information for several aquifers present along the proposed pipeline area in Montana is included in Table 3.3-2. Available studies and reports indicate that water within these aquifers exhibits moderate to high total dissolved solids (TDS) concentrations that are typically related to high salinity and dissolved carbonates. The overall upward gradient and resulting upward movement of groundwater from deeper, more saline aquifers into the overlying aquifers is a primary source of TDS in shallow groundwater in the proposed pipeline area in Montana. In general, aquifer systems that are deep and occur in older rock formations have high TDS.

Table 3.3-2 Groundwater Quality of Select Subsurface Aquifers

Aquifer	Regional Aquifer Group[a]	State	County	Total Dissolved Solids (mg/L)[b,c]	Other Water Quality Information[d]
Judith River Formation	NGPAS	MT	Phillips, Valley	500-10,000	Sodium chloride rich in Valley County
Missouri River Alluvium	AA	MT	Valley	800-2,700	na
Hells Creek/Fox Hills	NGPAS	MT	McCone	500-1,800	Sodium bicarbonate rich
Fox Hills	NGPAS	MT	Dawson, Prairie, Fallon	500-2,500	Sodium bicarbonate rich
Fort Union	NGPAS	MT	McCone, Dawson, Prairie, Fallon	500-5,000	Sodium bicarbonate rich
Yellowstone R. Alluvium	AA	MT	Dawson, Prairie, Fallon	1,000-1,500	Calcium bicarbonate rich
Hells Creek/Fox Hills	NGPAS	SD	Harding, Perkins, Meade	1,000-3,000	Sodium bicarbonate rich
Ogallala Formation	NHPAQ	SD	Tripp	<500	Sodium bicarbonate rich
Pleistocene River Terrace	AA	SD	Tripp	30-4,000	na
White River Alluvium	AA	SD	Tripp	287-688	Sodium bicarbonate rich

Aquifer	Regional Aquifer Group[a]	State	County	Total Dissolved Solids (mg/L)[b,c]	Other Water Quality Information[d]
Ogallala Formation	NHPAQ	NE	Keya Paha	100-250	na
Sand Hills Unit	NHPAQ/ AA	NE	Rock-Greeley	<500	na
Ogallala Formation	NHPAQ	NE	Greeley-Nance	<500	na
Platte River Unit	NHPAQ/ AA	NE	Merrick	<500	na
Eastern Nebraska Unit	NHPAQ/ AA	NE	Merrick-Jefferson	<500	na

Source: Lobmeyer 1985, Swenson and Drum 1955, Smith et al. 2000, LaRocque 1966, Whitehead 1996, Rich 2005, Hammond 1994, Cripe and Barari 1978, Newport and Krieger 1959, Stanton and Qi 2007.

[a] NGPAS = Northern Great Plains Aquifer System; AA = Alluvial aquifer; NHPAQ = Northern High Plains Aquifer
[b] mg/L = milligrams per liter
[c] Total Dissolved Solids are classified as a secondary contaminant by the Environmental Protection Agency with a non-mandatory standard of 500 mg/L
[d] na = not available

South Dakota

Key Aquifers

In northwestern South Dakota, bedrock aquifers beneath the proposed pipeline area are part of the NGPAS (Whitehead 1996), and along the southern border with Nebraska, the proposed pipeline area passes through an area underlain by the Ogallala Formation of the NHPAQ. The distribution of key aquifers in South Dakota is shown in Figure 3.3.2-3. These aquifers include the Late Cretaceous Fox Hills and Hells Creek aquifers in Harding, Perkins, and Meade counties. The town of Bison uses groundwater from the Fox Hills aquifer to meet water supply demands.

These municipal wells are 565 to 867 feet deep and yield up to 50 gpm (Steece 1981). Shallow alluvial aquifers are also present at stream crossings including the Little Missouri River, South Fork Grand River, Clarks Fork Creek, Moreau River, Sulphur Creek, Red Owl Creek, Narcelle Creek, and Cheyenne River.

In Haakon, Jones, and Lyman counties, major water-producing aquifers are not present, as the proposed route through this area is underlain by the aquitard-forming rocks of the Late Cretaceous Pierre Shale, and groundwater below the Pierre shale in the rocks of the NGPAS and the GPA is typically very saline. In this area, the floodplains of the Bad River and the White River contain shallow alluvial aquifers that are used for water supply.

Beneath a short segment of the proposed pipeline area in Tripp County, groundwater is present within the Ogallala Formation of the NHPAQ and in Pleistocene-aged river terrace aquifers (Whitehead 1996). Tertiary-aged aquifers in the vicinity also include Brule and Arikaree Formations, but the proposed pipeline area does not cross these formations. The Ogallala Formation's depth to groundwater is typically 10 to 70 feet bgs (Hammond 1994) in this area with wells yielding 250 to 750 gpm.

Nearby Public Water Supply Wells and Private Water Wells

One PWS well (associated with the Colome SWPA) is identified within 1 mile of the proposed pipeline area in Tripp County. This PWS well is screened at a relatively shallow depth (reportedly less than 54 feet bgs) within the Tertiary Ogallala Formation. The proposed pipeline area would pass through the Colome SWPA in Tripp County. No private water wells are located within approximately 100 feet of the proposed pipeline area in South Dakota. All identified wells within 1 mile of the proposed Project area in South Dakota are included on Figure 3.3.2-3.

The Mni Wiconi Project brings surface water from the Missouri River to the Pine Ridge Indian Reservation and other parts of western South Dakota. The project is designed to supplement the Mni Wiconi Rural Water System, which consists of hundreds of shallow municipal and private wells in southwestern South Dakota, some of which are near or within the proposed Project area (see Figure 3.3.2-3). The Mni Wiconi Project will use a proposed surface water intake on the Missouri River to provide potable water to the Mni Wiconi Rural Water System and to replace the poor water quality of shallow wells within the area. The Mni Wiconi Project is discussed in more detail in Section 3.3.3.2, South Dakota Surface Water.

Depth to Groundwater

Depths to groundwater reported on well logs for well locations within 1 mile of the proposed pipeline area in South Dakota are provided in Figure 3.3.2-3. The number of wells within 1 mile of the proposed pipeline by groundwater depth category is as follows:

- Category A (very shallow)—11
- Category B (shallow)—12
- Category C (unclear but potentially very shallow)—4
- Category D (unclear but potentially shallow)—30
- Category E (deep)—30

Water Quality

Available water quality information for several aquifers present along the proposed pipeline area in South Dakota is shown in Table 3.3-2. Available studies and reports indicate that, in general, water within the NGPAS aquifers and some younger aquifer areas exhibit moderate levels of TDS. The overall upward gradient of groundwater from deeper, more saline aquifers into the upper aquifers is a primary source of TDS in the shallow groundwater in the proposed pipeline area in South Dakota. In the area of the Mni Wiconi Rural Water System area, where the NHPAQ is present as the Ogallala Formation or Quaternary alluvium, elevated concentrations of nitrate are common in shallow groundwater. Hammond (1994) reports nitrate concentrations up to 67.3 milligrams per liter (mg/L) in wells near the proposed pipeline area. The USEPA Maximum Contaminant Level for nitrate in drinking water is 10 mg/L. A primary driver in the development of the Mni Wiconi Rural Water System was to provide alternate water sources to areas with groundwater quality concerns (U.S. Bureau of Reclamation [undated]). Where the NHPAQ or outlying smaller alluvial aquifers are not present, groundwater yields are typically low because the area is underlain by the fine-grained Pierre Shale.

Nebraska

Key Aquifers

Much of the proposed pipeline area in Nebraska overlies the NHPAQ system, which supplies 78 percent of the public water supply and 83 percent of irrigation water in Nebraska (Emmons and Bowman 2000). In Nebraska, the NHPAQ system includes six main hydrogeologic units, including the Tertiary Brule Formation, Arikaree Group, and Ogallala Formation, and Quaternary/Recent alluvium of the Eastern Nebraska Unit, the Platte River Valley Unit, and the Sand Hills Unit. The distribution of these aquifers in the proposed pipeline area is illustrated on Figure 3.3.2-4. The proposed pipeline route would extend 274 linear miles through areas underlain by the NHPAQ system. The pipeline would immediately overlie 98 miles of the Eastern Nebraska Unit, 88 miles of the Ogallala Formation, 16 miles of the Platte River Valley Unit, and 72 miles of the Sand Hills Unit (see Figure 3.3.2-4).

In the High Plains Aquifer, which includes the NHPAQ system, hydraulic conductivity (a measurement of the rate of movement of water through a porous medium such as an aquifer at a hydraulic gradient of 1:1) ranges from 25 to 100 feet per day (ft/d) and averages 60 ft/d (Weeks et al. 1988). In general, groundwater in the High Plains Aquifer flows from west to east at a velocity (which also takes into account the hydraulic gradient, i.e., slope of the water table) of 1 ft/d (Luckey et al. 1986).

The soils of the Sand Hills Unit of the NHPAQ system are derived primarily from aeolian dune sands and are characterized by very low organic and clay/silt fractions. According to the U.S. Geological Survey (USGS), the hydraulic conductivity of the NHPAQ is relatively low, particularly in the Sand Hills north of the Platte River (Gutentag et al. 1984, Luckey et al. 1986). The aquifer material in this region is composed mainly of fine sands and silts with low hydraulic conductivity that underlie the typically unsaturated dune sands (Luckey et al. 1986).

Hydraulic conductivity estimates for the Sand Hills Unit of the NHPAQ system are variable, with a high of 50 ft/d (Gutentag et al. 1984) and a low of 10 ft/d (Bleed and Flowerday 1998). Assuming an average groundwater gradient of 0.002 in the eastern portion of the Sand Hills Unit of the NHPAQ system in Nebraska (from Bleed and Flowerday 1998), and assuming the maximum estimated hydraulic conductivity of 50 ft/d, the groundwater flow velocity in that portion of the NHPAQ system averages around 0.1 ft/d.

Along the proposed pipeline area south of the Sand Hills Unit, much of the soils originate in part from glacial loess and drift deposits. The fine-grained loess deposits can be as thick as 200 feet and can locally restrict water flow where fractures are absent (Stanton and Qi 2007, Johnson 1960).

Certain areas within the Ogallala Formation of the NHPAQ system contain soils or lithologic zones that inhibit downward migration (Gurdak et al. 2009). In these areas, transport of dissolved chemicals from the land surface to the water table is slower, taking decades to centuries (Gurdak et al. 2009). Even in these areas, however, localized preferential flow paths do exist that could enable dissolved chemicals to move at an increased rate through the unsaturated zone to the water table. These units with lower permeability are more likely to be present beneath topographic depressions where precipitation or surface water collects as a result of the lower infiltration rates through these units. These areas within the Ogallala Formation of the NHPAQ system consist of geologic units composed of unconsolidated sand, gravel, clay, and silt along

with layers of calcium carbonate and siliceous cementation (Stanton and Qi 2007). According to the USGS water quality report, a zone of post-deposition cementation is present in many of these areas near the top of the Ogallala Formation, creating an erosion-resistant ledge. The Ogallala Formation also contains localized ash beds. These cementation zones and ash layers would serve as localized aquitards within the Ogallala Formation and would tend to inhibit vertical migration.

The water quality in the NHPAQ system is suitable for drinking and as irrigation water, but impacts from farming operations are present in areas of shallow groundwater (Stanton and Qi 2007). In areas where crop irrigation occurs and shallow groundwater is present, elevated levels of fertilizers, pesticides, and herbicides, including nitrate and atrazine, have been reported. Concentrations of these constituents are generally higher in the near-surface groundwater.

In Keya Paha County (northern Nebraska), wells yielding 100 to 250 gpm are reported from the NHPAQ and alluvial aquifers present in the Keya Paha and Niobrara River valleys (Newport and Krieger 1959). The Niobrara River, which receives groundwater recharge from surrounding aquifers, is also used as a source of irrigation and municipal water supply.

In Boyd County, the proposed pipeline area is underlain by the Ogallala Formation, the aquitard Pierre Shale, and alluvial aquifers present in the Keya Paha and Niobrara River valleys. In northern Holt County and through most of Nance County, the proposed pipeline area is again underlain by the NHPAQ system (Sand Hills Unit over the Ogallala Formation). The Sand Hills Unit typically has a water table aquifer and a depth to groundwater of less than 30 feet bgs (Stanton and Qi 2007), as is reflected in the shallow aquifer inventory in Table 3.3-1. Alluvial aquifers are also present along the Elkhorn River and tributaries of the Loup River and in areas of the Sand Hills Unit, which in this area consists of mixed aeolian and fluvial deposits mantling the upper Ogallala Formation.

In southernmost Nance County, the proposed pipeline area is underlain by undivided Tertiary and Quaternary/Recent alluvial sediments of the NHPAQ system (Eastern Nebraska Unit). At the Nance/Merrick County line, the proposed pipeline area enters the Platte River alluvium, which includes alluvium accumulated in the valleys of the Platte and Loup Rivers, used for irrigation, domestic, and municipal water supply in the area.

The proposed pipeline route exits the Platte River alluvium in Polk County and re-enters the Eastern Nebraska Unit of the NHPAQ system, which is used for irrigation, domestic, and municipal water supply. The public water supply for Hordville, approximately 7 miles west of the proposed pipeline route, comes from wells screened within this aquifer at depths ranging from 160 to 262 feet bgs (Keech 1962).

From York to Jefferson counties, the depth to groundwater averages 80 feet bgs within the Eastern Nebraska Unit of the NHPAQ system (Stanton and Qi 2007). Additionally, the proposed pipeline area crosses alluvial aquifers along Beaver Creek, the West Fork of the Big Blue River, and the alluvial floodplain of the South Fork Turkey Creek.

Nearby Public Water Supply Wells and Private Water Wells

A total of 38 known PWS wells are present within 1 mile of the proposed pipeline area in Boone, York, Fillmore, Saline, and Jefferson counties. The nine SWPAs within 1 mile of the proposed pipeline area include those for the towns of St. Edward, Bradshaw, York, McCool Junction, Exeter, Western, Jansen, and Steele City, and the Rock Creek State Park. The only SWPA traversed by the proposed pipeline area in Nebraska is in Steele City, Jefferson County. A total

of 14 private water wells are located within approximately 100 feet of the proposed pipeline area within Antelope, Polk, York, Fillmore, and Jefferson counties. All identified wells within 1 mile of the proposed Project area in Nebraska are included on Figure 3.3.2-4.

The Clarks wellhead protection area along the Platte River is described as containing 30 feet or less of shallow alluvial materials in the Platte River valley. This thin alluvial material is underlain by the Pierre Shale which acts as a confining layer for the wellhead protection area. The proposed pipeline route is approximately 3.5 miles downgradient of the wellhead protection area.

A previous potential Project alignment intersected the SWPA for the town of Western, Nebraska. The Western Alternative was developed to avoid the wellhead protection area near the city of Western, and the current Project alignment is now located at least 0.5 mile upgradient of the Western SWPA near the city of Western.

Depth to Groundwater

Depths to groundwater reported on well logs for existing well locations within 1 mile of the proposed pipeline area in Nebraska are provided in Figure 3.3.2-4. The number of wells within 1 mile of the proposed pipeline by groundwater depth category is as follows:

- Category A (very shallow)—193
- Category B (shallow)—86
- Category C (unclear but potentially very shallow)—44
- Category D (unclear but potentially shallow)—596
- Category E (deep)—1,205

Additionally, a USGS analysis suggests that depth to groundwater in the NHPAQ system is variable and ranges from 0 to 272 feet bgs (Stanton and Qi 2007). The median depths to groundwater in the NHPAQ units that would be crossed by the proposed pipeline area in Nebraska are listed for each formation:

- Ogallala Formation—110 feet bgs
- Eastern Nebraska Unit—79 feet bgs
- Sand Hills Unit—20 feet bgs
- Platte River Valley Unit—5 feet bgs

The well locations where estimated groundwater depth falls within Categories A and C can be used to estimate the distance along the proposed pipeline area in Nebraska where water depths less than or equal to 10 feet bgs could be encountered. These data suggest that approximately 16 miles of the proposed pipeline area in Nebraska could encounter groundwater at depths less than or equal to 10 feet bgs (see Figure 3.3.2-4). Most of these areas are present in the Sand Hills Unit and the Platte River Valley Unit and overlie the deeper Ogallala Formation.

Water Quality

Available water quality information for several aquifers present along the proposed pipeline area in Nebraska is included in Table 3.3-2. Available studies and reports indicate that, in general, water within the NHPAQ and alluvial aquifers in the state exhibit low concentrations of TDS, making the water in the shallow aquifers generally suitable for irrigation, potable, and industrial uses. Groundwater in deeper aquifers in Nebraska (GPA and WIPA) is typically moderately to highly saline and generally is not extracted for use in the vicinity of the proposed pipeline area.

Of the over 96,000 groundwater quality samples collected from Nebraska wells between 1974 to 2010, 33 percent contained over 10 mg/L nitrate (the federal drinking water standard), and 15 percent of the samples contained over 20 mg/L nitrate. Sample 2007 data distribution indicate that groundwater in wells along much of the proposed pipeline area in Nebraska contains nitrate at concentrations greater than 10 mg/L (Nebraska Department of Environmental Quality [NDEQ] 2011).

3.3.3 Surface Water

This section describes the streams and rivers the proposed pipeline would cross by state, including their water quality use classifications and impairments. Surface water features classified as either open water or riverine are addressed in the Wetlands portion of this document, Sections 3.4 and 4.4. Additionally, waterbodies that are present within 10 miles downstream of waterbody crossings along the proposed route are documented, as well as surface drinking water supplies within 1 mile of the proposed pipeline right-of-way (ROW). Potential impacts due to ancillary features such as access roads or valve locations are described by state. A pipe storage and staging location in North Dakota would not impact any surface water features. The proposed pipeline improvements include two proposed pump stations in Kansas; additional relevant information regarding the pump stations in Kansas is pending and will be included in this review as part of the Final Supplemental EIS.

3.3.3.1 Montana Surface Water

The proposed pipeline ROW would traverse a physiographic region commonly referred to as the northern Great Plains Province, which includes a glaciated section of the Missouri Plateau and is characterized by generally treeless, gently rolling terrain broken by buttes and a network of young perennial[2] and intermittent[3] streams, and small isolated mountain ranges (Wiken et al. 2011). North of the Missouri River, the proposed pipeline route traverses the southern extent of glaciation by continental ice sheets associated with the late Wisconsin stage approximately 35,000 to 11,150 years ago (Fullerton et al. 2004). The relatively young glacial terrain is characterized by ground and frontal moraines and a mosaic of small lakes (kettles) and prairie potholes. Moving southward past Fort Peck Reservoir through McCone County marks the beginning of the non-glaciated portion of the Missouri Plateau. Here, the terrain consists of more

[2] A perennial stream, river, pond, or lake exhibits continuous flow in its stream bed or a volume of open water including a frozen surface all year round during periods of normal precipitation.
[3] An intermittent or seasonal stream, river, pond, or lake exists for longer periods, but not year-round and may be influenced by groundwater contributions.

deeply entrenched stream networks cutting through mostly older sedimentary formations of the late Cretaceous and Tertiary period.

In eastern Montana, the wettest month of the year is typically June. Flooding occurs primarily in May and June when the effects of rains are multiplied by runoff from snow melt in the mountains (USGS 2012c). Flooding is sometimes caused by ice jam blockage or gorging in the winter; flash floods, triggered by large convective thunderstorms in the summer, are also typical in the area.

Waterbodies Crossed

There are 459 waterbody crossings along the proposed pipeline route in Montana, as presented in Appendix D, Waterbody Crossing Tables and Required Crossing Criteria for Reclamation Facilities, Table 1. Of the 459 crossings, nine are perennial streams, 424 are intermittent streams, 20 are canals, and six waterbodies are identified as either artificial or natural lakes, ponds, or reservoirs. Based on stream width, adjacent topography, adjacent infrastructure, best management practices, permitting, and sensitive environmental areas, four horizontal directional drilling (HDD) constructed crossings are proposed to avoid disturbing the waterbodies listed below:

- Frenchman River in Phillips County (also known as Frenchman Creek) (approximately 135 feet wide, milepost [MP] 25.2);
- Milk River in Valley County (approximately 100 feet wide, MP 83.4);
- Missouri River in Valley and McCone counties (approximately 1,000 feet wide, MP 89.6); and
- Yellowstone River in Dawson County; HDD crossing includes a man-made channel tributary (30 feet), and a Yellowstone River side channel (75 feet) combined with the main Yellowstone River channel (approximately 780 feet wide, MP 198.0).

The remaining 454 waterbodies would be crossed using one of several non-HDD methods described in the Construction, Mitigation, and Reclamation Plan (CMRP) (Appendix G). The crossing method for each waterbody would be depicted on construction drawings, but would ultimately be determined in consultation with Montana Department of Environmental Quality (MDEQ) and other agencies and be based on site-specific conditions at the time of crossing. Qualified individuals[4] would be involved in the permitting process to ensure proper identification of channel migration zones to further aid in selecting the appropriate crossing method, burial depth, and seasonal timing. In addition to the 459 waterbodies crossed by the proposed pipeline, six waterbodies are within the ROW but not crossed by the pipeline.

Several route variations have been proposed to either reduce impacts at a crossing or to address landowner concerns. There are three proposed U. S. Bureau of Reclamation (BOR) canal crossings anticipated, one in Valley County near MP 85 and two in Dawson County between MP

[4] Qualified individuals are professionals or experts competent to evaluate the indicated subjects and/or fields of investigation and assessment such that the proposed Project will provide proper engineering design, environmental, and public safety impact mitigation as dictated by regulation and generally accepted industry practices.

196 and MP 197 (Figure 2.1.1-3). For these crossings, Keystone would apply general design requirements consistent with BOR facility crossing criteria as specified in Appendix G, CMRP.

Waterbodies Classifications

The proposed pipeline ROW would cross a number of streams and rivers with state water quality use descriptions based on their surface water classification or on waterbody type. There are 15 waterbodies with *Surface Water Classifications* or *Use Attainment Assessments* for the proposed route in Montana. Table 3.3-3 presents the names of these waterbodies, organized by county from north to south, and includes their state water quality use designations and use attainment assessment values (MDEQ 2012). The State of Montana has set its water quality standards as a means to define the water quality necessary to protect the defined water uses and to prevent degradation of the water resource. The primary goal is to prevent and remove pollutants; however, Montana has additional protections that are intended to prevent adverse hydrologic effects to the waters of the state.

Table 3.3-3 Streams and Rivers Crossed by Proposed Pipeline in Montana with State Water Quality Designations or Use Designations

Waterbody Name	County	Use Class Description	Use Attainment Assessment[a,b,c]			
			AqL	AG	DW	Rec
Frenchman River	Phillips	Drinking Water; Recreation; Warm Water Non-Salmonid Fishes and associated Aquatic Life; Agricultural/Industrial	P	P	F	P
Rock Creek	Valley	Non-Salmonid	ND	ND	ND	ND
Willow Creek	Valley	Non-Salmonid	ND	ND	ND	ND
Buggy Creek	Valley	Drinking Water; Recreation; Warm Water Non-Salmonid Fishes and associated Aquatic Life; Agricultural/Industrial	P	F	F	F
Cherry Creek	Valley	Drinking Water; Recreation; Warm Water Non-Salmonid Fishes and associated Aquatic Life; Agricultural/Industrial	F	F	F	F
Milk River	Valley	Drinking Water; Recreation; Warm Water Non-Salmonid Fishes and associated Aquatic Life; Agricultural/Industrial	ND	F	N	N
Missouri River	Valley	Drinking Water; Recreation; Cold Water Salmonid Fishes and associated Aquatic Life; Agricultural/Industrial	P	F	F	F
Middle Fork Prairie Elk Creek	McCone	Recreation; Warm Water Non-Salmonid Fishes and associated Aquatic Life; Agricultural/ Industrial; Degradation Prohibited	P	ND	ND	ND
East Fork Prairie Elk Creek	McCone	Recreation; Warm Water Non-Salmonid Fishes and associated Aquatic Life; Agricultural/ Industrial; Degradation Prohibited	P	ND	ND	ND
Redwater River	McCone	Recreation; Warm Water Non-Salmonid Fishes and associated Aquatic Life; Agricultural/ Industrial; Degradation Prohibited	P	ND	ND	F
Yellowstone River	Dawson	Drinking Water; Recreation; Warm Water Non-Salmonid Fishes and associated Aquatic Life; Agricultural/Industrial	P	F	ND	ND
Pennel Creek	Fallon	Recreation; Warm Water Non-Salmonid Fishes and associated Aquatic Life; Agricultural/ Industrial; Degradation Prohibited	P	ND	ND	F

Waterbody Name	County	Use Class Description	Use Attainment Assessment[a,b,c]			
			AqL	AG	DW	Rec
Sandstone Creek	Fallon	Recreation; Warm Water Non-Salmonid Fishes and associated Aquatic Life; Agricultural/Industrial; Degradation Prohibited	P	ND	ND	F
Little Beaver Creek	Fallon	Recreation; Warm Water Non-Salmonid Fishes and associated Aquatic Life; Agricultural/ Industrial; Degradation Prohibited	ND	ND	ND	ND
Boxelder Creek	Fallon	Recreation; Warm Water Non-Salmonid Fishes and associated Aquatic Life; Agricultural/ Industrial; Degradation Prohibited	ND	ND	ND	ND

Source: USGS 2012; MDEQ 2012.

[a] F = Full Support; P = Partial Support; N = Not Supporting; I = Insufficient Information; ND = No Data.
[b] Where the Montana 2012 Integrated Report Appendix A contains a value of X and where there are no entries or blank columns, this table denotes those conditions as ND = No Data.
[c] AqL = Aquatic Life; AG = Agriculture; DW = Drinking Water; Rec = Recreation.

Impaired or Contaminated Waterbodies

Contamination or impairments have been documented in nine sensitive or protected waterbodies that would be crossed by the proposed pipeline in Montana (see Appendix D, Waterbody Crossing Tables and Required Crossing Criteria for Reclamation Facilities, Table 4). Contamination in these waterbodies includes at least one of the following parameters of concern: iron, *E. coli*, lead, mercury, nitrogen (total), phosphorus (total), total Kjeldahl[5] nitrogen (TKN), total dissolved solids, dissolved solids, nitrate/nitrite (nitrite + nitrate as N). Impairments in these waterbodies include: temperature, hydrostructure flow regulation or modification, fish-passage barriers, alteration in stream-side or littoral[6] vegetative cover, chlorophyll-a, low flow alteration, and physical substrate habitat alteration. See Table 3.3-4.

Table 3.3-4 Impaired or Contaminated Waterbodies in Montana

Waterbody Name	Parameters of Concern
Middle Fork Prairie Elk Creek	Alteration in stream-side or littoral vegetative covers, nitrogen (total), phosphorus (total), physical substrate habitat alterations, TKN
East Fork Prairie Elk Creek	Alteration in stream-side or littoral vegetative covers, nitrogen (total), phosphorus (total), physical substrate habitat alterations, TKN
Missouri River	Alteration in stream-side or littoral vegetative covers, other flow regime alterations, temperature, water
Frenchman River	Alteration in stream-side or littoral, vegetative covers, chlorophyll-a, low-flow alterations
Milk River	*E. coli*, lead, mercury
Yellowstone River	Fish-passage barrier

[5] Total Kjeldahl nitrogen or TKN is the sum of organic nitrogen, ammonia (NH3), and ammonium (NH4+) in the chemical analysis of soil or water as determined with the Kjeldahl method of analysis. This measurement is a required metric in regulatory reporting.
[6] Defined for lake shore environments as the vegetated zone that extends from the maximum water surface elevation to shoreline areas that are permanently submerged. Littoral vegetation is typically defined as emergent and anchored to the benthic strata, effective in preventing erosion.

Waterbody Name	Parameters of Concern
Buggy Creek	Iron
Sandstone Creek	Nitrate/nitrite (nitrite + nitrate as N), nitrogen (total)
Pennel Creek	TDS

Source: USGS 2012a; MDEQ 2012.

Water Supplies

Along the proposed pipeline ROW in Montana, municipal water supplies are largely obtained from groundwater sources and are described in Section 3.3.2, Groundwater. No municipal surface water supplies are known to be located within 1 mile of the proposed Project ROW. There are 178 lakes, ponds, or reservoirs, located within 10 miles downstream of a proposed water crossing, with the potential for one or all of the following uses: recreation, livestock watering, or agricultural water supply (see Appendix D, Waterbody Crossing Tables and Required Crossing Criteria for Reclamation Facilities, Table 7). Named waterbodies with a surface area in excess of 10 acres and within the 10-mile downstream range include Lindsay Reservoir and Salsbery Reservoir. Additionally, there are four waterbodies that are unnamed on the NHD with surface areas of 10 acres or larger within the 10-mile downstream range.

3.3.3.2 South Dakota Surface Water

The proposed pipeline ROW traverses the non-glaciated Missouri Plateau physiographic region of South Dakota, which is characterized by rolling plains of shale and sandstone interrupted by occasional buttes. The rolling surface of the non-glaciated Missouri Plateau has many low scarps indicating a geologically old landscape, in contrast to a mantle of glacial till and geologically young landscapes to the north. Some areas resemble dissected, badland terrain and deeply entrenched river breaks (Hogan 1995). Streams are mostly ephemeral[7] and intermittent with a few larger perennial rivers that cross the region from the western mountains (Malo 1997). Many small impoundments along intermittent streams store surface runoff and are used for stock water and/or irrigation water and control. Non-regulated streams and rivers maintain a high sediment load of fine-grained alluvium. Natural surface water flows have been altered by manmade structures creating a significant change in the surface water characteristics. These changes may affect stream bank and bed conditions on which various habitats are based. Flooding occurs primarily in May and June, but peak flows may occur between March and July on many streams depending on seasonal fluctuations in snowpack, precipitation, temperature, and subsequent snow melt (USGS 2012b).

Waterbodies Crossed

There are 333 waterbody crossings along the proposed Project route in South Dakota, which includes 16 perennial streams, 313 intermittent streams, and four man-made impoundments (Appendix D, Waterbody Crossing Tables and Required Crossing Criteria for Reclamation Facilities, Table 3). Based on stream width, adjacent topography, adjacent infrastructure, best

[7] An ephemeral stream, river, pond, or lake is that which only flows or is present for a short period following precipitation or snowmelt.

management practices, permitting, and sensitive environmental areas, five rivers in South Dakota would be crossed using the HDD method:

- Little Missouri River in Harding County (approximately 385 feet wide, MP 295.06);
- Cheyenne River in Meade and Pennington counties (approximately 1,600 feet wide, MP 430.07);
- Bridger Creek in Haakon County (approximately 75 feet wide, MP 433.58);
- Bad River in Haakon County (approximately 145 feet, MP 485.95); and
- White River in Lyman and Tripp counties (approximately 500 feet wide, MP 541.3).

The remaining 327 waterbodies would be crossed using one of several non-HDD methods described in the CMRP (Appendix G). The crossing method for each waterbody would be depicted on construction drawings, but would ultimately be determined in consultation with the South Dakota Department of Environment and Natural Resources (SDDENR) and other agencies and be based upon site-specific conditions at the time of crossing. Qualified individuals would be involved in the permitting process to ensure proper identification of channel migration zones to further aid in selecting the appropriate crossing method, burial depth, and seasonal timing.

In addition to the 333 waterbodies crossed by the centerline of the proposed Project, three waterbodies are present within the ROW for which there is no inlet or outlet indicated by the NHD; these may be potholes[8] or another similar features.

The FEIS stated that BOR water canal crossings would include one crossing in Haakon County near MP 467 and one in Jones County near MP 510 (Figure 2.1.1-4). According to the data sources used to prepare the Supplemental EIS (USGS 2012), it is unclear which canals BOR currently owns and/or operates. Ownership information is pending and will be included in this review as part of the Final SEIS. Prior to construction, Keystone would consult with the canal owner/operator regarding the crossing of any canal infrastructure. Keystone would apply general design requirements consistent with canal owner/operator facility crossing criteria for all canal crossings as specified in Appendix G, CMRP.

Waterbodies Classifications

The proposed pipeline would cross 10 streams and rivers with state water quality use descriptions based on their surface water classification or waterbody type. Table 3.3-5 presents the names of these waterbodies, organized by county from north to south, and includes their state water quality designations.

[8] Potholes, also referred to as kettles, are fluvioglacial landforms resulting from blocks of ice calving from the front of a receding glacier and becoming partially to wholly buried by glacial outwash sediment. Typically these depressions fill with water on a seasonal or intermittent cycle.

Table 3.3-5 Streams and Rivers Crossed by Proposed Pipeline in South Dakota with State Water Quality Designations or Use Designations

Waterbody Name	County	Designated Use	Use Support[a]
Little Missouri River	Harding	Fish/Wildlife Prop, Rec, Stock, Irrigation Waters; Limited Contact Recreation; Warm Water Semipermanent Fish Life	Full; Full; Full; Non
South Fork Grand River	Harding	Fish/Wildlife Prop, Rec, Stock, Irrigation Waters; Limited Contact Recreation; Warm Water Semipermanent Fish Life	Full; Non; Full; Full
Clarks Fork Creek	Harding	Warm water Marginal Fish Life Propagation Waters; Limited Contact Recreation Waters.	Not Assessed
North Fork Moreau River	Butte	Warm water Marginal Fish Life Propagation Waters; Limited Contact Recreation Waters.	Not Assessed
South Fork Moreau River	Perkins	Fish/Wildlife Prop, Rec, Stock, Irrigation Waters; Limited Contact Recreation; Warm water Marginal Fish Life	Non; Non; Full; Full
Pine Creek	Meade	Warm water Marginal Fish Life Propagation Waters; Limited Contact Recreation Waters	Not Assessed
Cheyenne River	Meade	Fish/Wildlife Prop, Rec, Stock; Immersion Recreation; Irrigation Waters; Limited Contact Recreation; Warm water Permanent Fish Life.	Full; Non; Full; Non; Non
Bad River	Haakon	Warm water Marginal Fish Life Propagation Waters; Limited Contact Recreation Waters	Not Assessed
Williams Creek	Jones	Fish/Wildlife Prop, Rec, Stock, Irrigation Waters	Insufficient Data; Insufficient Data
White River	Tripp	Fish/Wildlife prop, Rec, Stock; Irrigation Waters; Limited Contact Recreation; Warm water Semipermanent Fish Life	Full; Full; Non; Full

Source: USGS 2012d; SDDENR 2012b.

[a] Use support listing of No Data represents a basin support value of Not Assessed as reported in the 2012 South Dakota Integrated Report for Surface Water Quality Assessment.

In addition to the streams listed in this table, all streams in South Dakota are assigned the beneficial uses of fish and wildlife propagation, recreation, and stock watering (SDDENR 2012b).

Impaired or Contaminated Waterbodies

Contamination or impairment has been documented in five of these sensitive or protected waterbodies in South Dakota. Table 3.3-6 provides the names of the waterbodies and the contaminant or impairment (see also Appendix D, Waterbody Crossing Tables and Required

Crossing Criteria for Reclamation Facilities, Table 6). Contamination or impairment in these waterbodies includes unacceptable levels of at least one of the following parameters: total suspended solids, TDS, salinity, specific conductance, *E. coli*, and fecal coliform.

Table 3.3-6 Impaired or Contaminated Waterbodies in South Dakota

Waterbody Name	Impairment
Little Missouri River	Suspended Solids
South Fork Grand River	Salinity and Specific Conductance
South Fork Moreau River	Total Dissolved Solids, Specific Conductance
Cheyenne River	*E. Coli* and Fecal Coliform, Total Suspended Solids
White River	*E. Coli*

Source: USGS 2012d; SDDENR 2012b.

Water Supplies

Along the proposed ROW in South Dakota, municipal water supplies are largely obtained from groundwater sources and are described in Section 3.3.2, Groundwater. No municipal surface water supplies are known to be located within 1 mile of the proposed Project ROW.

The Mni Wiconi Project withdraws surface water from the Missouri River in Pierre, South Dakota, to provide potable water to the Mni Wiconi Rural Water System for rural water users southwestern South Dakota. The BOR holds easements and is responsible for the protection of Indian trust assets (ITAs), which Mni Wiconi infrastructure is associated with. The proposed pipeline ROW would cross Mni Wiconi water distribution infrastructure at various locations within the Mni Wiconi Rural Water System. BOR, in conjunction with its tribal partners, may have specific requirements and conditions for energy pipeline crossings. Prior to construction, Keystone would consult with the water system owner/operator regarding the crossing of any water system infrastructure. Keystone would apply general design requirements consistent with BOR facility or infrastructure interfaces and crossings.

In addition, the route would cross tributaries to the Missouri River, the Cheyenne River approximately 100 miles upstream, and the Bad River approximately 44 miles upstream of the Mni Wiconi Project intake. Impacts to the Missouri River system from pipeline spills are addressed in Section 4.13, Potential Releases.

Waterbodies and reservoirs located within 10 miles downstream of a proposed water crossing, with the potential for one or all of the following uses: recreation, livestock watering, or agricultural water supply are summarized in Appendix D, Waterbody Crossing Tables and Required Crossing Criteria for Reclamation Facilities, Table 9. The larger of these waterbodies (those greater than 10 acres) include Lake Gardner and 18 other reservoirs that are unnamed on the U.S. Geological Survey 2012 NHD. The analysis identified approximately 304 additional waterbodies located within 10 miles downstream of a proposed crossing that were less than 10 acres.

3.3.3.3 Nebraska Surface Water

The proposed pipeline ROW would enter north-central Nebraska near the edge of the northern NDEQ-identified Sand Hills Region and the northern High Plains, which are subdivisions of the Great Plains province. The High Plains are remnants of a former fluviatile (produced by rivers)

plane that stretched from the Rocky Mountains to the Central Lowlands physiographic province to the east (Leighty 2001). Streams are typically overloaded with fine-grained sediment, mostly silt and sand with smaller quantities of gravel. Nebraska's rivers of the central High Plains typically flow through broad, flat valleys and deposit and rework sediments forming dynamic and unstable braided channel and transient depositional bars within relatively flat and broad valleys (Wiken et al. 2011). In northern and central Nebraska, the formation of sand dunes has taken place during the later stages of physiographic evolution. Sand dunes occur in many places in the High Plains, but mostly on the leeward sides of rivers, which derive their sand from the braided channels of local and adjacent stream channels. During periods of low water, the surface soils become dry and winds are capable of entraining and transporting loess to adjacent uplands (Leighty 2001).

The proposed pipeline will cross six major river basins in Nebraska—Niobrara, Elkhorn, Loup, Middle Platte, Big Blue, and the Little Blue. Some of these basins may have either fully or over appropriated surface water supplies. There may be additional restrictions on surface water withdrawals for water use in the proposed project's temporary potable water systems, construction applications, and pipeline testing, all of which may require permitting.

Similar to Montana and South Dakota, flooding in Nebraska typically occurs during spring (April-June); however, ice jams, rapid snowmelt, and intense rainfall have all contributed to major flooding in the recent past (USGS 2012d). Blockage of channels by ice jams in some of the larger braided rivers such as the Elkhorn and Platte are triggered by relatively abrupt weather changes in mid or late winter (Mason and Joeckel 2007), and have the potential to cause significant lateral channel migration.

Waterbodies Crossed

There are 281 waterbody crossings along the proposed Project route in Nebraska, including 31 perennial streams, 237 intermittent streams, eight canals, and five artificial or natural lakes, ponds, or reservoirs (Appendix D, Waterbody Crossing Tables and Required Crossing Criteria for Reclamation Facilities, Table 2). Based on stream width, adjacent topography, adjacent infrastructure, best management practices, permitting, and sensitive environmental areas, five rivers in Nebraska would be crossed using the HDD method:

- Keya Paha River in Boyd County (approximately 300 feet wide, MP 618.1);
- Niobrara River in Boyd and Holt counties (approximately 1,250 feet wide, MP 626.0);
- Elkhorn River in Antelope County (approximately 775 feet wide, MP 713.3);
- Loup River in Nance County (approximately 1,200 feet wide, MP 761.6); and
- Platte River in Merrick County (approximately 2,000 feet wide, MP 775.1).

The remaining 276 waterbodies would be crossed using one of several non-HDD methods described in the CMRP (Appendix G). The crossing method for each waterbody would be depicted on construction drawings but would ultimately be determined based on site-specific conditions at the time of the crossing. Qualified individuals would be involved in the permitting process to ensure proper identification of channel migration zones to further aid in selecting the appropriate crossing method. In addition to the 281 waterbodies crossed by the centerline of the

proposed pipeline, there are seven waterbodies within the ROW that would not be crossed by the proposed pipeline.

Waterbodies Classifications

The proposed pipeline would cross a number of streams and rivers with state water quality use descriptions based on their surface water classification or by waterbody type. There are 40 classified streams that would be crossed by the proposed pipeline in Nebraska. Table 3.3-7 presents the names of these waterbodies, organized by county from north to south, and includes their state water quality designations.

Table 3.3-7 Streams and Rivers Crossed by Proposed Pipeline in Nebraska with State Water Quality Designations or Use Designations

Waterbody Name	County	Designated Use	Use Support/Attainment[a]
Unnamed Tributary to Buffalo Creek	Keya Paha	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Dry Creek	Keya Paha	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Wolf Creek	Keya Paha	Cold Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Spotted Tail Creek	Keya Paha	Cold Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Alkali Creek	Keya Paha	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Keya Paha River	Boyd	Primary contact Recreation; Warm Water Aquatic Live (Class A); Agricultural Water Supply; Aesthetics	Impaired; Supported; Supported; Supported
Big Creek	Boyd	Cold Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Niobrara River	Holt	Primary Contact Recreation; Warm Water Aquatic Live (Class A*); Agricultural Water Supply; Aesthetics	Impaired; Supported; Supported; Supported
Beaver Creek	Holt	Cold Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Big Sandy Creek	Holt	Primary Contact Recreation; Warm Water Aquatic Life (Class A); Agricultural Water Supply; Aesthetics	No Data; No Data; No Data; No Data
Unnamed Tributary to Brush Creek	Holt	Cold Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Brush Creek	Holt	Cold Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data

Waterbody Name	County	Designated Use	Use Support/Attainment[a]
North Branch Eagle Creek	Holt	Primary Contact Recreation; Cold Water Aquatic Life (Class B); Agricultural Water Supply; Aesthetics	No Data; No Data; No Data; No Data
Middle Branch Eagle Creek	Holt	Primary Contact Recreation; Cold Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; Supported; No Data; No Data
East Branch Eagle Creek	Holt	Cold Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Honey Creek	Holt	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Blackbird Creek	Holt	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Redbird Creek	Holt	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Unnamed Tributary to Redbird Creek	Holt	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Middle Branch Verdigre Creek	Holt	Cold Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
South Branch Verdigre Creek	Holt	Primary Contact Recreation; Cold Water Aquatic Life (Class B); Agricultural Water Supply; Aesthetics	No Data; No Data; No Data; No Data
Big Springs Creek	Antelope	Cold Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Unnamed Tributary to Big Springs Creek	Antelope	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Hathoway Slough	Antelope	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Al Hopkins Creek	Antelope	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Elkhorn River	Antelope	Primary Contact Recreation; Warm Water Aquatic Life (Class A); Agricultural Water Supply; Aesthetics	Impaired; Supported; Supported; Supported
Ives Creek	Antelope	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Beaver Creek	Boone	Primary Contact Recreation; Warm Water Aquatic Life (Class A); Agricultural Water Supply—Class A; Aesthetics	Impaired; Impaired; Supported; Supported

Waterbody Name	County	Designated Use	Use Support/Attainment[a]
Bogus Creek	Boone	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Plum Creek	Nance	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	No Data; No Data; No Data
Loup River	Nance	Primary Contact Recreation; Warm Water Aquatic Life (Class A); Agricultural Water Supply—Class A; Aesthetics	Impaired; Supported; Supported; Supported
Prairie Creek	Nance	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	Impaired; Supported; Supported
Platte River	Polk	Primary Contact Recreation; Warm Water Aquatic Life (Class A*); Agricultural Water Supply—Class A; Aesthetics	Supported; Supported; Supported; Supported
Big Blue River	Polk	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	Impaired; Supported; Supported
Lincoln Creek	York	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	Impaired; No Data; No Data
Beaver Creek	York	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	Impaired; No Data; No Data
West Fork Big Blue River	York	Primary Contact Recreation; Warm Water Aquatic Life (Class A); Agricultural Water Supply—Class A; Aesthetics	Impaired; Impaired; Supported; Supported
Turkey Creek	Fillmore	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	Supported; No Data; No Data
South Fork Swan Creek	Jefferson	Warm Water Aquatic Life (Class B); Agricultural Water Supply—Class A; Aesthetics	Supported; No Data; No Data
Cub Creek	Jefferson	Warm Water Aquatic Life (Class A); Agricultural Water Supply—Class A; Aesthetics	Supported; No Data; No Data

Source: USGS 2012c; NDEQ 2012a and 2012b.

[a] The No Data designation in this table represents NDEQ surface water assessment outcomes of Not Assessed for assigned beneficial uses as defined in Section 4.0 of the NDEQ 2012 Water Quality Integrated Report.

Impaired or Contaminated Waterbodies

Contamination or impairment has been documented in 2012 Water Quality Integrated Report, NDEQ, Water Quality Division, April 1, 2012, for 10 of these sensitive or protected waterbodies that would be crossed by the proposed pipeline in Nebraska. Table 3.3-8 provides the names of the waterbodies and the contaminant or impairment (see also Appendix D, Waterbody Crossing Tables and Required Crossing Criteria for Reclamation Facilities, Table 5). Contamination in these waterbodies includes unacceptable levels of at least one of the following parameters:

E. coli, dissolved oxygen, and atrazine. In some cases, the listed impairment is an impaired aquatic community.

Table 3.3-8 Impaired or Contaminated Waterbodies in Nebraska

Waterbody Name	Impairment
Keya Paha River	*E. coli*
Niobrara River	*E. coli*
Elkhorn River	*E. coli*
Beaver Creek	*E. coli*
Loup River	*E. coli*
Prairie Creek	Low dissolved oxygen
Big Blue River	Low dissolved oxygen, atrazine
Lincoln Creek	Impaired aquatic community
Beaver Creek	Impaired aquatic community
West Fork Big Blue River	*E. coli*, May–June atrazine, impaired aquatic community

Source: USGS 2012c; NDEQ 2012a and 2012b.

The USFWS has concluded that the Platte River ecosystem is in a state of jeopardy and that any depletion of flows would be considered significant. The USFWS has adopted a jeopardy standard for all Section 7 ESA consultations on federal actions that result in water depletions to the Platte River system (USFWS 2012).

In an effort to avoid or minimize impacts to sensitive waterbodies, detailed consultation with the USFWS and Natural Resource Conservation Service (NRCS) should be considered during the permitting phases when planning stream crossings in depleted and drought prone watersheds.

Water Supplies

Along the proposed pipeline route in Nebraska, municipal water supplies are largely obtained from groundwater and are described in Section 3.3.2, Groundwater. No municipal surface water supplies are known to be located within 1 mile of the proposed Project ROW.

Waterbodies and reservoirs, located within 10 miles downstream of a proposed water crossing, with the potential for one or all of the following uses: recreation, livestock watering, or agricultural water supply are summarized in Appendix D, Waterbody Crossing Tables and Required Crossing Criteria for Reclamation Facilities, Table 8. The larger of these waterbodies (those greater than 10 acres) include Cub Creek Reservoir 14C, Cub Creek Reservoir 13C, Recharge Lake, Big Indian Creek Reservoir 8-E, Big Indian Creek Reservoir 10-A, and six unnamed reservoirs (unnamed according to the USGS 2012 NHD [USGS 2012b]). The analysis identified an additional 68 waterbodies or reservoirs located within 10 miles downstream of a proposed crossing that were less than 10 acres in size.

3.3.4 Floodplains

Floodplains are areas of land adjacent to rivers and streams that convey overflows during flood events. Floodwater energy is dissipated as flows spread out over a floodplain, and significant storage of floodwaters can occur through infiltration and surficial storage in localized depressions on a floodplain. Floodplains form where overbank floodwaters spread out laterally and deposit fine-grained sediments. The combination of rich soils, proximity to water, riparian forests, and the dynamic reworking of sediments during floods creates a diverse landscape with

high habitat quality. Floodplains typically support a complex mosaic of wetland, riparian, and woodland habitats that are spatially and temporally dynamic.

Changing climatic and land use patterns in much of the west-central United States has resulted in region-wide incision of many stream systems. Stream systems cutting channels deeper into the surrounding floodplain cause high floodplain terraces to form along valley margins. These floodplain terraces are common along the proposed pipeline route and receive floodwaters less frequently than the low floodplains adjacent to the streams.

From a policy perspective, the Federal Emergency Management Agency (FEMA) defines floodplain as being any land area susceptible to being inundated by water from any source (FEMA 2005). 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 in carrying out its responsibilities for the following:

- Acquiring, managing, and disposing of federal lands, and facilities;
- Providing federally undertaken, financed, or assisted construction and improvements; and
- Conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

Both state-administered and FEMA-designated floodplains, as well as some undesignated floodplain areas, crossed by the proposed route in Montana, South Dakota, and Nebraska are listed in Tables 3.3-9, 3.3-10, and 3.3-11, respectively. In Montana, the proposed route crosses 12 floodplains, while four are crossed in South Dakota and 74 are crossed in Nebraska. Significant portions of the proposed route do not have FEMA or state emergency management mapping of floodplains. Pump Station 24 in Nance County Nebraska may be inaccessible during periods of flood. Most if not all access roads to PS-24 cross significant flood plain areas associated with the Loup River and Prairie Creek systems.

Table 3.3-9 Designated Floodplain Areas Crossed by the Proposed Pipeline Route in Montana

County	Approximate Mileposts	Waterbody Associated with Floodplain
Valley	59.38 -59.39	Grass Coulee Creek
Valley	59.89 - 59.91	Spring Creek
Valley	61.74 - 61.75	Morgan Creek
Valley	65.90 - 66.20	Cherry Creek
Valley	67.83 - 67.93	Foss Coulee
Valley	69.45 - 69.52	Spring Coulee
Valley	70.02 - 70.09	Hawk Coulee
Valley	71.70 - 71.90	East Fork Cherry Creek

County	Approximate Mileposts	Waterbody Associated with Floodplain
Valley	83.20 - 85.50	Milk River
Valley/McCone	89.10 - 90.70	Missouri River
McCone	148.23 - 148.78	Redwater River
Dawson	197.24 - 198.17	Yellowstone River

Source: FEMA 2012; 2011 FEIS Table 3.3.1.3-1 (for Redwater River and Yellowstone River).

Table 3.3-10 Designated[a] Floodplain Areas Crossed by the Proposed Pipeline Route in South Dakota

County	Approximate Mileposts	Waterbody Associated with Floodplain
Harding	294.8 - 295.0	Little Missouri River
Meade/Pennington	429.7 - 430.4	Cheyenne River
Haakon	485.9 - 486.0	Bad River
Lyman/Tripp	541.0 - 541.7	White River

Source: FEMA 2012.

[a] The proposed pipeline does not cross any South Dakota state, county, or FEMA-designated floodplains. Floodplains listed denote those identified in the 2011 Final Environmental Impact Statement and updated with current proposed Project milepost data.

Table 3.3-11 Designated Floodplain Areas Crossed by the Proposed Pipeline Route in Nebraska

County[a]	Approximate Mileposts	Waterbody Associated with Floodplain
Boyd	617.85 - 618.18	Keya Paha River
Boyd	621.17 - 621.20	Big Creek
Boyd	625.81 - 626.09	Niobrara
Antelope	683.03 - 683.14	Big Springs Creek
Antelope	685.08 - 685.11	Unnamed Tributary to Big Springs Creek
Antelope	707.71 - 707.75	Al Hopkins Creek
Antelope	712.77 - 713.52	Elkhorn River
Antelope	718.5 - 718.76	Saint Clair Creek
Boone	725.16 - 725.23	North Shell Creek
Boone	730.16 - 730.20	Unnamed Tributary to Shell Creek
Boone	731.07-731.10	Shell Creek
Boone	731.24 -731.26	Unnamed Tributary to Shell Creek
Boone	731.37 -731.38	Unnamed Tributary to Shell Creek
Boone	733.06 -733.08	Unnamed Tributary to Shell Creek
Boone	735.67 -735.70	Unnamed Tributary to Vorhees Creek
Boone	737.28 -737.40	Vorhees Creek
Boone	738.20 -738.22	Unnamed Tributary to Vorhees Creek
Boone	738.56 -738.58	Unnamed Tributary to Vorhees Creek
Boone	738.97 -738.99	Unnamed Tributary to Vorhees Creek
Boone	739.26 -739.28	Unnamed Tributary to Vorhees Creek
Boone	740.03 -740.05	Unnamed Tributary to Vorhees Creek
Boone	740.03 -740.06	Vorhees Creek
Boone	741.23 -741.25	Unnamed Tributary to Vorhees Creek
Boone	743.73 -743.86	Beaver Creek
Boone	745.07 -745.09	Unnamed Beaver Creek
Boone	746.10 -746.19	Unnamed Beaver Creek
Boone	748.47 -748.66	Bogus Creek
Boone	748.70 -748.84	Unnamed Tributary to Bogus Creek

County[a]	Approximate Mileposts	Waterbody Associated with Floodplain
Boone	750.39 -750.64	Unnamed Tributary to Bogus Creek
Nance	753.08 - 753.14	Unnamed Tributary to Skeedee Creek
Nance	759.55 - 759.68	Plumb Creek
Nance	760.11 - 760.14	Unnamed Tributary to Plumb Creek
Nance	761.13 - 762.36	Loup River
Nance	765.3 - 765.85	Unnamed Tributary to Prairie Creek
Nance	765.99 - 766.01	Prairie Creek
Nance	766.13 - 767.17	Prairie Creek
Merrick	767.17 - 768.51	Prairie Creek
Merrick	769.99 - 773.62	Silver Creek
Merrick	774.55 - 775.09	Platte River
Polk	775.09 - 775.68	Platte River
Polk	777.22 - 777.34	Unnamed Tributary to Platte River
Polk	784.67 - 784.83	Unnamed Tributary to Prairie Creek
Polk	785.56 - 785.65	Prairie Creek
Polk/York	788.89 - 788.94	Big Blue River
York	797.81 - 798.12	Lincoln Creek
York	801.12 - 801.8	Unnamed Tributary to Beaver Creek
York	803.31 - 803.43	Beaver Creek
York	809.41 - 809.42	Unnamed Tributary to West Fork Big Blue River
York	809.51 - 809.53	Unnamed Tributary to West Fork Big Blue River
York	810.57 - 810.59	Unnamed Tributary to West Fork Big Blue River
York	812.70 - 813.13	West Fork Big Blue River
Fillmore	818.24 - 818.35	Indian Creek
Fillmore	827.69 - 827.75	Unnamed Tributary to Turkey Creek
Fillmore	830.74 - 830.79	Unnamed Tributary to Turkey Creek
Fillmore	831.35 - 831.84	Turkey Creek
Saline	833.28 - 833.35	Unnamed Tributary to Turkey Creek
Saline	836.39 -836.45	Unnamed Tributary to North Fork Swan Creek
Saline	836.64 - 836.65	Unnamed Tributary North Fork Swan Creek
Saline	836.84 - 836.95	Unnamed Tributary North Fork Swan Creek
Saline	838.35 - 838.40	Unnamed Tributary North Fork Swan Creek
Saline	838.57 - 838.61	Unnamed Tributary North Fork Swan Creek
Saline	839.56 - 839.62	Unnamed Tributary North Fork Swan Creek
Saline	844.76 - 844.79	Unnamed Tributary South Fork Swan Creek
Saline	846.23 - 846.27	Unnamed Tributary South Fork Swan Creek
Jefferson	847.81 - 847.84	Unnamed Tributary South Fork Swan Creek
Jefferson	848.35 - 848.40	South Fork Swan Creek
Jefferson	853.00 - 853.08	Unnamed Tributary South Fork Swan Creek
Jefferson	853.30 - 853.36	Unnamed Tributary South Fork Swan Creek
Jefferson	859.04 - 859.16	Cub Creek
Jefferson	860.13 - 860.20	Unnamed Tributary to Cub Creek
Jefferson	860.30 - 860.38	Unnamed Tributary to Cub Creek
Jefferson	860.71 - 860.82	Unnamed Tributary to Cub Creek
Jefferson	868.80 - 868.83	Unnamed Tributary to Big Indian Creek
Jefferson	871.12 - 871.18	Unnamed Tributary to Big Indian Creek

Source: FEMA 2012; NDNR 2012b; FIRM maps provided by Jefferson County floodplain administrator.

[a] Holt County does not have any FIRMs (based on conversation with Holt Colt Planning and Zoning Officer).

The U.S. Department of the Interior (DOI), through the National Wild and Scenic River System, has a duty to protect designated river environments. The DOI has noted several potential impacts due to floodplain activities of the proposed Project. In an effort to avoid or minimize impacts to DOI assets, it is recommended that National Park Service criteria relating to Wild and Scenic Rivers be considered when designing crossings of tributaries to and upstream of the Niobrara and Missouri National River segments (DOI 2012).

3.3.5 Connected Actions

There are three connected actions in the vicinity of the proposed Pipeline route, including:

- Bakken Marketlink Project;
- Big Bend to Witten 230-kV Transmission Line; and
- Electrical Distribution Lines and Substations.

Further discussion regarding connected actions and water resources is provided in Section 4.3.5; Connected Actions.

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3.4 WETLANDS

3.4.1 Introduction

This section discusses wetland resources in the proposed Project area. The description of wetland resources is based on information provided in the 2011 Final Environmental Impact Statement (Final EIS) as well as new circumstances or information relevant to environmental concerns that have become available since the publication of the Final EIS, including the proposed reroute in Nebraska. The information that is provided here builds on the information provided in the Final EIS and in many instances replicates that information with relatively minor changes and updates. Other information is entirely new or substantially altered from that presented in the Final EIS. Specifically, the following information, data, methods, and/or analyses have been substantially updated in this section from the 2011 document:

- An expanded description of the wetland resources encountered within the proposed Project area is provided and includes figures to illustrate the proposed pipeline route relative to regional ecosystems and wetlands within Montana, South Dakota, and Nebraska. The description of wetland resources is based on information from field surveys, including additional field surveys conducted by TransCanada Keystone Pipeline, LP (Keystone) along the Nebraska portion of the proposed pipeline route, and on information and data provided by government agencies;
- An expanded description of wetland resources of special concern that are known or have potential to occur within the proposed Project area is included; and
- A new section (Section 3.4.4, Federal and State Regulatory Setting) has been added to describe applicable federal and state wetland regulations that may apply to the proposed Project.

3.4.2 Environmental Setting

Wetlands are areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of wetland vegetation typically adapted for life in saturated soil conditions (Cowardin et al. 1979). Wetland ecosystems are dynamic and often have fluctuating levels of water and saturation and a variety of wetland vegetation that includes floating, submerged, and/or emergent (erect, rooted, and herbaceous plants) (Cowardin et al. 1979). Being a dynamic system, not all wetlands are wet year round, and, conversely, not all wet areas qualify as wetlands.

Functions provided by wetlands within the proposed Project area include surface water storage (flood control), shoreline stabilization (wave damage protection/shoreline erosion control), stream flow maintenance (maintaining aquatic habitat and aesthetic appreciation opportunities), groundwater recharge, sediment removal and nutrient cycling (water quality protection), aquatic productivity support (fishing, shell fishing, and waterfowl hunting), production of trees (timber harvest), production of herbaceous growth (livestock grazing and haying), production of peaty soils (peat harvest), and provision of plant and wildlife habitat (hunting, trapping, photography, nature observation, and aesthetics) (U.S. Environmental Protection Agency [USEPA] 2001). The degree to which a given wetland performs these functions depends on a number of factors including wetland type (e.g., wet meadows versus forested), landscape position (association with

rivers versus wet meadows), and level of impairment or impact. Many of the wetlands throughout the proposed Project area have been extensively altered by historical and current agricultural practices. Wetland alterations as a result of farming practices may limit the capacity for individual wetlands to perform certain wetland functions; however, wetlands of significant value do exist throughout the proposed Project area (see Section 3.4.3, Wetlands of Special Concern or Value).

Wetlands are classified according to shared environmental factors, such as vegetation, soils, and hydrology (Cowardin et al. 1979). Wetland systems within the proposed Project area are defined in Table 3.4-1 and are classified as palustrine or riverine / openwater, based on vegetation or surface water cover. These wetlands are composed of a dominance of trees, shrubs, persistent emergent herbaceous vegetation, or open water. Palustrine wetland types occur in various locations in the landscape, including along streams or rivers, adjacent to open water ponds or lakes, on slopes, or within depressions. Subsystems of the palustrine wetland types within the proposed Project area include palustrine emergent (PEM), palustrine scrub-shrub (PSS), and palustrine forested (PFO). Surface water dominated wetland types in the Cowardin et al. (1979) classification system include the scoured areas within river or stream bed systems of riverine wetlands (R) and open water (OW) within ponds or lake systems (lacustrine) (Table 3.4-1).

Table 3.4-1 Description of Wetland Types in Proposed Project Area

Wetland Type	Wetland Code	Description
Palustrine emergent wetland	PEM	Emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. All water regimes are included except those irregularly exposed. In areas with relatively stable climatic conditions, emergent wetlands maintain the same appearance year after year. In other areas, such as the prairies of the central United States, climatic fluctuations cause them to revert to an open water phase in some years. Emergent wetlands are known by many names, including marsh, wet meadow, fen, prairie pothole, and slough.
Palustrine forested wetland	PFO	Forested wetlands are characterized by woody vegetation that is 6 meters tall or taller. Forested wetlands are most common in the eastern United States and in those sections of the West where moisture is relatively abundant, particularly along rivers and in the mountains. Forested wetlands normally possess an overstory of trees, an understory of young trees or shrubs, and an herbaceous layer. Forested wetlands are most often associated with riparian areas within the proposed Project area.
Palustrine scrub-shrub wetland	PSS	Scrub-shrub wetlands include areas dominated by woody vegetation less than 6 meters tall. Vegetation forms found in this wetland type include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. Scrub-shrub wetlands may represent a successional stage leading to a forested wetland or they may be relatively stable communities. Scrub-shrub wetlands are often associated with riparian areas within the proposed Project area, but occur in non-riparian areas as well.

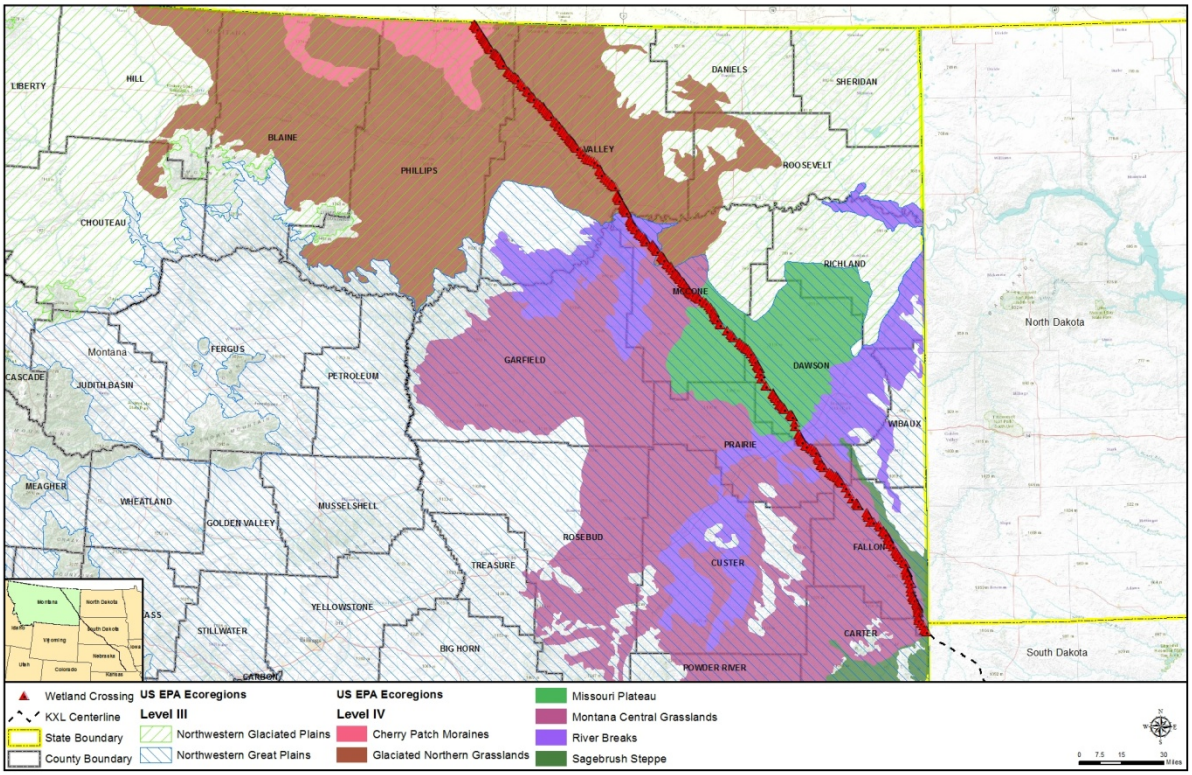
Wetland Type	Wetland Code	Description
Riverine perennial water	R2	The lower perennial subsystem includes low-gradient rivers and streams (riverine system) where some water flows throughout the year and water velocity is slow. The upper perennial subsystem includes high-gradient rivers and streams where some water flows throughout the year, water velocity is high, and there is little floodplain development. Perennial streams have flowing water year-round during a typical year, the water table is located above the stream bed for most of the year, groundwater is the primary source of water, and runoff is a supplemental source of water.
Riverine-intermittent water, ephemeral water	R4	The intermittent subsystem includes channels where the water flows for only part of the year, when groundwater provides water for stream flow. When water is not flowing, it may remain in isolated pools or surface water may be absent. Runoff is a supplemental source of water. Ephemeral streams have flowing water only during, and for a short duration after, precipitation events in a typical year. Groundwater is not a source of water for the stream.
Open water	OW	Open water habitats are rivers, streams, lakes, and ponds (riverine, lacustrine, and palustrine systems, respectively) where, during a year with normal precipitation, standing or flowing water occurs for a sufficient duration to establish an ordinary high-water mark. Aquatic vegetation within the area of standing or flowing water is either non-emergent, sparse, or absent. Vegetated shallows are considered as open waters.

Source: Cowardin et al. 1979.

The following subsections present a general description of the wetland types encountered along the proposed pipeline route through each state. The primary area of focus for the proposed Project is Montana, South Dakota, and Nebraska where the pipeline would be located; however, there are Project-related facilities also located in North Dakota and Kansas.

3.4.2.1 Montana

The proposed pipeline route crosses the eastern plains of Montana, which are characterized by saline/alkaline wetlands, prairie pothole wetlands, and wetlands associated with rivers and streams (Montana Watercourse 2008). The distribution of wetlands identified in Montana is illustrated by ecoregion in Figure 3.4.2-1. “Ecoregion” is defined by the USEPA as “Areas of similarity regarding patterns in the mosaic of abiotic and biotic, aquatic and terrestrial ecosystem components, including geology, physiography, vegetation, climate, soils, hydrology, land use, and wildlife, with humans being considered as part of the biota” (Omernick 1995). The pipeline would pass through two USEPA Level III Ecoregions (USEPA 2010, 2011a, b): Northwestern Glaciated Plains and the Northwestern Great Plains. The Northwestern Glaciated Plains Ecoregion roughly corresponds to a similar U.S. Geological Survey (USGS) region known as the Prairie Pothole Region (USGS 2006a, b). The Prairie Pothole Region is characterized by emergent wetlands, small lakes, and saline/alkaline wetlands that occur within a landscape of glacial debris, rolling hills, depressions, and scars caused by glacial activity (USGS 2006a, b). The Northwestern Great Plains Ecoregion is characterized by pothole-like wetlands, herbaceous wet meadow wetlands, saline/alkaline wetlands, and riparian wetlands associated with streams and rivers.



Source: exp Energy Services Inc. 2012a; USFWS 2012; Fry 2011; USGS 2011; USEPA 2011a, b.

Figure 3.4.2-1 Montana Wetland Crossings and USEPA Ecoregions

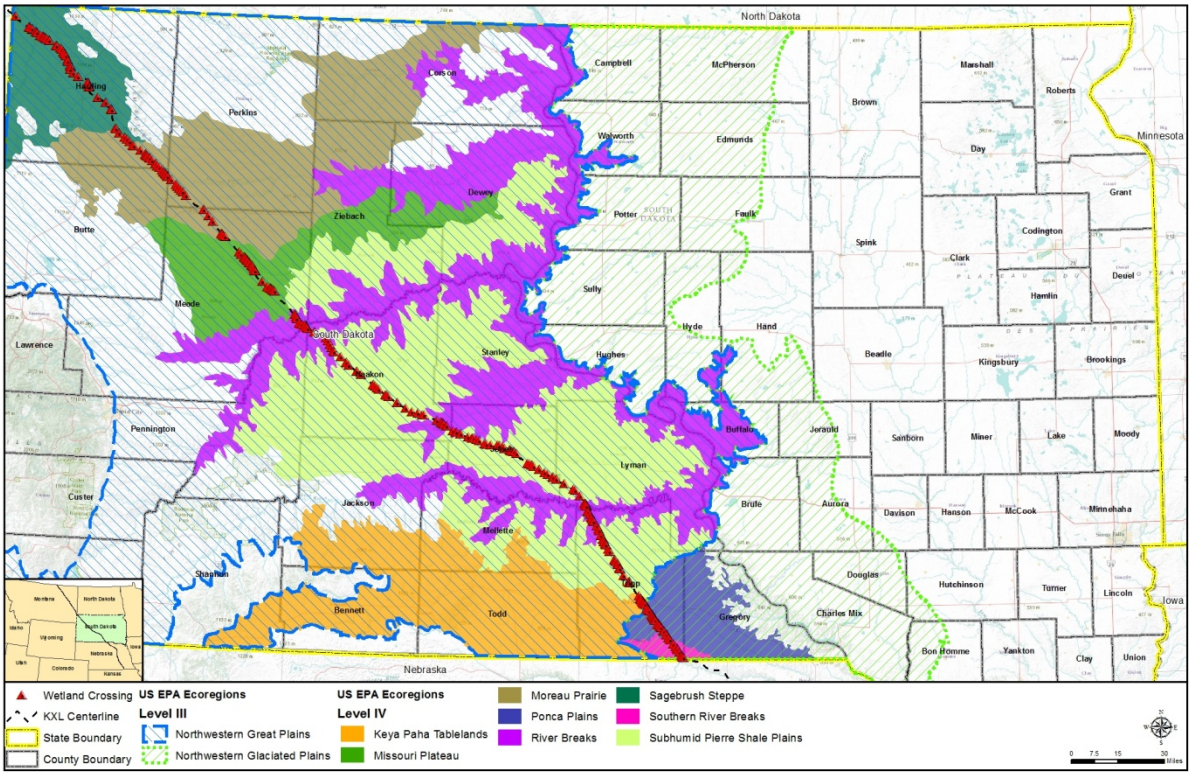
3.4.2.2 North Dakota

The only proposed-Project related facility in North Dakota would be a pipe yard and rail siding located in Bowman County, North Dakota. The pipe yard and rail siding are existing facilities that were previously built for other users and would be used by the proposed Project for the purpose of equipment and materials storage. The footprint for the pipe yard and rail siding would remain the same and no wetlands are located within the existing boundary of these sites.

3.4.2.3 South Dakota

The distribution of wetlands identified in South Dakota is illustrated by ecoregion in Figure 3.4.2-2. The proposed Project would pass through the same USEPA Level III Ecoregions as described for Montana. The majority of the wetlands along the South Dakota portion of the proposed route are associated with the Northwestern Great Plains Level III Ecoregion (i.e. herbaceous wet meadows, saline/alkaline wetlands, riparian wetlands, and pothole-like wetlands). Moving south, the route would pass through the Northwestern Glaciated Plains Level III Ecoregion. Again, this Ecoregion roughly coincides with the Prairie Pothole Region of South Dakota and includes emergent wetlands, small lakes, and saline/alkaline wetlands that occur within a landscape of glacial debris, rolling hills, depressions, and scars caused by glacial activity (USGS 2006a, b). Where the proposed route would pass through the very southern

portion of the state (i.e., Tripp County), shallow water table and near-surface aquifer conditions support wetlands associated with surface water features, such as ponds, lakes, streams, and rivers.



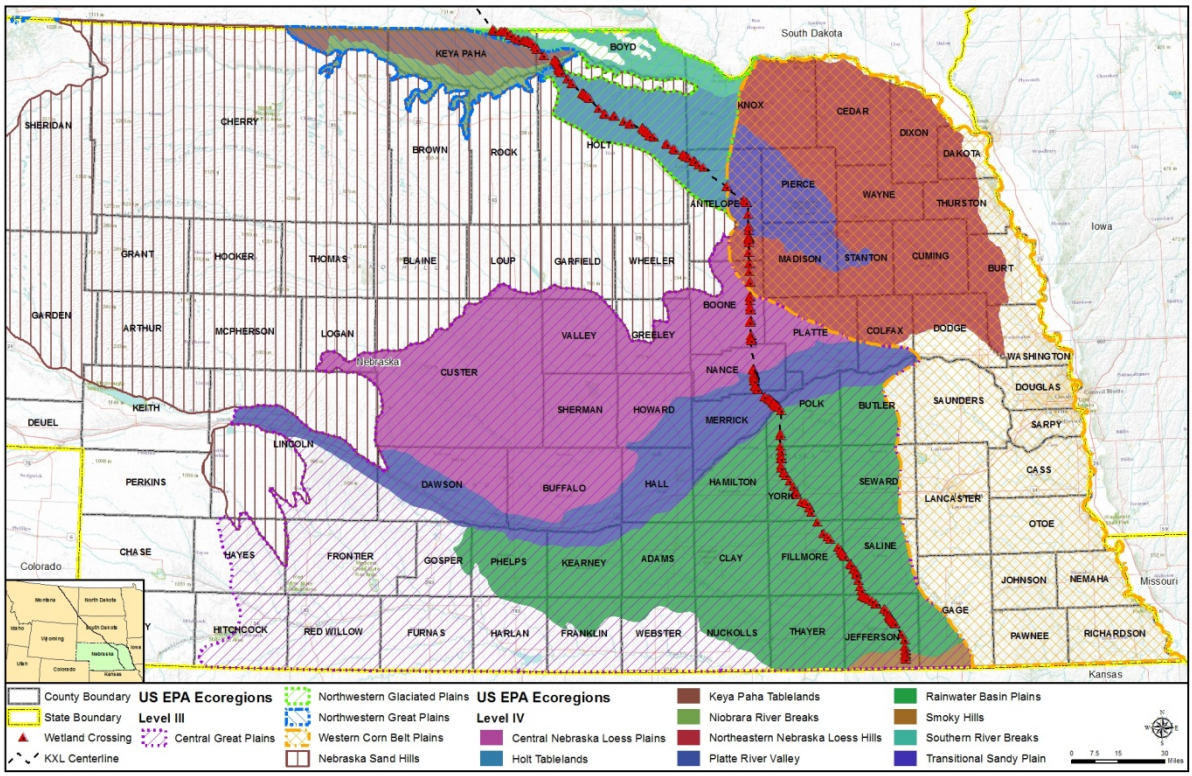
Source: exp Energy Services Inc. 2012a; USFWS 2012; Fry 2011; USGS 2011; USEPA 2011a, b.

Figure 3.4.2-2 South Dakota Wetland Crossings and USEPA Ecoregions

3.4.2.4 Nebraska

The distribution of wetlands identified in Nebraska is illustrated by ecoregion in Figure 3.4.2-3. The following USEPA Level III Ecoregions (USEPA 2010, 2011 a, b) would be crossed by the proposed Project: Northwestern Great Plains, Northwestern Glaciated Plains (i.e. Prairie Pothole Region), Western Corn Belt Plains, and Central Great Plains. Within these broad Ecoregions are several smaller regional complexes that have been referred to in previous Project reports (Final EIS). These smaller regional complexes include the Nebraska Department of Environmental Quality (NDEQ)-identified Sand Hills Region, the Central Table Playas, and the Rainwater Basin (Nebraska Game and Parks Commission [NGPC] 2005) (Figure 3.4.2-3). The NEDQ-identified Sand Hills Region wetlands and wetlands adjacent to this region have similar characteristics and include saturated wet meadows, shallow marshes, and lakes supported by shallow or near-surface aquifer conditions. Central Table Playa wetlands, located in the central portion of Nebraska, are associated with loess (wind-deposited silt) deposits and are typically

small, seasonally flooded wetlands. Wetlands in the Rainwater Basin of south-central Nebraska include wetlands associated with gently rolling loess-covered plains.



Source: exp Energy Services Inc. 2012a, b; NGPC 2011; Fry 2011; USFWS 2012; USGS 2011; USEPA 2011a, b.

Figure 3.4.2-3 Nebraska Wetland Crossings and USEPA Ecoregions

3.4.2.5 Kansas

The proposed Project would require two new pump stations, one in Clay County, Kansas, and another in Butler County, Kansas, in order to maintain the pressure required to transport crude oil at the desired throughput volumes. Based on National Wetland Inventory (NWI) mapping (U.S. Fish and Wildlife Service [USFWS] 2012), there are no wetlands within the footprint or immediate vicinity of either pump station.

Given that there are no known wetlands associated with proposed facilities located in North Dakota and Kansas, the remainder of this section will focus the wetland discussion on Montana, South Dakota, and Nebraska.

3.4.3 Wetlands of Special Concern or Value

The following are wetlands of special concern or value that are located within the proposed Project area.

3.4.3.1 Sensitive Wetland Areas

For the purpose of this analysis, sensitive wetland areas are regional wetlands that have been identified as being important natural resources including the Prairie Pothole Region in Montana, South Dakota, and northern Nebraska; wetlands that are in the vicinity of and with similar characteristics to the NDEQ-identified Sand Hills Region; and the Rainwater Basin Region in Nebraska.

Prairie Potholes Region

The Prairie Pothole Region of North America roughly coincides with the Northwestern Glaciated Plains (Level 3 EPA Ecoregion; USEPA 2010, 2011a), as mapped in Figures 3.4.2-1, 3.4.2-2, and 3.4.2-3. It extends from Canada southeast to Iowa, and also occurs in northern Montana, the eastern half of South Dakota, and the northern portion of Nebraska (USEPA 2010, 2011a, 2012a). This ecoregion is discussed further in Section 3.5, Terrestrial Vegetation.

The landscape of the Prairie Pothole Region is largely the result of glaciation events during the Pleistocene Epoch (about 11,000 to 1.6 million years ago). When the last glaciers retreated, they left a landscape scattered with small depressional wetlands called potholes or sloughs. Prairie potholes receive most of their water through rain and snowmelt. These pothole wetlands are important hydrologic features because of their importance in water movement. Water in these wetlands can move in three ways: from the wetland to the groundwater table (recharge), from groundwater table into wetland (discharge), and through the wetland at the surface of exposed water table (flow-through) (USGS 2006a, b). The USFWS has negotiated wetland easements with private landowners for some prairie potholes in Montana and South Dakota, including some that may be crossed by the proposed Project corridor. Private wetland easements may also potentially exist along the pipeline.

The Prairie Pothole Region is considered to have wetlands of special concern because it contains critical waterfowl breeding habitat that accounts for approximately 10 percent of the waterfowl breeding habitat on the continent (Young 1992). In addition, due to agricultural and commercial conversion, only an estimated 40 to 50 percent of prairie pothole wetlands remain undrained today (USEPA 2012a).

The proposed Project area passes through the Prairie Pothole Region in the following locations:

- Phillips, Valley, and McCone counties in eastern Montana, from milepost (MP) 0 to MP 90 and MP 110 to MP 117 (Figure 3.4.2-1);
- Tripp County in southern South Dakota, from MP 580 to MP 600 (Figure 3.4.2-2); and
- Keya Paha, Boyd, Holt and Antelope counties in Nebraska, from MP 601 to MP 618 (Figure 3.4.2-3).

Pothole wetlands are concentrated in these proposed Project corridor locations, but other depressional wetlands with pothole characteristics are located throughout the proposed Project corridor.

Sand Hill and Sand Hill-Like Wetland Regions

The Sand Hills Region is an NDEQ-identified region in the northern portion of Nebraska (NGPC 2011) that has been avoided by the proposed Project route (Figure 3.4.2-3). Certain portions of the proposed Project corridor, however, may cross through areas with near surface aquifer conditions, sandy soils, and poor revegetation potential (NDEQ 2012a). Wetlands may be present where the proposed Project corridor would pass northeast of the NDEQ-identified Sand Hills Region (NGPC 2011) (Figure 3.4.2-3). These wetlands may be traversed by the proposed Project in Holt and Antelope counties (MP 619 to MP 627, and MP 698 to MP 715). In addition, the NGPC has identified the "Loup/Platte River Sandhills Complex" (not part of the NDEQ-identified Sand Hills Region), near the Platte River in central-eastern Nebraska (NGPC 2005). This region has fragile soils and wetland characteristics and has a similar geographic footprint as the Platte River Valley Ecoregion illustrated on Figure 3.4.2-3. A portion of the proposed Project corridor in Nebraska would cross through this complex in Nance and Merrick counties (MP 762 to MP 776). Keystone has made numerous revisions to the proposed route to avoid known wetlands characterized by fragile and sandy soils.

Rainwater Basin Region

The Rainwater Basin Region in south-central Nebraska (Level 4 USEPA Ecoregion; USEPA 2010) was named for the abundant natural wetlands that formed where clay-bottomed playa depressions occur (Figure 3.4.2-3). These depressions flood quickly during heavy rainstorms and snow melt. The topography within the Rainwater Basin Region is relatively flat, with a poorly developed surface water drainage system. The Rainwater Basin Wetland Management District contains approximately 60 wetland easements in south-central Nebraska, and these are managed by the USFWS and the NGPC. There are approximately 34,103 acres of wetlands remaining in the Rainwater Basin (NGPC 2005), which is only about 10 percent of what historically occurred; the largest threat to these wetlands has been and continues to be habitat loss due to farmland conversion. The NGPC considers these wetlands to be endangered and the USFWS identified the Rainwater Basin wetlands as one of nine areas in the United States of critical concern for wetland losses (NGPC 2005). In addition, the Rainwater Basin Region provides important wildlife habitat for millions of birds, including the endangered whooping crane (see discussion on the wildlife that inhabits the Rainwater Basin Region in Subsection 3.6.2.1). The southern third of the proposed Project corridor in Nebraska, from approximately MP 777 to MP 872, would cross through the Rainwater Basin Plains Ecoregion illustrated in Figure 3.4.2-3.

3.4.3.2 Protected Wetlands

For the purpose of this analysis, wetlands that are protected under easements or agreements through voluntary government programs and resource conservation groups are considered sensitive. Easement-protected wetlands that may occur within the proposed Project area include: USFWS wetland easements, Natural Resources Conservation Service (NRCS) Wetland Reserve Program (WRP) agreements, NRCS Conservation Reserve Program (CRP) agreements, U.S. Department of Agriculture (USDA) Farmable Wetland Program (FWP) agreements, and various easements managed by natural resource conservation groups such as state land trusts, The Nature Conservancy, Ducks Unlimited, Pheasants Forever, and the Audubon Society to name a few.

The USFWS provides compensation to landowners to permanently protect wetlands under USFWS wetland easements (Title 16 of the United States Code Section 668dd[c]). These

wetlands cannot be drained, filled, leveled, or burned. There are several USFWS wetland easements in the Prairie Potholes Region in Montana and South Dakota that may be crossed by the proposed Project. In addition, there are several USFWS wetland easements within the Rainwater Basin Wetland Management District in Nebraska, some of which may be within the proposed Project area.

The WRP is a voluntary program administered by the NRCS. Under this program, NRCS provides technical and financial support to help landowners with their wetland restoration efforts, and in return the wetlands are placed under long-term or permanent protective agreements. The proposed Project would not cross any NRCS conservation agreements, but the proposed Project could affect a number of NRCS financial assistance conservation agreements. No WRP wetlands are known to occur in the proposed Project area, although they may be present.

The CRP is a voluntary program for agricultural landowners administered by the USDA Farm Service Agency. Landowners receive funds to establish long-term, resource-conserving vegetation cover to help prevent topsoil erosion and safeguard the nation's natural resources, including wetland resources. The proposed Project area crosses approximately 39 CRP agreements in Montana, 39 in South Dakota, and 36 in Nebraska (see CRP miles crossed in Table 3.9-4 of the Land Use, Recreation, and Visual Resources section); some of these CRP agreements may include wetlands.

The USDA Farm Service Agency also manages the FWP, which is a voluntary program to restore farmable wetlands and associated buffers. Under the FWP, farmed lands that were once wetlands, or lands that are currently constructed wetlands designed to receive flow for a row-crop agricultural drainage system, would have their hydrology restored to establish vegetative cover. FWP lands are enrolled through the CRP (described above). See Section 3.9.2.3 in the Land Use, Recreation, and Visual Resources section for more information on the CRP.

Natural resource groups such as state land trusts, The Nature Conservancy, Ducks Unlimited, Pheasants Forever, and the Audubon Society may also manage wetland conservation easements or lands that contain important wetland habitat within the proposed Project area.

3.4.3.3 Important Habitat for Wildlife and Threatened/Endangered Species

Wetlands that are of particular importance to wildlife include wetlands associated with migrating and nesting waterfowl; threatened/endangered and candidate species including, but not limited to, whooping crane (*Grus americana)*, western prairie (white-) fringed orchid (*Platanthera praeclara*), and piping plover (*Charadrius melodus)*; or wetlands that otherwise provide a limited resource for sensitive flora (vegetation) and fauna (animals). Details regarding important habitat for wildlife and threatened/endangered species are included in Section 3.6, Wildlife, and Section 3.8, Threatened and Endangered Species and Species of Conservation Concern.

3.4.4 Federal and State Regulatory Setting

Permits are required for the discharge of fill material into waters of the United States under the authority of Section 404 of the Clean Water Act (CWA). These permits would be obtained prior to construction in wetland areas. Waters of the United States include the area below the ordinary high water mark of stream channels and lakes or ponds connected to the tributary system, including wetlands adjacent to or wetlands with a *significant nexus* to these waters. "Waters have

the requisite significant nexus if they, either alone or in combination with similarly situated waters in the region, significantly affect the chemical, physical, or biological integrity of traditional navigable waters or interstate waters" (USEPA 2011c, 2012c). The Section 404 permitting process for Montana, South Dakota, and Nebraska is under the jurisdiction of the Omaha District of the U.S. Army Corps of Engineers (USACE).

Isolated waters and wetlands that are not directly linked to navigable or interstate waters, as well as man-made channels and ditches, may be waters of the United States in certain circumstances; this must be determined on a case-by-case basis by the USACE. Under the authority of Section 10 of the Rivers and Harbors Act, USACE permits are required for structures or work in, over, under, or affecting navigable waters of the United States.

All wetlands and waterways crossed by the proposed Project would be evaluated under the preliminary jurisdictional determination process. Under this process, all wetlands are tentatively considered jurisdictional until an approved determination is made by USACE (Regulatory Guidance Letter No. 08-02). The use of preliminary jurisdictional determinations does not imply that approved jurisdictional determinations would also be completed. Unless an approved jurisdictional determination is specifically requested by Keystone, preliminary jurisdictional determinations would be utilized. Where required by USACE, compensatory wetland mitigation (i.e. creating wetlands to offset the proposed loss of wetlands) would be provided by Keystone for permanent losses of jurisdictional wetlands and water resources. Compensatory Mitigation Plans would be developed and carried out in accordance with Title 33 of the Code of Federal Regulations Part 332 (Compensatory Mitigation for Losses of Aquatic Resources). These plans would be developed during the permitting phase when more site specific details are available and incorporated into the Section 404/Section 401 permit applications for review by coordinating agencies prior to approval. Functional assessments for all jurisdictional wetlands would likely be required by the USACE during the Section 404 permitting process. Local and state agencies may require pre- and post-construction functional assessments depending on their agreed-upon mitigation and compensation plans with Keystone. These data would be used to determine restoration, mitigation, and monitoring requirements. Based on the agreed upon restoration, mitigation and monitoring requirements, wetland monitoring plans would be developed to ensure all impacted wetlands are restored or compensated for to acceptable level.

Wetlands are regulated at the state level primarily by state environmental quality agencies. Individual states administer clean water regulations that have been delegated to them from USEPA pursuant to Section 401 of the CWA. States generally have regulatory jurisdiction over a given wetland if it meets their definition of a *waters of the state*. County and municipal governments may also have wetland regulations, although for the purpose of this analysis, wetland regulation is only summarized to the state level.

The Montana Department of Environment Quality (MDEQ) oversees all Section 401 Water Quality Certifications and reviews Section 404 permit applications for compliance with state water laws (MLS 2011). The MDEQ and Native American tribes with authority for administering water quality programs "can review, approve, condition, or deny all Federal permits or licenses that might result in a discharge to State or Tribal waters" (MDEQ 2010). A water of the state in Montana is defined as a "body of water, irrigation system, or drainage system either surface or underground." Wetlands meeting this definition would be considered a *water of the state* and would therefore be regulated by MDEQ. This definition does not include wetlands associated with lagoons or waste treatment ponds. Nor would it include, for example,

wetlands associated with diverted irrigation water that does not return to a water of the state (i.e., flow ends in a field or sprinkler system) (MLS 2011).

The South Dakota Department of Environment and Natural Resources (SDDENR) oversees all Section 401 Water Quality Certifications and reviews Section 404 permit applications for compliance with state water laws (SDDENR, 2012a and 2012b). The waters of the state definition for South Dakota is similar to that of Montana and Nebraska and include all streams, lakes, ponds, impounding reservoirs, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, public or private, situated wholly or partly within or bordering upon the state (SDCL 34A-2-2(12)). Wetlands meeting this definition would be considered a *water of the state* and would therefore be regulated by SDDENR. South Dakota excludes wetlands associated with lagoons or waste treatment ponds from their state water definition.

The NDEQ also oversees all Section 401 Water Quality Certification and reviews Section 404 permit applications for compliance with state water laws (NDEQ 2012b). Through an anti-degradation policy, the NDEQ certifies 404 permits under Section 401 (Title 120) and has established water quality standards for *all* surface waters and wetlands, regardless of federal jurisdictional status (Title 117) (ASWM 2011). Wetland mitigation for all wetland impacts is required prior to 401 Water Quality Certification. The definition of waters of the state in Nebraska is an extensive list that includes wetlands and "all other bodies or accumulations of water, surface or underground" (NDEQ 2012c). Wetlands meeting this definition would be considered a *water of the state* and would therefore be regulated by NDEQ.

Throughout the proposed Project development process, consultations have been made with the USACE Omaha district office and state resource agencies. These consultations were used to develop specific wetland and waters of the U.S. information required for permit applications. Consultations would continue with all appropriate agencies during the development of avoidance and minimization strategies for all temporary, short- and long-term, and permanent impacts to wetlands, as well as for the development of mitigation and monitoring requirements. Prior to any potential disturbance within the proposed Project area, all wetland and water resources of the state and U.S. would be delineated and surveyed as required by the USACE, under the review of the USEPA and any applicable state agencies. These detailed wetland and waters data would be used to complete notification and permitting requirements under Sections 401 and 404 of the CWA. Other federal, state, county, or local wetland regulatory oversight may be triggered if a particular wetland area provides critical or limited habitat for federal- or state-listed species or if the wetlands are of particular value or sensitivity.

Wetlands on farmed lands, often referred to as sub-irrigated areas, are common in some areas of the proposed Project area. These wetlands are managed by Section 404 of the CWA and a wetland conservation provision under the Swampbuster provision of the Food Security Act (USEPA 2012c). Fill activity in farmed wetlands is regulated under the Swampbuster provisions of the 1985 and 1990 farm bills to discourage the conversion of wetlands to agricultural use if they receive USDA farm benefits (USACE 2012b). Wetlands on farmed lands fall into two categories: 1) *Farmed wetlands*; and 2) *Prior converted wetlands*.

Farmed wetlands are wetlands that were manipulated before 1985 to support agriculture (e.g., by drainage or leveling), but continue to support wetland habitat (e.g., potholes and playas). *Farmed wetlands* are also regulated by Section 404 of the CWA if they are jurisdictional, and in some

cases at the state level if they meet the state's definition of a *water of the state* (USACE 2012b). In contrast, *Prior converted wetlands* are former wetland areas that were also manipulated before 1985, but no longer meet hydrologic criteria, and have not been abandoned (defined as inactive farming for five consecutive years). Activities in *Prior converted wetlands* are not subject to the CWA Section 404 or Swampbuster provision, unless production has been abandoned for five consecutive years and wetland conditions return (USACE 2012b).

Commodities planted in wetlands converted by drainage or leveling (or other conversion activities) after December 23, 1985, or where wetlands have been purposely converted to agricultural production, even if a crop is not planted, after November 28, 1990, would result in USDA benefit ineligibility. Section 404 permits are not required when an agricultural activity is exempt (i.e., normal farming activities, such as plowing and seeding); these exemptions must not be associated with the conversion of wetlands to non-wetlands (USACE 2012b). As a result of changes in vegetation species at the time of wetland conversion to farmland, wetland vegetation indicators are often absent and cannot be used for routine wetland determinations. Hydrologic and hydric soil criteria may also be absent or disturbed in converted wetlands.

The NRCS is the lead agency for conducting delineations for Swampbuster and CWA Section 404 on agricultural lands (USACE 2012b); the USACE may require more detailed delineations depending on the activity. The USACE is the lead agency for wetlands on non-agricultural lands or for non-agricultural activities on agricultural lands (e.g., pipeline construction). The NRCS maintains records of converted wetlands that receive USDA benefits; these records may be confidential and require landowner permission to access the environmental history of the land.

Other state or local wetland regulations may apply to wetland fill activity. However, due to the large number of counties and potential municipalities adjacent to or within the proposed Project area, these regulations are not specifically addressed in this section. Local wetland regulations would be consulted during the permitting process. The Section 404 permitting process would address this issue by requesting a "list of all local, state, and federal permits" that have been "issued, waived, denied or [are] pending." A summary of the federal and state regulatory setting described above is provided in Table 3.4.-2.

Table 3.4-2 Wetland Permitting Summary

	Agency	Regulation / Permit Type	Description
Federal	U.S. Army Corps of Engineers	Section 10 of Rivers and Harbors Act	Placement of structures or work in, over, under, or affecting navigable waters of the U.S.
	U.S. Army Corps of Engineers	Clean Water Act Section 401 Certification (managed by states, see below)	Activities that may adversely affect state water quality standards for "waters of the state". Managed by states.
	U.S. Army Corps of Engineers	Clean Water Act Section 404	Discharge of dredged or fill material into jurisdictional wetlands
	U.S. Environmental Protection Agency	Clean Water Act Section 404(c) (EPA "Veto Authority")	EPA has authority to prohibit, restrict, or deny discharge of dredged or fill material to "waters of the US" (including wetlands) if it will have unacceptable adverse effects on municipal water supplies, fishery areas, wildlife, or recreational areas

	Agency	Regulation / Permit Type	Description
	U.S. Environmental Protection Agency	Federal 'Antidegradation' law (40CFR 131.12)	Each State must develop, adopt, and retain a statewide antidegradation policy regarding water quality standards and establish procedures for its implementation through the water quality management process.
	U.S. Department of Agriculture (USDA) - Natural Resource Conservation Service (NRCS)	Swampbuster provision under the Food Security Act	The USDA-NRCS is the lead agency for wetlands associated with agricultural land. The USDA-NRCS manages *farmed* wetlands and *prior converted* wetlands under the wetland conservation provisions defined in the Swampbuster provisions of the Food Security Act.
Montana-State	Dept. of Environmental Quality	Federal Clean Water Act Section 401 Certification	Activities that may adversely affect state water quality standards for "waters of the state" (including wetlands). Managed by states.
	Dept. of Environmental Quality	Federal Clean Water Act Section 404	Reviews all Section 404 permit applications for compliance with state water laws
	Dept. of Environmental Quality	Anti-degradation Clause	Regulates water quality degradation beyond Section 401 (including in wetlands)
South Dakota-State	Dept. of Environment and Natural Resources	Federal Clean Water Act Section 401 Certification	Activities that may adversely affect state water quality standards for "waters of the state" (including wetlands). Managed by states.
	Dept. of Environment and Natural Resources	Federal Clean Water Act Section 404	Reviews all Section 404 permit applications for compliance with state water laws
	Dept. of Environmental Quality	Anti-degradation Clause	Regulates water quality degradation beyond Section 401 (including in wetlands)
Nebraska-State	Dept. of Environmental Quality	Federal Clean Water Act Section 401 Certification	Activities that may adversely affect state water quality standards for "waters of the state" (including wetlands). Managed by states.
	Dept. of Environmental Quality	Federal Clean Water Act Section 404	Reviews all Section 404 permit applications for compliance with state water laws
	Dept. of Environmental Quality	Anti-degradation Clause	Regulates water quality degradation beyond Section 401 (including in wetlands)

3.4.5 Connected Actions

The proposed Project would also include several connected actions including: 1) the Bakken Marketlink Project, 2) the Big Bend to Witten 230-kV Transmission Line, and 3) Electrical Distribution Lines and Substations. Connected actions are more fully addressed in Section 4.4.5, Wetlands, Connected Actions, but are described briefly here. The Bakken Marketlink Project would involve the construction and operation of metering systems, three new storage tanks near Baker, Montana, and two new storage tanks within the boundaries of the proposed Cushing tank

farm. The Big Bend to Witten 230-kV Transmission Line would provide upgrades to the power grid in South Dakota to support power requirements for pump stations in South Dakota. The third connected action is associated with the electrical distribution lines and substations that would be required throughout the length of the proposed Project corridor to support pump stations and other integral Project-related ancillary facilities. All three of the connected actions have potential to affect regional wetland types described in Sections 3.4.2 through 3.4.4 above. Additional wetlands-related information associated with the connected actions is provided in Section 4.4.5, Wetlands, Connected Actions.

3.4.6 References

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3.5 TERRESTRIAL VEGETATION

3.5.1 Introduction

This section discusses terrestrial vegetation resources in the proposed Project area. The description of terrestrial vegetation resources is based on information provided in the 2011 Final Environmental Impact Statement (Final EIS) as well as new circumstances or information relevant to environmental concerns that have become available since the publication of the Final EIS, including the proposed reroute in Nebraska. The information that is provided here builds on the information provided in the Final EIS and in many instances replicates that information with relatively minor changes and updates. Other information is entirely new or substantially altered from that presented in the Final EIS. Specifically, the following information, data, methods, and/or analyses have been substantially updated in this section from the 2011 document:

- The number, type, and length of ecoregions, land uses, and vegetation communities crossed by the Project have changed due to changes in the proposed Project route and the exclusive use of Geographical Information Systems (GIS) databases such as the National Land Cover Database (NLCD 2006) and the United States Geological Survey Gap Analysis (Fry et. Al. 2011);
- Biologically unique landscapes and communities of conservation concern crossed by the pipeline have changed, with the most significant changes occurring in Nebraska due to changes in the proposed Project route and the avoidance of the NDEQ-identified Sand Hills Region; and
- Noxious weed occurrences along the proposed Project have changed due to the Project reroutes and new information since preparation of the Final EIS.

3.5.2 Ecoregions

Vegetative cover is an important component in the classification of ecoregions that reflects differences in ecosystem quality and integrity (U.S. Environmental Protection Agency [USEPA] 2007). Ecoregions are described through analysis of patterns and composition of geology, physiography, native vegetation, climate, soils, land use, wildlife, and hydrology. Variation in temperatures and precipitation, and differences in soils and parent materials along the northwest to southeast gradient crossed by the proposed Project route, result in wide variation in vegetation communities. Ecoregions are divided and further subdivided into four levels. The level of generalization of delineated ecosystems respects different levels of planning and reporting needs while still linking habitats based on their similarities (Commission for Environmental Cooperation [CEC] 1997). The two most detailed ecoregion levels, Level III and Level IV, are discussed in this section.

The proposed Project route would cross the following four Level III Ecoregions of the United States from northwest to southeast (percentages of total Level III Ecoregions crossing mileage shown in parentheses):

- Northwestern Glaciated Plains (24 percent);
- Northwestern Great Plains (16 percent);

- Western Corn Belt Plains (4 percent); and
- Central Great Plains (56 percent).

Ancillary facilities not adjacent to the proposed Project route would also be built in North Dakota and Kansas and would be located in the Northwestern Great Plains (ID No. 43), Central Great Plains (ID No. 27), and the Flint Hills (ID No. 28) Level III Ecoregions. Table 3.5-1 below provides a summary of the Level III Ecoregions in Montana, South Dakota, Nebraska, and Kansas in which proposed Project facilities would be located

Level IV Ecoregions (USEPA 2012) are more detailed regions (subsets of Level III Ecoregions) used for state-level review. The proposed Project route would cross a total of 19 Level IV Ecoregions of the United States. Level IV Ecoregions are presented by milepost in Table 3.5-2 below (grouped by the respective Level III Ecoregions in which they are located) and are supported by descriptions of dominant native vegetation communities per Ecoregion within each state. Figures 3.5.2-1 through 3.5.2-3 depict the Level III and Level IV Ecoregions crossed by the proposed Project route.

Ancillary facilities in North Dakota and Kansas are not adjacent to the proposed Project's pipeline route, and are therefore not included in Table 3.5-2 below; however, the pipe yard in North Dakota is located in the Missouri Plateau Level IV Ecoregion (43a) and the pump station in Clay County, Kansas would be located in the Smoky Hills (27a) Level IV Ecoregion. The descriptions for these Ecoregions are included in Table 3.5-2. The pump station in Butler County, Kansas would be located within the Flint Hills (28a) Level IV Ecoregion which is considered "the largest remaining intact tallgrass prairie in the Great Plains. The natural tallgrass prairie still exists in most areas and is used for range and pasture land. However, some cropland agriculture has been implemented in river valleys and along the periphery of the Flint Hills, especially in the northwest corner where the topography is more level" (USEPA 2012c).

3.5.3 General Vegetation Resources

The general land cover types crossed by the proposed Project route include cultivated cropland, developed land, nonvascular and sparse rock vegetation, grassland/rangeland, upland forest, open water, wetland forest, and palustrine emergent wetlands. These were identified as being present within 250 feet of the centerline of the proposed pipeline route using the 2011 U.S. Geological Survey (USGS) GAP Analysis (USGS 2011). Cultivated cropland generally consists of introduced crop species, which provide food for livestock and human consumption. Developed lands include several ecosystem designations such as open space, low and medium intensity, and non-specific. The land covers that are characterized by naturally occurring terrestrial and aquatic vegetation include nonvascular and sparse rock vegetation (associated with the Western Great Plains Badlands), grassland/rangeland, upland forests, open water, wetland forests, and palustrine emergent wetlands.

Tables 3.5-3 (proposed pipeline) and 3.5-4 (proposed ancillary facilities) describe the land cover types and ecosystems designations in which proposed Project facilities would be located, and provide examples of common plant species known to occur within the designations.

Table 3.5-1 USEPA Level III Ecoregions Crossed by Proposed Project Facilities

Level III Ecoregion (ID Number)	States in which Ecoregion is Located	Description
Northwestern Glaciated Plains (42)	Montana, South Dakota, and Nebraska	This is a transitional region between the generally more level, moister, more agricultural Northern Glaciated Plains to the east and the generally more irregular, dryer, Northwestern Great Plains to the west and southwest. The western and southwestern boundary roughly coincides with the limits of continental glaciations. This region is pocked by a moderately high concentration of semi-permanent and seasonal wetlands, locally referred to as Prairie Potholes.
Northwestern Great Plains (43)	Montana, North Dakota, South Dakota, and Nebraska	This region includes the Missouri Plateau section of the Great Plains. It is a semiarid rolling plain of shale and sandstone punctuated by occasional buttes. Native grasslands, largely replaced on level ground by winter and spring wheat and alfalfa, persist in rangeland areas on broken topography. Agriculture is restricted by the erratic precipitation and limited opportunities for irrigation.
Western Corn Belt Plains (47)	Nebraska	Once covered with tallgrass prairie, over 90 percent of this ecoregion is now used for cropland agriculture; much of the remainder is forage for livestock. A combination of nearly level to gently rolling glaciated till plains and hilly loess plains, ample precipitation mainly in the growing season, and fertile, warm, and moist soils make this one of the most productive areas of corn and soybean.
Central Great Plains (27)	Nebraska, Kansas	This region is slightly lower, receives more precipitation, and is somewhat more irregular than the Western High Plains to the west. Once grasslands with scattered low trees and shrubs in the south, much of this region has been converted to croplands. The eastern boundary marks the eastern limits of the major winter wheat-growing area of the United States.
Flint Hills (28)[a]	Kansas	This region is characterized by rolling hills composed of shale and cherty limestone, rocky soils, and by humid, wet summers. The Flint Hills marks the western edge of the tallgrass prairie. Erosion of the softer Permian limestone has left the more resistant chert (or flint) deposits, producing the hilly topography and coarse soils of the area. The natural tallgrass prairie still exists in most areas and is used for range and pasture land.

Sources: Classification of Level III Ecoregions is based on USEPA (2007); descriptions of the regions are based on USEPA (2002).

[a] The Flint Hills Ecoregion occurs at the location of the Butler County, Kansas, pump station and is not crossed by the proposed Project pipeline.

Table 3.5-2 USEPA Level III and IV Ecoregions Crossed by Proposed Project Facilities

Level IV Ecoregions (ID Number)	Milepost In	Milepost Out	Total Miles	Potential Natural Vegetation	Land Use and Land Cover
Level III: Northwestern Glaciated Plains					
Cherry Patch Moraines (42m)	0	7	7	Grama (*Bouteloua* spp.)-needlegrass (*Hesperostipa* spp.)-wheatgrass (*Pascopyrum* spp.); shrubs limited to moister depressional areas.	Undulating to strongly sloping ecoregion that has many seasonal lakes and wetlands and includes one of the most extensive and prominent end moraines in Montana. Shortgrass prairie vegetation is native and shrubs are restricted to moist depressions. Steep slopes, hummocky moraines, gullies, bouldery knolls, gravelly ridges, and coulees are often grazed. Extensive cereal farming occurs elsewhere.
Glaciated Northern Grasslands (42j)	8	90	82	Grama-needlegrass-wheatgrass.	Glaciated, dissected, rolling to strongly rolling drift plain with many seasonal impoundments. Mostly rangeland with some farming on scattered, undissected benches and on alluvial, irrigated soils.
	110	117	7		
		Total	89		
Ponca Plains (42g)	580	593	13	Mixed-grass prairie - little bluestem (*Schizachyrium scoparium*), prairie sandreed (*Calamovilfa longifolia*), green needlegrass (*Nassella viridula*), and needle and thread (*Hesperostipa comata*).	Unglaciated, level to rolling plains. Intensive row crops, soybeans, corn, sunflowers, alfalfa, and some grazing.
Southern River Breaks (42h)	594	618	23	Mixed-grass prairie: western wheatgrass (*Pascopyrum smithii*), little bluestem, sideoats grama (*Bouteloua curtipendula*), and green needlegrass on uplands. Deciduous woodland: bur oak (*Quercus macrocarpa*), American basswood (*Tilia americana*), and eastern redcedar (*Juniperus virginiana*) in canyons and northfacing slopes. Plains cottonwood (*Populus deltoides monilifera*), green ash (*Fraxinus pennsylvanica*), peachleaf willow (*Salix amygdaloides*), boxelder (*Acer negundo*), buffaloberry (*Shepherdia* spp.), and sumac (*Rhus* spp.).	Lightly glaciated, dissected hills and canyons with high relief bordering Keya Paha River. Mixed grass and woodlands grazing.

Level IV Ecoregions (ID Number)	Milepost In	Milepost Out	Total Miles	Potential Natural Vegetation	Land Use and Land Cover
Holt Tablelands (42p)	628	697	69	Mixed-grass prairie: little bluestem, switchgrass (*Panicum virgatum*), sideoats grama, blue grama (*Bouteloua gracilis*), sand dropseed (*Sporobolus cryptandrus*), needle and-thread, prairie sandreed, and sand bluestem (*Andropogon hallii*).	A transitional area between the loamy, glaciated regions with loess soils to the east and the Sand Hills in the west and south. Cropland agriculture occurs on the more level tablelands and in areas with loamy soils, whereas grassland is found in areas of greater relief.
				Level III: Northwestern Great Plains	
River Breaks (43c)	91	105	14	In Montana: bottomlands with heavy soils – western wheatgrass, buffalograss (*Bouteloua dactyloides*); with gravelly soils – threadleaf sedge (*Carex filifolia*), and needle and thread. On north-facing slopes – junipers *(Juniperus* spp.) and deciduous trees. In South Dakota: blue grama, western wheatgrass, buffalograss, some bluestem, and prairie sandreed. Rocky Mountain juniper (*Juniperus copulorum*) in draws and on north slopes, scattered cottonwoods (*Populus* spp.) in riparian areas.	In Montana: unglaciated, very dissected terraces and uplands that descend to the Missouri River system and the Yellowstone River system. Primarily used for grazing on native grasses with remnant woodlands in draws and on north facing slopes and alluvial flats. In South Dakota: unglaciated, highly dissected hills and uplands bordering Cheyenne River, Bad River, and White River and alluvial plains. Mostly rangeland and native grasses, cattle grazing, remnant woodlands in draws and on alluvial flats.
	195	200	5		
	423	434	11		
	483	491	8		
	498	498	1		
	540	550	10		
		Total	49		
Montana Central Grassland (43n)	106	109	3	Grama-needlegrass-wheatgrass.	Unglaciated, rolling plains studded with buttes and badlands dissected by many small, ephemeral, or intermittent streams, underlain by fine-grained sedimentary rock. Primarily rangeland, with some irrigated and dry-land farming, and coal mining.
	118	133	15		
	201	285	84		
		Total	102		
Missouri Plateau (43a) *	134	194	60	In Montana: wheatgrass-needlegrass. In South Dakota: blue grama, wheatgrass/needlegrass, little bluestem, and prairie sandreed.	In Montana: primarily unglaciated, treeless, rolling hills and gravel-covered benches; less arid soils result in mosaic of rangeland and farmland with spring wheat, hay, barley, and oats; in contrast to neighboring regions which are mainly rangelands. Subject to wind erosion. In South Dakota: unglaciated, moderately dissected rolling plains with isolated sandstone buttes. Mosaic of dry-land farming with spring wheat, barley, oats, sunflowers, and alfalfa.
	392	421	29		
		Total	89		

Level IV Ecoregions (ID Number)	Milepost In	Milepost Out	Total Miles	Potential Natural Vegetation	Land Use and Land Cover
Sagebrush Steppe (43e)	285	286	1	Little sagebrush (*Artemisia arbuscula*), big sagebrush (*A. tridentata*), with western wheatgrass, green needlegrass, blue grama, Sandberg bluegrass (*Poa secunda*), and buffalograss.	Unglaciated, level to rolling plains with occasional buttes, badlands, scoria mounds, and salt pans with thick mats of shortgrass prairie and dusky gray sagebrush. Primarily grazing with minimal cultivation.
Moreau Prairie (43j)	341	391	50	Western wheatgrass, green needlegrass, blue grama, and buffalograss.	Unglaciated, level to rolling plains with occasional buttes, badlands, and numerous salt pans on alkaline soils. Mostly cattle and sheep ranching, with occasional dry-land wheat and alfalfa.
Subhumid Pierre Shale Plains (43f)	435	482	47	Shortgrass prairie: western wheatgrass, green needlegrass, blue grama, and buffalograss.	Unglaciated, undulating to rolling plains with steep-sided, incised streams on shale. Rangeland cattle grazing, dry-land farming winter wheat, and alfalfa.
	492	539	47		
	551	574	23		
		Total	117		
Keya Paha Tablelands (43i)	575	579	4	Mosaic of Sand Hills transition prairie and gravelly mixed-grass prairie: little bluestem, blue grama, sideoats grama, prairie sandreed, threadleaf sedge, western wheatgrass, and needle and thread.	Unglaciated, level to rolling sandy plains with isolated gravelly buttes, dissected near streams. Rangeland with areas of cropland, alfalfa, winter wheat, millet, and corn are principal crops.
	619	625	6		
		Total	10		
Niobara River Breaks (43r)	626	627	1	Ponderosa pine (*Pinus ponderosa*) woodlands with eastern redcedar south-facing bluffs and canyon slopes. Deciduous woodlands: bur oak, American basswood, green ash, and some paper birch (*Betula papyrifera*) on north-facing bluffs and lower canyon slopes. Plains cottonwoods and eastern redcedar on floodplains and mixed grass and Sand Hills prairies in valley.	Rangeland with scattered cropland in valley bottom. Recreational use.
				Level III: Western Corn Belt Plains	
Transitional Sandy Plain (47l)	698	715	17	Potential natural vegetation is a combination of Sand Hills prairie, tallgrass prairie, and some wet meadows, and lacks the oak-hickory forest component found in more eastern regions.	Contains some of the characteristics of Sand Hills in the west and the glaciated regions to the east. This level to rolling plain has fine sandy loams to fine sands with soils coarser and sandier than those in other regions.

Level IV Ecoregions (ID Number)	Milepost In	Milepost Out	Total Miles	Potential Natural Vegetation	Land Use and Land Cover
Northeastern Nebraska Loess Hills (47k)	716	733	17	Cropland, especially corn, is common, and there is more irrigated agriculture and pastureland, but fewer scattered woodlands than neighboring Western Corn Belt Plains.	Has an older, coarser loess mantle that is not as weathered as in ecoregions to the south. The climate is generally cooler with slightly lower annual precipitation than in southern glaciated regions.
				Level III: Central Great Plains	
Central Nebraska Loess Plains (27e)	734	761	27	Mixed-grass prairie big bluestem, little bluestem, sideoats grama, blue grama, and western wheatgrass with eastern redcedar intrusion. Redcedar concentrated in northwest and next to Sand Hills.	Rolling, dissected plains with deep loess layer, perennial and intermittent streams. Predominantly rangeland with large areas of cropland in winter wheat, corn, forage crops, and some irrigated agriculture.
Platte River Valley (27g)	762	776	14	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.	Flat, wide, alluvial valley with shallow, interlacing streams on a sandy bed. Extensive cropland, much of which is irrigated, corn, grain sorghum, soybeans, and alfalfa. Some native rangeland and hay lands; many channelized streams and flood control structures.
Rainwater Basin Plains (27f)	777	872	95	Transitional tallgrass prairie to the east and mixed-grass prairie in the west dominated by big bluestem, little bluestem, and sideoats grama. Wetlands dominated by western wheatgrass, sedge, spikerush (*Eleocharis* spp.) and slender bulrush (*Schoenoplectus heterochaetus*).	Flat to gently rolling loess-covered plains; historically covered with extensive rainwater basins and wetlands. Extensive cropland, dry-land sorghum and winter wheat, irrigated corn, and alfalfa. Most of the basins have been drained for cultivation.
Smokey Hills (27a)	873	875	2	Transition from tallgrass prairie in the east to mixed-grass prairie in the west. Some floodplain forests along riparian areas.	Cropland with winter wheat as primary crop (more corn grown in irrigated areas) and areas of grassland.

Sources: Level III Ecoregions are based on USEPA (2007); Level IV Ecoregions are based on (USEPA 2012a, USEPA 2012b, and USEPA 2012c). Plant names follow U.S. Department of Agriculture, Natural Resources Conservation Service (USDA NRCS) (2012) PLANTS Database. Milepost information from exp Energy Services, Inc. 2012.

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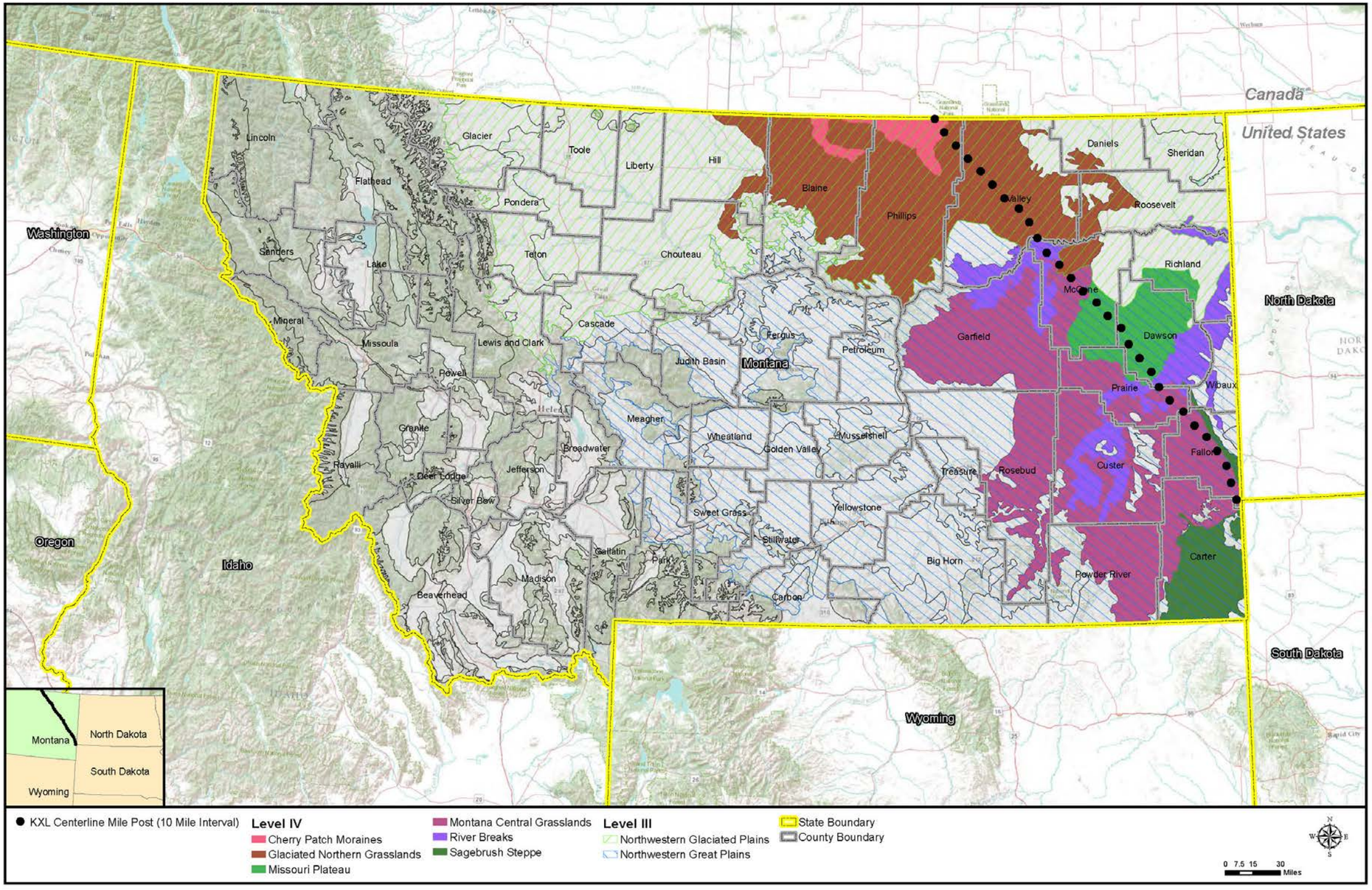

Source: USEPA 2012a through 2012c, respectively.

Figure 3.5.2-1 Montana USEPA Ecoregions

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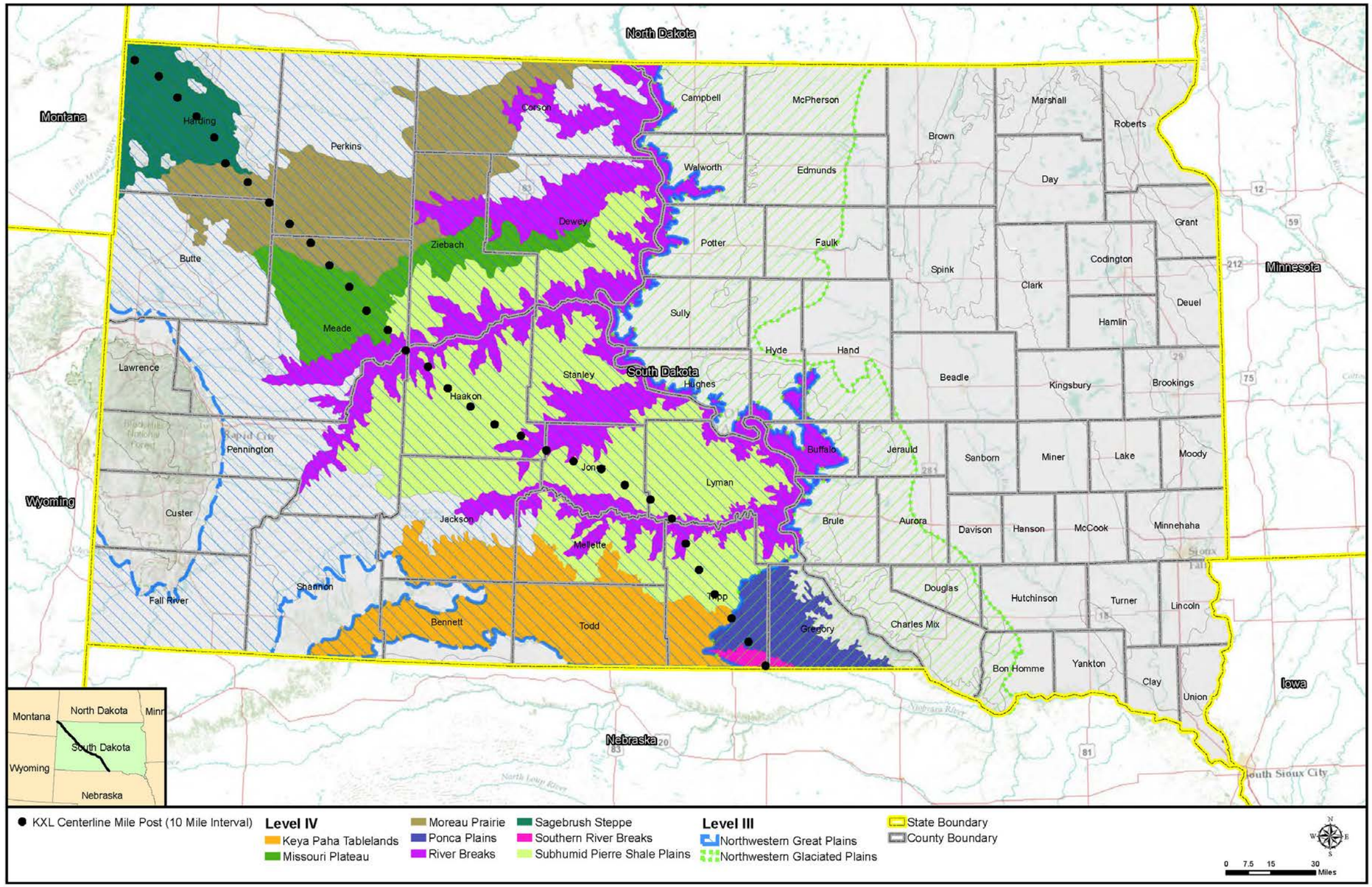

Source: USEPA 2012a through 2012c, respectively.

Figure 3.5.2-2 South Dakota USEPA Ecoregions

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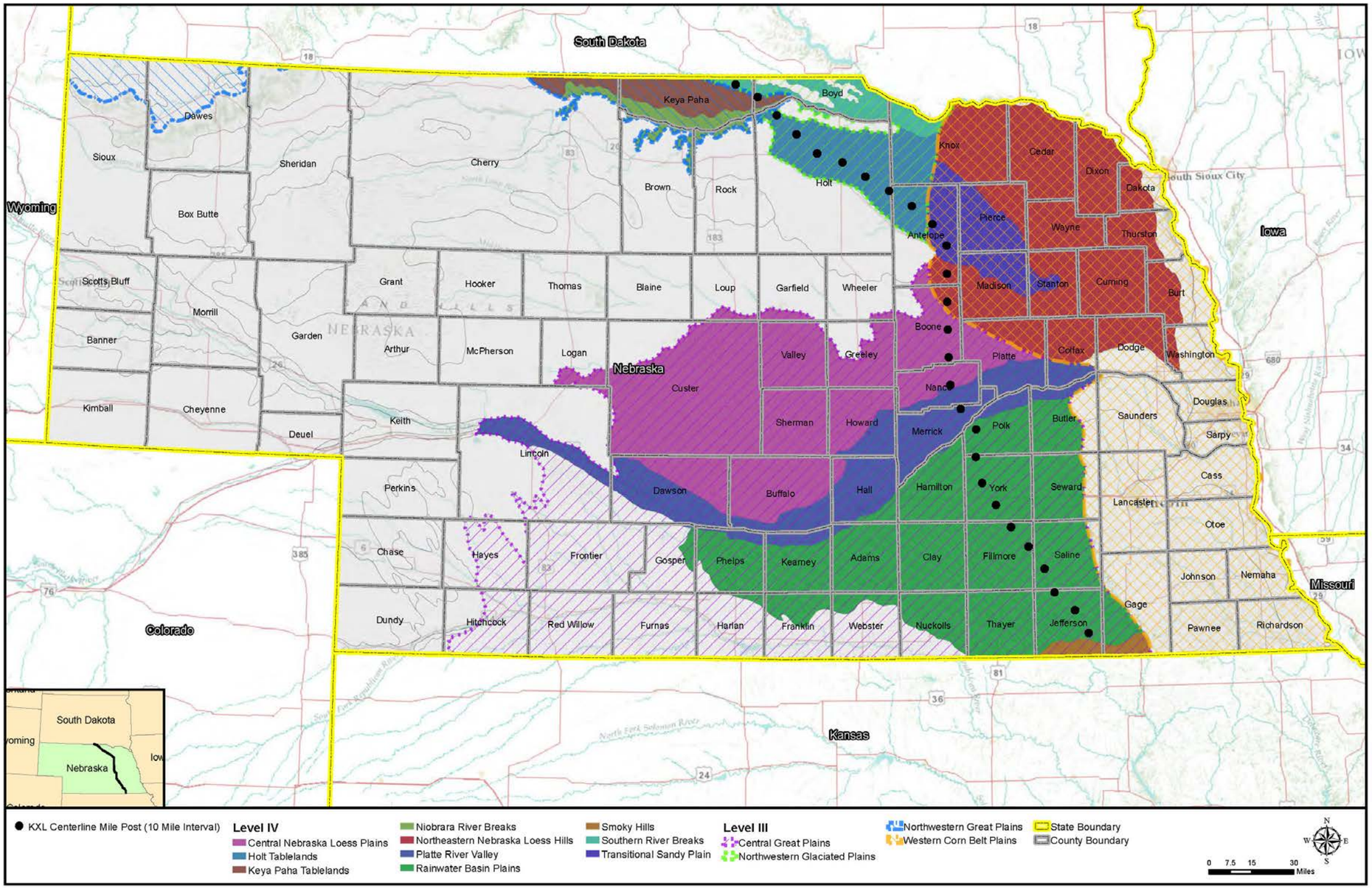

Source: USEPA 2012a through 2012c, respectively.

Figure 3.5.2-3 Nebraska USEPA Ecoregions

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Table 3.5-3 Land Cover Types with Ecosystem Designations Crossed by the Proposed Pipeline Route

Ecosystem Designation	Description	Common Plants	Presence per State		
			MT	SD	NE
Cultivated Cropland					
Cultivated Cropland	Cultivated land, row crops, hayfields.	Wheat, barley, oats, sorghum, corn, beans, and hay.	x	x	x
Pasture/Hay		Non-native grasslands.	x	x	x
Developed Land					
Open Space	Land that is not intensively developed for residential, commercial, industrial, or institutional use.	NA[a]	x	x	x
Low Intensity	Areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-49% of the total cover. Single-family housing units are commonly found in these areas.	NA	x	x	x
Medium Intensity	Areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50-79% of the total cover. Single-family housing units are commonly found in these areas.	NA	x	x	x
Non-Specific				x	x
Nonvascular/Sparse Rock Vegetation					
Western Great Plains Badlands	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	
Grassland/Rangeland					
Inter Mountain Basins Big Sagebrush Steppe	Occurs on both glaciated and non-glaciated landscapes. Soils are typically deep and non-saline with a microphytic crust.	Wyoming big sagebrush *(Artemisia tridenta* spp. *Wyomingensis)*, western wheatgrass, xeromorphic shrubs.	x	x	
Northwestern Great Plains Mixed-grass Prairie	Occurs on both glaciated and non-glaciated 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	x
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	

Ecosystem Designation	Description	Common Plants	Presence per State		
			MT	SD	NE
Perennial Grassland and Forbland	Herbaceous cover dominated by introduced perennial grasses and forbs.	Crested wheatgrass, smooth brome, Kentucky bluegrass, knapweed, Canada thistle, leafy spurge, pepperweed, and sweetclover.			x
Western Great Plains Sand Prairie	Coarse textured soils.	Needle and thread, little bluestem, 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	x
Central Mixed-grass 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
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	
Upland Forest					
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	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	
Northern Rocky Mountain Foothill Conifer Wooded Steppe	Occurs between lower tree line and grasslands or shrublands on warm, dry, exposed sites that are too droughty to support a canopy.	Ponderosa pine, western juniper *(Juniperus occidentalis)*, and bluebunch wheatgrass *(Pseudoroegneria spicata).*	x	x	

Ecosystem Designation	Description	Common Plants	Presence per State		
			MT	SD	NE
Northern Rocky Mountain Foothill Limber Pine-Juniper Woodland	Found in the foothill and lower montane zones. Receives a relatively small amount of precipitation. It occurs mainly on limestone substrates.	Limber pine *(Pinus flexilis)* and juniper.	x		
Western Great Plains Dry Bur Oak Forest/ 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 redcedar.		x	x
Ruderal Forest	Pioneer species of disturbed lands.	Maple, oak, ponderosa pine with crested wheatgrass, smooth brome, and Kentucky bluegrass.			x
NC Interior Dry-Mesic Oak Forest/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
Open Water					
Open Water (Fresh)	Open water, sometimes associated with wetland habitat.	Emergent and submergent vegetation.	x	x	x
Wetland Forest					
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	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		
Introduced Riparian and Wetland Vegetation	Dominated by introduced species that are spontaneous, self-perpetuating, and the delayed result of planting, cultivation, and/or human maintenance.	Purple loosestrife *(Lythrum salicaria)*, reed canary grass *(Phalaris arundinacea)*, and common reed.	x		
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.		x	x
Southern 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, switchgrass, big bluestem.			x

Ecosystem Designation	Description	Common Plants	Presence per State		
			MT	SD	NE
Palustrine Emergent Wetland					
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 (*Lemna* spp.), pondweeds (*Elodea* spp.), duckweeds (*Lemnaceae* spp.), spikerush, and foxtail barley (*Hordeum jubatum*).	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 *(Polygonum* spp.*)*, and pond lilies *(Numphaeaceae* spp.*)*.	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)* is the dominant shrub.	x	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	x	
Eastern Great Plains Wet Meadow, Prairies, and Marsh	Herbaceous wetland communities that are found in drainages within loess-mantled hills.	Hydrophytic graminoids.		x	x
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	x	x

Source: USGS 2011 GAP Analysis. Descriptions and common plants obtained from metadata. Plant names follow U.S. Department of Agriculture (USDA) National Resource Conservation Services (NRCS) 2012 PLANTS Database.

[a] Not applicable (NA).

Table 3.5-4 Land Cover Types with Ecosystem Designations in which Proposed Ancillary Facilities in North Dakota and Kansas would be Located

Ecosystem Designation	Description	Common Plants
	North Dakota	
	Cultivated Cropland	
Cultivated Cropland	Cultivated land, row crops, hayfields.	Wheat, barley, oats, sorghum, corn, beans, and hay.
	Developed Land	
Open Space	Land that is not intensively developed for residential, commercial, industrial, or institutional use.	NA[a]
	Grassland/Rangeland	
Northwestern Great Plains Mixed-grass Prairie	Occurs on both glaciated and non-glaciated landscapes. Soils are typically deep and non-saline with a microphytic crust.	Western wheatgrass, thickspike wheatgrass, green needlegrass, blue grama, and needle and thread.
	Upland Forest	
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, skunkbush sumac, snowberry, silver buffalo berry, shrubby cinquefoil, silverberry, and horizontal rug juniper.
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.
	Kansas	
	Developed Land	
Open Space	Land that is not intensively developed for residential, commercial, industrial, or institutional use.	NA[a]
	Grassland/Rangeland	
Harvested Forest - Grass/Forb Regeneration	Harvested forest lands for timber. Perennial groundcovers regenerating under natural conditions.	Crested wheatgrass, smooth brome, Kentucky bluegrass, knapweed, Canada thistle, leafy spurge, pepperweed, and sweetclover.
Southeastern Great Plains Tallgrass Prairie	This system is primarily found in the Flint Hills and Osage Plains of Kansas and Oklahoma. Generally thin soil layer over limestone beds; relatively unsuitable for farming.	Big bluestem, switchgrass, little bluestem, indiangrass, stiff goldenrod (*Oligoneuron rigidum*), Nebraska blazing star *(Liatris punctata*), white heath aster (*Symphyotrichum ericoides*).

Ecosystem Designation	Description	Common Plants
	Upland Forest	
North-Central Interior Dry-Mesic Oak Forest and Woodland	System is typically found throughout glaciated areas of the Midwest, usually occurring in gently rolling landscapes with well drained soils.	Bur oak, Northern Red Oak *(Quercus rubra)*, bitternut hickory *(Carya cordiformis)*, and mockernut hickory (*Carya alba)*.
	Wetland Forest	
Southeastern Great Plains Floodplain Forest	System is typically found in floodplains of rivers of the East Central Texas Plains, Texas Blackland Prairie Regions, Crosstimbers, and the southeastern edge of the Central Great Plains. Soil formation is dominated by periodic flooding and related sediment deposition.	Pecan (*Carya illinoinensis*), cedar elm (*Ulmus crassifolia*), American elm (*Ulmus americana*), sugarberry (*Celtis laevigata*), water oak (*Quercus nigra*), and white ash (*Fraxinus americana*).

Source: USGS 2011 GAP Analysis. Descriptions and common plants obtained from metadata. Plant names follow U.S. Department of Agriculture (USDA) National Resource Conservation Services (NRCS) 2012 PLANTS Database.

[a] Not applicable (NA).

3.5.4 Biologically Unique Landscapes and Vegetation Communities of Conservation Concern

Native vegetation communities throughout the proposed Project area have been altered by agricultural, urban, and industrial development and by changes in ecosystem processes that have maintained or reset succession, including fire, bison grazing, and prairie dog use. Some of the vegetation communities crossed by the proposed Project route have become conservation concerns by state and federal agencies as well as non-profit collaborations. Vegetation communities are generally of concern because of declining abundance, sensitivity to disturbance, and/or reliance of listed or sensitive species on the habitats that they create. The vegetative communities of conservation concern crossed by the proposed Project route include native grasslands, Rainwater Basin, sagebrush steppe, riparian forest, and native forests. Additionally, vegetation cover within wetlands, conservation and reserve areas, wildlife production areas, and unique landscapes are sensitive habitats that provide valuable resources for wildlife. The following subsections provide brief descriptions of these unique vegetation communities. Figures 3.5.4-1 through 3.5.4-3 illustrate the current distribution of native grasslands, Rainwater Basin, sagebrush steppe, riparian forest, and native forest communities crossed by the proposed Project route.

3.5.4.1 Native Grasslands

Native grasslands or prairies are among the most threatened native vegetation communities in the United States. In the past, grasslands such as the tallgrass prairies, mixed-grass prairies, and shortgrass prairies dominated central North America. Across the proposed Project area, the influence of fire and grazing, especially by large herds of bison in the past, maintained native grasslands in a relatively treeless condition. With suppression of fires, woody vegetation has encroached upon the prairie landscape in some parts of Great Plains. Prairies have been lost to agriculture, urbanization, and mineral exploration and altered by invasions of non-native plants, fire suppression, and the establishment of woodlots and shelterbelts.

Tallgrass prairie is the wettest of the grasslands composed of sod-forming grasses. Mixed-grass prairies are intergrades between tallgrass and shortgrass prairies characterized by the warm-season grasses of the shortgrass prairie and the cool and warm-season grasses of the tallgrass prairie. Shortgrass prairies are dominated by blue grama and buffalograss—two warm-season grasses that flourish under intensive grazing. For some of the Great Plains states crossed by the proposed Project route, estimated declines range from 83 to 99 percent for native tallgrass prairie, 30 to 75 percent for mixed-grass prairie range, and 35 to 79 percent for shortgrass prairie (Samson et al. 1998). The proposed Project route would cross through the unique Verdigris-Bazile landscape in northeastern Nebraska. This area consists primarily of a mosaic of cropland, restored native grasslands, native tallgrass and mixed-grass prairie, and exotic cool season grasslands (Nebraska Natural Legacy Project [NNLP] 2012). Because of the decline and the importance of these areas as wildlife habitat, conservation of native prairie remnants is a high priority throughout the proposed Project area. Many of the sensitive plant species discussed in Section 3.8, Threatened and Endangered Species, that occur along the proposed pipeline route occur within native grasslands.

3.5.4.2 Rainwater Basin

The proposed Project route crosses through the Rainwater Basin landscape in Nebraska. The Rainwater Basin encompasses a 17-county area in central Nebraska. It is a complex of wetlands and grasslands on the flat to rolling loess-covered plains of the Rainwater Basin Plains. The landscape was historically a tall- to-mid-grass prairie plain containing as many as 11,000 playa1 wetlands that covered more than 100,000 acres (Western Hemisphere Shorebird Reserve Network [WHSRN] 2012). This complex of playa wetlands formed by wind scour[1] retains water because of impervious clay layers accumulated in the bottoms of the depressions over thousands of years. These clay layers slow water from seeping into the ground (LaGrange 2005). Surface water drainage is poorly developed, and wetlands fill with precipitation and snowmelt (Schneider et al. 2005). This region supports millions of migratory ducks, geese, and shorebirds. Vegetation communities include mixed grass, tallgrass, and saline prairie communities.

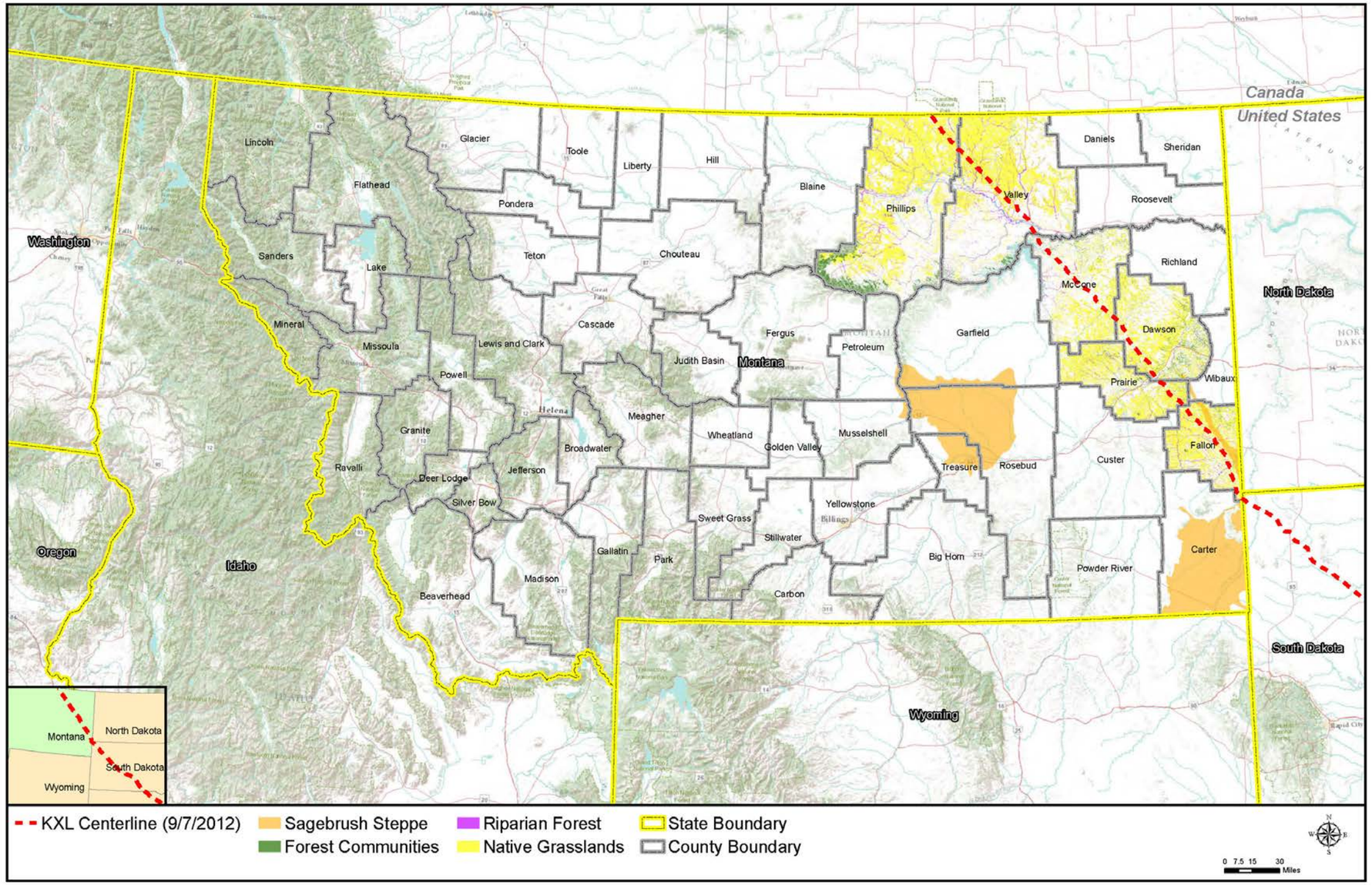
3.5.4.3 Sagebrush Steppe

Mixed shrub and grass habitats characterize large expanses of grasslands throughout Montana and South Dakota. Depending on site moisture, communities may include silver sagebrush in more moist areas, big sagebrush and rabbitbrush (*Chrysothamnus* spp. and *Ericameria* spp.) in drier areas, or greasewood in alkali flats. Large areas of intact native sagebrush grasslands are a conservation priority in Montana and South Dakota. Sagebrush is susceptible to fire, and low-lying, xeric[2] big sagebrush communities may have a natural fire return interval of 100 to 200 years depending on topography and exposure. Sagebrush communities on more moist sites may have a natural fire interval of decades (U.S. Fish and Wildlife Service [USFWS] 2008). Post-fire re-establishment of sagebrush communities may require 20 to 50 years.

3.5.4.4 Riparian Habitats and Bottomland Hardwood

Riparian areas are important as wildlife habitat within the western United States (USFWS 1997) because riparian areas provide wildlife with habitat for food, dens, and nests. Riparian areas represent a transition between wetland and upland habitats but generally lack the amount or duration of water present in wetlands. Riparian vegetation may include wetland or upland plants. Riparian habitats identified as conservation priorities in Montana by the Natural Resource Conservation Services (NRCS) Wildlife Habitat Incentive Program include woody draws (dry streambed areas dominated by broadleaf riparian communities such as cottonwood-alder-chokecherry-willow communities), shrub riparian communities (alder-chokecherry-dogwood communities), graminoid[3]and forb[4] riparian communities (bluejoint reedgrass-cinquefoil-cattails), and mixed riparian communities (mixed grasses and shrubs) (NRCS 2012).

[1] Shallow, ephemeral ponds or lagoons that experience significant seasonal changes in semi-arid to arid climates. Often have high salinity or may be completely dry (Aber 2012).
[2] Habitat generally deficient of moisture.
[3] Grass or grass-like plant, including grasses (*Poaceae*), sedges (*Cyperaceae*), rushes (*Juncaceae*), arrow-grasses (*Juncaginaceae*), and quillworts (*Isoetes*) (USDA NRCS 2012).
[4] Vascular plant without significant woody tissue above or at the ground. Forbs and herbs may be annual, biennial, or perennial but always lack significant thickening by secondary woody growth and have perennating buds borne at or below the ground surface (USDA, NRCS 2012).



Source: USGS GAP 2011; Fry et al. 2011; USEPA 2012a.

Figure 3.5.4-1 Montana Vegetation Communities of Conservation Concern

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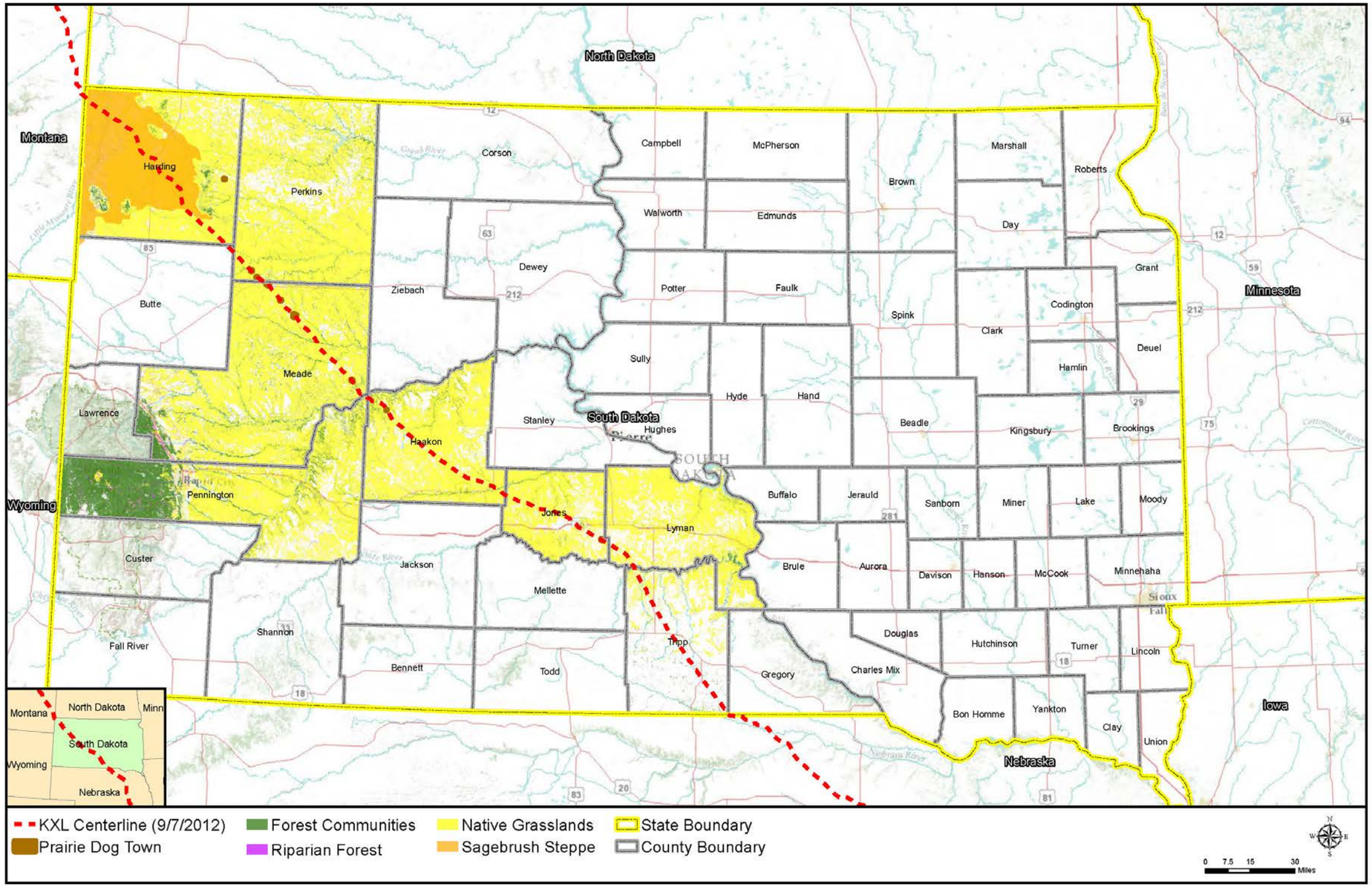

Source: USGS GAP 2011; Fry et al. 2011; USEPA 2012b; and exp Energy Services, Inc. 2012.

Figure 3.5.4-2 South Dakota Vegetation Communities of Conservation Concern

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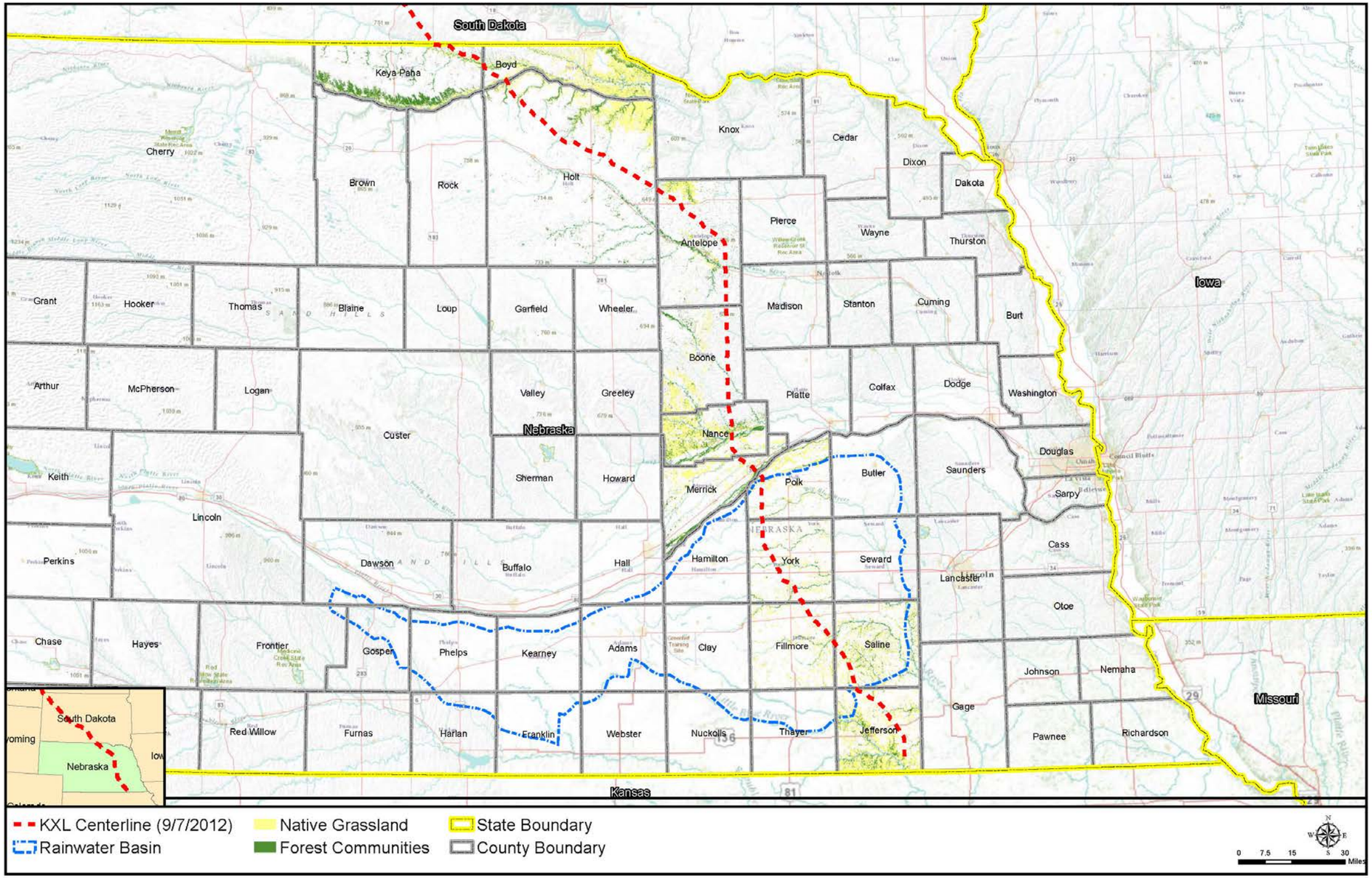

Source: USGS GAP 2011; Fry et al. 2011; USEPA 2012c; and exp Energy Services Inc. 2012.

Figure 3.5.4-3 Nebraska Vegetation Communities of Conservation Concern

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Extensive riparian habitats occur near the confluence of the Milk and Missouri Rivers, and near the Yellowstone River in Montana. High-priority conservation riparian communities in South Dakota include areas with emergent, scrub-shrub, or forest vegetation in semi-permanent or permanent depressional wetlands and low-gradient perennial streams and rivers (South Dakota Department of Game, Fish, and Parks [SDGFP] 2006). The proposed Project route would cross through the Keya Paha Watershed, Lower Niobrara River, Verdigris-Bazile, and Lower Loup River Unique Landscapes in Nebraska with priority cottonwood-willow riparian woodlands.

3.5.4.5 Forest Communities

Native wooded communities were once an integral component of the prairie landscape throughout the Great Plains where they provide foraging, breeding, and refuge habitats for many wildlife species. Prairie woodlands were generally limited in size and distribution by fire to river breaks and protected areas. Many of these communities have been lost due to land conversion to agricultural uses, levee construction, and urban development.

In Montana, green ash and cottonwood woodlands are declining in number (Montana Fish, Wildlife & Parks [MFWP] 2005). No forested habitats are considered high-conservation priorities within the Great Plains Steppe region of South Dakota (SDGFP 2006). Within the biologically unique landscapes identified in Nebraska, several forest communities are identified as conservation priorities including Keya Paha Watershed (oak woodland), Middle Niobrara River (bur oak-basswood-ironwood forest, oak woodland, and ponderosa pine woodland), and Lower Loup River (oak woodland) (Schneider et al. 2005).

3.5.4.6 Traditionally Used Native Plants

Native Americans traditionally have used many native plants for food, construction materials, forage for livestock, fuel, medicine, and spiritual purposes (Johnston 1987, Hart and Moore 1976, and Gilmore 1977). Although dependence on plants for many aspects of survival in the natural environment has become less pronounced in recent times, plants continue to be of substantial importance to the culture of most Native Americans. The plants themselves are important and in some cases, indigenous peoples consider them sacred. Places where traditionally used plants grow and have been collected for many generations may be considered to have spiritual and cultural significance.

Plants of ethnobotanical importance known or likely to occur in the proposed Project area include plants from all native vegetation communities, although many grow in wetlands and riparian areas. Important wetland and riparian plants include cottonwood (*Populus* spp.), hawthorn (*Crataegus* spp.), sweet grass (*Hierochloe odorata*), cattail (*Typha* spp.), snowberry (*Symphoricarpos* spp.), silver buffaloberry (*Sheperdia argentea*), and saskatoon (*Amelanchier alnifolia*). Wetlands and riparian habitats occupy a small percentage of the land area in the Great Plains; however, they are disproportionately important as sources of traditionally used plants. Native grasslands also provided numerous traditionally used plants including: Indian bread-root (*Psoralea esculenta*), wild flax (*Linum lewisii*), prickly pear cactus (*Opuntia* spp.), fringed sage (*Artemisia frigida*), and white sage (*Artemisia ludoviciana*). Reductions in native grasslands have also reduced populations of plants valued by Native Americans. In addition to plants traditionally used by Native Americans, many people also use and collect for sale the purple (or prairie) coneflower (*Echinacea* spp.) as an herbal supplement.

3.5.5 Wetland and Conservation Easements

The proposed Project route would cross multiple conservation easements including USFWS wetland easements, MFWP Conservation Easements, and multiple conservation agreements enrolled in the NRCS Conservation Reserve Program and the Wetland Reserve Program. The Wetland Reserve Program and Conservation Reserve Program are described in Section 3.9, Land Use, Recreation, and Visual Resources, of this Supplemental Environmental Impact Statement. The exact location and extent of these easements or agreements relative to the proposed Project route is pending additional relevant information and will be included, as available, in this review as part of the Final Supplemental EIS.

3.5.6 Noxious Weeds

Under the Federal Plant Protection Act of 2000 (formerly the Noxious Weed Act of 1974 [Title 7 of the United States Code Sections 2801–2814]), the U.S. Department of Agriculture (USDA) defines a noxious weed as "any plant or plant product that can directly or indirectly injure or cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment." Noxious weeds and invasive plants are non-native, undesirable native, or introduced species. They are able to exclude and out-compete desirable native species, thereby decreasing overall species diversity. The Federal Plant Protection Act contains a list (updated February 2012) of 137 federally restricted and regulated noxious weeds (as per Title 7 of the Code of Federal Regulations, Chapter III, Part 360) including 19 aquatic and wetland weeds, 62 parasitic weeds, and 56 terrestrial weeds. Each state is federally mandated to uphold the rules and regulations set forth by the Federal Plant Protection Act and to manage its lands accordingly.

In addition to federal noxious weed lists, each state maintains a list of state and local noxious weeds. County weed control boards or districts are present in most counties along the proposed pipeline route. These county weed control boards monitor local weed infestations and provide guidance on weed control. Weed distributions (USDA NRCS 2012) in the counties along the proposed pipeline route suggest that 50 noxious weeds and invasive plants could potentially occur within the construction right-of-way. These are broadly categorized as follows:

- Six aquatic or wetland weeds;
- Thirty-seven upland weeds; and
- Seven weeds that may occur in either wetland or upland habitats.

Of these 50 weeds (listed in Table 3.5-5), 46 occur in Montana, 31 occur in South Dakota, and 28 occur in Nebraska. Of those, common crupina (*Crupina vulgaris*) and dodder (*Cuscuta* spp.) are federally designated noxious weeds. Executive Order 13112 directs federal agencies to prevent the introduction of invasive species, provide for their control, and minimize the economic, ecological, and human health impacts that invasive species can cause. It further specifies that federal agencies shall not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless it has been determined that the benefits outweigh the potential harm and that all feasible and prudent measures to minimize risk have been taken.

Table 3.5-5 Federal, State, or Local Introduced, Invasive, and Noxious Weeds Potentially Occurring Along the Proposed Project Route[a]

Species[c]	Status/Habitat	Occurrence and State/County Designations[b,d]		
		MT	SD	NE
Hardheads [Russian knapweed] (*Acroptilon [Centaurea] repens*)	Introduced/Upland	x	x	
Lesser [Common] burdock (*Arctium minus*)	Introduced/Upland	x	x	x
Hoary alyssum (*Berteroa incana*)	Introduced/Upland	x		
Cheatgrass (*Bromus tectorum)*	Introduced/Upland	x	x	x
Flowering rush (*Butomus umbellatus)*	Introduced/Wetland	x		x
Whitetop [Hoary cress] (*Cardaria draba*)	Introduced/Upland	x	x	x
Spiny plumeless thistle (*Carduus acanthoides*)	Introduced/Upland		x	x
Nodding plumeless [musk] thistle (*Carduus nutans*)	Introduced/Upland	x	x	x
Diffuse [white] knapweed (*Centaurea diffusa*)	Introduced/Upland	x	x	x
Yellow star-thistle (*Centaurea solstitialis*)	Introduced/Upland	x	x	x
Spotted knapweed (*Centaurea stoebe [maculosa])*	Introduced/Upland	x	x	x
Rush skeletonweed (*Chondrilla juncea*)	Introduced/Upland	x		
Tall thistle (*Cirsium altissimum*)	Native/Upland			x
Canada thistle (*Cirsium arvense*)	Introduced/Wetland and Upland	x	x	x
Flodman thistle (*Cirsium flodmanii*)	Native/Upland			x
Bull thistle (*Cirsium vulgare*)	Introduced/Upland	x	x	x
Poison hemlock (*Conium maculatum*)	Introduced/Wetland and Upland	x	x	x
Field bindweed (*Convolvulus arvensis*)	Introduced/Upland	x	x	x
Common Crupina *(Crupina vulgaris)*[b]	Introduced/Upland	x		
Dodder *(Cuscuta spp.)*	Introduced and Native/ Upland	x	x	x
Gypsyflower [Houndstongue] (*Cynoglossum officinale*)	Introduced/Upland	x	x	x
Scotch Broom (*Cytisus scoparius*)	Introduced/Upland	x		
Common viper's bugloss [Blueweed] (*Echium vulgare*)	Introduced/Upland	x		
Russian olive (*Elaeagnus angustifolia*)	Introduced/Upland	x	x	x
Leafy spurge (*Euphorbia esula*)	Introduced/Upland	x	x	x
Baby's breath (*Gypsophila paniculata*)	Introduced/Upland	x	x	
Orange hawkweed (*Hieracium aurantiacum*)	Introduced/Upland	x	x	
Meadow hawkweed complex (*Hieracium caespitosum, H. x. floribundum, H. piloselloides*)	Introduced/Upland	x		

Species[c]	Status/Habitat	Occurrence and State/County Designations[b,d]		
		MT	SD	NE
Hydrilla (*Hydrilla verticillata*)	Introduced/Wetland	x		
Common St. Johnswort (*Hypericum perforatum*)	Introduced/Upland	x		x
Paleyellow iris [Yellow flag iris] (*Iris pseudacorus*)	Introduced and Upland and Wetland	x		
Dyer's woad (*Isatis tinctoria*)	Introduced/Upland	x		
Broadleaved [Perennial] pepperweed (*Lepidium latifolium*)	Introduced/Upland	x		
Oxeye daisy (*Leucanthemum vulgare [Chrysanthemum leucanthemum]*)	Introduced/Upland	x	x	
Dalmatian toadflax (*Linaria dalmatica*)	Introduced/Upland	x	x	
Butterandeggs [Yellow toadflax] (*Linaria vulgaris*)	Introduced/Upland	x	x	
Purple loosestrife (*Lythrum salicaria*)	Introduced/Wetland	x	x	x
Eurasian (Spike) watermilfoil (*Myriophyllum spicatum*)	Introduced/Aquatic	x		x
Scotch cottonthistle (*Onopordum acanthium*)	Introduced/Upland		x	
Common reed (*Phragmites australis*)	Native/Wetland	x	x	x
Japanese knotweed complex [Crimson beauty] (*Polygonum cuspidatum, P. polystachyum, P. sachalinense*)	Introduced/Upland and wetland	x	X`	x
Curlyleaf pondweed (*Potamogeton crispus*)	Introduced/Aquatic	x		
Sulphur cinquefoil (*Potentilla recta)*	Introduced/Upland	x		
Tall buttercup (*Ranunculus acris*)	Introduced/Upland	x		
Tansy Ragwort (*Senecio jacobaea*)	Introduced/Upland	x		
Field [Perennial] sowthistle (*Sonchus arvensis*)	Introduced/Upland and wetlands	x	x	
Tamarisk [Saltcedar] (*Tamarix* spp.)	Introduced/Upland and wetland	x	x	x
Common tansy (*Tanacetum vulgare)*	Introduced/Upland	x	x	x
Puncturevine (*Tribulus terrestris*)	Introduced/Upland	x	x	x
Common mullein (*Verbascum thapsus*)	Introduced species/ Upland	x	x	x

Source: exp Energy Services Inc. 2012a.

[a] This information was compiled from federal and state websites listing the declared noxious weed lists for each state. For specific state designations see the following USDA NRCS 2012 website: http://plants.usda.gov; Montana Department of Agriculture (MDA) 2012 Website: http://agr.mt.gov/agr/Producer/Weeds/, South Dakota Department of Agriculture (SDA) 2012 Website: http://www.state.sd.us/doa/das/hp-w&p.htm, Nebraska Department of Agriculture (NDA) 2012 Website: http://www.agr.ne.gov/noxious_weed/index.htm.
[b] Introduced, invasive, or noxious weed observed by exp Energy Services, Inc. during field surveys within counties crossed by proposed Project route or within state.
[c] Species in bold are federal noxious weeds (USDA NRCS 2012). Common and species synonyms in square brackets [ ] are as listed on state noxious weed or plant lists.
[d] Ancillary facilities in North Dakota and Kansas are not adjacent to the proposed Project's pipeline route, and are therefore not included in this table.

3.5.7 Connected Actions

The proposed Project would also include several connected actions including: 1) the Bakken Marketlink Project, 2) the Big Bend to Witten 230-kilovolt (kV) Transmission Line, and 3) Electrical Distribution Lines and Substations. Connected actions are more fully addressed in Section 4.5.6, Connected Actions, but described briefly here. The Bakken Marketlink Project would involve the construction and operation of metering systems, three new storage tanks near Baker, Montana, and two new storage tanks within the boundaries of the proposed Cushing tank farm. The Big Bend to Witten 230-kV Transmission Line would provide upgrades to the power grid in South Dakota to support power requirements for pump stations in South Dakota. The third connected action is associated with the electrical distribution lines and substations that would be required throughout the length of the proposed Project corridor to support pump stations and other integral Project-related ancillary facilities. All three of the connected actions will affect terrestrial vegetation and land cover types described in Section 3.5.3, General Vegetation Resources, above. Additional impact information associated with the connected actions is provided in Section 4.5.6, Connected Actions.

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3.6 WILDLIFE

3.6.1 Introduction

This section discusses wildlife resources in the proposed Project area. The description of wildlife resources is based on information provided in the 2011 Final Environmental Impact Statement (Final EIS) as well as new circumstances or information relevant to environmental concerns that have become available since the publication of the Final EIS, including the proposed reroute in Nebraska. The information that is provided here builds on the information provided in the Final EIS and in many instances replicates that information with relatively minor changes and updates. Other information is entirely new or substantially altered from that presented in the Final EIS. Specifically, the following information, data, methods, and/or analyses have been substantially updated in this section from the 2011 document:

- All mammals, birds, reptiles, and amphibians with known habitats in the proposed Project route have been listed as compared to the Final EIS which provided a representative list of species; and
- Habitat types crossed by the pipeline have changed, with the majority of the changes taking place in Nebraska due to the reroute.

This section addresses common big game animals; small game animals and furbearers; waterfowl and game birds; and other nongame animals in the proposed Project area, with specific emphasis on the species and their habitats. Threatened, endangered, and otherwise protected species are discussed in Section 3.8, Threatened and Endangered Species and Species of Conservation Concern. Aquatic species are discussed in Section 3.7, Fisheries.

3.6.2 Environmental Setting

The proposed Project would cross several habitats, which are listed in Table 3.6-1. Approximately 32 percent of habitat (4,014.9 acres) along the proposed Project right-of-way (ROW) has been converted to agricultural land with crops such as soybean, corn, and hay in various phases of production, although in Nebraska, 65 percent of the area that would be impacted by the Project is cropland. These areas are not considered optimal habitat for native wildlife that prefer natural habitats with various vegetation types native to the region (Avery 2006). Additionally, many of the native grassland habitats are actively grazed by domestic livestock; therefore, wildlife use within these areas may be diminished if not actively managed (Vavra 2005).

Table 3.6-1 Habitat Types Located within the Proposed Project ROW

Vegetation Community Classification	Length of Community Crossed (Miles)	Acreage of Construction Disturbance			Acreage of Operation Disturbance		
		Montana	South Dakota	Nebraska	Montana	South Dakota	Nebraska
Cultivated Crops	291.0	904.8	707.7	2,402.4	372.6	298.3	1,093.0
Grassland/Pasture	523.7	2,833.7	3,786.8	1,123.9	1,138.7	1,557.6	483.8
Upland Forest	3.1	8.0	3.3	28.5	3.4	3.0	12.1
Open Water	1.3	1.8	1.7	4.5	1.8	1.5	4.5
Forested Wetlands	4.9	19.3	21.3	17.2	8.9	9.0	11.3

Vegetation Community Classification	Length of Community Crossed (Miles)	Acreage of Construction Disturbance			Acreage of Operation Disturbance		
		Montana	South Dakota	Nebraska	Montana	South Dakota	Nebraska
Shrub-Scrub	34.1	495.1	43.2	0.0	189.8	18.3	0.0
Emergent Herbaceous Wetlands	2.3	7.1	16.2	8.8	2.6	7.6	3.7
Developed Land	15.8	63.5	60.9	136.4	22.4	22.4	52.3
Total	**876.2**	**4,333.3**	**4,641.1**	**3,721.7**	**1,740.2**	**1,917.7**	**1,660.7**

Source: National Land Cover Database (Fry et al. 2011).

The proposed Project would cross diverse vegetative habitats used by a myriad of wildlife species. The vegetation characteristics of each habitat (i.e., height, type, and extent of coverage) are important factors in determining likelihood for presence of a species. Some larger wildlife species use many habitat types within their ranges, foraging areas, and territories while smaller species may only use one or two habitat types. Migratory birds and mammals use multiple habitats and may use a habitat seasonally. For example, white-tailed deer (*Odocoileus virginianus*) tend to move to low-lying valleys during winter months and waterfowl may nest in grasslands and wetlands during the spring and summer (Ducks Unlimited 2012).

3.6.2.1 Big Game Animals

The primary big game species that may occur in the proposed Project area due to habitat presence are listed in Table 3.6-2. All of the big game species occur in Montana, South Dakota, and Nebraska with the exception of the gray wolf (*Canis lupus*), which does not occur in South Dakota or Nebraska, and the mountain lion (*Puma concolor*), which does not occur in Nebraska. Bighorn sheep (*Ovis canadensis*) can be found in steep-sloped areas along the pipeline ROW from Montana to Nebraska. Pronghorn antelope (*Antilocapra americana*) are generally more abundant west of the proposed Project area. Translocation has been used to re-establish elk (*Cervus canadensis*) in Montana and South Dakota and elk have been re-established in some areas near the proposed Project in Nebraska; however, most of their preferred habitat and known range would be avoided by the current route (Nebraska Game and Parks Commission [NGPC] 2012a). American bison (*Bos bison*) is a species of conservation concern in Montana and once occurred in large numbers throughout the Great Plains. Free-ranging bison no longer occur within the area that would be crossed by the proposed Project route (Montana Field Guides 2012).

Table 3.6-2 Big Game with Habitat within the Proposed Project Area

Species	Occurrence by State			Habitat Type
	MT	SD	NE	
Bighorn sheep (*Ovis canadensis*)	x	x	x	Semi-open, rough, rocky steep buttes and canyons of mountains; forage in mixed grass prairies, forests, and forest edges
Elk (*Cervus canadensis*)	x	x	x	Coniferous forests, mixed grass prairies, meadows, and along forest edges
Gray wolf (*Canis lupus*)	x			Habitat generalists
Mountain lion (*Puma concolor*)	x	x		Require cover and large prey availability

Species	Occurrence by State			Habitat Type
	MT	SD	NE	
Mule deer (*Odocoileus hemionus*)	x	x	x	Often characterized by drainages with deciduous trees and shrubs and north slopes dominated by coniferous or evergreen trees
Pronghorn antelope (*Antilocapra americana*)	x	x	x	Open plains, fields, grasslands, brush, deserts, and basins
White-tailed deer (*Odocoileus virginianus*)	x	x	x	Wooded areas

Source: American Society of Mammalogists 2012. IUCNNR 2012. Montana Field Guides 2012. Smithsonian Institute 2012. University of Michigan Museum of Zoology 2012.

In the northern portions of their range, white-tailed deer, mule deer (*Odocoileus hemionus*), and elk may aggregate or yard during winter in stream bottoms, on south-facing slopes, or in other areas where snow accumulations are reduced. In Nebraska, where the proposed pipeline ROW has been modified to avoid the Nebraska Department of Environmental Quality-identified Sand Hills Region, white-tailed deer, mule deer, elk, and pronghorn are the principal big game animals that occur along the proposed Project route. White-tailed deer and mule deer are highly adaptable and inhabit a variety of habitats, including grasslands, shrublands, woodlands, and to a limited degree, croplands. White-tailed deer and mule deer may also be found in close association with humans (Mackie et al. 1998). Some habitat ranges for these species are considered crucial for maintenance of game populations. State agencies and the Bureau of Land Management have established several habitat categories based on species' seasonal use of the habitat. For example, crucial winter range areas are considered essential in determining a game population's ability to maintain itself at a certain level over the long term. Other regions may not usually be a part of a herd's range, but are used as survival areas during extremely harsh winters.

The proposed Project has been designed to avoid impacts to many state and federally managed areas within the vicinity of the Project area. In Nebraska, all state-managed Wildlife Management Areas that provide protected habitats for wildlife have been avoided. These areas are all more than 500 feet from the proposed Project centerline (NGPC 2012b).

3.6.2.2 Small Game and Furbearers

The small game animals and furbearers most often hunted or trapped in the proposed Project area include cottontail (*Sylvilagus floridanus*), mountain cottontail (*Sylvilagus nuttallii*), coyote (*Canis latrans*), Virginia opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), red fox (*Vulpes vulpes*), and squirrel (*Sciurus* spp.). Cottontail, coyote, opossum, red fox, and raccoon use a wide variety of habitats, including croplands, forests, shelterbelts, living snow fences, and rangelands. Many furbearers expected to be present in the proposed Project area, such as American beaver, American mink, raccoon, and weasel, are associated with riparian and wetland areas. A complete list of small game species and furbearers that have known habitats within the proposed Project area is presented in Table 3.6-3.

Table 3.6-3 Small Game and Furbearers with Habitat within the Proposed Project Area

Species	Occurrence by State			Habitat Type
	MT	SD	NE	
American badger (*Taxidea taxus*)	x	x	x	Open areas and forest edges
American beaver (*Castor canadensis*)	x	x	x	Ponds, marshes, rivers, and wetlands
American mink (*Neovison vison*)	x	x	x	Forested areas that are near rivers, streams, lakes, ponds, and marshes
Black-tailed jackrabbit (*Lepus californicus*)		x	x	Meadows, prairies, desert scrublands, and farmlands
Bobcat (*Lynx rufus*)	x	x	x	Found in a wide variety of habitat including woodlands, brush, forests, upland prairies, grasslands with mixed forests, badlands, and mountainous areas
Common muskrat (*Ondatra zibethicus*)	x	x	x	Swamps, marshes, rivers, ponds, lakes, drainage ditches, and canals preferable with 4-6 feet of still or slow moving water
Coyote (*Canis latrans*)	x	x	x	Found in a wide variety of habitats including fields, plains, and bushy areas
Desert cottontail (*Sylvilagus audubonii*)		x		Woodlands, grasslands, creosote brush, and desert areas
Eastern cottontail (*Sylvilagus floridanus*)	x	x	x	Fields, woodlands, swamps, and thickets
Eastern fox squirrel (*Sciurus niger*)	x	x	x	Open forests, woodlands, and wooded strips along streams and rivers
Eastern gray squirrel (*Sciurus carolinensis*)		x	x	Mature hardwood forests >40 hectares that have dense understory and ample den sites
Eastern spotted skunk (*Spilogale putorius*)			x	Forest edges
Franklin's ground squirrel (*Spermophilus franklinii*)			x	Tallgrass and mixed grass prairies
Gray fox (*Urocyon vinereoargenteus*)			x	Prefers areas with lots of brush or woods
Least weasel (*Mustela nivalis*)	x	x	x	Open areas such as meadows, farmlands, marshes, and brushy areas
Long-tailed weasel (*Mustela frenata*)	x	x	x	Woodlands, thickets, farmland, and are found near water sources
Mink (*Mustela vison*)		x	x	Forested areas that are near rivers, ponds, streams, lakes, and marshes
Mountain cottontail *(Sylvilagus nuttallii*)	x	x		Sagebrush, western juniper, and grassland areas near cover
Nutria (*Myocaster coypus*)			x	Wetlands or riverbanks
North American porcupine (*Erethizon dorsatum*)	x	x		Coniferous, deciduous, and mixed forests in addition to scrubland
Raccoon (*Procyon lotor*)	x	x	x	Usually lives in wooded areas near water, but it is very adaptable
Red fox (*Vulpes vulpes*)	x	x	x	Wooded areas, prairies, and farmland
River otter (*Lontra canadensis*)		x	x	Near rivers, lakes, swamps
Southern flying squirrel (*Glaucomys volans*)			x	Deciduous forests
Spotted ground squirrel (*Spermophilus spilisoma*)		x		Semiarid grasslands
Striped skunk (*Mephitis mephitis*)	x	x	x	Open areas with a mix of habitats
Thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*)		x	x	Grasslands and prairies

Species	Occurrence by State			Habitat Type
	MT	SD	NE	
Virginia opossum (*Didelphis virginiana*)		x	x	Ideal habitat is an area interspersed with woods, wetlands, and farmlands
White-tailed jackrabbit (*Lepus townsendii*)		x	x	Open prairies and plains

Source: American Society of Mammalogists 2012. IUCNNR 2012. Montana Field Guides 2012. Smithsonian Institute 2012. University of Michigan Museum of Zoology 2012.

3.6.2.3 Waterfowl and Game Birds

Waterfowl follow distinct, traditional migration corridors or flyways in their annual travels between breeding and wintering areas. The Central Flyway is composed of some or all of each of the states of Montana, Wyoming, Colorado, New Mexico, Texas, Oklahoma, Kansas, Nebraska, South Dakota, and North Dakota, and the Canadian provinces of Alberta, Saskatchewan, and the Northwest Territories (U.S. Fish and Wildlife Service [USFWS] 2012). The proposed Project route is located entirely within the Central Flyway (USFWS 2012); a list of all bird orders and the number of species that may use the areas near the Project route is provided in Table 3.6-4.

Table 3.6-4 Birds Identified within the Counties of the Proposed Project Area

Order	Family	Description	No. of Species
Accipitriformes	Accipitridae	Hawks and Eagles	11
	Cathartidae	Turkey Vulture (*Cathartes aura*)	1
	Pandionidae	Osprey (*Pandion haliaetus*)	1
Anseriformes	Anatidae	Ducks and Geese	31
Apodiformes	Apodidae	Chimney Swift (*Chaetura pelagica*)	1
	Trochilidae	Hummingbirds	2
Caprimulgiformes	Caprimulgidae	Nighthawks	4
Charadriiformes	Charadriidae	Plovers and Killdeer	7
	Laridae	Gulls and Terns	9
	Recurvirostridae	Stilts and Avocet	2
	Scolopacidae	Sandpipers, Snipe, and Woodcock	31
Columbiformes	Columbidae	Doves	5
Coraciiformes	Alcedinidae	Belted Kingfisher (*Megaceryle alcyon*)	1
Cuculiformes	Cuculidae	Cuckoos	2
Falconiformes	Falconidae	Kestrels, Merlin, Falcons	5
Galliformes	Gaviidae	Common Loon (*Gavia immer*)	1
	Odontophoridae	Northern Bobwhite (*Colinus virginianus*)	1
	Phasianidae	Upland Game Birds (Pheasant, Grouse, Turkey)	7
Gruiformes	Gruidae	Cranes	2
	Rallidae	Coots and Rails	5
Passeriformes	Alaudidae	Horned Lark (*Eremophila alpestris*)	1
	Bombycillidae	Waxwings	2
	Calcariidae	Longspurs and Buntings	5

Order	Family	Description	No. of Species
	Cardinalidae	Tanagers, Buntings, and Grosbeaks	10
	Certhiidae	Brown Creeper (*Certhia americana*)	1
	Corvidae	Jays, Crows, and Magpies	3
	Emberizidae	Towhees and Sparrows	25
	Fringillidae	Finches and Grosbeaks	11
	Hirundinidae	Martins and Swallows	7
	Icteridae	Blackbirds, Meadowlarks, Orioles, and Grackles	13
	Laniidae	Shrikes	2
	Mimidae	Catbirds, Mockingbirds, and Thrashers	4
	Motacillidae	Pipits	2
	Paridae	Chickadees and Titmouse	2
	Parulidae	Warblers	29
	Passeridae	House Sparrow (*Passer domesticus*)	1
	Polioptilidae	Blue-gray Gnatcatcher (*Polioptila caerulea*)	1
	Regulidae	Kinglets	2
	Sittidae	Nuthatches	2
	Sturnidae	European Starling (*Sturnus vulgaris*)	1
	Troglodytidae	Wrens	7
	Turdidae	Bluebirds, Robins, and Thrush	9
	Tyrannidae	Flycatchers, Phoebes, Pewees, and Kingbirds	15
	Vireonidae	Vireos	7
Pelecaniformes	Ardeidae	Wading birds (Bittern, Herons, Egrets)	11
	Pelecanidae	American White Pelican (*Pelecanus erythrorhynchos*)	1
	Threskiornithidae	White-faced Ibis (*Plegadis chihi*)	1
Piciformes	Picidae	Woodpeckers	8
Podicipediformes	Podicipedidae	Grebes	5
Strigiformes	Strigidae	Owls	8
	Tytonidae	Barn Owl (*Tyto alba*)	1
Suliformes	Phalacrocoracidae	Cormorants	2

Source: South Dakota Ornithologists Union 2012. USGS 2012. Nebraska Ornithologists Union 2012. Montana Field Guides 2012.

All ducks, geese, swans, waterbirds, shorebirds, and sandhill cranes present within the proposed Project area are considered migratory. Most of the region's waterfowl and waterbirds nest within the proposed Project area or to the north, and migrate through the Project area during spring and fall. All migratory birds (identified in Title 50 of the Code of Federal Regulations Part 10.13) are protected by the Migratory Bird Treaty Act (MBTA) (Title 16 of the United States Code 703–712; 40 Stat. 755 as amended), which prohibits the take of any migratory bird without authorization from the USFWS. The MBTA states that "unless and except as permitted by regulations. . . it shall be unlawful at any time, by any means or in any manner, to. . . take, capture, kill, possess. . . any migratory bird, any part, nest, or eggs of any such bird. . ." Non-

migratory birds such as upland game birds and non-native birds such as European starling (*Sturnus vulgaris*), rock pigeon (*Columba livia*), and house sparrow (*Passer domesticus*) are not protected by the MBTA, although harvest of upland game birds is regulated under state wildlife laws and regulations.

Hunting seasons for migratory birds are set and regulated by the USFWS and state wildlife management agencies. Waterfowl are harvested primarily in fall; however, spring light goose seasons (snow goose [*Chen caerulescens*] and Ross's goose [*Chen rossii*]) are open in some areas in response to expanding populations of these birds, which nest in arctic Canada. Many waterfowl breed in habitats that would be crossed by the proposed Project route, and additional migrants pass through the Project area to and from northern breeding grounds during spring and fall. Sandhill cranes (*Grus canadensis*) are hunted in Montana and South Dakota. Nebraska is closed to hunting for sandhill cranes (Sharp et al. 2006).

Wild turkey (*Meleagris gallopavo*), sharp-tailed grouse (*Tympanuchus phasianellus*), and northern bobwhite (*Colinus virginianus*) are a few of the upland non-migratory game birds that are not protected by the MBTA. Some native game birds are considered conservation concerns and are discussed in Section 3.8, Threatened and Endangered Species and Species of Conservation Concern. Seasons and bag limits for native and introduced game birds, such as ring-necked pheasant (*Phasianus colchicus*), greater sage-grouse (*Centrocercus urophasianus*), and gray partridge (*Perdix perdix*), are set by state wildlife management agencies. Wild turkey is hunted primarily during spring (bearded birds, males only), when most harvest occurs; but they also may be taken during fall hunts, which are usually open for any turkey. Most other resident game birds are hunted during the fall. Mourning dove (*Zenaida macroura*), Wilson's snipe (*Gallinago delicata*), and American woodcock (*Scolopax minor*) are migratory game birds that are protected by the MBTA. Hunting seasons and limits are set and regulated by the USFWS and state wildlife management agencies.

3.6.2.4 Non-Game Animals

The proposed Project route would cross many different habitats that are home to a wide variety of non-game animals. These diverse species function and provide value as prey for game animals and pest and disease control. In addition, presence, diversity, and abundance of particular species can be indicators of overall health and productivity of particular habitats. Non-game animals present in the proposed Project area include species of mammals, birds, reptiles, amphibians, and invertebrates. Below are brief descriptions and discussions of the non-game animals expected to be found within the proposed Project area.

Non-Game Mammals

Small mammals such as bats (*Vespertilionidae*, *Molissidae*), northern pocket gophers (*Geomyidae*), mice (*Muridae*), shrews (*Soricidae*), ground squirrels (*Sciuridae*), and voles (*Muridae*) are important prey for larger mammals, raptors, and snakes. Several non-game mammals expected to be present in the proposed Project area are listed as state or federally endangered, threatened, candidate species, or as species of special concern. These species are discussed in Section 3.8, Threatened and Endangered Species and Species of Conservation Concern. A list of non-game mammals potentially present along the proposed Project route is found below in Table 3.6-5.

Table 3.6-5 Non-Game Mammals Potentially Present in Proposed Project Area

Species	Occurrence by State			Habitat Type
	MT	SD	NE	
Big brown bat (*Eptesicus fuscus*)	x	x	x	Habitat generalist
Black-tailed prairie dog (*Cynomys ludovicianus*)[a]		x		Open, level shortgrass plains
Bushy-tailed woodrat (*Neotoma cinerea*)	x	x		Crevices where there is a large amount of debris to build a nest; occasionally nests in tree forks
Cinereus shrew (*Sorex cinereus*)	x	x	x	Damp or moist habitats in coniferous or deciduous forests, grassy bogs, marshes, and other riparian areas with dense overhead plant cover
Deer mouse (*Peromyscus maniculatus*)	x	x	x	Mixed forests and grasslands
Dwarf shrew (*Sorex nanus*)	x			Rocky areas and meadows in alpine tundra; In sub-alpine areas, spruce-fir bogs, coniferous forests, sedge marshes, and open woodlands
Eastern mole (*Scalopus aquaticus*)		x	x	Fields, meadows, pastures, and open woodlands
Eastern pipistrelle (*Pipistrellus subflavus*)			x	Forested areas
Eastern red bat (*Lasiurus borealis*)	x	x	x	Forested or shrub areas
Evening bat (*Nycticeius humeralis*)			x	Forested areas
Fringed myotis (*Myotis thysanodes*)[a]	x			High elevation forests
Hayden's shrew (*Sorex haydeni*)[a]	x		x	Grasslands
Hispid cotton rat (*Sigmodon hispidus*)			x	Dense, grassy areas
Hispid pocket mouse (*Chaetodipus hispidus*)		x	x	Shortgrass prairies and grasslands
Hoary bat (*Lasiurus cinereus*)[a]	x	x	x	Edge of coniferous and deciduous forests
Least chipmunk (*Tarrias minimus)*		x	x	Boreal and temperate forests
Least shrew (*Cryptotis parva*)			x	Open areas with tallgrass or areas with fallen trees and brush to provide protection
Little brown myotis (*Myotis lucifugus*)	x		x	Variety of forested habitat near riparian areas; roosts include caves and mines with stable, cool temperatures, slow air currents, and high humidity
Long-eared myotis (*Myotis evotis*)	x	x		Rock outcroppings and dead trees
Long-legged myotis (*Myotis volans*)	x	x		Mountainous or relatively rugged areas with a preference for coniferous forests
Long-tailed vole (*Microtus longicaudus*)	x			Forests, woodlands, grasslands, and prairies
Meadow jumping mouse (*Zapus hudsonius*)[a]		x	x	Moist grasslands
Meadow vole (*Microtus pennsylvanicus*)	x	x	x	Grasslands, woodlands, marshes, and along streams and lakes
Merriam's shrew (*Sorex merriami*)	x			Sagebrush steppe, grassland, brushlands, and woodlands at higher elevations
Nine banded armadillo (*Dasypus novemcinctus*)	x	x	x	Bottomland hardwood forests, scrub, and brushlands near water sources
Northern grasshopper mouse (*Onychomys leucogaster*)	x	x		Shortgrass prairies, sand dunes, and sage brush flats

Species	Occurrence by State			Habitat Type
	MT	SD	NE	
Northern pocket gopher (*Thomomys talpoides*)		x	x	Fossorial
Northern short-tailed shrew (*Blarina brevicauda*)			x	Damp bushy woodlands, marshes, and bushy borders of fields
Olive backed pocket mouse (*Perognathus fasciatus*)		x		Arid and semi-arid upland habitats that include thinly covered grasslands
Plains harvest mouse (*Reithrodontomys montanus*)			x	Climax and nearly climax, well-drained grasslands
Plains pocket gopher (*Geomys bursarius*)		x		Open to sparsely wooded areas
Plains pocket mouse (*Perognathus flavescens*)		x	x	Open habitats of loose, sandy soil with little to moderate vegetation
Prairie vole (*Microtus ochrogaster*)	x	x	x	Prairies and grasslands
Preble's shrew (*Sorex prelei*)	x			Sagebrush-grassland habitats
Sagebrush vole (*Lemmiscus curtatus*)	x	x		Sagebrush flats
Silver-haired bat (*Lasionycteris noctivagans*)	x	x	x	Grasslands and forests, preferably old-growth
Southern bog lemming (*Synaptomys cooperi*)			x	Sphagnum bogs and occasionally grasslands
Townsend's big-eared bat (*Corynorhinus townsendii*)[a]	x	x		Douglas fir and lodgepole pine forests, ponderosa pine woodlands, Utah-juniper sagebrush scrub, and cottonwood bottomlands
Western harvest mouse (*Reithrodontomys megalotis*)	x	x		Grasslands, prairies, meadows, and marshes
Western small-footed myotis (*Myotis ciliolabrum*)	x	x	x	Moist areas in rock crevices, caves, mines, or abandoned swallow nests
White-footed mouse (*Peromyscus leucopus*)	x	x	x	Wooded or brushy areas
Woodchuck (*Marmota monax)*		x		Low elevation forests, small woodlots, fields, and pastures
Woodland vole (*Microtus pinetrum*)			x	Deciduous forests
Yellow-bellied marmot (*Marmota flaviventris*)		x		Moderately warm, dry habitats at low to mid-level elevations

Source: American Society of Mammalogists 2012. IUCNNR 2012. Montana Field Guides 2012. Smithsonian Institute 2012. University of Michigan Museum of Zoology 2012.

[a] Species of special concern and potential species of special concern to be addressed in Section 3.8, Threatened and Endangered Species and Species of Conservation Concern.

Raptors and Other Migratory Birds

The proposed Project route falls entirely within the Prairie Avifaunal Biome (Rich et al. 2004). Breeding landbirds in grassland habitats in the Prairie Avifaunal Biome are primarily short-distance migrants, with several species wintering in the southern portions of the proposed Project area, and others overwintering in the southeastern United States and southwestern United States (Rich et al. 2004). Many migratory birds use habitats crossed by the proposed Project route for nesting, migration, and overwintering, with large numbers of species nesting in the northern portion of the Project area. Bald eagles and golden eagles (*Aquila chrysaetos*) and their nests are further protected by the Bald and Golden Eagle Protection Act (16 United States Code 688–688d [a and b]). Bald and golden eagles are discussed in Section 3.8, Threatened and Endangered

Species and Species of Conservation Concern, as are other migratory birds that have been identified for conservation concern. Destruction or disturbance of a migratory bird nest that results in the loss of eggs or young is a violation of the MBTA.

The proposed Project route would cross through two important bird areas (IBAs) as defined by the National Audubon Society (National Audubon 2012). The first (from north to south) is the North Valley Grasslands IBA in Montana, which is considered a globally important site because it supports 15 species of grassland birds, 5 of which are considered globally threatened (Montana Audubon 2012). The site contains one of the largest blocks of intact grasslands in Montana, including rare mixed-grass prairie with porcupinegrass (*Hesperostipa spartea*) and thickspike wheatgrass (*Elymus lanceolatus*). This site supports 73 species of birds including 7 endemic breeding birds: ferruginous hawk (*Buteo regalis*), long-billed curlew (*Numenius americanus*), Sprague's pipit (*Anthus spragueii*), lark bunting (*Calamospiza melanocorys*), Baird's sparrow (*Ammodramus bairdii*), McCown's longspur (*Rhynchophanes mccownii*), and chestnut-collared longspur (*Calcarius ornatus*). Long-billed curlews, Sprague's pipits, and chestnut-collared longspurs occur in this IBA in numbers that exceed the threshold for global significance, and McCown's longspurs and Baird's sparrow numbers occur in this IBA in numbers that exceed the threshold for continental significance (Montana Audubon 2012). Horned larks (*Eremophila alpestris*) and western meadowlarks are especially abundant in this IBA (Montana Audubon 2012).

The second IBA crossed by the proposed Project route is the Rainwater Basin IBA in Nebraska. The area is located in the narrowest portion of the Central Flyway. From mid-February to mid-March, millions of waterfowl use the wetlands and uplands for resting, feeding, and pair bond formation. Typical species abundance includes three to six million snow geese, four million mallards (*Anas platyrhynchos;* 50 percent of the mid-continent population), 900,000 white-fronted geese (*Anser albifrons;* 90 percent of the mid-continent population), 900,000 pintails (*Anas acuta;* 30 percent of the mid-continent population), and millions of other migrating birds (Audubon Nebraska 2012). More than 40 percent of Nebraska's whooping crane (*Grus americana)* sightings have been recorded in this IBA, and, in the fall, more use-days for the species have been recorded than in any other area in the United States. Other notable species recorded in this IBA include greater prairie-chicken (*Tympanuchus cupido*), bobolink (*Dolichonyx oryzivorus*), short-eared owl (*Asio flammeus*), and sandhill cranes (Audubon Nebraska 2012).

The proposed Project route would also cross three bird conservation regions that are ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues, as defined by the U.S. North American Bird Conservation Initiative (USNABCI) (USNABCI 2000). These regions are Prairie Potholes (Region 11), which provides breeding and migratory habitat to over 200 species of birds; Badlands and Prairies (Region 17), which is habitat for some of the healthiest populations of high-priority dry-grassland birds; and Central Mixed Grass Prairie (Region 19), which acts as an important spring migration area (USNABCI 2000).

Aerial surveys of large bird species stick nests were conducted along the proposed Project ROW during spring 2008, 2009, and 2010 and will be continued into 2013 along the route modifications in Montana, South Dakota, and Nebraska. The scope of these surveys is to identify large stick nest sites of raptors and herons in deciduous trees within a 0.25- to 1-mile band from the proposed Project pipeline centerline, and to document locations of all nests (active and

inactive) that could potentially be removed prior to construction (and the nesting season) to avoid direct impacts to nesting birds.

Reptiles

Reptiles are known to exist within all habitat types along the proposed Project route. Species found in the Project area are listed below in Table 3.6-6. Reptiles are important prey for many raptors, small mammals, and other reptiles. Some of these reptiles are considered state-listed species of special concern. These species are discussed in Section 3.8, Threatened and Endangered Species and Species of Conservation Concern.

Table 3.6-6 Reptiles Potentially Present within the Proposed Project Area

Order	Family	Species	MT	SD	NE
Squamata	Anguidae	Slender Glass Lizard (*Ophisaurus attenuates*)			x
	Colubridae	Coachwhip (*Mastiophus flagellum*)			x
		Common Kingsnake (*Lampropeltis getula*)			x
		Eastern Glossy Snake (*Arizona elegans*)			x
		Eastern Racer (*Coluber constrictor*)	x	x	x
		Gopher Snake (*Pituophis catenifer*)	x	x	x
		Great Plains Rat Snake (*Pantherophis emoryi*)			x
		Milk Snake (*Lampropeltis triangulum*)[a]	x	x	x
		Plains Blackhead Snake (*Tantilla nigriceps*)			x
		Prairie Kingsnake (*Lampropeltis calligaster*)			x
		Smooth Green Snake (*Liochlorophis vernalis*)	x	x	x
		Western Fox Snake (*Mintonius ramspotti*)		x	x
		Western Rat Snake (*Scotophis obsoletus*)			x
	Croalidae	Northern Copperhead (*Agkistrodon contortrix*)			x
		Prairie Rattlesnake (*Crotalus viridis*)	x	x	x
		Timber Rattlesnake (*Crotalus horridus*)			x
		Western Massasauga (*Sistrurus catenatus*)			x
	Dipsadidae	Eastern Hognose Snake (*Heterodon platirhinos*)		x	x
		Ringneck Snake (*Diadophis punctatus*)		x	x
		Western Hognose Snake (*Heterodon nasicus*)[a]	x	x	x
		Western Worm Snake (*Carphophis vermis*)			x
	Natricidae	Brown Snake (*Storeria dekayi*)		x	x
		Common Garter Snake (*Thamnophis sirtalis*)	x	x	x
		Graham's Crayfish Snake (*Regina grahamii*)			x
		Lined Snake (*Tropidoclonion lineatum*)		x	x
		Northern Water Snake (*Natrix sipedon*)		x	x
		Plains Garter Snake (*Thamnophis radix*)	x	x	x
		Redbelly Snake (*Storeria occipitomaculata*)		x	
		Western Ribbon Snake (*Thamnophis proximus*)			x
		Western Terrestrial Garter Snake (*Thamnophis elegans*)	x	x	x
	Phrynosomatidae	Lesser Earless Lizard (*Holbrookia maculata*)		x	x
		Mountain Short-horned Lizard (*Phrynosoma hernandesi*)[a]	x	x	x
		Prairie Lizard (*Sceloporus consobrinus*)		x	x
		Sagebrush Lizard (*Sceloporus graciosus*)	x	x	x
	Scincidae	Five-lined Skink (*Plestiodon fasciatus*)		x	x
		Great Plains Skink (*Plestiodon obsoletus*)			x
		Many-lined Skink (*Plestiodon multivirgatus*)[a]		x	x
		Northern Prairie Skink (*Plestiodon septendrionalis*)		x	x
	Teiidae	Six-lined Racerunner (*Aspidoscelis sexlineata*)		x	x

Order	Family	Species	MT	SD	NE
Chelonia	Chelydridae	Common Snapping Turtle (*Chelydra serpentina*)[a]	x	x	x
	Emydidae	Blanding's Turtle (*Emys blandingii*)		x	x
		False Map Turtle (*Graptemys pseudogeographica*)		x	x
		Northern Painted Turtle (*Chrysemys picta*)	x	x	x
		Ornate Box Turtle (*Terrapene ornata*)[a]		x	x
		Slider (*Trachemys scripta*)			x
	Kinosternidae	Yellow Mud Turtle (*Kinosternum flavescens*)			x
	Trionychidae	Smooth Softshell (*Apalone mutica*)		x	x
		Spiny Softshell (*Apalone spinifera*)[a]	x	x	x

Source: Center for North American Herpetology 2012 and the Montana Field Guides 2012.

[a] Species of special concern and potential species of special concern to be addressed in Section 3.8, Threatened and Endangered Species and Species of Conservation Concern.

Amphibians

Potential habitat for amphibians in the proposed Project area includes perennial and intermittent stream reaches, wetlands, and ephemeral ponds. Some amphibians expected to be present within the proposed Project area are considered state-listed species of special concern. These species are discussed in Section 3.8, Threatened and Endangered Species and Species of Conservation Concern. A complete list of amphibian species expected to be present in the proposed Project area is found in Table 3.6-7.

Table 3.6-7 Amphibians Potentially Present within the Proposed Project Area

Order	Family	Species	MT	SD	NE
Caudata	Ambystomidae	Barred Tiger Salamander (*Ambystoma mavortium*)	x	x	x
		Eastern Tiger Salamander (*Ambystoma tigrinum*)			x
		Smallmouth Salamander (*Ambystoma texanum*)			x
	Proteidae	Common Mudpuppy (*Necturus maculosus*)		x	
Salientia	Bufonidae	American Toad (*Anaxyrus americanus*)		x	x
		Canadian Toad (*Anaxyrus hemiophrys*)		x	
		Great Plains Toad (*Anaxyrus cognatus*)[a]	x	x	x
		Woodhouse Toad (*Anaxyrus woodhousii*)	x	x	x
	Hylidae	Blanchard's Cricket Frog (*Acris blanchardii*)		x	x
		Cope's Gray Tree Frog (*Hyla chrysoscelis*)		x	x
		Eastern Gray Tree Frog (*Hyla vesicular*)		x	x
		Northern Cricket Frog (*Acris crepitans*)			x
		Ornate Chorus Frog (*Pseudacris maculata*)	x	x	x
	Microhylidae	Great Plains Narrowmouth Toad (*Gastrophryne olivacea)*			x
	Ranidae	Bullfrog (*Lithobates catesbeianus*)	x	x	x
		Northern Leopard Frog (*Lithobates pipiens*)[a]	x	x	x
		Plains Leopard Frog (*Lithobates blairi*)		x	x
		Wood Frog (*Lithobates sylvaticus*)		x	
	Scaphiopodidae	Central Plains Spadefoot Toad (*Scaphiopus bombifrons*)		x	x
		Plains Spadefoot (*Spea bombifrons*)	x		

Source: Center for North American Herpetology 2012 and the Montana Field Guides 2012.

[a] Species of special concern and potential species of special concern to be addressed in Section 3.8, Threatened and Endangered Species.

Invertebrates

Montana, South Dakota, and Nebraska are home to tens of thousands of invertebrate species. Many different types of invertebrates occur within the proposed Project area including bees, beetles, butterflies, cicadas, crustaceans, earthworms, grasshoppers, hornets, moths, and spiders; these species are food for birds, amphibians, reptiles, and small mammals. Among these species are 24 insects on Nebraska's Natural Heritage Elements list, including the American burying beetle (Nebraska's only federally endangered insect), 4 species of tiger beetles, and 18 species of butterflies (Hoback 2005); 83 species on Montana's Wildlife Action Plan (Montana Natural Heritage Program and Montana Fish Wildlife and Parks 2009); and 29 species on South Dakota's Wildlife Action Plan (South Dakota Game, Fish, and Parks 2012). Species of concern are addressed in Section 3.8, Threatened and Endangered Species and Species of Conservation Concern.

3.6.3 Connected Actions

There are three connected actions in the vicinity of the proposed Pipeline route:

- Bakken Marketlink Project;
- Big Bend to Witten 230-kilovolt (kV) Transmission Line; and
- Electrical Distribution Lines and Substations.

The wildlife resources found along and in the proposed connected action project areas are similar to the wildlife resources of the proposed pipeline corridor itself. Connected actions are more fully addressed in Section 4.6.5, Connected Actions, but described briefly here. The Bakken Marketlink Project would involve the construction and operation of metering systems, three new storage tanks near Baker, Montana, and two new storage tanks within the boundaries of the proposed Cushing tank farm. The Big Bend to Witten 230-kV Transmission Line would provide upgrades to the power grid in South Dakota to support power requirements for pump stations in South Dakota. The third connected action is associated with the electrical distribution lines and substations that would be required throughout the length of the proposed Project corridor to support pump stations and other integral Project-related ancillary facilities. All three of the connected actions have the potential to affect wildlife described in Section 3.6.2, Environmental Setting, above.

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3.7 FISHERIES

3.7.1 Introduction

This section discusses Fisheries resources in the proposed Project area. The description of Fisheries resources is based on information provided in the 2011 Final Environmental Impact Statement (Final EIS) as well as new circumstances or information relevant to environmental concerns that have become available since the publication of the Final EIS, including the proposed reroute in Nebraska. The information that is provided here builds on the information provided in the Final EIS and in many instances replicates that information with relatively minor changes and updates. Other information is entirely new or substantially altered from that presented in the Final EIS. Specifically, the following information, data, methods, and/or analyses have been substantially updated in this section from the 2011 document:

- The number and type of stream crossings and stream crossing methods have changed due to changes in the proposed Project route as well updated field survey information provided by Keystone. The stream crossing assessment is comprised of a desktop analysis based on National Hydrologic Dataset (NHD) information and supplemented by TransCanada Keystone Pipeline, LP (Keystone) field survey descriptions where available; and
- Information on the fisheries resources for waterbodies within 10 miles downstream of the proposed Project area is presented.

The description of the fisheries resources is based on information and data provided by government agencies and subject matter experts. This information was supplemented by additional field surveys conducted by Keystone along the proposed pipeline route.

The scope of the following discussion of the affected environment focuses on fish and fish habitats that currently exist within and immediately adjacent to the proposed pipeline right-of-way (ROW). Waterbodies in this assessment are those that support fish and fish habitat and that would be crossed by the proposed pipeline. These waterbodies include streams, rivers, ponds, reservoirs, and lakes. In the event of a spill or release of material from the proposed pipeline, habitats far downstream from the ROW could be impacted. This section also includes an overview of the fish resources in these downstream waters; however, impacts to these resources are discussed in the Potential Releases sections (Sections 3.13 and 4.13).

3.7.2 Environmental Setting

The general environmental setting for fish resources is the surface waters of the Missouri River drainage basin. The proposed Project route enters the United States in Montana and crosses the semi-arid plain and prairie regions of the northern Midwest that make up the Great Plains. The Missouri River originates in the high mountains of Montana east of the continental divide (Brown 1971). The Missouri River is the longest river in North America, and the streams and rivers in Montana, South Dakota, and Nebraska that are crossed by the proposed Project corridor all drain into the Missouri River.

Most portions of the Great Plains that were formerly prairie and grasslands are now heavily impacted by agriculture and, to a lesser extent, affected by urbanization, which has caused hydrologic disturbance and physical modification including stream channelization, habitat

fragmentation, and alteration of the riparian corridor (Dodds et al. 2004). Prairie streams are subject to flooding as well as drying, and species inhabiting these streams have evolved to accommodate significant environmental disturbance and intermittency of flow (Dodds et al. 2004). Part of this accommodation is the ability to rapidly recolonize previously dry stream channel reaches (Matthews 1988). The availability of refuge habitat during dry spells and floods can influence stream fish assemblages (Schlosser 1995) and, in some instances, is critical for the completion of fish life cycles (Schiemer and Spindler 1989, Bisson et al. 1982).

The typical stream types found within the Missouri River Basin include those characterized as prairie streams and big rivers. The fish fauna of prairie streams are often less diverse than fish fauna in streams of other regions because prairie streams are subject to widely fluctuating environmental conditions, and only fish tolerant of these conditions can persist (Pflieger 1975).

In big-river systems like the mainstem Missouri River, species have adapted to tolerate high levels of turbidity. Historically, the Missouri and other big rivers transported large quantities of sediment downstream. However, the sediment load transported by big rivers of the Midwest today is reduced because of the construction of large dams and reservoirs that trap suspended sediments.

The Nebraska segment of the proposed pipeline would skirt the eastern edge of the Nebraska Department of Environmental Quality (NDEQ)-identified Sand Hills Region. Lakes and streams of the NDEQ-identified Sand Hills Region are inhabited by 75 fish species, many of which are common big-river generalists capable of withstanding a wide range of environmental conditions. Less common and rare species, such as the northern redbelly dace (*Phoxinus eos*), are more sensitive to fluctuations in environmental conditions and may exist in small pockets separated from other portions of the species range. In many cases, they are restricted to more stable headwater habitats. Pike, bass, and perch have been introduced to NDEQ-identified Sand Hill Region lakes, and trout have been introduced to several coldwater streams to provide recreational fishing opportunities (Schneider et al. 2011).

Juvenile and adult aquatic insects, worms, shellfish, and other invertebrate life are assumed to inhabit all proposed Project area waterbodies. These organisms provide food for juvenile and adult fish. Species composition of macroinvertebrate communities depends on the physical and chemical characteristics of the water; hence, macroinvertebrates are important indicators of water quality (Keystone 2009).

Lakes, ponds, and reservoirs within 10 miles downstream of the proposed Project area typically support the same species of recreational and commercial fish as the streams that supply them. These waterbodies can provide suitable habitats for spawning, rearing, and foraging, and can also provide seasonal refuge when conditions in adjacent stream segments become unsuitable. While natural lakes typically do not restrict fish movement, many artificial waterbodies are constructed with dams and outlet configurations that prevent upstream fish movement, thus isolating upstream populations and limiting re-colonization following extirpation events.

3.7.2.1 Fisheries Resources

This section addresses fish species with recreational or commercial significance that occur in waterbodies that would be crossed by, or are within 10 miles downstream of, the proposed Project route. Special status fish species including threatened, endangered, and species of

concern are discussed in Sections 3.8 and 4.8, Threatened and Endangered Species and Species of Conservation Concern.

Common fish species with recreational or commercial value that occur across the proposed Project area are listed in Table 3.7-1. Many of these species are native North American fish that have been introduced into watersheds where they did not previously occur to provide for recreational fisheries, while the common carp (*Cyprinus carpio*) is an exotic Eurasian introduction.

Table 3.7-1 Common Recreational and Commercial Fish Associated with Proposed Project Route Stream Crossings

Species or Group	Status[a]	Montana	South Dakota	Nebraska
Bass (smallmouth, largemouth, spotted) (*Micropterus* spp.)	Recreational	x	x	x
Bluegill *(Lepomis macrochirus)*	Recreational		x	x
Brook trout (*Salvelinus fontinalis)*	Recreational	x	x	x
Buffalo (bigmouth, smallmouth) (*Ictiobus* spp.)	Recreational/ Commercial	x	x	x
Bullheads (black, yellow) (*Ameiurus* spp.)	Recreational	x	x	x
Burbot *(Lota lota)*	Recreational	x		
Common carp (*Cyprinus carpio)*	Recreational/ Commercial	x	x	x
Channel catfish (*Ictalurus punctatus)*	Recreational/ Commercial	x	x	x
Crappie (black, white) (*Pomoxis* spp.)	Recreational	x	x	x
Flathead catfish (*Pylodictis olivaris)*	Recreational/ Commercial		x	x
Freshwater drum (*Aplodinotus grunniens)*	Recreational/ Commercial	x	x	x
Green sunfish (*Lepomis cyanellus)*	Recreational	x	x	x
Minnows (baitfish) Fathead minnow (*Pimephales promelas);* Golden shiner (*Notemigonus crysoleucas*); and others	Recreational/ Commercial	x	x	x
Muskellunge (*Esox masuinongy)*	Recreational		x	x
Northern pike (*Esox lucius)*	Recreational	x	x	x
Paddlefish (*Polyodon spatula)*	MT-SC; BLM-S	x		
Pumpkinseed (*Lepomis gibbosus)*	Recreational	x	x	x
Rainbow trout *(Oncorhynchus mykiss)*	Recreational	x	x	x
Sauger (*Sander canadensis)*	MT-SC; BLM-S	x	x	x

Species or Group	Status[a]	Montana	South Dakota	Nebraska
Shad (baitfish) Gizzard shad *(Dorosoma cepedianum)*	Commercial		x	x
Shortnose gar (*Lepisosteus platostomus)*	MT-SC	x	x	x
Shovelnose sturgeon (*Scaphirhynchus platorynchus)*	Commercial	x	x	x
Sunfish (longear, orangespot, redear, warmouth) (*Lepomis* spp.)	Recreational	x	x	x
Walleye (*Sander vitreus)*	Recreational	x	x	x
Yellow perch (*Perca flavescens)*	Recreational/ Commercial	x	x	x

[a] BLM = Bureau of Land Management, MT = Montana, S = Sensitive, SC = Species of Concern.

Several fish that support important recreational or commercial fisheries have declined in abundance and are currently protected within some portions of their range. These fish are classified as threatened, endangered, or sensitive and are discussed in more detail in Sections 3.8 and 4.8, Threatened and Endangered Species and Species of Conservation Concern, and in Appendix H, 2012 Biological Assessment.

Spawning periods and habitats for some recreational and commercial fish species in the proposed Project area are shown in Table 3.7-2. Fish species are particularly sensitive to habitat disruption caused by construction during spawning periods. Spawning periods for fish that range across the length of the proposed Project route would vary depending on latitude. After spawning, the type and length of habitat use for larval and juvenile fish rearing vary depending on the fish species, life history stage, and site-specific conditions. Eggs would be expected to hatch relatively soon after spawning activities (for example, 3 to 16 days for common carp). Therefore, use of these waterbodies for larval rearing would be expected to overlap and extend beyond the identified spawning periods in Table 3.7-2.

Fisheries information was derived primarily from fishery distribution maps available on agency websites, supplemented by information provided by regional biologists. The proposed Project route would involve 56 perennial stream crossings and 974 intermittent stream crossings. Of these streams, the proposed Project route would cross 52 perennial streams (two crossed multiple times) that contain known or potential habitat for fish of recreational or commercial value. Surface water classifications used to assess potential fisheries resource values of streams that would be crossed by the proposed pipeline route are provided in Appendix D, Waterbody Crossing Tables and Required Crossing Criteria for Reclamation Facilities. Section 3.7.2.2, Types of Fisheries Affected, discusses the perennial crossings for each state, the proposed crossing method, and the presence or absence of a fishery of special concern based on state surface water classifications.

There are 580 lakes, ponds, or reservoirs that are within 10 miles downstream of proposed water crossings. A large majority of these waterbodies consists of small ponds or reservoirs, while 36 are greater than 10 acres in surface area. A comprehensive list of these waterbodies is provided in Appendix D, Waterbody Crossings, Tables 7, 8, and 9. These waterbodies typically support the same recreational and commercial fish species that are listed in Table 3.7-1, with spawning periods and habitats that are equivalent to those provided in Table 3.7-2.

Table 3.7-2 Recreational and Commercial Fish Spawning Periods and Habitats

	Month[a]												
Species or Group[b,c]	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**Habitat**
Bass (*Micropterus* spp.)					■	■							Shallow areas over clean gravel and sand bottoms.
Buffalo (bigmouth, smallmouth) (*Ictiobus* spp.)				■	■	■							Spawn at depths of 4 to 10 feet over gravel or sand substrates.
Bullhead (yellow and black) (*Ameiurus* spp.)					■	■							Usually spawn in weedy or muddy shallow areas by building nests.
Burbot (*Lota lota*)	■	■	■									■	Eggs are scattered over sand or gravel substrates.
Common carp (*Cyprinus carpio*)				■	■	■							Adhesive eggs scattered in shallow water over vegetation, debris, logs, or rocks.
Flathead catfish (*Pylodictis olivaris*)						■	■						Nest builders with habitat similar to channel catfish.
Channel catfish (*Ictalurus punctatus*)					■	■	■						Prefer areas with structure such as rock ledges, undercut banks, logs, or other structure where they build nests.
Crappie (*Pomoxis* spp.)					■	■							Eggs deposited in depressions on bottom in cove or embayments.
Freshwater drum (*Aplodinotus grunniens*)					■	■							Buoyant eggs drift in river currents during development.
Muskellunge (*Esox masuinongy*)					■	■							Spawn in tributary streams and shallow lake channels.
Northern pike (*Esox lucius*)					■	■							Small streams or margins of lakes over submerged vegetation.
Paddlefish (*Polydon spatula*)				■	■								Move into rivers and spawn over flooded gravel bars.
Sauger (*Sander canadensis*)				■	■								Move into tributary streams or backwaters where they spawn over rock substrates.
Shad (baitfish) (*Dorosoma cepedianum*)				■	■	■							Spawn in shallow water over sandy/rocky substrates; eggs scattered, adhere to objects.
Shovelnose sturgeon (*Scaphirhynchus platorynchus*)					■	■							Spawning occurs in open water channels of large rivers over rocky or gravelly bottoms.
Sunfish (*Lepomis* spp.)					■	■	■	■					Nest builders in diverse substrates and shallow depths.
Walleye (*Sander vitreus*)				■	■								Spawn in lakes and streams in shallow water over rock substrates.

	Month[a]												
Species or Group[b,c]	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**Habitat**
White bass (*Morone chrysops*)													Egg masses deposited over sand bars, submerged.
Yellow perch (*Perca flavescens*)													Shallow open water over weedy areas.

Sources: NatureServe 2009; Eddy and Underhill 1974; Harlan et al. 1987; Pflieger 1975; Pflieger 1997; Hoese and Moore 1977; Robison and Buchanan 1988; Thomas et al. 2007; Miller and Robison 2004; Ross 2001; and Pattillo et al. 1997.

[a] Spawning periods are approximate and could occur in only a portion of a particular month.
[b] Rainbow trout and brook trout are not included because these species are not documented to spawn in streams crossed by the proposed Project route; their presence and persistence is a result of continued hatchery fish stocking programs.
[c] Some species are grouped into families in this table (i.e., sunfish), but are presented as individual species in Table 3.7-1.

3.7.2.2 Types of Fisheries Affected

This section addresses fisheries potentially found in perennial streams (including rivers) that would be crossed by the proposed Project route, as well as all ponds, lakes, and reservoirs within 10 miles downstream of these crossings. Although intermittent streams may be of some value in terms of fisheries resources, they are not addressed in this section because they are unable to support a year-round fishery and impacts are expected to be minimal. The proposed Project area includes coldwater (trout), coolwater (perch and pike), and warmwater (catfish, bullheads, sunfish, carp, and bass) fisheries.

Surface water classifications based on a waterbody's water quality and resource values are important elements of fisheries management in each state. The classification systems for each of the states crossed by the proposed pipeline route are administered by the following agencies:

- Montana Department of Environmental Quality (MDEQ 2012);
- South Dakota Department of Environmental and Natural Resources (SDDENR 2012); and
- NDEQ (2012b).

Table 3.7-3 provides the locations of proposed pipeline crossings at perennial streams identified as contributing habitat for recreational and commercial fisheries. No surface water resources containing fisheries were identified near the facilities to be located in North Dakota (pipe storage yard and rail siding) or in Kansas (pump stations).

Table 3.7-3 Proposed Perennial Stream Crossings along the Proposed Project Route

County	Approximate Milepost	Waterbody Name	Relevant Surface Water or Fishery Class/Rating[a,b]	Number of Crossings
Phillips	25.3	Frenchman River	Non-Salmonid	1
Valley	39.0	Rock Creek	Non-Salmonid	1
Valley	40.4	Willow Creek	Non-Salmonid	1
Valley	83.4	Milk River	Non-Salmonid	1
Valley/ McCone	89.7	Missouri River	Marginal Salmonid/Red Ribbon, Class II Recreational Fishery	1
Dawson	198.1	Yellowstone River	Non-Salmonid/Blue Ribbon, Class I Recreational Fishery	1
Fallon	247.1	Sandstone Creek	Non-Salmonid	1
Fallon	265.3	Little Beaver Creek	Non-Salmonid	1
Fallon	284.5	Boxelder Creek	Non-Salmonid	1
Harding	292.6	Shaw Creek	Fish Propagation	1
Harding	295.0	Little Missouri River	WW Semi-permanent	1
Harding	300.4	Kimble Creek	Fish Propagation	1
Harding	303.5	Unnamed Tributary to Dry House Creek	Fish Propagation	1
Harding	321.6	South Fork Grand River	WW Semi-permanent	1
Harding	326.4	Clarks Fork Creek	WW Marginal	1
Butte	361.0	North Fork Moreau River	WW Marginal	1
Perkins	368.9	South Fork Moreau River	WW Marginal	1
Meade	387.8	Pine Creek	WW Marginal	1

County	Approximate Milepost	Waterbody Name	Relevant Surface Water or Fishery Class/Rating[a,b]	Number of Crossings
Meade	428.1	Narcelle Creek	Fish Propagation	1
Meade	430.1	Cheyenne River	WW Permanent	1
Haakon	486.0	Bad River	WW Marginal	1
Jones	498.3	Dry Creek	Fish Propagation	1
Tripp	541.3	White River	WW Semi-permanent	1
Tripp	547.3	Cottonwood Creek	Fish Propagation	1
Tripp	600.0	Buffalo Creek	Fish Propagation	1
Keya Paha	602.06	Unnamed Tributary to Buffalo Creek	Class B Warmwater	3
Keya Paha	610.55	Wolf Creek	Class B Coldwater	1
Keya Paha	612.47	Unnamed Tributary to Keya Paha River	Class B Warmwater	1
Keya Paha	613.73	Spotted Tail Creek	Class B Coldwater	1
Keya Paha	614.10	Unnamed Tributary to Spotted Tail Creek	Class B Warmwater	1
Keya Paha	616.97	Alkali Creek	Class B Warmwater	1
Boyd	618.11	Keya Paha River	Class A Warmwater	1
Holt	626.09	Niobrara River	Class A Warmwater	1
Holt	626.86	Beaver Creek	Class B Coldwater	1
Holt	632.69	Big Sandy Creek	Class A Warmwater	1
Holt	639.96	Unnamed Tributary to Brush Creek	Class B Coldwater	1
Holt	640.28	Unnamed Tributary to Brush Creek	Class B Coldwater	1
Holt	646.82	North Branch Eagle Creek	Class B Coldwater	1
Holt	649.30	Middle Branch Eagle Creek	Class B Coldwater	1
Holt	653.07	East Branch Eagle Creek	Class B Coldwater	1
Holt	663.01	Redbird Creek	Class B Warmwater	3
Holt	679.99	South Branch Verdigre Creek	Class B Coldwater	1
Antelope	683.07	Big Springs Creek	Class B Coldwater	1
Antelope	713.34	Elkhorn River	Class A Warmwater	1
Boone	743.77	Beaver Creek	Class A Warmwater	1
Nance	759.62	Plum Creek	Class B Warmwater	1
Nance	761.67	Loup River	Class A Warmwater	1
Nance	766.65	Prairie Creek	Class B Warmwater	1
Polk	775.14	Platte River	Class A Warmwater	1
York	803.35	Beaver Creek	Class B Warmwater	1
York	812.83	West Fork Big Blue River	Class A Warmwater	1
Fillmore	831.79	Turkey Creek	Class B Warmwater	1

Source: Geographic information system data source for waterbody name—U.S. Geological Survey (USGS) National Hydrology Data Set (USGS 2012); data source for Montana—MDEQ 2012; data source for South Dakota—SDDENR 2012 and South Dakota Legislature 2012; data source for Nebraska—NDEQ 2012a.

[a] WW = Warmwater.
[b] Surface water or fishery class / rating descriptions are provided in the text of the sections following the table.

Montana

Montana distinguishes surface water classifications based on their ability to support coldwater (salmonid) or warmwater (non-salmonid) fisheries (MDEQ 2012). The perennial streams the proposed Project route would cross in Montana are classified as supporting non-salmonid

fisheries, except for the Missouri River crossing below Fort Peck dam, which is classified as marginal for supporting salmonid fisheries (Table 3.7-3). The Missouri River east of Fort Peck Reservoir to the border of Richland County is classified as a Red Ribbon—Class II Recreational Fishery, or a recreational fishery of high value. Salmonid fish supported by this fishery include brown trout (*Salmo trutta*), mountain whitefish (*Prosopium williamsoni*), and rainbow trout (*Oncorhynchus mykiss*). The reach of the Yellowstone River where the proposed Project route would cross in Dawson County is classified as a Blue Ribbon—Class I Recreational Fishery, or a recreational fishery of outstanding value. Non-salmonid fish supported by this fishery include burbot (*Lota lota*), channel catfish (*Ictalurus punctatus*), paddlefish (*Polyodon spatula*), sauger (*Sander canadensis*), smallmouth bass (*Micropterus dolomieu*), and walleye (*Sander vitreus*).

The proposed Project route would cross nine perennial streams in Montana that support recreational or commercial fisheries. Four of these perennial stream crossings, the Frenchman River (Milepost [MP] 25.3), the Milk River (MP 83.4), the Missouri River (MP 89.7), and the Yellowstone River (perennial side channel at MP 197.8 and main channel at MP 198.1), would use the horizontal directional drilling (HDD) method (see Section 2.1.9, Waterbody Crossings, for a description of the HDD method). All other perennial stream crossings in Montana would use one of the open-cut crossing methods, also described in Section 2.1.9.

There are 178 lakes, ponds, or reservoirs located within 10 miles downstream of a proposed water crossing in Montana, as listed in Appendix D, Waterbody Crossings, Table 7. Named waterbodies with a surface area in excess of 10 acres and within the 10-mile downstream range include Lindsay Reservoir and Salsbery Reservoir. Additionally, there are four waterbodies that are unnamed on the U.S. Geological Survey 2012 NHD) (USGS 2012a) with surface areas of 10 acres or larger within the 10-mile downstream range.

South Dakota

South Dakota classifies surface waters based on a waterbody's ability to support coldwater and warmwater fish presence and propagation (SDDENR 2012). Warmwater classes are subdivided into permanent fish life propagation, semi-permanent fish life propagation, and marginal fish life propagation. Nine of the 16 perennial fish streams the proposed Project route would cross in South Dakota are classified as supporting warmwater fisheries, while the remaining seven are classified more generally as supporting fish propagation, with no warmwater or coldwater designation (Table 3.7-3). Those classified as supporting warmwater fisheries include one permanent warmwater fishery (Cheyenne River), three semi-permanent warmwater fisheries (Little Missouri, South Fork Grand, and White rivers), and five marginal warmwater fisheries. Common recreational fish found in these streams include catfish, walleye, sauger, bullhead, and bass.

The proposed Project route would cross 16 perennial streams in South Dakota that support recreational or commercial fisheries. Four of these perennial waterbodies, the Little Missouri River (MP 295.0), the Cheyenne River (MP 430.1), the Bad River (MP 486), and the White River (MP 541.3), would be crossed using the HDD method. In addition, the HDD method would be used to cross one intermittent waterbody, Bridger Creek (MP 433.6) All other perennial streams in South Dakota would be crossed by one of the open-cut methods.

Waterbodies and reservoirs located within 10 miles downstream of a proposed water crossing are summarized in Appendix D, Waterbody Crossings, Table 9. The larger of these waterbodies

(those greater than 10 acres) include Lake Gardner and 18 other reservoirs that are unnamed on the USGS 2012 NHD (USGS 2012c). The analysis identified approximately 304 additional waterbodies located within 10 miles downstream of a proposed crossing that were less than 10 acres.

Nebraska

Nebraska classifies surface waters as supporting coldwater or warmwater fish and as providing habitat for year-round maintenance of one or more identified key species (Class A) or as providing habitat where the variety of warmwater biota is limited by water volume or flow, water quality, substrate composition, or other habitat conditions (Class B) (NDEQ 2012b). Key species are those identified as endangered, threatened, sensitive, or recreationally important aquatic species. The proposed Project would cross 27 perennial streams in Nebraska that have fishery classifications (Table 3.7-3). Of these, 10 are coldwater streams that are rated as Class B waters. Coldwater fish that may be maintained year-round by stocking could include brook trout (*salvelinus fontinalis*), brown trout, or rainbow trout. Of the 17 crossings of warmwater streams, eight are rated Class A and nine are rated Class B. Common recreationally important warmwater fish include catfish, bass, crappie, sauger, shovelnose sturgeon (*Scaphirhynchus platorynchus*), sunfish, walleye, and yellow perch (*Perca flavescens*). In addition, forage fish (bait fish) important for the federally endangered interior least tern (*Sternula antillarum*) are found in the Platte, Niobrara, and Loup Rivers.

Of the 27 proposed perennial stream crossings in Nebraska that support recreationally important fisheries, five of those would be crossed using the HDD method, including the Keya Paha River (MP 618.1), the Niobrara River (MP 626.1), the Elkhorn River (MP 713.3), the Loup River (MP 761.7), and the Platte River (MP 775.1). Other perennial stream crossings in Nebraska would use one of the open-cut methods. Two perennial fisheries streams (unnamed tributaries to Buffalo Creek and Redbird Creek) would each be crossed three times by the proposed route.

Waterbodies and reservoirs located within 10 miles downstream of a proposed water crossing are summarized in Appendix D, Waterbody Crossings, Table 8. The larger of these waterbodies (those greater than 10 acres) include Cub Creek Reservoir 14C, Cub Creek Reservoir 13C, Recharge Lake, Big Indian Creek Reservoir 8-E, Big Indian Creek Reservoir 10-A, and six unnamed reservoirs (unnamed according to the USGS 2012 NHD [USGS 2012b]). The analysis identified an additional 68 waterbodies or reservoirs located within 10 miles downstream of a proposed crossing that were less than 10 acres in size.

3.7.2.3 Connected Actions

There are three connected actions in the vicinity of the proposed Pipeline route:

- Bakken Marketlink Project;
- Big Bend to Witten 230-kV Transmission Line; and
- Electrical Distribution Lines and Substations.

The fisheries resources found along and in the proposed connected action project areas are similar to the fisheries resources of the proposed pipeline corridor itself.

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3.8 THREATENED AND ENDANGERED SPECIES AND SPECIES OF CONSERVATION CONCERN

3.8.1 Introduction

This section addresses federal and state endangered species regulations that would be applicable under the proposed Project (Section 3.8.2, Regulatory Framework); animal and plant species that are federal or state-listed endangered, threatened, or candidates; Bureau of Land Management (BLM) sensitive species (Section 3.8.4); and species of conservation concern (Section 3.8.6). Species have been evaluated using a qualitative assessment of the potential direct and indirect impacts to species and their habitat through literature review and consultations with federal and state agencies and regional biologists. It also addresses federally designated critical habitat that may occur in the proposed Project area (Sections 3.8.3, Federally Protected and Candidate Species, and 3.8.5, State Protected Species, respectively). In addition there are species under consideration for federal listing under Federal Endangered Species Act (ESA) of 1973. Summaries of occurrence and life history are based on available literature; consultations and correspondence with federal and state agencies; agency required site-specific surveys; public and agency websites; and review of state natural heritage data.

3.8.2 Regulatory Framework

3.8.2.1 Federal Regulations

Federal Endangered Species Act

Under the ESA, the Secretary of the Interior and the Secretary of Commerce (through National Oceanic and Atmospheric Administration [NOAA]) jointly have the authority to list a species as threatened or endangered (16 United States Code [USC] 1533[c]). Pursuant to the requirements of the ESA, a federal agency reviewing a proposed project within its jurisdiction must determine whether any federally listed threatened, endangered species, or proposed species (*federally protected species)* may be present in a project site, and whether the proposed project would have a potentially significant impact on such species. In addition, the agency is required to determine whether the project is likely to jeopardize the continued existence of any species proposed to be listed under the ESA or result in the destruction or adverse modification of critical habitat proposed to be designated for such species (16 USC 1536[3], [4]).

Proposed species are those candidate species that have been determined to warrant listing as either threatened or endangered and have been officially proposed as such in a Federal Register notice after the completion of a status review and consideration of other protective conservation measures. Proposed species are federally protected. The mountain plover (*Charadrius montanus*) and the Platte River caddisfly (*Ironoquia platensis*) were identified as occurring within the proposed Project area. However, listing for both of these species was not warranted (USFWS 2011a, USFWS 2012b). Although these species are not discussed in Section 3.8.3, Federally Protected and Candidate Species, the mountain plover is a BLM sensitive species and is therefore discussed in Section 3.8.4, BLM Sensitive Animals and Plants.

Candidate species are plants and animals for which the USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened under ESA, but

for which development of a proposed listing regulation is precluded by other higher priority listing activities. Candidate species are not federally protected under the ESA, but most candidate birds are federally protected under the Migratory Bird Treaty Act (MBTA). However, because it is reasonably foreseeable that candidate species may become protected under the ESA within the life of the proposed Project, they are addressed herein. *Delisted* species are species that were formerly listed as threatened or endangered under the ESA, but have been formally removed from listing. The bald eagle (*Haliaeetus leucocephalus*) is a species occurring in the proposed Project area that has been delisted from the ESA. The gray wolf (*Canis lupus*), which was considered in this Supplemental EIS and the Biological Assessment (BA) but later determined to be unlikely to occur in the proposed Project area, has been delisted from the ESA in Montana but remains listed in South Dakota and Nebraska.

The ESA is administered by both the National Marine Fisheries Service of the National Oceanic and Atmospheric Administration (NMFS or NOAA Fisheries) and the USFWS. NOAA Fisheries is responsible for animals that spend most of their lives in marine waters, including marine fish, most marine mammals, and anadromous fish such as Pacific salmon (i.e., those fish which travel from the ocean and ascend up rivers for breeding). The USFWS is responsible for all other federally listed plants and animals.

Pursuant to the requirements of the ESA, a federal agency that undertakes, funds, or approves a project (which may include the issuance of a license, permit, or grant for a non-federal project) must determine whether the project may affect federally protected species or designated critical habitat. If so, pursuant to Section 7 of the ESA (Section 7 ESA), the federal agency must consult with NOAA Fisheries or the USFWS, as appropriate, to ensure that the project will not jeopardize any species continued existence or result in the adverse modification of designated critical habitat. The consultation process can be informal, resulting in a determination that the project is not likely to adversely affect federally protected species or critical habitat, or it can be formal, resulting in the issuance of a Biological Opinion including reasonable and prudent measures to minimize adverse impacts to federally protected species and critical habitat.

Projects that would result in a *take* of any federally protected species are required to obtain authorization from NOAA Fisheries and/or USFWS, as appropriate. Under the ESA definition, *take* means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Authorization for a take that is incidental to a lawful activity is obtained through one of two processes, depending on whether a federal agency is involved in carrying out, funding or permitting the project. For projects with a federal nexus, (i.e., connection with a federal action such as a permit) take authorization is provided through an incidental take statement, which is typically included as a part of a Biological Opinion issued after completion of the formal Section 7 ESA consultation process described above. For projects without a federal nexus, the project proponent must obtain an incidental take permit issued under Section 10 of the ESA, which requires completion of a habitat conservation plan.

Migratory Bird Treaty Act

The federal MBTA (16 USC, Section 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.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (BGEPA), enacted in 1940, (16 U.S.C. 668-668d) prohibits the take of bald eagles and golden eagles (*Aquila chrysaetos*) except as otherwise permitted in the BGEPA. From 1967 to 2007 the bald eagle was listed as either threatened or endangered (depending on the state) under the ESA. While the bald eagle is no longer listed under the ESA, it remains protected under the BGEPA, and some state endangered species acts. In addition, both the bald eagle and golden eagle are protected under the MBTA (16 USC 703-712).

3.8.2.2 State Regulations

Montana Species Regulations

Montana does not have a state endangered species act, but does maintain a list of species of concern, which is maintained by the Montana Natural Heritage Program and the Montana Fish Wildlife and Parks. Montana species of concern are native animals breeding in the state that are considered to be at risk due to declining population trends, threats to their habitats, and/or restricted distribution.

The species of concern designation does not provide as much protection to species as federal/state endangered species acts. Thus there is no section that specifically discusses Montana species of concern below, but any Montana species of concern that are not otherwise identified in this Section 3.8 due to legal protection by other federal/state agencies, are evaluated in Appendix N, Supplemental Information for Compliance with MEPA.

North Dakota Species Regulations

North Dakota does not have any endangered species regulation. Only those species listed under the federal ESA are considered threatened or endangered in North Dakota.

South Dakota Species Regulations

The South Dakota endangered species law was passed in 1977. The lead agency responsible for the conservation of threatened and endangered species is the South Dakota Department of Game, Fish, and Parks. The South Dakota Department of Game, Fish, and Parks reviews the list of threatened and endangered species every 2 years.

Rare species are also protected by the South Dakota Natural Heritage Program, a cooperative project of The Nature Conservancy and the South Dakota Department of Game, Fish and Parks. The Natural Heritage Program documents and monitors how rare species are and the potential threats to the continued survival of approximately 400 plant and animal species, as well as a number of unique natural features and plant communities. The goal of the Natural Heritage Program is to intervene before species decline to the point of being listed as threatened or endangered (Ashton and Dowd 1991).

Nebraska Species Regulations

In Nebraska, threatened and endangered species are protected under the Nebraska Nongame and Endangered Species Conservation Act (Nebraska Rev. Stat. §37-801 through 37-811). The lead agency in charge of implementing this law is the Nebraska Game and Parks Commission

(NGPC). In addition, Nebraska has special laws that protect all birds except game birds, English sparrows, European starlings, and pigeons other than Antwerp or homing pigeons (§37-237.01). It is unlawful to hunt, have in possession, take or needlessly destroy the nests or eggs of any protected birds (§37.540).

Kansas Species Regulations

The Kansas Nongame and Endangered Species Conservation Act of 1975 protects state and federally listed species. The Kansas Department of Wildlife, Parks and Tourism is the agency responsible for identifying and undertaking appropriate conservation measures for species listed as threatened and endangered under this act.

3.8.3 Federally Protected and Candidate Species

Section 7 of the ESA requires that projects involving a federal agency such as the U.S. Department of State (Department) initiate consultation consistent with the USFWS and/or NOAA Fisheries, to determine the likelihood of the project adversely affecting federally protected species (see Section 3.8.2, Regulatory Framework, above, for more information on the ESA). If, upon review of existing data, the Department determines that any federally protected species or habitats may be affected by the proposed Project, the Department is required to prepare a BA to identify the nature and extent of adverse impacts and to recommend mitigation measures that would avoid the habitat and/or species or that would reduce potential impact to acceptable levels. The USFWS then uses the information contained in the BA to develop a Biological Opinion for the proposed Project, which includes recommended conservation measures and compensatory mitigation for unavoidable impacts that were assessed during the consultation process.

For the previously proposed Project, the Department and TransCanada Keystone Pipeline, LP (Keystone), acting as the Department's non-federal designee for informal consultation, consulted with the USFWS on threatened and endangered species (no NOAA Fisheries-listed species were determined to be potentially affected by the previously proposed Project). The Department, the USFWS, and Keystone worked to develop the 2011 BA for the previously proposed Project (Appendix T of the Final EIS), which includes analyses of potential Project impacts to federally protected species, recommended conservation measures, and affect determinations.

Since the Final EIS, the proposed Project has been revised and a 2012 BA has been prepared and is included as Appendix H of this Supplemental Environmental Impact Statement (Supplemental EIS).

Table 3.8-1 lists 13 federal threatened, endangered, or candidate species which were considered in the 2012 BA for the proposed Project (see Appendix H). These federally listed species were identified by the Department, USFWS, BLM, and state agencies as potentially occurring in the proposed Project area. In the paragraphs following this table, the 13 federally protected and candidate species status and potential occurrence in the proposed Project area are discussed. In addition to these 13 species, the northern long-eared bat (*Myotis septentrionalis*) is also discussed below. The northern long-eared bat is currently being considered by the USFWS for listing under the ESA; it is possible that this species may become federally-listed if and when this Project is implemented.

Table 3.8-1 Summary of Federally Protected and Candidate Species Included in the 2012 BA and their State Status

Common Name (*Scientific Name*)	Federal Status	State Status
Mammals		
Black-footed ferret (*Mustela nigripes)*	Endangered/ Experimental Populations	MT Species of Concern SD Endangered NE Endangered KS Endangered
Gray wolf (*Canis lupus*)	Endangered/ Experimental Populations	SD Endangered NE Endangered
Birds		
Eskimo curlew (*Numenius borealis*)	Endangered	SD Endangered NE Endangered KS Endangered
Greater sage-grouse (*Centrocercus urophasianus*)	Candidate	MT Species of Concern SD Species of Greatest Conservation Need
Interior least tern (*Sternula antillarum*)	Endangered	MT Species of Concern SD Endangered NE Endangered KS Endangered
Piping plover (*Charadrius melodus*)	Threatened	MT Species of Concern SD Threatened NE Threatened KS Threatened
Sprague's pipit (*Anthus spragueii*)	Candidate	MT Species of Concern
Whooping crane (*Grus americana*)	Endangered	MT Species of Concern SD Endangered NE Endangered KS Endangered
Fish		
Pallid sturgeon (*Scaphirhynchus albus*)	Endangered	MT Species of Concern SD Endangered NE Endangered KS Endangered
Topeka shiner (*Notropis topeka*)	Endangered	NE Endangered KS Endangered
Invertebrates		
American burying beetle (*Nicrophorus americanus*)	Endangered	NE Endangered KS Endangered
Plants		
Blowout penstemon (*Penstemon haydenii*)	Endangered	NE Endangered
Western prairie fringed orchid (*Platanthera praeclara*)	Threatened	NE Threatened

MT = Montana; SD = South Dakota; NE = Nebraska; KS = Kansas

3.8.3.1 Federally Protected Mammals

Preliminary evaluations identified two federally protected mammals that could potentially occur within the proposed Project area (Table 3.8-1): the black-footed ferret (*Mustela nigripes*) and the gray wolf. Note, however, that the gray wolf was ultimately eliminated from detailed analysis, as explained below.

Gray Wolf—Endangered/Experimental Populations

Gray wolves (*Canis lupus*) are currently listed as federally endangered in Nebraska and the western half of North Dakota and South Dakota, and were delisted in Montana in May 2011. They are also a Montana species of concern.

The USFWS has split this species into five distinct population segments (DPS), of which three DPS (the Western Great Lakes, Wyoming, and Northern Rocky Mountain, the last DPS includes the Montana population) were delisted from the ESA due to recovery. One population (the Mexican gray wolf population) is an experimental, non-essential population, and not an endangered species under the ESA; the last population in western South Dakota and Nebraska remains endangered under the ESA.

In Montana, the gray wolf's range is in the western part of the state, and does not extend as far east as the proposed Project area. In Nebraska, one gray wolf was killed in Spalding, Nebraska in 2002 and was determined to be a dispersing male from Minnesota (USFWS 2003). Prior to this 2002 occurrence, a gray wolf had not been sighted in Nebraska since 1913 (USFWS 2003). There are no known resident populations of gray wolves in South Dakota (USFWS 2011b). Some wolves that disperse from Yellowstone National Park have occasionally been found in western South Dakota, but sightings are infrequent, with only three gray wolves recorded in recent years (Wildlife News 2012). Since there are no resident populations of gray wolves in South Dakota or Nebraska, and since the species is no longer listed in Montana and does not occur as far east as the proposed Project area in this state, the gray wolf is unlikely to be adversely affected by the Project, so it was eliminated from detailed analysis in this Supplemental EIS.

Black-Footed Ferret—Endangered/Experimental Populations

The black-footed ferret (*Mustela nigripes)* is an endangered species throughout its range, except where non-essential, experimental populations have been introduced (e.g., the population of ferrets introduced into the Rosebud Sioux Reservation in south-central South Dakota). Members of non-essential experimental populations located outside national wildlife refuge or national park lands are protected as proposed species under the ESA (16 USC 1531 *et seq.*), and as threatened species where they occur on national wildlife refuges or national parks (Section 10(j)). Members of reintroduced populations within the species historic range that have not been designated as experimental populations are protected as endangered. This species is also a state-listed endangered species in South Dakota, Nebraska, and Kansas, and a Montana species of concern. There is no USFWS-designated critical habitat for the black-footed ferret.

Black-footed ferrets once numbered in the tens of thousands, but widespread destruction of their habitat and exotic diseases in the 1900s brought them to the brink of extinction. Only 18 remained in 1986, but due to reintroduction efforts there were approximately 1,000 black-footed ferrets in the wild in 2011, and an additional 280 in breeding facilities (USFWS 2010b). Black-

footed ferrets are nocturnal and solitary; they feed almost exclusively on prairie dogs and use prairie dog burrows (USFWS 2008c). Black-footed ferrets use the same habitats as prairie dogs: grasslands, steppe, and shrub steppe. It is estimated that about 99 to 148 acres of prairie dog colony are needed to support one ferret (NatureServe 2009). The breeding season is generally between March and April.

Experimental, non-essential populations were reintroduced to several sites in the United States in 1994, including north-central Montana and South Dakota. None of the four reintroduced black-footed ferret populations in Montana are well established at this time, and there is ongoing concern about the genetic viability of the captive population (MFWP 2009a, USFWS 2008c). Six populations of ferrets have been reintroduced to South Dakota, of which two of these populations (the Cheyenne River, SD and the Conata Basin, SD) were classified as successful, self-sustaining populations in 2008 (USFWS 2008c). In Nebraska, the black-footed ferret probably occurred historically in the western three-quarters of the state, coincident with the range of the prairie dog. The black-footed ferret is a Nebraska state endangered species, although this species has not been observed there since 1949 (NGPC 2009a).

The proposed Project route crosses the historical range of the black-footed ferret in Montana, South Dakota, southwest North Dakota, Nebraska, and Kansas. Black-footed ferrets are not known to exist outside of reintroduced populations (USFWS 2008c), and the ten reintroductions of black-footed ferrets in Montana and South Dakota are outside of the proposed Project right-of-way (ROW). Natural Heritage Program data for Montana and South Dakota (Montana Natural Heritage Program 2008; SDGFP 2008) contain no historical records of black-footed ferret occurrences within 5 miles of the proposed Project ROW.

During a meeting with Keystone representatives on May 5, 2008, the USFWS Grand Island Ecological Services Field Office indicated that black-footed ferrets do not occur within the previously proposed Keystone XL Project area in Nebraska. On June 11, 2008, the USFWS Pierre Ecological Services Field Office and AECOM indicated that black-tailed prairie dog (*Cynomys ludovicianus*) towns in the entire state of South Dakota 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 black-tailed prairie dogs and/or their habitat would not be required to meet the USFWS survey guidelines for black-footed ferrets, or undergo consultations under Section 7 of the ESA (AECOM 2008d).

Since the black-footed ferret is dependent on prairie dogs, the assessment of potential impacts to experimental populations has focused on black-tailed prairie dog colonies and complexes that could be affected by the proposed Project. The proposed Project route does not occur within the known ranges of the Gunnison's prairie dog or white-tailed prairie dog (NatureServe 2009), the other two prairie dog species that could serve as prey for black-footed ferrets.

Aerial and/or pedestrian field surveys were conducted from 2008 through 2012 along the proposed Project route in Montana, to identify prairie dog towns crossed by the Project ROW. In 2008, one potential prairie dog town was identified in Valley County, Montana. Subsequent surveys determined that this town was occupied by Richardson's ground squirrel (*Urocitellus richardsonii*), and possibly black-tailed prairie dogs, although no prairie dogs were observed. As a result of a Montana Department of Environmental Quality (MDEQ) reroute incorporated into the proposed Project, the currently proposed Project route avoids this town.

In summary, all prairie dog towns within the proposed Project ROW are unsuitable for the reintroduction of the black-footed ferret, and there are no currently existing black-footed ferret populations known to be present within the proposed ROW (USFWS 2011).

Northern Long-eared Bat—Under Consideration

The northern long-eared bat (*Myotis septentrionalis*) is not a federally protected species, but is under consideration by USFWS. In January 2011, the USFWS received a request to list the northern long-eared bat as either threatened or endangered under the ESA, as well as the eastern small-footed bat (*Myotis leibii*) (which is not located in the states in which the proposed Project would cross). In June 2011, the USFWS released a 90-day finding on the request (USFWS 2011c). In that finding, the USFWS determined that substantial information exists to warrant further evaluation of both bat species to determine if they should be listed. The USFWS has begun a review of the status of these species to determine if listing is warranted and will issue a 12-month finding. This species is a BLM sensitive species.

The northern long-eared bat ranges from the southeast corner of the Northwest Territory, east across each Canadian province, and covers 38 states in the central and eastern part of the United States including eastern Montana, North Dakota, South Dakota, Kansas, and Nebraska. The northern long-eared bat does not migrate, but may travel up to 30 miles from winter hibernation to summer roosts. This species uses caves and mines during hibernation which can begin as early as August and continue through the winter months. During the summer months, this species relies less on caves and more on old growth forests for roosts and reproduction, especially old cottonwood trees 100 years or older, and late successional forests (mature stands). They roost under the bark of dead and dying trees. Old and mature forests provide habitat (decaying trees, loose park, tree snags, and stumps) for roosting, feeding, and maternity colonies of northern long-eared bats. In addition to the natural setting, the northern long-eared bat also roosts in buildings. Breeding takes place in late summer and early fall with a gestation period ranging between 50 and 60 days. Females give birth to one pup the following spring. The northern long-eared bat typically forages on the edge of heavily forested areas, along hillsides, ridges, water, and clearings. These opportunistic insectivores use echolocation to find their prey and forage one to two hours after dusk and before dawn.

In Montana, there are two records of this species. One record is from Flathead County in northwestern Montana, but there is little information about this record except that it is five to ten years old, it is out of their known range, and the proposed Project ROW does not go through northwestern Montana (MNHP and MFWP 2012c). The second record for this species is from an abandoned coal mine near Culbertson, Montana in Roosevelt County, over 60 miles east of the proposed Project ROW, but this mine has been closed and bats can no longer enter the cave. In addition, this species may have been misidentified at this location (Prellwitz 2012).

In North Dakota, there is a single record in McKenzie County, and the proposed pipe yard stockpile site would not be in McKenzie County (it would be in Bowman County).

In South Dakota, this species is known to occur in 11 counties including Harding, Perkins, Meade, Custer, Pennington, Lawrence, Charles Mix, Gregory, Hughes, Lyman, and Yankton counties. Of these counties in South Dakota, the pipeline is routed through three counties where northern long-eared bat occurs (Meade, Perkins, and Custer).

In Nebraska, this species is known to occur in 12 counties including Sheridan, Cass, Sarpy, Holt, Jefferson, Keya Paha, Brown, Knox, Webster, Lancaster, Cherry, and Washington counties. Of these counties in Nebraska, the pipeline is routed through three counties where northern long-eared bat occurs (Keya Paha, Holt, and Jefferson).

3.8.3.2 Federally Protected and Candidate Birds

Preliminary evaluations identified four federally protected birds and two listed as candidates which could potentially occur within the proposed Project area (Table 3.8-1). In addition to ESA protection, all of the birds listed in this section are federally protected under the MBTA, except for the greater sage-grouse (*Centrocercus urophasianus*) (excluded from protection under the MBTA because it is a non-migratory game bird). Additional federal protections under the MBTA and the BGEPA are discussed in Section 3.8.2.

Eskimo Curlew—Endangered

The Eskimo curlew (*Numenius borealis*) is a federally endangered species, and a South Dakota and Nebraska endangered species. This species was once abundant; historical accounts indicate flocks of thousands migrated from northern North America to the Argentine pampas, crossing central North America and the Atlantic coast. They bred in northern Canada and migrated through the prairies of the United States south to the grasslands in South America, spending most of their time during migration in prairies and grasslands, including prairies and grasslands in Nebraska (Audubon 2009). Currently, the Eskimo curlew is thought to be extinct. The species has not been confirmed in Nebraska since 1926 and in South Dakota since 1963, and does not occur in Montana (USFWS 2012d). USFWS and NGPC determined that this species would not be impacted by the proposed Project. Therefore, this species was eliminated from further analysis.

Greater Sage-Grouse—Candidate

The greater sage-grouse (*Centrocercus urophasianus*) was petitioned for federal listing under the ESA several times. On March 23, 2010, USFWS announced that listing the greater sage-grouse (rangewide) was warranted, but precluded by higher priority listing actions (USFWS 2010a, 75 FR 13910). Consequently, the greater sage-grouse is a candidate species for listing under the ESA. In addition, they are a BLM sensitive species, a Montana species of concern, and a South Dakota species of greatest conservation need. Critical habitat has not been identified for greater sage-grouse, but they are considered a sagebrush obligate species (Braun et al. 2001). Core habitat has been designated in Montana.

Greater sage-grouse are the largest grouse species in North America. Greater sage-grouse occur in 11 western states including Montana and South Dakota, where they are hunted during a limited season in September. They depend on a variety of shrub-steppe habitats throughout their life cycle, and are considered obligate users of several species of sagebrush (USFWS 2010a). They occur at elevations ranging from 4,000 feet to over 9,000 feet (USFWS 2012a).

Greater sage-grouse are lekking birds; males gather and perform mating displays for females at leks. After mating, females nest, on average, between approximately 2 to 4 miles and up to approximately12 miles from the lek site. Leks are typically located in areas of bare ground or low-density vegetation such as ridge tops; individuals return to about the same location each spring (March through June), although leks may shift in location over time. Nesting typically

occurs in areas with a sagebrush canopy cover of between 15 to 25 percent (USFWS 2010a). Although sagebrush habitat is crucial throughout the year for all life stages, wet meadows and riparian areas are critical for brood-rearing. Greater sage-grouse diet varies by season. Spring, nesting, and brood-rearing birds eat forbs (herbaceous flowering plants) and insects, and wintering birds eat and take cover in sagebrush (USFWS 2010a). Greater sage-grouse may migrate between winter, breeding, and summer areas with movements of up to 100 miles (USFWS 2010a); greater sage-grouse gradually move from sagebrush uplands to moister areas such as streambeds or wet meadows during the late brood-rearing period (3 weeks after hatch) as vegetation withers during the hot, dry summer months (USFWS 2010a).

Since issuance of the August 2011 Final EIS, the BLM issued the *Instruction Memorandum No. 2012-043, Greater Sage-Grouse Interim Management Policies and Procedures (Interim Policy)* in order to maintain or promote sustainable greater sage-grouse populations and conservation of its habitat (BLM 2011). The Interim Policy identifies policies and procedures to minimize habitat loss in Preliminary Priority Habitat (PPH) and Preliminary General Habitat (PGH) areas. PPH in Montana are the MFWP delineated core areas, which are the highest conservation value habitats, as determined by coordination between BLM and MFWP. The BLM is coordinating with the respective state wildlife agency in Montana and with SDGFP in accordance with the Interim Policy, although federal lands are not involved with the proposed Project in South Dakota. The proposed Project crosses PPH within one area of South Dakota, on private lands which are not applicable to the interim policy.

Greater sage-grouse inhabit sagebrush habitats in the proposed Project area between the Canadian/Montana border and northwestern South Dakota. The proposed Project route crosses through greater sage-grouse Management Zone I (MZ I) in Montana and western South Dakota, which supported an estimated 62,320 greater sage-grouse in Montana and 1,500 greater sage-grouse in South Dakota during 2007 (USFWS 2010a). Keystone has been conducting annual surveys within a 4-mile radius of proposed Project components to locate greater sage-grouse leks, or monitor known leks, since 2009. In 2011, Keystone monitored 46 lek sites within Montana and South Dakota; displaying male greater sage-grouse were observed at 35 of these lek sites (WESTECH 2011). In 2012, displaying male greater sage-grouse were observed at 18 of these same leks on the day(s) of survey (see 2012 BA in Appendix H for greater sage-grouse survey results). Surveys in 2011 and 2012 show that activity levels at each lek site vary from year to year and the Montana Fish Wildlife and Parks Department (MFWP) and South Dakota Department of Game Fish and Parks (SDGFP) consider 28 of these 46 lek sites to be active in any given year.

Interior Least Tern—Endangered

The interior population of least tern (*Sternula antillarum*) was federally listed as endangered in 1985. The interior least tern is listed by state endangered species acts as endangered in South Dakota and Nebraska, and is a Montana species of concern. They are small, migratory shorebirds that hover and dive into standing or flowing water to catch small fish (USFWS 1994). The interior least tern is one of three subspecies of the least tern; the east coast subspecies is not listed as threatened or endangered, and the west coast subspecies is federally listed as endangered. The interior least tern is migratory; it winters in South America, then journeys north to central North American river systems to breed. The summer breeding population extends west-east from eastern Colorado and New Mexico to southern Indiana, and north-south from Montana down to

Texas. The nesting season for interior least tern is from April 15 through September 1 throughout the breeding range, with nesting occurring later at more northern latitudes. This species nests on riverine sandbars and at sand and gravel mining operations and forages in rivers and associated wetlands.

Surveys for suitable habitat and the occurrence of interior least tern nests were conducted at the crossings of the Yellowstone, Missouri, Cheyenne, Platte, Loup, and Niobrara rivers in 2008, 2011, and 2012 (see the 2012 BA in Appendix H for more information on these surveys).

In Montana, the Yellowstone River crossing of the proposed pipeline route in Dawson County has historically supported, and currently supports, breeding populations of interior least terns (AECOM 2008b, AECOM 2009a). Suitable habitat also may be present along the Missouri River in Valley and McCone counties. Surveys were conducted along these two rivers in the summer of 2011 and no least terns were observed, but this river was flooded during the surveys, and therefore habitat was not visible. Surveys need to be repeated where the proposed Project route would cross this river.

Within South Dakota, the Cheyenne River crossing of the proposed pipeline route, on the border of Meade, Pennington, and Haakon counties, has potentially suitable habitat for interior least terns (AECOM 2008c). This species was not observed along the Cheyenne River during 2008 and 2011 surveys, but the 2011 surveys were conducted when there was flooding and habitat was not visible. Therefore, surveys should be repeated along this proposed river crossing.

Within Nebraska, there is suitable habitat for interior least terns along the proposed Project ROW at the Platte, Loup, and Niobrara river crossings (AECOM 2008a). The proposed Project route would cross the Platte River along the Merrick and Polk county border, and sandbars and sand/gravel pits associated with this segment of river are known to support breeding interior least terns. In addition, four least terns were observed at the Niobrara River crossing between Boyd and Holt counties in 2012, and two non-nesting least terns were observed along the Loup River crossing in Nance County in 2012 (see 2012 BA in Appendix H).

Piping Plover—Threatened

There are three breeding populations of piping plovers (*Charadrius melodus)* in the United States—the Northern Great Plains population (which occurs in the same area as the proposed Project), the Great Lakes population, and the Atlantic Coast population. The Northern Great Plains population is federally listed as threatened, and state-listed as threatened in South Dakota, Nebraska, and Kansas. It is also a species of concern in Montana. The USFWS designated critical habitat for the Northern Great Plains breeding population of the piping plover (67 FR 57638) in Montana, Nebraska, North Dakota, and South Dakota in 2002 (USFWS 2002), but the Nebraska critical habitat was later remanded (USFWS 2009). The proposed Project route would not cross through any critical habitat for this species, although there is critical habitat near the proposed Project area in Montana at Fort Peck Reservoir, and on the Missouri River downstream of Wolf Point.

The piping plover is a small shorebird that occupies sand and gravel bars and beaches along major rivers and around lakes, reservoirs, ponds, and alkali wetlands; it forages on invertebrates. The piping plover forages for invertebrates on exposed beach substrates and nests on barren or sparsely vegetated sandbars in river channels and wetlands. Piping plovers migrate through the

proposed Project area during both the spring and fall. The nesting season for the piping plover is from April 15 through September 1.

Presence of breeding piping plovers along the proposed Project route is limited to Montana and Nebraska; during a meeting with Keystone representatives on June 10, 2008, SDGFP indicated that breeding piping plovers are not in the proposed Project area in South Dakota. Potential breeding habitat within the proposed Project area for the piping plover is limited to alkali wetlands in Montana, and sandy beaches and sandbars along the Platte, Loup, and Niobrara rivers in Nebraska.

Within Montana, nesting birds occur on alkali lakes and wetlands and have been found in the Fort Peck Reservoir. Wetland and waterbody surveys conducted between May and November from 2008 to 2011 did not identify any suitable alkali wetlands for nesting piping plovers along the proposed Project route in Valley County. According to the USFWS Billings Ecological Services Field Office, individual transient piping plovers may be observed along some portions of the Yellowstone River, but there are no breeding records within the proposed Project area (AECOM 2009a). The USFWS Billings Ecological Field Office indicated that surveys had failed to identify nesting piping plover within the proposed Project area in Montana, and therefore did not recommend surveys for this species in Montana (AECOM 2009a).

Piping plovers breeding in Nebraska are found nesting on sandbars and at commercial sand pits and foraging in wet sand on sandbars and mud flats in rivers and associated wetlands along three rivers crossed by the proposed Project route: the Niobrara, Loup, and Platte rivers. Piping plovers migrate through Nebraska during both the spring and fall. These crossings were historically identified as critical habitat for the piping plover, but as mentioned above, this critical habitat designation has been remanded in Nebraska and is no longer legally recognized as such (USFWS 2008a).

Keystone conducted breeding piping plover surveys along the proposed Project route crossings of the Missouri, Platte, Loup, and Niobrara rivers in July 2008, June 2011, and June and July 2012. Only one individual foraging plover was identified during these surveys, at the Niobrara River crossing in 2008. Note that the Niobrara River crossing under the currently proposed Project is many miles east of the Niobrara River crossing that was analyzed during 2008 studies, under the previously proposed Project. 2012 surveys along the currently proposed route did not detect this species along the Niobrara River.

Despite the lack of breeding piping plovers observed along the proposed Project route during recent surveys, this species may nest along the Niobrara, Loup, and Platte rivers in Nebraska at the proposed Project crossings.

Sprague's Pipit—Candidate

Sprague's pipit (*Anthus spragueii*) is a candidate for federal listing as threatened or endangered species (75 FR 56028), and a species of concern in Montana. They are a grassland species—native to the mixed grass prairie ecosystem in the northern Great Plains of North America (Jones 2010).

Sprague's pipit is a medium sized short-distance migrant songbird (passerine). They breed in the northern Great Plains, with their highest numbers in the central mixed-grass prairie primarily in north-central and eastern Montana, to North Dakota through to northwestern and north-central South Dakota (Jones 2010). Migration occurs through the central Great Plains in April and May

and late September through early November (Jones 2010). They winter in the southern United States. Sprague's pipits establish nesting territories and construct nests on the ground in intermediate height and density grasslands, primarily with native grasses, little bare ground, and few shrubs, during May to August (Jones 2010). Breeding territories are established for both nesting and foraging, and are likely influenced by the size of grassland patches and the amount of grassland in the landscape (Jones 2010).

In Montana, data indicate that the highest likelihood of Sprague's pipit along the proposed Project route is in native grasslands north of the Missouri River (MNHP, MFWP 2012a), although the species is also known to occur in native grasslands in eastern Montana. The proposed Project route would cross habitats that may support breeding Sprague's pipits in Fallon, Dawson, McCone, Phillips, Prairie, and Valley counties.

High quality breeding habitat for Sprague's pipits occurs in the 44.2 miles of the North Valley Grasslands Important Bird Area (IBA) which is crossed by the proposed Project route (see Section 3.6.2.4, Non-game Animals, for more information on IBAs crossed by the Project) in northern Montana, where this species is relatively common. Outside of the habitat north of the Missouri River, the proposed Project route would cross approximately 87 miles of native, mixed grass prairie that could serve as suitable habitat for this species, depending on grazing regimes and adjacent human activity.

In South Dakota, Sprague's pipits are a rare summer resident in central and northwestern South Dakota within native prairie grasslands (Jones 2010). The proposed Project route would cross approximately 119 miles of native, mixed grass prairie that could serve as suitable habitat depending on grazing regimes and adjacent human activity. In Nebraska, Sprague's pipits are uncommon seasonal migrants (Jones 2010).

Whooping Crane—Endangered

The whooping crane (*Grus americana)* was federally listed as endangered in 1970, is state listed as endangered by South Dakota and Nebraska, and is state listed as a species of concern by Montana (USFWS 2007). The whooping crane is a migratory bird and also is protected under the MBTA.

The USFWS designated critical habitat for whooping crane wintering grounds and migration stopover areas in 1978. The migratory stopover critical habitat areas are along the Platte River between Lexington and Denman, Nebraska (CWS, USFWS 2007), which is west of where the proposed Project would cross the Platte River. Proposed Project activities would not cross through any critical habitat areas.

During spring and fall migration, the Aransas-Wood Buffalo Population (AWBP) moves through the central Great Plains including portions of Montana, North Dakota, South Dakota, Nebraska, and Kansas. Birds from the AWBP depart from their wintering grounds in Texas from late March through early May, for spring migration. Fall migration typically begins in mid-September, with most birds arriving on wintering grounds between late October and mid-November (CWS, USFWS 2007).

Whooping cranes use a variety of habitats during migration, including a variety of croplands, prairie grasslands, and emergent wetlands for feeding, and semi-permanently flooded palustrine wetlands, broad river channels, and shallow portions of reservoirs for roosting (Austin and Richert 2001, Johns et al. 1997). They eat insects, minnows, crabs, clams, crayfish, frogs,

rodents, small birds, and berries (USFWS 2004).The whooping crane occurs as a migrant throughout the proposed Project area. The majority of the proposed Project route in South Dakota, Nebraska, North Dakota, and Kansas is within the central flyway whooping crane migration corridor through the central Great Plains (CWS, USFWS 2007) (see Figure 3.8.3-1, below). Specifically, in South Dakota, approximately 160 miles of the proposed Project route would be within the 95 percent migration corridor for the AWBP whooping crane population (i.e., 95 percent of the AWBP whooping cranes migrate within a 170-mile-wide corridor that runs north south through South Dakota); and in Nebraska, approximately 200 miles of the Project route would be within the 95 percent AWBP whooping crane migration corridor. The proposed Project ROW in Montana, the northern half of the Project ROW in South Dakota, and the 60-acre pipe yard proposed in North Dakota would all be west of the 95 percent flyway migration corridor. However, individual birds can be found outside the flyway migration corridor and could possibly occur within the proposed Project area in Montana, northern South Dakota, and North Dakota during spring and fall migration.

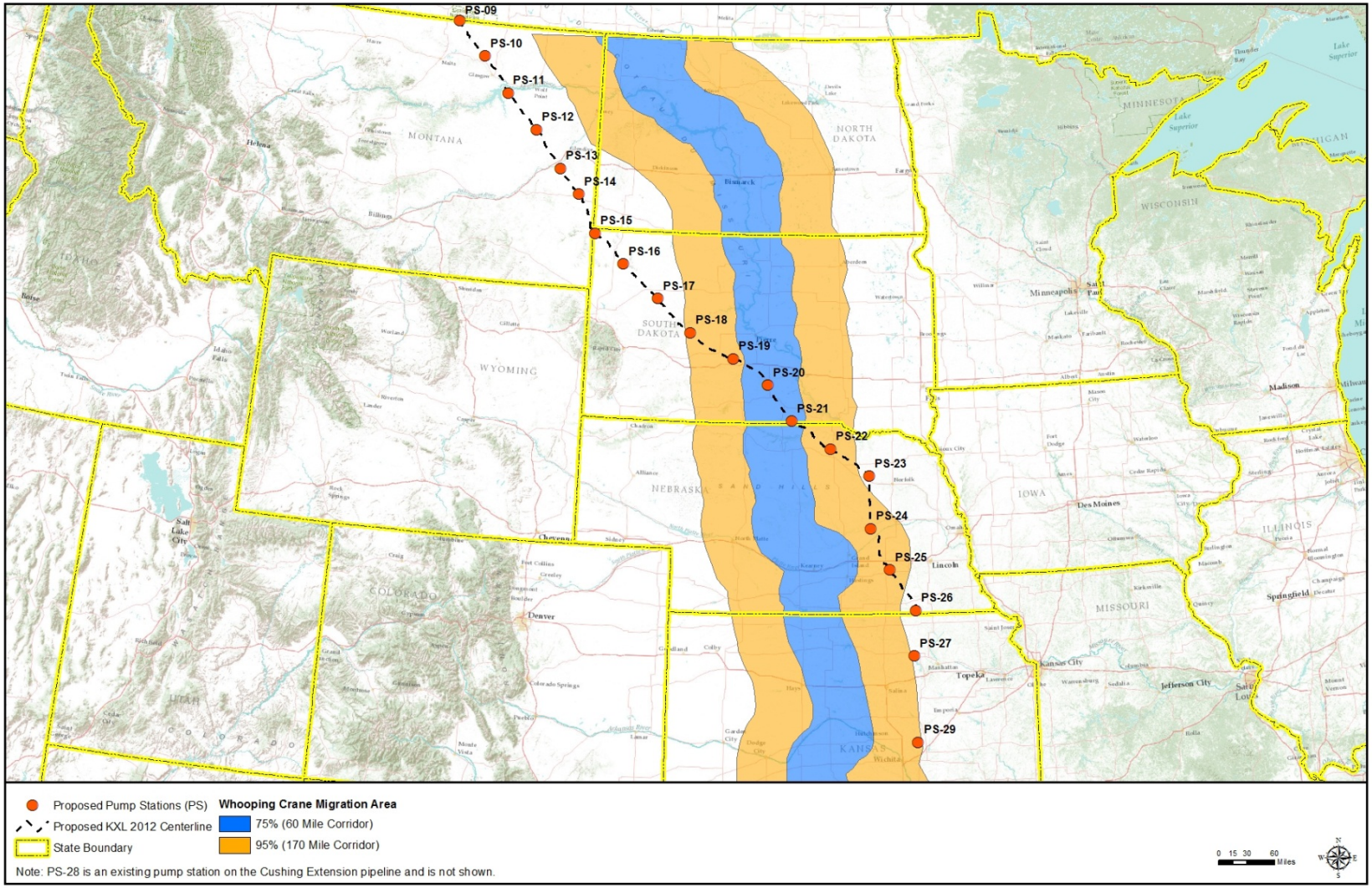
The MFWP identified the Yellowstone River in Montana as a potential stop-over site for whooping cranes during a MFWP meeting with Keystone representatives on February 3, 2009 (AECOM 2009b). In South Dakota, the Missouri River system is used by whooping cranes, but this species also may use wetlands during severe weather episodes. Additional correspondence with SDGFP indicated that the White and Cheyenne rivers in South Dakota contain suitable stop-over habitat, although it is very unlikely that whooping cranes would be present at these crossings (AECOM 2008a). According to the USFWS Grand Island Ecological Services Field Office and the NGPC, major river systems used by whooping cranes in Nebraska include the Platte, Loup, Republican, Cedar, and Niobrara rivers (USFWS 2008d). The Platte, Loup, and Niobrara rivers are crossed by the proposed Project route.

3.8.3.3 Federally Protected Fish

Preliminary evaluations identified two federally protected fish species that could potentially occur within the proposed Project area (Table 3.8-1). One of these species, the Topeka shiner, was eliminated from further analysis, as discussed below.

Topeka Shiner—Endangered

The Topeka shiner (*Notropis topeka*) is a federal, Nebraska, and Kansas endangered species. In Nebraska, the proposed Project would be outside of the Topeka shiner's range (AECOM 2008a). In Kansas, the proposed Project would only be within the range of the Topeka shiner in Butler County, Kansas (USFWS 2008a). The proposed Project area would not cross through any critical habitat that is designated for this species. One pump station site is proposed for construction in Butler County, Kansas. The pump station site is located within an agricultural field and suitable habitat does not exist for the Topeka shiner in or near this location. In South Dakota, the Topeka shiner is located in the James, Vermillion, and Big Sioux river watersheds. The species inhabits cool, clear, spring-fed streams with well-developed riparian corridors. The proposed Project route, however, would not cross any streams where Topeka shiners have been found based on extensive survey work conducted for this and other native fish species. Thus, the proposed Project is not expected to impact this species and was eliminated from further analysis.



Source: TransCanada 2012.

Figure 3.8.3-1 Central Flyway Whooping Crane Migration Corridor for the Aransas-Wood Buffalo Population

Pallid Sturgeon—Endangered

The pallid sturgeon (*Scaphirhynchus albus*) was federally listed as endangered in 1990 (55 FR 36641), and is a South Dakota, Nebraska, and Kansas endangered species, and a Montana species of concern. The USFWS produced a recovery plan for the pallid sturgeon (USFWS 1993). No critical habitat has been designated for the species. However, several areas have been designated as Recovery Priority Management Areas (RPMAs) in the species recovery plan (USFWS 1993). The proposed Project crosses the Missouri, Yellowstone, and Milk rivers, which are located in pallid sturgeon RPMAs 1 and 2: RPMA 1 is from the Missouri River from the headwaters of Fort Peck Reservoir upstream to the confluence of the Marias River, Montana; and RPMA 2 is from the Missouri River from Fort Peck Dam to the head waters of Lake Sakakawea, including the Yellowstone River upstream to the mouth of the Tongue River (USFWS 1993). The Milk, Missouri, and Yellowstone rivers would be crossed using the HDD method.

Current distribution of the pallid sturgeon includes the upper and lower Missouri River drainage, the lower Yellowstone River drainage, the upper and lower Mississippi River drainages, and the lower Ohio River drainage (NatureServe 2009). The pallid sturgeon is one of the rarest fish of the Missouri and Mississippi rivers. This sturgeon is adapted to habitat conditions that existed in these large rivers prior to their wide-scale modification by dams, diversions, and flood control structures. Habitats required by pallid sturgeon are formed by floodplains, backwaters, chutes, sloughs, islands, sandbars, and main channel waters within large river ecosystems. Prior to dam development along the Missouri and Mississippi rivers, these features were in a constant state of change. With the introduction of dams and bank stabilization, areas of former river habitat have been covered by lakes, water velocity has increased in remaining river sections (making deep stretches of clear water), and water temperatures have significantly decreased. All of these factors are believed to have contributed to the decline in pallid sturgeon populations (USFWS 1993).

Pallid sturgeons live in large, free-flowing, warm-water stream systems with a diverse assemblage of habitats, in a constant state of change (USFWS 1993). Pallid sturgeon feeding and nursery habitats include floodplains and backwaters, where adults and juveniles feed primarily on fish, and smaller juveniles feed primarily on the larvae of aquatic insects.

As noted above, this species may occur within the proposed Project area in the Missouri River, Milk River (a tributary to the Missouri River), and Yellowstone River in Montana. Pallid sturgeons also occur in the lower Platte River in Nebraska, downstream from the proposed Project route crossing (NGPC 2011).

In the Milk River, the pallid sturgeon has been found in recent years (2010 and 2011) in the Milk River in Montana from the Missouri River to the Vandalia Dam (Fuller and Haddix 2012).

In the Missouri River, it is estimated that 50 to 100 pallid sturgeons remain above Fort Peck Dam (west of the Project ROW), and 200 to 300 pallid sturgeons remain in the Missouri and lower Yellowstone rivers between Fort Peck Dam and Garrison Dam in North Dakota (Krentz 1997, Gardner 1994). Populations of pallid sturgeon in Montana are declining, with no evidence of reproduction. Pallid sturgeon between Fort Peck Dam and Lake Sakakawea, which is the portion of the Missouri River that would be crossed by the proposed Project, are an important portion of the total population (Tews 1994). Adult fish in this reach are nearing the end of their life expectancy and may attempt reproduction only a few more times (USFWS 2000). Pallid sturgeon

move downstream from the Fort Peck Dam to below the confluence of the Yellowstone and Missouri rivers in summer, and generally return to the Fort Peck Dam during winter. Most pallid sturgeons have been documented in the Missouri River downstream from its confluence with the Yellowstone River (Liebelt 1998). While no specific pallid sturgeon spawning locations have been identified in the Missouri River, such locations likely exist.

3.8.3.4 Federally Protected Invertebrates

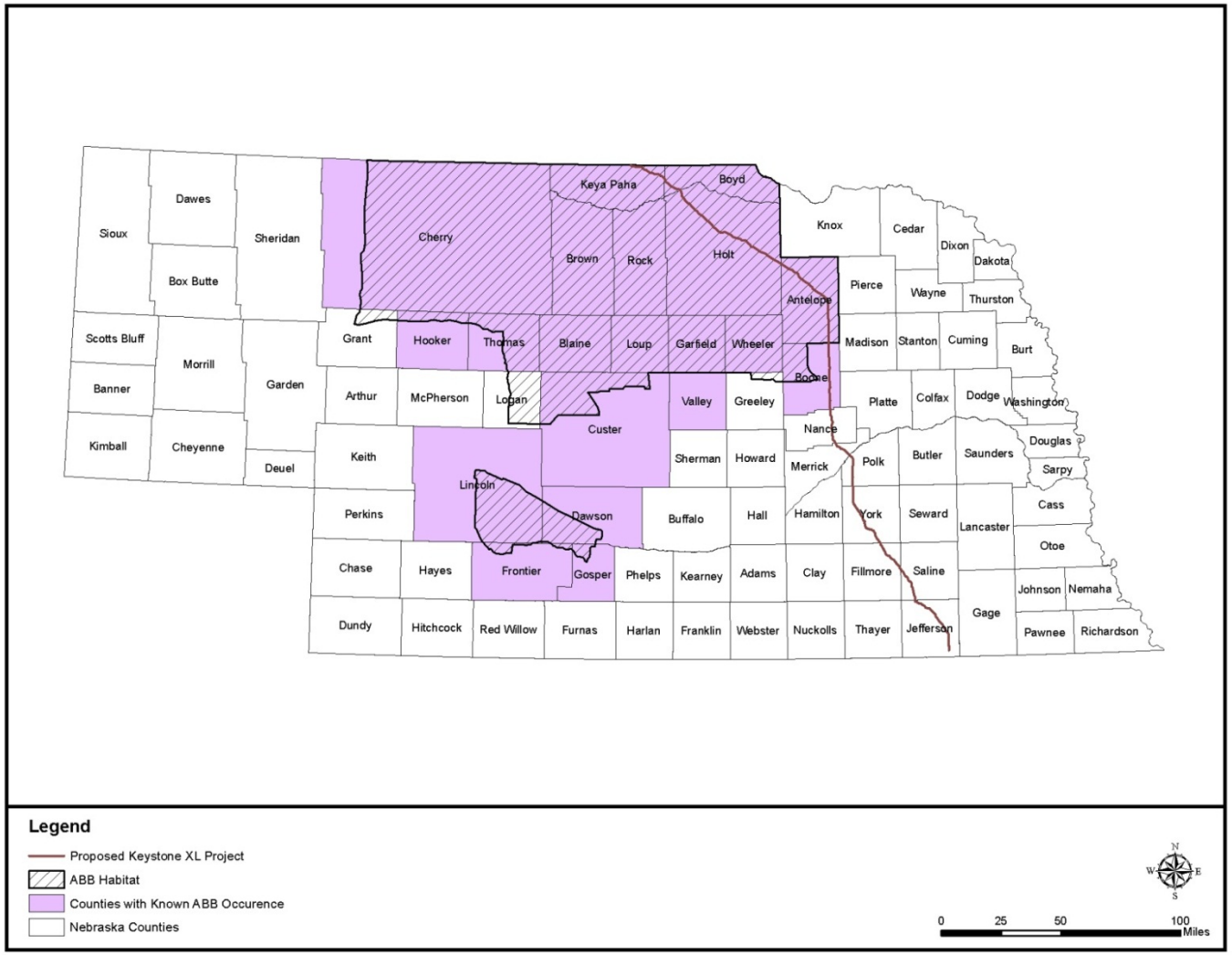
American Burying Beetle—Endangered

Analyses identified one federally protected invertebrate that could potentially occur within the proposed Project area (Table 3.8-1), the American burying beetle (*Nicrophorus americanus*). The American burying beetle was federally listed as endangered in August 1989 (54 FR 29652), and is state-listed as endangered in Nebraska and Kansas. Critical habitat has not been designated. The Final Recovery Plan (USFWS 1991) was signed on September 27, 1991.

American burying beetles have generally been found in level areas with relatively loose, well-drained soils, amongst litter layers from previous years. They are scavengers, dependent on carrion for food and reproduction. This species plays an important role in breaking down decaying matter and recycling it back into the ecosystem. This species was recorded historically in at least 35 states in the eastern and central United States, as well as along the southern portions of the eastern Canadian provinces. Currently, it is known to exist in isolated colonies in at least seven states: Arkansas, Kansas, Nebraska, Oklahoma, Texas, South Dakota, and Rhode Island (USFWS 2008b). American burying beetles have disappeared from over 90 percent of their historical range.

American burying beetles have been collected from three South Dakota counties: Todd, Tripp, and Gregory (Backlund and Marrone 1997). The American burying beetle occupies about a 100-square-mile area centered in Tripp County (USFWS 2008b), and extending into Todd and Gregory counties (Backlund and Marrone 1997). The best habitat for the beetles in South Dakota is similar to that of the northern Nebraska population, and consists of wet meadows in sandy soils with scattered cottonwoods. In 2005 surveys for this species identified a relatively high concentration of American burying beetles in southern Tripp County, which the Project route would cross through. The proposed Project route would cross through approximately 33 miles of suitable habitat for this species in South Dakota. American burying beetles occur at high concentrations in two Nebraska regions (Figure 3.8.3-2). In the south, they occur in loess canyons, and in the north a large population occurs in the NDEQ-identified Sand Hills Region, centered around Rock and Brown counties. However, they also occur in other locations in Nebraska.

The proposed Project would result in construction of approximately 500 miles of pipeline through South Dakota and Nebraska. Since 2008, reconnaissance surveys of habitat suitability for this species, along the proposed pipeline route in South Dakota and Nebraska, were conducted and habitat was rated based on the Nebraska habitat readings system that reflects the potential for American burying beetle occurrence based on general habitat characteristics (Hoback 2010). Preliminary range areas were recently developed based on presence of American burying beetle from previous studies in Nebraska, and a windshield survey to categorize suitable habitat based on land use.



Source: USFWS 2008b.

Figure 3.8.3-2 American Burying Beetle Range in Nebraska (USFWS 2008b)

The proposed pipeline route enters Nebraska from South Dakota, beginning at Keya Paha County. The proposed route in Nebraska passes through three counties with known American burying beetle presence (Keya Paha, Holt, and Boyd counties), and one county (Antelope) with historical occurrence (Hoback 2010). The route then passes through a number of central and southern Nebraska counties where American burying beetle has not been found either historically or through recent (in the past 10 years) survey efforts.

Based on 2012 presence/absence sampling, approximately 50 miles of the reroute in Nebraska would affect habitat occupied by low numbers of American burying beetle. These surveys were conducted at 54 sites in northern Keya Paha, Holt, Antelope, and Boyd counties (Hoback 2012). During the August 2012 survey, American burying beetles were found in Holt and Keya Paha counties. No American burying beetles were captured in Boyd or Antelope counties. In Holt County, American burying beetles were found at 19 of 29 sites surveyed. In Keya Paha County, American burying beetles were found at 9 locations of 14 sites surveyed. Capture rates ranged from 0 to 2.8 American burying beetles per trap-night. Because American burying beetles are susceptible to desiccation (drying out), capture rates are likely to have been affected by the drought in Nebraska during summer 2012 (see 2012 BA in Appendix H for more information on these surveys, as well as trap data from 1999 through 2012).

Control traps were run during sampling at sites in Holt County where American burying beetles were known to be numerous to the west of the proposed Project area. These traps produced between 0.7 and 7.0 American burying beetles per trap night. The control trap results (0.7 to 7.0 beetles per trap-night) compared to the trap results from Holt and Keya Paha counties in the proposed Project area (0 to 2.8 beetles per trap-night). The control traps success suggests that populations of American burying beetles to the east of the Sandhills are not as dense as populations that occur in the Sandhills.

3.8.3.5 Federally Protected Plants

Information on federally protected plants potentially found along the proposed Project route was obtained from the USFWS, the various state Natural Heritage Programs (NHPs), state agencies, and field surveys. The NHPs provided information on the status of plant populations within individual states and in some cases, surveys were completed along the proposed Project route. Potential occurrence within the proposed ROW was evaluated for each plant based on its known distribution and habitat requirements.

Two federally protected plants were initially considered because they could potentially occur in the proposed Project area—the blowout penstemon (*Penstemon haydenii*) and the western prairie fringed orchid (*Platanthera praeclara*). As discussed below, the blowout penstemon was eliminated from further consideration.

Blowout Penstemon—Endangered

The blowout penstemon (*Penstemon haydenii*) is a federally listed endangered plant, and a Nebraska listed endangered plant. It occurs in sand blowout areas in Nebraska and Wyoming sand hill habitat. This plant can be found in early successional blowout habitat where it has little competition for scarce water and nutrients from other plants. However, as blowout habitats mature and become stabilized, other plants become established, and the blowout penstemon disappears. Thus, stabilization of blowouts and other disturbances that result in physical loss of these habitats can have an adverse effect on this species.

Blowout penstemons are found in the Sandhills of north central Nebraska. The USFWS' 2012 5-year review (2012c) cites Stubbendieck's 2008 unpublished annual monitoring report for this species, which indicates that there were 32 known blowout penstemon populations (10 native population sites and 22 introduced population sites) in the Sandhills. All 32 of these populations, and thus the entire known range for this species, are west of the proposed Project area.

The northern portion of the proposed Project route in Nebraska avoids the Sand hills. Pedestrian botanical surveys of the proposed Project route in 2012 also did not locate any suitable habitat for the species. Based on the lack of suitable habit for this species in the proposed Project area, and the fact that the Project area is outside of the known range for this species, the blowout penstemon is not expected to occur in the Project area.

Western Prairie Fringed Orchid—Threatened

The western prairie fringed orchid (*Platanthera praeclara*) is federally listed as threatened, state listed as threatened in Nebraska, and is a species of conservation concern in South Dakota. No critical habitat has been designated for the western prairie fringed orchid.

This perennial orchid is found in tallgrass calcareous (chalky) silt loam or sub-irrigated sand prairies and may occur along ditches or roadsides. Flooding may be an important agent of seed dispersal (Hof et al. 1999), although seeds develop into flowering plants only under appropriate hydrologic and other conditions. The western prairie fringed orchid flowers from May to August, but peaks in late June and early July.

The western prairie fringed orchid is presently known to occur in six states (Iowa, Kansas, Minnesota, Missouri, Nebraska, and North Dakota), and may be locally extinct (extirpated) from South Dakota (USFWS 1996, USGS 2006b). Factors that indicate the species could still be present in South Dakota include: 1) incomplete surveys in areas of suitable habitat crossed by the proposed Project route on private lands; and 2) erratic flowering patterns with long dormancies that make detection difficult (Phillips 2003). One area where this species may occur in South Dakota and near the proposed Project area, is southwest of Highway 18 in Tripp County (AECOM 2008a). Most remaining populations are found in North Dakota and Minnesota, with about three percent of the populations found in the southern portion of its historical range (USFWS 1996). In Nebraska, the western prairie fringed orchid occurs in Holt, Antelope, and Boone counties (NGPC 2011).

Surveys were conducted in suitable habitat for the western prairie fringed orchid in June 2009, May through June 2011, and 2012 in Tripp County, South Dakota and Holt, Greeley, and Wheeler counties in Nebraska (more information for these surveys is provided in Appendix H, the 2012 BA). Additional surveys were conducted along the proposed route in May and June 2012, in suitable habitat in Holt, Antelope, and Boone counties in Nebraska . One western prairie fringed orchid was located in 2009 at a wetland in the previously proposed Project ROW. Two plants were located at the same site in 2011. No western prairie fringed orchids were detected along the proposed Project route in Nebraska in 2012, although suitable habitat was present in several areas, and some areas of potentially suitable habitat were not surveyed due to access denial. Additional botanical surveys are planned along the proposed Project route for 2013.

3.8.4 Bureau of Land Management Sensitive Animals and Plants

The BLM maintains its own list of sensitive animals and plants, in order to properly manage these species to promote their conservation and reduce the likelihood and need for future listing under the ESA. The proposed Project route would traverse through approximately 42.5 miles of federal lands in Montana. These federal lands are primarily composed of grasslands leased to farmers with livestock (see Section 3.9, Land Use, Recreation, and Visual Resources, for more information on federal lands and applicable management plans).

BLM Montana offices evaluate potential Project impacts on BLM sensitive species which includes species that have been determined, in coordination with the Montana Natural Heritage Program, Montana Fish, Wildlife and Parks Department, and the U.S. Forest Service, to be recommended for sensitive designation. BLM also evaluates both federal candidate species and federal delisted species within five years of delisting.

All BLM designated sensitive animals and plants with potential occurrence in Montana are also Montana designated species of concern. Additional Montana species of concern that potentially occur within the proposed Project area and that are not designated by BLM as sensitive are discussed in Appendix N, Supplemental Information for Compliance with MEPA. The BLM sensitive species that have the potential to occur within the proposed Project area include 8 mammals, 29 birds, 5 reptiles, 3 amphibians, 5 fish, and 4 plants, which are listed in Table 3.8-2, below.

Table 3.8-2 BLM Sensitive Species Potentially Occurring in the Proposed Project Area in Montana

Species	Occurrence and Habitat
Mammals	
Black-tailed prairie dog (*Cynomys ludovicianus*)	Black-tailed prairie dog colonies are generally associated with open grasslands and shrub grasslands in relatively level sites with silty clay loam, sandy clay loam or clay loam soils. See Section 3.8.3, Federally Protected and Candidate Species, and in Appendix H, the 2012 BA, for more information on prairie dog surveys conducted in Montana as part of black-footed ferret surveys.
Fringed bat (*Myotis thysanodes*)	This species occurs throughout Montana during mid-June to early September in roost sites include caves, mines, and buildings. They occur in a variety of habitats, from low to mid-elevation grassland, woodland, and desert habitats, up to and including spruce-fir forests.
Long-eared bat (*Myotis evotis*)	This species occurs throughout Montana and is active during mid-June to early September. Hibernacula are located in riverbreak habitat in northeast Montana. This species is found in wooded and rocky areas; roost sites include hollow trees, caves, mines and buildings.
Long-legged bat (*Myotis volans*)	This species occurs throughout Montana, and they are active during mid-June to early September. They roost in trees (under thick bark), hollow trees, buildings, caves, and abandoned mines, and hibernate in caves. They inhabit montane coniferous forest (mountain forests) and riparian habitat (habitat along rivers and streams).
Meadow jumping mouse (*Zapus hudsonius*)	This species occurs in southeastern Montana. The meadow jumping mouse inhabits dense stands of tall grass and forbs (herbaceous flowering plants) in marshy areas, riparian areas, woody draws, and grassy upland slopes. They often favor sites bordered by small streams.

Species	Occurrence and Habitat
Northern long-eared bat (*Myotis septentrionalis*)	This species occurs infrequently in the northeastern corner of Montana, although many range maps for this species do not include Montana as part of their range at all (Bat Conservation International 2012, MNHP and MFWP 2012c). Their summer roosts are typically under tree bark and in buildings, and their winter hibernacula typically include moist caves and abandoned mines. See Section 3.8.3 for more information on this species.
Swift fox (*Vulpes velox*)	This species occurs in north central Montana. This species inhabits 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. There are several records of this species along the northern, international border of Phillips and Valley counties, and this species occurs in the grasslands in Phillips County (Prellwitz 2012). See Section 3.8.5, below, for more information on this species habitat requirements and potential areas of occurrence in the proposed Project area.
Townsend's big-eared bat (*Corynorhinus townsendii*)	This species occurs throughout much of Montana. They roost and hibernate in caves and mines. There are no known roosts for this species in the proposed Project area, although this species likely forages in and travels through the Project area.
Birds	
Baird's sparrow (*Ammodramus bairdii*)	This species occurs throughout central and eastern Montana, in mixed-grass prairies, alfalfa fields, and fallow cropland. The Baird's sparrow breeds in early June to late July, and nests on the ground.
Bald eagle (*Haliaeetus leucocephalus*)	This species occurs throughout Montana. They nest and roost in large trees that are near water with abundant fish and waterfowl prey. Previous surveys conducted along the proposed Project ROW identified 2 nest sites and 3 winter roosts in Montana (see Section 3.8.5.2, South Dakota State Protected Species, for information on bald eagle survey results).
Black-crowned night-heron (*Nycticorax nycticorax*)	This species nests and migrates throughout Montana. They inhabit shallow marshes and other types of wetlands. They nest from May to July, generally on islands that can afford them protection from predators.
Black tern (*Chlidonias niger*)	This species occurs in perennial wetlands throughout Montana. They nest low in marshes, on floating vegetation mats, muskrat houses, or on the ground near water.
Bobolink (*Dolichonyx oryzivorus*)	This species nests and migrates throughout Montana. They inhabit native and agricultural grasslands, wet meadows, and fallow fields. They nest on the ground between late April and July.
Brewer's sparrow (*Spizella breweri*)	This species nests and migrates throughout Montana, in sagebrush steppe with high shrub cover and large patch size. They nest in big sagebrush from May through July.
Burrowing owl (*Athene cunicularia*)	This species nests and migrates throughout much of Montana. They nest from March to October in open grasslands with abandoned prairie dog, ground squirrel, or badger burrows.
Chestnut-collared longspur (*Calcarius ornatus*)	This species nests throughout central and eastern Montana. They nest from May through August in native mixed-grass prairie, and in short to medium grasses that have been recently grazed or mowed.
Dickcissel (*Spiza americana*)	This species nests throughout eastern Montana from late May to August. They nest in grasses, shrubs or trees in grasslands.
Ferruginous hawk (*Buteo regalis*)	This species migrates and nests throughout Montana. They nest in mixed grass prairie with greasewood and big sagebrush, on the ground, in shrubs, on rock outcrops, and in trees. Nesting typically occurs from April through August.
Franklin's gull (*Leucophaeus pipixcan*)	This species migrates through Montana primarily between April and October. The few known breeding areas for this species in Montana are in Phillips, Roosevelt, and Sheridan counties. The Franklin's gull nests colonially on large prairie marsh complexes over water in emergent cattails and bulrushes.

Species	Occurrence and Habitat
Golden eagle (*Aquila chrysaetos*)	This species migrates, nests and winters throughout Montana. They nest from March to August on rock outcrops, cliff ledges, and trees. They forage in the prairie, in sagebrush, and in open woodlands. Eight golden nests were identified along the proposed Project route, including two in Montana and six in South Dakota.
Greater sage-grouse (*Centrocercus urophasianus*)	This species occurs year-round in east, central and southwest Montana. They inhabit sagebrush habitat at elevations ranging from 4,000 to over 9,000 feet. See Section 3.8.3.2 for a more complete description of this species habitat requirements and occurrences in the proposed Project ROW.
LeConte's sparrow (*Ammodramus lecontei*)	This species breeds in the northeast and northwest corners of Montana from May to August. They nest and forage in moist meadows, marsh and bog edges in rushes, grass or sedges; they forage on insects and seeds.
Loggerhead shrike (*Lanius ludovicianus*)	This species breeds throughout most of Montana from mid-June to mid-July, in areas with a large component of shrubs and forbs.
Long-billed curlew (*Numenius americanus*)	This species breeds and migrates throughout Montana. They nest and forage in well-drained native grasslands, shrublands, and agricultural fields.
Marbled godwit (*Limosa fedoa*)	This species breeds east of continental divide and north of the Yellowstone River in Montana. They nest in short-grass prairie, pastures, marshes, and flooded plains, and forage on insects.
McCown's longspur (*Calcarius mccownii*)	This species breeds throughout Montana east of the Continental Divide. They nest and forage in short-grass prairie or heavily grazed mixed-grass prairie.
Mountain plover (*Charadrius montanus*)	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 (Andres and Stone 2009), but this species may nest in prairie dog towns along the Project route.
Nelson's (sharp-tailed) sparrow (*Ammodramus nelsoni*)	This species nests in Sheridan County, Montana in freshwater marshes in emergent vegetation.
Northern goshawk (*Accipiter gentilis*)	This species is a year-round Montana resident. They nest primarily in western Montana in mature conifer forests, and winter primarily in eastern Montana.
Peregrine falcon (*Falco peregrinus*)	This species is a year-round Montana resident and breeding resident April to September. They nest on ledges and cliffs, often near open habitats where they can hunt for prey.
Red-headed woodpecker (*Melanerpes erythrocephalus*)	This species breeds throughout central and eastern Montana and along the Missouri and Yellowstone rivers in May and June. They inhabit deciduous riparian forests (especially large cottonwood forests) and savannas.
Sage thrasher (*Oreoscoptes montanus*)	This species nests throughout central and eastern Montana from April through July. They nest on the ground or in sagebrush, and use sagebrush and shrubs during migration.
Sedge wren (*Cistothorus platensis*)	This species breeds in the northeast corner of Montana from May through August. They nest in wet sedge meadows and sedge marsh edges.
Sprague's pipit (*Anthus spragueii*)	This species breeds throughout central and eastern Montana from May to August. They nest on the ground in short-grass and mixed-grass prairie, wet meadows, and alkaline wetlands. See Section 3.8.2, Federally Protected and Candidate Species, for more information on this species habitat requirements and known/expected occurrence within the proposed Project ROW in Montana.
Swainson's hawk (*Buteo swainsoni*)	This species is a summer resident and a breeder throughout Montana during April to October. They typically nest between May and September in river bottoms, woody draws and shelterbelts.

Species	Occurrence and Habitat
Yellow-billed cuckoo (Eastern Distinct Population Segment) (*Coccyzus americanus*)	This species nests in the southern half of Montana in June and July, in trees in riparian forests and wooded draws.
Yellow rail (*Coturnicops noveboracensis*)	This species nests in the northeast corner of Montana from May through July, in marshes and wet meadows.
Reptiles and Amphibians	
Milksnake (*Lampropeltis triangulum*)	This species occurs sporadically in central and eastern Montana. There is only one record of this species in Dawson County, near the proposed Project route. They are active from May through October, and hibernate from November to March. They inhabit sandstone bluffs, rock outcrops, grasslands, and open ponderosa pine savanna.
Snapping turtle (*Chelydra serpentina*)	This species occurs in the lower Yellowstone River basin in eastern Montana, Milk River, and Missouri River, backwaters of large rivers, reservoirs, ponds, streams with permanent water and sandy or muddy bottoms. They nest from May to June on land.
Spiny-softshell (*Apalone spinifera*)	This species occurs in the Yellowstone River Basin in Montana, in large prairie rivers, and in slow-moving streams. They are active May through September, and nest in open areas in sand, gravel, and soft soil near water.
Western hog-nosed snake (*Heterodon nasicus*)	This species occurs in central and eastern Montana along major river systems and tributaries. They are active from May through October, and inhabit sagebrush grasslands with sandy soil.
Greater short-horned lizard (*Phrynosoma hernandesi*)	This species occurs throughout central and eastern Montana. They are active from April to October, and inhabit dry open forests, grasslands and sagebrush with sun-baked soil, ridges between coulees, and limestone outcrops.
Great Plains toad (*Bufo cognatus*)	This species occurs throughout central and eastern Montana, and inhabits grasslands near glacial potholes, stock ponds, irrigation ditches, and coulees. They breed in temporary pools flooded grasslands. They are active from May to September.
Northern leopard frog (*Rana pipiens*	This species occurs throughout central and eastern Montana. They are active from March to November, and inhabit ponds, pools in intermittent streams, and wetlands.
Plains spadefoot (*Spea bombifrons*)	This species occurs throughout central and eastern Montana. They are active from May to August, and inhabit sagebrush-grasslands with soft sandy/gravelly soils near permanent or temporary water.
Fish	
Northern redbelly and finescale dace hybrid (*Phoxinus eos* and *Phoxinus neogaeus* hybrid)	This species occurs in the upper Missouri River and tributaries north of Missouri River in Montana, beaver ponds, bogs and clear streams, and slow-flowing creeks and ponds. They spawn in spring and early summer, and forage on diatoms, algae, zooplankton, insects.
Paddlefish (*Polyodon spathula*)	This species occurs 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.
Pearl dace (*Margariscus margarita*)	This species occurs in cool tributaries of the Missouri River including the Milk River, and Frenchman, Rock, and Willow creeks in Montana; they spawn in spring over gravel or sand.
Sauger (*Sander canadensis*)	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 mainstem of large tributaries with bluff pools and rocky substrates.

Species	Occurrence and Habitat
Sturgeon chub (*Macrhybopsis gelida*)	This species occurs in the Missouri, Yellowstone, and Powder rivers, in turbid water with moderate to strong currents over bottoms ranging from rocks and gravel to coarse sand. They spawn from June through July. Sturgeon chubs occur in the Yellowstone, Powder, and Missouri Rivers and some of their tributaries in Montana.
Plants	
Bractless blazingstar [Bractless mentzelia] (*Mentzelia nuda*)	This species occurs in Dawson and Valley counties in Montana. They occur in sandy or gravelly soil of open hills and roadsides, and typically bloom in July.
Broadbeard beardtongue [Narrowleaf Penstemon] (*Penstemon angustifolius*)	This species occurs in grasslands on hills and slopes with sandy soil, and are often abundant in blowouts or sparsely-vegetated areas. They typically bloom from May through June. It is known to occur in Dawson and Fallon counties in Montana.
Persistent-sepal yellow-cress (*Rorippa calycina*)	This species occurs in McCone County, Montana. They occur in sparsely vegetated, moist sandy to muddy banks of streams, stock ponds, and man-made reservoirs near the high water line. They typically bloom from May through July.
Prairie phlox [Plains phlox] (*Phlox andicola*)	This species occurs in Dawson County, Montana, in sandy soils in grasslands and ponderosa pine woodland, often associated with sparsely vegetated blowouts and loose sand below sandstone outcrops. They typically bloom between May and early June.

3.8.5 State-Protected Species

All states crossed by the proposed Project route, except Montana, designate endangered and threatened species, and afford state protections to these species. Montana maintains a listing of species of concern. Those species that are listed in Montana and are also state-protected in other states are presented here, although species listed only as Montana species of concern are not discussed. Protections given to animals and plants are established within the statutes for each state. Further, each state crossed by the proposed Project route maintains a comprehensive wildlife conservation strategy (including a state wildlife action plan), as charged by Congress. These wildlife action plans identify the condition of each state's wildlife and habitats (including low and declining populations), identify the challenges to these resources, and describe long-term conservation strategies. Table 3.8-3 lists state endangered and threatened species that have been identified through consultations with state resource agencies as potentially occurring along the proposed Project route. State-protected animals and plants that are also federally protected are discussed in Section 3.8.3. State-protected species potentially occurring along the proposed Project route include three mammals, seven birds, one reptile, eight fish, one invertebrate, and one plant.

Table 3.8-3 State Protected Animals and Plants Potentially Occurring along the Proposed Project Route

Species	Federal and BLM Status[a]	State Status and Occurrence				Comments
		MT	SD	NE	KS	
Mammals						
Black-footed ferret (*Mustela nigripes*)	E	SC	E	E	E	Inhabits prairie dog towns of the Central Plains grassland habitat, and feeds primarily on prairie dogs.

Species	Federal and BLM Status[a]	State Status and Occurrence				Comments
		MT	SD	NE	KS	
River otter (*Lontra canadensis*)			T	T		North America, uses aquatic and riparian habitats, burrows along shorelines, eats fish.
Swift fox (*Vulpes velox*)	BLM-S	SC	T	E		Central Plains, uses habitats with high densities of small mammal prey. Uses dens year-round, but will move frequently between dens when raising pups, as fleas can become a problem.
Birds						
Bald eagle (*Haliaeetus leucocephalus*)	DL BLM-S	SC	T		T	North America, breeds and winters in areas near water, eats fish and waterfowl; resident and migrant populations.
Eskimo curlew (*Numenius borealis*)	E		E	E	E	Inhabit grasslands of North America (summer) and South America (winter).
Interior least tern (*Sternula antillarum*)	E	SC	E	E	E	Inhabit barren to sparsely vegetated sandbars along rivers, sand and gravel pits, or lake and reservoir shorelines.
Peregrine falcon (*Falco peregrinus*)	DL BLM-S	SC	E			North America, nests on ledges, cliffs; eats birds, winters coastal proposed Project area, resident and migrant.
Piping plover (*Charadrius melodus*)	T	SC	T	T	T	Central Plains, inhabits sand and gravel bars and beaches along major rivers and around lakes, reservoirs, ponds, and alkali wetlands.
Whooping crane (*Grus americana*)	E	SC	E	E	E	Central United States and Canada, use a variety of habitats during migration, including a variety of croplands for feeding, and wetlands that are generally 10 acres or less for roosting. Breed in isolated marshes.
Reptiles						
Massasauga (*Sistrurus catenatus*)				T		Central United States, Great Lakes region; wet prairies, marshes, uplands; uses burrows, eats animals, short migrations.
Fish						
Blacknose shiner (*Notropis heterolepis*)			E	E		Northern United States; Keya Paha, Niobrara rivers and tributaries, Spring Creek, SD, NE; weedy lakes streams; eats insects.
Blackside darter (*Percina maculata*)					T	Central US; clear gravel or sand bottom streams, eats insects.
Finescale dace (*Phoxinus neogaeus*)			E	T		North United States; Keya Paha, Niobrara, South Fork Elkhorn rivers, Spring Creek, SD, NE; bogs, creeks, rivers, eats invertebrates.
Northern redbelly dace (*Phoxinus eos*)	BLM-S	SC	T	T		North United States; Upper Missouri River and tributaries, Frenchman Creek, Yellowstone River and tributaries east of the Powder River, MT; Keya Paha, Niobrara rivers and tributaries, Spring Creek, SD, NE; boggy lakes, streams; herbaceous.
Pallid sturgeon (*Scaphirhynchus albus*)	E	SC	E	E	E	Inhabit large, free-flowing, warm-water stream systems, where they live close to the bottom of the rivers, where there are sand and gravel bars.

Species	Federal and BLM Status[a]	State Status and Occurrence				Comments
		MT	SD	NE	KS	
Pearl dace (*Margariscus margarita*)	BLM-S	SC	T			North United States; Missouri River, Milk River, Rock Creek, Willow Creek, and Frenchman Creek, MT; Keya Paha tributaries, SD; bogs, clear streams, spawns on sand-gravel; omnivorous.
Sicklefin chub (*Macrhybopsis meeki*)		SC	E		E	Missouri River, MT, SD, NE, KS; Yellowstone, Milk rivers, MT; large warm rivers with gravel, sand; bottom feeder.
Sturgeon chub (*Macrhybopsis gelida*)	BLM-S	SC	T	E	T	Missouri River; Yellowstone and Powder Rivers, MT; Cheyenne and White rivers SD; large turbid rivers; bottom feeder.
Topeka shiner (*Notropis topeka*)	E			E	T	Occurs 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. Topeka shiner streams generally have clean gravel, rock, or sand bottoms.
Invertebrates						
American burying beetle (*Nicrophorus americanus*)	E			E	E	Inhabits grassland prairie, forest edge, and scrubland, in Arkansas, Kansas, Nebraska, Oklahoma, South Dakota, and Rhode Island.
Plants						
Small white lady's slipper (*Cypripedium candidum*)				T		North Central, Northeast United States; perennial orchid, mesic-to-wet native prairie, flowers May to June.

a (FC = Federal Candidate; DL = Federally delisted; BLM-S = BLM Sensitive; E = Endangered; T = Threatened; SC = Species of Concern)

3.8.5.1 Montana State Protected Species

Montana does not have a state endangered species act, but does maintain a list of species of concern. Most of these species are also listed by other states, the federal ESA, or by BLM as a sensitive species, and are discussed in the appropriate sections. Those species that are only listed as a species of concern by Montana are discussed in Appendix N, Supplemental Information for Compliance with MEPA.

3.8.5.2 South Dakota State Protected Species

The following South Dakota threatened and endangered species were considered in this Supplemental EIS, because their preferred habitat and range occurs or historically occurred within the proposed Project area. Note that those South Dakota threatened and endangered species that are also federally listed species are not discussed in this section, because they are discussed above in Section 3.8.3, Federally Protected and Candidate Species. Table 3.8-3, above, provides the full list of South Dakota threatened and endangered species that were considered in this Supplemental EIS, including those species that are also federally listed.

Mammals

River Otter

River otters (*Lontra canadensis*) are a South Dakota and Nebraska threatened species. River otters are adaptable and use a variety of habitat types, but require aquatic habitats. Although they frequent lakes and ponds, river otters typically live in marshes and along wooded rivers and streams with sloughs and backwater areas. Otters use dens in the ground that were previously built by beavers or other animals. Denning occurs during March to September. Most river otter mortality is related to human activity. In Nebraska, accidental trapping has been the largest known mortality factor for reintroduced animals. Habitat destruction, pesticide use, and pollutants also affect the species (NGPC 2009b). River otters are likely to occur throughout the proposed Project area along large rivers.

Swift Fox

The swift fox (*Vulpes velox*) is a South Dakota threatened species, a Nebraska endangered species, a Montana species of concern, and a BLM sensitive species. Historically, swift foxes were widely distributed throughout the central Great Plains. Swift foxes use open prairie and arid plain habitats, including areas intermixed with winter wheat fields. Swift foxes are thought to have been common on the eastern plains of Montana in the early 1900s but were believed to be exterminated in the state by 1969. Reintroductions of the swift fox on the Blackfeet Indian Reservation, Fort Peck Indian Reservation, and in southern Alberta and Saskatchewan from 1983 to 1991 are likely the source of expanding populations in Montana (MNHP 2009, Foresman 2001). Swift foxes create dens within burrows. A fox may dig a burrow or use a burrow made by other animals, usually in sandy soil on high ground in open prairies, along fencerows, and occasionally in plowed fields. Individuals may use several different dens throughout the year (NatureServe 2009).

The proposed Project route crosses swift fox range in Phillips, Valley, Dawson, Prairie, and Fallon counties in Montana (Kahn et al. 1997), and suitable habitat in Fallon and McCone counties in Montana. Montana Natural Heritage Program data indicate that there are several records of this species occurring in northern Philips and Valley County within the last five years (MNHP and MFWP 2012b), and BLM has indicated that swift fox could be present near the proposed Project route in Montana, and the proposed Project route crosses several areas identified as recently occupied by swift fox. In particular, BLM expects the swift fox to occur along the proposed Project route in northern Phillips County, in the grasslands west of Frenchman Creek (Prellwitz 2012).

In South Dakota, the proposed Project route crosses through swift fox range in Haakon and Jones counties in South Dakota between the reintroduction sites of the Bad River Ranches (Turner Endangered Species Fund), Badlands National Park, and the Lower Brule Sioux Tribe Reservation (SDGFD 2009). In addition, there is suitable habitat for this species in Harding, Butte, Perkins, Meade, and Pennington counties in South Dakota (Kahn et al. 1997). South Dakota National Heritage Program (SDNHP) data indicate three swift fox records in Haakon County along the proposed Project route.

The proposed Project route would be outside of the known distribution of the swift fox in Nebraska (NGPC 2011).

Birds

Bald Eagle

Bald eagles occur throughout the United States and the proposed Project area. The bald eagle was removed from federal listing in 2007, but remains state-listed in South Dakota and Kansas as a threatened species. The bald eagle is federally protected under both the BGEPA and the MBTA. Bald eagles are associated with riparian or lacustrine areas for foraging and nesting. They generally nest and roost in large trees or snags with open crowns in areas that are relatively free of disturbance. Nesting territories are most often near open water with a prey base of fish and waterfowl. Bald eagles use upland areas to feed on small mammals and carrion, especially during the winter. Nests are typically within one mile of permanent water. Roost sites are an important habitat component for bald eagles and include live trees and snags that provide good visibility and that are located near nest sites or foraging areas.

Four active bald eagle nests were documented during raptor nest surveys for the proposed Project during April 2009: two in Montana (along the Yellowstone and Missouri rivers), and two in Nebraska. Five active bald eagle nests were documented during raptor nest surveys for the proposed Project during April 2010. Twelve bald eagle winter roost sites were identified during surveys for the proposed Project during February 2009. Winter roost sites were identified at three proposed river crossings in Montana (Yellowstone River, Missouri River, and Frenchman Reservoir); three proposed river crossings in South Dakota (White River, Cheyenne River, South Fork Moreau River); and six proposed river crossings in Nebraska (Platte River, Loup River, Cedar River, Dry Creek, Niobrara River, Keya Paha River). Surveys have not been conducted since the proposed Project was rerouted in Nebraska. There may be bald eagle summer roosting or winter nesting present along portions of the proposed Project route. As with most birds, bald eagles may change their summer roosting and winter nesting locations, or expand into new locations, so absence at a location one year does not guarantee absence at that location in subsequent years.

Peregrine Falcon

The peregrine falcon (*Falco peregrinus*) is a South Dakota endangered species, a Montana species of concern, and a BLM sensitive species. The peregrine falcon is a non-breeding resident, breeding resident, permanent resident, or migrant throughout the United States, primarily west of the proposed Project area, although non-breeding residents are found throughout the east and along the Gulf of Mexico coast. Two of the three recognized subspecies could occur within the proposed Project area: the American peregrine falcon (*Falco peregrinus anatum*) and the Arctic peregrine falcon (*Falco peregrinus tundrius*). Both subspecies were previously federally protected as endangered under the ESA but have been delisted. The American peregrine falcon nests across interior Alaska and across Canada south to Baja California and northern Mexico. The Arctic peregrine falcon breeds on the North American tundra and winters in Latin America from Cuba and Mexico south through Central and South America and along the Gulf Coast from Florida west to eastern Mexico. Peregrine falcons use open habitats near cliffs and mountains. Nesting habitat occurs on cliffs near an adequate prey base.

Fish

Blacknose Shiner

The blacknose shiner (*Notropis heterolepis*) is a South Dakota and Nebraska listed endangered species. The blacknose shiner requires clean, cool, well-oxygenated streams with abundant aquatic vegetation. It is found in areas swept by currents, island heads, and sandbars, and is intolerant of turbid water and pollution. Spawning occurs in Nebraska during the last week of June and in general, from spring to midsummer. The blacknose shiner feeds on small aquatic insects, crustaceans, and algae. It serves as a host for the cylindrical papershell freshwater mussel (*Anodontoides ferussacianus*) (NatureServe 2009). The blacknose shiner is an important indicator of high water quality within pristine streams.

This minnow potentially occurs within suitable habitat in waterbodies that would be crossed by the proposed Project route in South Dakota and Nebraska. 2009 occurrence and habitat surveys did not detect this species, but identified two proposed Project route stream crossings with good habitat in South Dakota. Updated species surveys along the proposed Project route in Nebraska are planned for 2013, when streams with suitable habitat are flowing.

Finescale Dace

The finescale dace (*Phoxinus neogaeus*) is a South Dakota endangered and Nebraska threatened species. Populations of the finescale dace in South Dakota and Nebraska occur in small, isolated pools of water, and have been declining steadily since European settlement of this region over 100 years ago. Finescale dace can be found in sluggish, spring-fed streams with abundant vegetation and woody debris; the vegetation and cover provided by logs and brush supply shady areas for the dace to say out of the sun, ambush prey, and avoid predators. They can also occur in small spring-fed lakes and bogs (Stasiak and Cunningham 2006). Perhaps the most optimal habitat for this species is a series of beaver bonds filled with a constant supply of cool groundwater Finescale dace spawn in early spring from April to early June.

This species is associated with Niobrara, Loup and South Fork Elkhorn rivers in Nebraska, although their known range is west of the proposed Project route in Keya Paha, Nance, and Merrick counties (NGPC 2011).

In accordance with recommendations by the SDGFP and NGPC, field surveys of waterbodies identified as potentially containing finescale dace or habitat suitable for this minnow were conducted. No finescale dace were found during fall 2009 field surveys, although two locations contained habitat suitable for this species in South Dakota. Updated species surveys along the proposed Project route in Nebraska are planned for 2013, when streams with suitable habitat are flowing.

Northern Redbelly Dace

The northern redbelly dace (*Phoxinus eos*) is a South Dakota and Nebraska threatened species and a Montana species of concern. In addition, the northern redbelly dace—finescale dace hybrid is a BLM-sensitive species and a species of concern in Montana. It prefers sluggish, spring-fed streams with abundant vegetation and woody debris (Stasiak 2006). This minnow requires a constant supply of cool spring water that maintains sufficient oxygen levels during hot and dry summer conditions. During spawning, the northern redbelly dace becomes quite colorful,

reaching a maximum size of about 3 inches. In some locations in the northern United States, the northern redbelly dace hybridizes with its close relative, the finescale dace. The resulting hybrids are all females and produce female clones as offspring. The northern redbelly dace potentially occurs in: the Upper Missouri River and tributaries, including Frenchman Creek, and Yellowstone River and tributaries east of the Powder River, Montana; in tributaries of the Keya Paha River in South Dakota; and in tributaries of the Niobrara River and South Fork Elkhorn River in Nebraska.

Surveys of stream crossings identified as potentially containing the northern redbelly dace or its habitat as identified by the SDGFP and NGPC in 2009 did not detect this minnow, although two stream crossings contained good habitat for this species in South Dakota. Updated species surveys along the currently proposed Project route in Nebraska are planned for 2013, when streams with suitable habitat are flowing.

Pearl Dace

The pearl dace (*Margariscus margarita*) is a South Dakota threatened species, a Montana species of concern, and a BLM sensitive species. The pearl dace inhabits bog drainage streams, ponds, and small lakes, and is usually found over sand or gravel. Pearl dace spawn in clear water in weak or moderate currents (NatureServe 2009). They potentially occur in suitable habitat within the Missouri River, Milk River, Frenchman's Creek, Rock Creek, and Willow Creek in Montana and tributaries to the Keya Paha River in South Dakota that would be crossed by the proposed Project route. The pearl dace has been listed as a species of special concern in Montana and as threatened in South Dakota. Further, the BLM has listed this species as sensitive.

Surveys of waterbodies identified as potentially containing pearl dace or their habitat by the SDGFP and NGPC in 2009 found no pearl dace, although two proposed stream crossings in South Dakota contained suitable habitat.

Sicklefin Chub

The sicklefin chub (*Macrhybopsis meeki*) is a South Dakota endangered species, a Kansas endangered species, and a Montana species of concern. The sicklefin chub inhabits the shallows of warm large rivers that are continuously and heavily turbid, with strong currents over stable gravel and sand substrates (NatureServe 2009). The sicklefin chub potentially occurs in the Missouri, Milk and Yellowstone rivers in Montana and in the Cheyenne and White rivers in South Dakota. This species is not expected to be found in South Dakota along the proposed Project route (USGS 2006a).

Sturgeon Chub

The sturgeon chub (*Macrhybopsis gelida*) is a South Dakota and Kansas threatened species, a Nebraska endangered species, a Montana species of concern, and a BLM sensitive species. The sturgeon chub prefers large, turbid, sandy rivers over substrate of small gravel and coarse sand. It is often found in areas swept by currents, especially at the head of islands or exposed sandbars. Sturgeon chubs occur in the Yellowstone, Powder, and Missouri Rivers and some of their tributaries in Montana, Cheyenne and White Rivers in South Dakota, and the Platte River in Nebraska.

3.8.5.3 Nebraska State Protected Species

The following Nebraska threatened and endangered species were considered in this Supplemental EIS, because their preferred habitat and range currently or historically occurred in the proposed Project area. Note that those Nebraska threatened and endangered species that are also federally listed species are not discussed in this section, because they are discussed in Section 3.8.3, Federally Protected and Candidate Species (the full list of Nebraska-listed species considered, including those that are federally listed, are in Table 3.8-3, above).

Mammals

River Otter

The river otter is described above in Section 3.8.5.2, South Dakota State Protected Species. This species could occur in rivers throughout the proposed Project area.

Swift Fox

The swift fox is described above in Section 3.8.5.2, South Dakota State Protected Species. The proposed Project route would not cross the known distribution of the swift fox in Nebraska.

Reptiles

Massasauga

The massasauga (*Sistrurus catenatus*), or pygmy rattlesnake, is state listed as threatened in Nebraska. It lives in wet areas, including wet prairies, marshes, and low areas along rivers and lakes. In many areas, massasaugas also use adjacent uplands—including forest—during part of the year. They often hibernate in crayfish burrows, but they also may be found under logs and tree roots or in small mammal burrows. Unlike other rattlesnakes, massasaugas hibernate alone. Small mammal and crayfish burrows are used for winter hibernation. Females give birth in late July through early September. Movement within the home range occurs between suitable winter and summer habitats, sometimes spanning almost 2 miles. Most movement, however, occurs within 650 feet of their burrows. Peak activity occurs from about April or May through October. Suitable habitat is known to occur along the proposed Project route along waterbody shorelines within Jefferson County, Nebraska, in the southern portion of Nebraska.

Fish

Blacknose Shiner

A general description of the blacknose shiner and its habitat requirements are described above, in Section 3.8.5.2, South Dakota State Protected Species. Within the proposed Project area in Nebraska, this species is known to occur in Keya Paha County, which is the northernmost county in Nebraska that the proposed Project route would traverse (NGPC 2011). In accordance with recommendations by the NGPC, in 2009 biologists conducted occurrence and habitat surveys in tributaries to the Niobrara and South Fork Elkhorn rivers in Nebraska. They did not observe blacknose shiners, but they identified four proposed stream crossings containing marginally suitable habitat and one stream crossing with good habitat for this species. However, the

proposed Project route has been revised since the 2009 surveys, and surveys have not been conducted at the streams that would be crossed in these areas.

Finescale Dace

The finescale dace is described above, in Section 3.8.5.2, South Dakota State Protected Species. As mentioned in Section 3.8.5.2, in 2009 surveys for this species were conducted, but no occurrences were identified. Within Nebraska, this species was not identified in the original proposed Project area evaluated in the 2011 Final EIS, nor was any suitable habitat found for this species. However, the proposed route has been revised since the 2009 surveys, and surveys have not been conducted in these areas. Furthermore, this species is known to occur in Keya Paha County, which is the northernmost county in Nebraska that the proposed Project route would traverse (NGPC 2011).

Northern Redbelly Dace

A general description of the northern redbelly dace and its habitat requirements are described above, in Section 3.8.5.2, South Dakota State Protected Species. Within the Project area in Nebraska, this species is known to occur in Keya Paha County (NGPC 2011). This species was not detected during 2009 surveys in streams presumed to have suitable habitat for this species. However, the proposed route has been revised since the 2009 surveys, and these surveys have not been conducted at streams in these areas.

Sturgeon Chub

A general description of the sturgeon chub and its habitat requirements are described above, in Section 3.8.5.2, South Dakota State Protected Species. Within the proposed Project area, this species is known to occur in the Platte River (NGPC 2011).

Plants

Small White Lady's Slipper

The small white lady's slipper (*Cypripedium candidum*) is a Nebraska threatened species. It is found in wet prairies, mesic (dry) blacksoil prairie, wet blacksoil prairie, glacial till hill prairie, sedge meadow, calcareous (chalky) fens, and glades, generally with calcareous soils. It is a medium sized perennial orchid that flowers in Nebraska from mid-May through early June. This orchid maintains a symbiotic relationship with mycorrhiza fungi which assist the plant with seed germination and seedling growth through soil moisture and nutrient uptake. The small white lady's slipper could potentially occur within suitable habitat along the proposed Project route. Several counties that the proposed Project route would cross are presumed to have occurrences of this species, including Antelope, Boyd, Holt, Keya Paha, Nance, and Merrick counties in Nebraska (NGPC 2011).

3.8.5.4 Kansas State Protected Species

The proposed Project would require the construction of one pump station in Clay County, Kansas; and an existing pump station would be expanded in Butler County, Kansas, in order to transport the anticipated product volume through the associated pipeline at these locations. Thus, Kansas state-listed threatened and endangered species whose preferred habitat and range

currently or historically occurred in the proposed Project area are discussed below. Note that those Kansas threatened and endangered species that are also federally listed species are not discussed in this section, because they are discussed in Section 3.8.3, Federally Protected and Candidate Species. Table 3.8-3, above, provides the full list of Kansas threatened and endangered species considered in this Supplemental EIS, including those species that are also federally listed.

Birds

Bald Eagle

A general description of the bald eagle and its habitat requirements are described above, in Section 3.8.5.2, South Dakota State Protected Species. No bald eagles were identified during prior raptor surveys for the proposed Project, in Kansas. However, winter migrants occur near reservoirs and rivers throughout the state, and this species also nests in Kansas.

Fish

Blackside Darter

The blackside darter (*Percina maculata*) is a Kansas threatened species. It is a member of the Perch family and potentially occurs in creeks and small to medium rivers where it prefers quiet pools and pools with some current over gravel or sand bottoms (Page and Burr 1991). Blackside darters feed on benthic invertebrates and spawn in gravel pools greater than 1 foot deep; and they may migrate several miles between spawning and non-spawning habitats. In Kansas, it has historically occurred in Riley County, and there is designated critical habitat for this species in Wabaunsee County. The blackside darter is not expected to occur in either Clay or Butler counties, where the proposed Project pump stations would be (KDWPT 2012).

Sicklefin Chub

A general description of the sicklefin chub and its habitat requirements are described above, in Section 3.8.5.2, South Dakota State Protected Species. In Kansas, the sicklefin chub has historically occurred in the northeast corner of the state, east of where the proposed pump stations would be constructed/expanded as part of the proposed Project (KDWPT 2012).

Sturgeon Chub

General descriptions of the sturgeon chub and its habitat requirements are described above, in Section 3.8.5.2, South Dakota State Protected Species. This species is not known to occur in Butler or Clay counties (KDWPT 2012), where the proposed Project pump stations would be located.

3.8.6 Animals and Plants of Conservation Concern

This section discusses animals and plants, identified during consultations with agencies, that are of conservation concern and that potentially occur along the proposed Project route (Table 3.8-4). Many of these species are associated with woodland, wetland, or prairie habitats, which have been historically converted to agricultural use throughout the proposed Project area. The species of conservation concern have been identified and designated by federal and state wildlife

management agencies after review of abundance, population trends, distribution, number of protected sites, degree of threat to survival, suitable habitat trends, degree of knowledge about the species, and species life history (MFWP 2005, Schneider et al. 2005, SDGFP 2006, Wasson et al. 2005). These designations are intended to assist with conservation planning and maintenance of the natural heritage of each state.

Table 3.8-4 Animals and Plants of Conservation Concern Potentially Occurring along the Proposed Project ROW

Species	Occurrence and Habitat
Birds	
Golden eagle (*Aquila chrysaetos*)	Migrate, nest and winter throughout much of proposed Project area, nest March to August on rock outcrops, cliff ledges, trees; forage in prairie, sagebrush, and open woodlands on jackrabbits, ground squirrels, carrion, ungulate fawns, and small birds. Eight golden eagle nests were identified along the proposed Project route, including two in Montana and six in South Dakota.
Great blue heron (*Ardea herodias*)	Migrate, nest, and winter throughout proposed Project area; nests in large groups (rookeries) in forested wetlands riparian habitats, and freshwater and brackish marshes; eat invertebrates and fish. Several rookeries have been identified along the proposed Project route, including one in Montana and one in South Dakota. In addition, one rookery was identified along the previously proposed Project route through Nebraska, and rookeries may occur along the currently proposed route through Nebraska.
Raptors (except eagles)	Migrate, nest and winter throughout proposed Project area depending on species; nest on rock outcrops, cliff ledges, trees; forage in various habitats and small to medium size prey, and/or carrion.
Fish	
Plains topminnow (*Fundulus sciadicus*)	Missouri River drainages; clear, sandy to rocky, spring-fed streams, creeks, and medium to small rivers; in quiet pools, backwaters, overflow pools, usually near vegetation. Present at crossing at Lute Creek in SD. Suitable habitat in Lute and Buffalo Creek, Tripp County, SD; Keya Paha River, Spring Creek, Keya Paha County, NE; Elkhorn River, Holt Creek, Dry Creek, South Fork Elkhorn River, and two unknown streams, Holt County, NE.

3.8.7 Connected Actions

The proposed Project would also include several connected actions including: 1) the Bakken Marketlink Project; 2) the Big Bend to Witten 230-kV Transmission Line; and 3) Electrical Distribution Lines and Substations. These connected actions are described briefly here.

3.8.7.1 Bakken Marketlink Project

Construction and operation of the Bakken Marketlink Project would include approximately a 5-mile-long pipeline (route not yet determined) and three crude oil storage tanks and associated facilities near Baker, Montana, adjacent to the proposed Pump Station 14, and two crude oil storage tanks and associated facilities at the proposed Cushing tank farm in Cushing, Oklahoma, to store and deliver Bakken oil production from producers in North Dakota and Montana through the proposed Project pipeline. The known distribution of the greater sage-grouse and interior least tern would not overlap with pipelines or storage tanks proposed under this connected action. In addition, the Bakken Marketlink facilities near Baker would not likely affect the

whooping crane as this region is not within the whooping crane migration corridor. However, the Bakken Marketlink facilities would be constructed in a region used by Sprague's pipit and mountain plover. Additional federal-listed species, Montana species of concern, or BLM sensitive species may occur within the area where Bakken Marketlink Project activities would occur.

3.8.7.2 Big Bend to Witten 240-kV Transmission Line

The Big Bend to Witten 230-kV Transmission Line would provide upgrades to the power grid to support power requirements for pump stations in South Dakota. Federal and South Dakota listed species discussed above under Section 3.8.3, Federally Protected and Candidate Species, and Section 3.8.5.2, South Dakota State Protected Species, may occur where the transmission lines and associated poles/towers would be constructed.

3.8.7.3 Electrical Distribution Lines and Substations

The third connected action is associated with the electrical distribution lines and substations that would be required throughout the length of the proposed Project corridor to support pump stations and other integral Project-related ancillary facilities.

One active bald eagle nest was identified within 1 mile of the proposed power line route to proposed Pump Station 10 in Montana. Other federal- and state-listed species discussed in Sections 3.8.2 and 3.8.3, above, may occur where the electrical distribution lines and substations would be constructed under the proposed Project.

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3.9 LAND USE, RECREATION, AND VISUAL RESOURCES

3.9.1 Introduction

This section discusses land use and land ownership, recreation, and visual resources in the proposed Project area. The descriptions of these resources are based on information provided in the 2011 Final Environmental Impact Statement (Final EIS) as well as new circumstances or information relevant to environmental concerns that have become available since the publication of the Final EIS, including the proposed reroute in Nebraska. The information that is provided here builds on the information provided in the Final EIS and in many instances replicates that information with relatively minor changes and updates. Other information is entirely new or substantially altered from that presented in the Final EIS. Specifically, the following information, data, methods, and/or analyses have been substantially updated in this section from the 2011 document:

- Land ownership and land use types crossed by the pipeline have changed, with the majority changes occurring in Nebraska due to changes in the proposed Project route;
- The recreation and special interest areas crossed by the pipeline have changed, with the majority changes occurring in Nebraska due to changes in the proposed Project route; and
- The number and type of conservation easement and stream crossings have changed due to changes in the proposed Project route.

3.9.2 Environmental Setting

3.9.2.1 Land Ownership

The proposed Project would cross approximately 875 linear miles of land (see Table 3.9-1), including approximately 286 miles in Montana, 315 miles in South Dakota, and 274 miles in Nebraska. Ancillary facilities not adjacent to the proposed Project's pipeline would also be built in North Dakota and Kansas. The land crossed by the proposed Project is primarily private land (approximately 764 miles). In addition, the proposed route would cross approximately 47 miles of federal land and 64 miles of state- or local government-owned land.

The location of a proposed construction camp in northern Nebraska and the locations of four proposed pump stations (22 to 25) have not been determined at this time. The camp would occupy approximately 50 to 100 acres, with an ideal location being near the midpoint of Construction Spread 8 for the proposed pipeline (exp Energy Services, Inc. 2012a). The 16 proposed pump stations for which sites have been identified occupy a total of approximately 215 acres (see Table 2.1-3); thus it is assumed that the four pump stations (22 to 25) would each occupy approximately 12 to 15 acres.

Table 3.9-1 Land Ownership along the Proposed Project Route (miles)

	Land Ownership Status					
State	**Federal**	**State[a]**	**Local (Public)[b]**	**Private**	**Waterbody[c]**	**Total[d]**
Montana	46.6	30.6	0.5	207.6	0.6	285.9
South Dakota	0.0	26.3	1.8	286.4	0.5	315.0
Nebraska	0.0	4.1	0.1	269.8	0.8	274.8
Total[e]	**46.6**	**61.0**	**2.4**	**763.8**	**1.9**	**875.4**
Percent of Total	**5.3%**	**7.0%**	**0.3%**	**87.3%**	**0.2%**	**100%**

Sources: exp Energy Services, Inc. 2012a, exp Energy Services, Inc. 2012b.

[a] Includes state highway right-of-way (ROW).
[b] May not include all county road ROW.
[c] Includes waterbodies not located on a parcel under federal, state, or local ownership.
[d] Totals may not match due to rounding.
[e] Ancillary facilities in North Dakota and Kansas are discrete facilities and therefore are not associated with proposed Project pipeline mileage. The pipe yard and rail siding located in North Dakota would occupy 56.05 acres of private land. The two pump stations in Kansas would occupy 15.2 acres of private land.

Agricultural Land Use

Based on the mileage of land crossed as shown in Table 3.9-2, agricultural land constitutes approximately 39 percent of the land crossed by the proposed Project route. Crop production along the proposed pipeline route is estimated using statewide statistics. Table 3.9-3 shows the acreage devoted to crops in the states in which proposed Project facilities are located.

Table 3.9-2 Land Use Crossed by the Proposed Project Route (miles)

	Land Use Type						
State	**Agriculture**	**Developed**	**Forest**	**Rangeland**	**Water**	**Wetland[a]**	**Total[b]**
Montana	68.1	2.6	1.4	210.9	2.2	0.5	285.7
South Dakota	79.3	3.0	0.9	229.4	1.7	1.0	315.3
Nebraska	197.6	4.6	4.2	65.3	1.4	1.4	274.5
Total[c]	**345.0**	**10.2**	**6.5**	**505.6**	**5.3**	**2.9**	**875.4**
Percent of Total	**39.4%**	**1.2%**	**0.7%**	**57.8%**	**0.6%**	**0.3%**	**100%**

Source: exp Energy Services, Inc. 2012a, exp Energy Services, Inc. 2012b.

[a] The designations in Table 3.9-2 reflect mapping of actual use of the land surface. Some wetland areas that are part of (and used as) cultivated fields, forests, rangeland, or developed areas may not be included in the wetlands category. As a result, the values for wetlands and waterbodies in Table 3.9-2 may differ from values in Section 3.3, Water Resources; Section 3.4, Wetlands; and Section 3.5, Terrestrial Vegetation.
[b] Totals may not match due to rounding.
[c] Ancillary facilities in North Dakota and Kansas are discrete facilities and therefore are not associated with proposed Project pipeline mileage. The pipe yard and rail siding located in North Dakota would occupy 56.05 acres of private land. The two pump stations in Kansas would occupy 15.2 acres of private land.

Table 3.9-3 State Harvested Acreages of Most Commonly Harvested Crops, 2007[a]

State	Crop	State Harvested Acres (1,000s)	Percent of Total Harvested Area (by State)
Montana	Wheat for Grain, All	5,060	27.7%
	Hay and Forage, All	2,822	15.5%
	Barley for Grain	719	3.9%
	Other Crops	9,641	52.9%
	Total Cropland	**18,242**	100%
North Dakota	Corn for Grain	2,348	8.5%
	Wheat, All	8,428	30.6%
	Corn for Silage	1,965	7.1%
	Barley for Grain	1,385	5.0%
	Soybeans	3,074	11.2%
	Hay and Forage, All	2,525	9.2%
	Other Crops	7,802	28.3%
	Total Cropland	**27,527**	100%
South Dakota	Corn for Grain	4,455	23.3%
	Soybeans	3,223	16.9%
	Hay, All	3,240	17.0%
	Wheat for Grain, All	3,342	17.5%
	Other Crops	4,834	25.3%
	Total Cropland	**19,094**	100%
Nebraska	Corn for Grain	9,193	42.8%
	Soybeans	3,835	17.8%
	Hay and Forage, All	2,564	11.9%
	Wheat for Grain, All	1,964	9.1%
	Other Crops	3,930	18.3%
	Total Cropland	**21,486**	100%
Kansas	Corn for Grain	3,680	13.0%
	Wheat for Grain, All	8,528	30.2%
	Sorghum for Grain	2,626	9.3%
	Soybeans, All	2,591	9.2%
	Hay and Forage, All	2,800	9.9%
	Other Crops	7,991	28.3%
	Total Cropland	**28,216**	100%

Source: U.S. Department of Agriculture (USDA) 2009.

[a] 2007 is the most recent year for which agricultural census data are available.

Developed Land

As stated in the Final EIS, the proposed Project route was surveyed in spring 2009 to determine the number of inhabited or abandoned buildings within 25 feet and 500 feet of the construction right-of-way (ROW), and to develop site-specific crossing plans and procedures for residences in close proximity of the ROW. The Nebraska portion of the proposed ROW, as well as other route modifications in Montana and South Dakota, were surveyed in spring/summer 2012. As discussed in the Section 3.12.3, Noise, and as shown in Table 3.12-7, 27 structures (but no residences) are located within 25 feet of the proposed construction ROW, and 417 structures (including 31 residences) are located within 500 feet of the proposed construction ROW (these figures exclude ancillary facilities in North Dakota and Kansas). The closest residences are located approximately 200 feet from the proposed ROW. Nearly half (204) of the structures within 500 feet, and 24 of the 31 residences are located in Nebraska.

3.9.2.2 Conservation Programs

Table 3.9-4 details the conservation easements that would be crossed by the proposed Project route. As stated in the Final EIS, these easements are managed by either the USDA or the U.S. Fish and Wildlife Service (USFWS). Most of the easement miles crossed are associated with the Rainwater Basin Wetland Management District in Nebraska.

Table 3.9-4 USFWS, USDA, and Other Easements and Agreements Crossed by the Proposed Project Route

Easements[c]	Miles Crossed
Montana	
Cornwell Ranch Conservation Agreement (FWP)[a]	3.1
Philips County USFWS Wetland Easement	0.8
CRP[b] Agreement Land (consists of 39 easements)	9.4
South Dakota	
CRP Agreement Land (consists of 39 easements)	8.4
Nebraska	
CRP Agreement Land (consists of 36 easements)	3.9
Rainwater Basin Wetland Management District (USFWS)	89.4

Source: exp Energy Services, Inc. 2012a, exp Energy Services, Inc. 2012b.

[a] FWP = Farmable Wetlands Program.
[b] CRP = Conservation Reserve Program, see description in text.
[c] Ancillary facilities in North Dakota and Kansas are discrete facilities and therefore are not associated with proposed Project pipeline mileage.

USDA Programs

The Farm Service Agency (FSA) and the Natural Resources Conservation Service (NRCS), both part of the USDA, manage various types of government land conservation, cost-sharing, and financial programs. FSA programs include the CRP and the FWP, which enrolls land through the CRP. The CRP is one of the largest conservation programs in the country. Landowners with CRP contracts are provided rental payments and cost-sharing to develop long-term conservation vegetative covers on eligible farmland (including vegetative covers that enhance wetland

function on FWP land). The program goals are the reduction of erosion, improvement of water quality, enhancement of forest and wetland resources, and establishment of wildlife habitat. Landowners are encouraged to plant grasses, trees, and other vegetation on highly erodible cropland.

NRCS programs are voluntary private land conservation programs. They include easement programs to protect and restore wetlands and agricultural working lands, and financial assistance programs to help farmers and ranchers improve the condition of the natural resources on their lands. The Grassland Reserve Program is implemented by both the FSA and NRCS and provides rental and easement options. Both easements and rental contracts for these programs are available for a variety of durations, and some easements can be made in perpetuity. The proposed Project would not cross any NRCS conservation easements, but the proposed Project would affect a number of NRCS financial assistance conservation program agreements, as well as a number of FSA CRP and FWP agreements.

USFWS Programs

A USFWS wetland easement is a legal agreement that provides compensation to landowners to permanently protect wetlands. Wetlands covered by an easement cannot be drained, filled, leveled, or burned. When these wetlands dry up naturally, they can be farmed, grazed, or hayed. The easements typically allow localized, low-intensity, or broad extraction of natural resources (e.g., logging or mining). The proposed Project route would cross a wetland easement in Phillips County, Montana. It would also cross portions of the Rainwater Basin Wetland Management District (WMD). The Rainwater Basin itself is a "complex of wetlands scattered throughout a 17-county area" south of the Platte River in south-central Nebraska (USFWS 2012a). The Rainwater Basin wetlands are used by migratory birds in the spring and fall. The Rainwater Basin WMD is a public entity. Within the WMD, designated and enrolled wetlands and some surrounding lands are managed jointly by the USFWS and the Nebraska Game and Parks Commission to maintain wetland function and wildlife habitat. While the proposed Project route would cross through the WMD, it would not cross any wetlands or other lands managed by the USFWS or the State of Nebraska.

Recreation and Special Interest Areas

The proposed Project route would cross approximately 87.4 miles of recreation and special interest areas in Montana, South Dakota, and Nebraska (see Table 3.9-5). These areas would include local, state, or federal public lands, recreational waterbodies, state parks and forests, national historic trails, wildlife management areas, and wildlife refuges. The proposed Project would not affect any national parks or national forests; however, the proposed Project route would cross five national historic trails. The National Park Service (NPS) manages these national historic trails, which "commemorate historic (and pre-historic) routes of travel that are of significance to the entire Nation" (NPS 2012).

Table 3.9-5 Recreation and Special Interest Areas Crossed by the Proposed Project Route

State	Name/Ownership	Miles Crossed
Montana	Montana State Trust Lands (consists of 25 parcels)	19.5
	Bureau of Land Management (consists of 50 parcels)	42.5
	Missouri River (Milepost [MP] 88.9); Yellowstone River (MP 196.0)	0.2
	Lewis and Clark National Historic Trail	<1
South Dakota	Spring Creek (MP 346.8); Cheyenne River (MP 425.6); Sarah Laribee Creek (MP 464.8)	0.4
	State School Land	22.4
	Mni Wiconi Water Project (USBR)	<1
Nebraska	Bureau of Reclamation—canal	0.1
	Nebraska Board of Education/School Lands	3.9
	Cowboy Hiker/Biker Trail	<1
	Outlaw Scenic Byway (state)	<1
	Mormon Pioneer National Historic Trail	<1
	Pony Express National Historic Trail	<1
	California National Historic Trail	<1
	Oregon National Historic Trail	<1
Total[a]		**87.4**

Source: exp Energy Services, Inc. 2012a, exp Energy Services, Inc. 2012b.

[a] Excludes trail crossings. Ancillary facilities in North Dakota and Kansas are discrete facilities and therefore are not associated with proposed Project pipeline mileage.

Bureau of Land Management (BLM) field offices are required to manage federally owned public lands that would be crossed by the proposed Project route according to the following resource management plans, all of which are for lands in Montana: Big Dry, Powder River, and Judith Valley Phillips (BLM 1995, 1985, and 1992, respectively). These BLM lands are primarily composed of grasslands leased to farmers with livestock. Planned construction and operation of the proposed Project would be consistent with existing leases, management plans, and current land uses.

As discussed in the Section 3.3.3, Surface Water, the proposed Project route would cross 1,073 waterbodies in Montana, South Dakota, and Nebraska, including 56 perennial streams or rivers. Existing water-based recreational use likely takes place on or near these perennial waterbodies. State environmental agencies have listed recreation as a designated use for 34 of these waterbodies (including some waterbodies other than perennial streams and rivers), as shown in Table 3.9-6.

Table 3.9-6 Perennial Waterbodies with Recreational Use Designations[a]

Montana	South Dakota[b]	Nebraska
Frenchman River	Little Missouri River	Keya Paha River
Buggy Creek	South Fork Grand River	Niobrara River
Cherry Creek	Clarks Fork Creek	Big Sandy Creek

Montana	South Dakota[b]	Nebraska
Milk River	North Fork Moreau River	North Branch Eagle Creek
Missouri River	South Fork Moreau	Middle Branch Eagle Creek
Middle Fork Prairie Elk Creek	Pine Creek	South Branch Verdigre Creek
East Fork Prairie Elk Creek	Cheyenne River	Elkhorn River
Redwater River	Bad River	Beaver Creek
Yellowstone River	Williams Creek	Loup River
Pennel Creek	White River	Platte River
Sandstone Creek		West Fork Big Blue River
Little Beaver Creek		
Boxelder Creek		

Source: See sources for Tables 3.3-3, 3.3-5, and 3.3-7 in Section 3.3.3, Surface Water.

[a] Ancillary facilities in North Dakota and Kansas are discrete facilities and therefore are not associated with proposed Project pipeline mileage.
[b] All listed waterbodies in South Dakota are designated for "limited contact recreation" except for Williams Creek, which has no such limitation.

None of the waterbodies that would be crossed have been designated by federal, state, or local authorities as wild and/or scenic. The Niobrara River crossing point for the proposed Project route is approximately 12 miles downstream from the eastern (downstream) terminus of the Niobrara Scenic River segment.

3.9.2.3 Visual Resources

Visual resources are the visible physical features of a landscape that have an aesthetic value to viewers from viewpoints such as residences, recreation areas, rivers, and highways. All land has inherent visual values that warrant different levels of management. Aesthetic judgment, especially related to landscape views, is often considered subjective.

As a federal land-management agency, BLM is charged with managing the scenic resources of public lands through the Federal Land Policy and Management Act of 1976, as amended. As a result of that responsibility, the BLM's Visual Resource Management (VRM) methodology has been developed to identify and evaluate scenic resources under its jurisdiction and develop management objectives for those resources. The system classifies resources based on scenic quality, viewer sensitivity to visual change, and viewing distance (BLM 1980, 1984, and 1986).

Regulatory Framework

BLM Visual Resource Management

Montana is the only state in which the proposed Project route crosses through federal lands. These lands are managed by the BLM, and are thus subject to BLM's VRM Objectives. The system includes four visual inventory classes: Classes I and II are the most valued, Class III represents a moderate value, and Class IV is of least value. Management objectives for each class are tailored to the inherent visual value of the respective landscape. The Class I objective is to preserve the existing character of the landscape, including the natural ecological qualities, although some very limited management activity is permitted. The Class II objective is to preserve the existing character of the landscape, while keeping landscape changes to a minimum. Whatever landscape changes occur should reflect the ambient colors, textures, and form of the

surrounding features. The Class III objective is to keep landscape changes moderate while retaining some portion of the existing character of the landscape. Landscape changes should reflect the basic features found in the landscape character and should not attract much attention or dominate the view. The Class IV objective allows management activities that require major alterations to the existing character of the landscape that may dominate the view, although the location, disturbance, and blending with the surrounding landscape should be minimized.

With respect to the proposed Project, visual resource analysts for the Malta and Miles City BLM Field Offices conducted land inventories within their respective jurisdictions in Montana. Both offices recognize that, even though BLM lands are intermingled among private lands along the proposed route, the quality of the landscape is not limited by ownership. BLM cannot enforce VRM provisions on lands that they do not manage; however, non-federal property adjacent to BLM land is often managed and maintained in a manner that is compatible to the VRM classifications. As described above, resource management plans for the Big Dry (BLM 1995), Powder River (BLM 1985), and Judith Valley Phillips (BLM 1992) Resource Areas contain additional information on VRM classifications.

National Historic Trails

The NPS manages the five national historic trails crossed by the proposed Project route (see Table 3.9-6). Visual resources on national historic trail property are governed by the regulations of the federal, state, local or private entity that owns each trail segment. For example, visual resources trail segments that cross BLM land are managed under BLM VRM provisions. Visual resources on trail segments on private land are managed through the legal agreement between the landowner and NPS or state agencies (if any exist). There are no specific NPS regulations or guidelines related to visual resources for the trails as a whole (NPS 1999).

BLM Scenic Byways

The proposed Project route would cross one scenic byway, the Big Sky Back Country Byway in Montana (designated by the BLM in 2000). BLM's Byways Program is a component of the National Scenic Byways Program (BLM 2012); visual resources along BLM-owned byways are managed according to VRM requirements.[1]

State Guidance

South Dakota and Nebraska do not have formal guidelines for managing visual resources for private or state-owned lands. Montana's Major Facility Siting Act regulates visual impacts, but exempts pipeline projects (Montana Environmental Quality Council 1985). The prevailing landscape characteristics for land surrounding the proposed Project area are discussed below.

Existing Visual Setting

The proposed Project route crosses a variety of landscapes, including wetlands, waterways, floodplains, grassland/rangeland, and upland forest. The most common landscapes that would be affected during construction of the proposed Project consist of grasslands, rangelands, upland forest, and riparian areas (some of which are forested). Portions of the proposed Project route would follow existing utility ROWs and roads, while other segments would require a new ROW.

[1] BLM Byways Handbook (8357-1) provides specific direction for BLM's Byways program.

The BLM manages all federal lands that the proposed Project route crosses—approximately 298 linear miles in Montana—and no federal lands are crossed by the route in other states. National historic trails are managed by NPS, but are not necessarily federal lands. 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. Table 3.9-7 summarizes the BLM VRM classifications for federal lands crossed by the proposed Project route in Montana.

Table 3.9-7 VRM Classifications of Land Crossed by the Proposed Project Route in Montana

VRM Class (Linear Miles Crossed)[a]				
Class I	**Class II**	**Class III**	**Class IV**	**Total**
0	10.2	2.4	15.2	27.7

Source: BLM 2012

[a] Reflects only the Big Dry and Powder River Resource Areas. VRM data for the Judith Valley-Phillips Resource Area were not available.

3.9.3 Connected Actions

This section describes the baseline conditions for land affected by actions connected to the proposed Project.

3.9.3.1 Bakken Marketlink Project

Construction and operation of the Bakken Marketlink Project would include metering systems, a 5-mile pipeline segment (route not yet determined) and three new storage tanks near Baker, Montana. Table 3.9-8 summarizes the land use types that would be crossed by the Marketlink pipeline. Except for road ROWs, this project would remain entirely on private land. As reported in the Final EIS, the property proposed for the Bakken Marketlink facilities near Pump Station 14 is currently used as pastureland and hayfields; a survey of the property indicated that there were no waterbodies or wetlands on the property.

Table 3.9-8 Land Use Crossed by the Bakken Marketlink Project

	Land Use (miles)					
	Agriculture	**Developed**	**Forest**	**Rangeland**	**Water/Wetland**	**Total[a,b,c]**
Length	1.0	<0.1	0	4.0	0	5.1
Percent of Total	19.6%	2.0%	0	78.4%	0	100%

Source: exp Energy Services, Inc. 2012c, USGS 2006

[a] Includes state highway ROW.
[b] May not include all county road ROW.
[c] Totals may not match due to rounding.

3.9.3.2 Big Bend to Witten 230-kV Transmission Line

This section discusses the land use, recreation, and visual resources potentially affected by the proposed Big Bend to Witten 230-kilovolt (kV) Transmission Line project.

Land Ownership and Land Use

The Applicant Preferred Route of the Big Bend to Witten 230-kV Transmission Line would cross approximately 9 miles of the Lower Brule Sioux Reservation. The remainder of the route would be on private land. Table 3.9-9 summarizes the land use categories that would be crossed by the Applicant Preferred Route.

Table 3.9-9 Land Use Crossed by the Big Bend to Witten 230-kV Transmission Line Applicant Preferred Route

	Land Use (miles)					
	Agriculture	**Developed**	**Forest**	**Rangeland**	**Water/Wetland**	**Total[a]**
Length	24.4	7.1	0.2	43.7	0.4	75.8
Percent of Total	32.2%	9.4%	0.3%	57.7%	0.5%	100%

Source: Basin Electric Power Cooperative (BEPC) 2011 (Appendix J), USGS 2006

[a] Totals may not match due to rounding.

Recreation and Special Interest Areas

The potential alternative corridors would be located within or near five identified recreation areas managed by the Lower Brule Indian Reservation in the Lake Sharpe area. The Good Soldier Creek Recreation Area and the Trailwaters Recreation Area are east and west of State Highway 47, and the proposed transmission line would parallel Highway 47 in this vicinity. The Counselor Creek Recreation Area is approximately 3 miles west of the transmission line corridors (which are close together in this location). The Fort Thompson Recreation Area and North Shore Recreation Area are on the north shore of Lake Sharpe, also near the point where the alternative corridors would cross the lake.

Year-round recreation opportunities in these areas include shore fishing, hiking, picnicking, camping, boating, horseback riding, all-terrain vehicle riding, snowmobile and dirt bike riding, cross-country skiing, wildlife viewing, and photography. Recreational access permits are required for all non-tribal members using these recreation areas and all other tribal lands.

Water-based recreational opportunities are present at perennial and intermittent stream crossings and on Lake Sharpe. The Applicant Preferred Route crosses three perennial streams, and run parallel to and within 100 feet of a perennial stream for approximately 5.3 miles (Appendix J, BEPC Routing Report) (see Section 4.3.5.2, Water Resources, Big Bend to Witten 230-kV Transmission Line).

Visual Resources

The Big Bend to Witten 230-kV Transmission Line alternatives would pass through sparsely populated areas in Lyman and Tripp counties. Communities within the alternative corridors include Reliance and Hamill, with 2010 populations of 191 and 11, respectively (U.S. Census Bureau 2010). The Lower Brule Indian Reservation is located at the proposed northern terminus.

3.9.3.3 Electrical Distribution Lines and Substations

The proposed Project would require electrical service from local power providers (see Section 2.1.12, Connected Actions) for pump stations and other aboveground facilities. This section describes the baseline conditions in areas that could potentially be affected by distribution lines from existing external power lines to facilities of the proposed Project. The pipe storage yard and rail siding in North Dakota would not require construction of electrical distribution lines or substations. At this time, the precise locations of at least four pump stations in Nebraska have not been determined. Information is pending and will be included in the Final Supplemental EIS, as available.

Land Ownership

Table 3.9-10 shows the ownership of land that the distribution line ROWs would cross in Montana and South Dakota. Private land comprises the majority of the land crossed by these ROWs.

Table 3.9-10 Land Ownership along the Proposed Power Distribution Line ROWs (Miles)

State[a]	Federal	State	Local	Private	Total[b]
Montana	38.6	7.5	1.2	90.9	138.2
South Dakota	6.1	12.7	3.1	139.1	161.0

Source: exp Energy Services, Inc. 2012b.

[a] The location of electrical distribution lines in Nebraska and Kansas have not been determined.
[b] Totals may not match due to rounding.

Land Use

Land use categories along the proposed power distribution line ROWs include developed land, agricultural land, rangeland, forest land, and waterbodies and wetlands (see Table 3.9-11). The descriptions of these uses are similar to those for lands that would be crossed by the proposed Project route, as discussed in Section 3.9.2, Environmental Setting. There would be 14 existing buildings within 50 feet of the power lines in Montana, and 48 in South Dakota (exp Energy Services, Inc. 2012b).

Table 3.9-11 Land Use along the Proposed Power Distribution Line ROWs (Miles)

	Land Use Type						
State[a]	**Agriculture**	**Developed**	**Forest**	**Rangeland**	**Water**	**Wetland**	**Total[b]**
Montana	25.8	2.7	0.5	107.6	1.3	0.5	138.2
South Dakota	42.5	17.4	0.5	97.9	1.6	1.1	161.0

Source: exp Energy Services, Inc. 2012b.

[a] The location of electrical distribution lines in Nebraska and Kansas have not been determined.
[b] Totals may not match due to rounding.

Recreation and Special Interest Areas

The proposed power distribution lines would likely cross recreation and special interest areas, as described in Table 3.9-12. No recreation or special interest areas would be crossed by these features in Nebraska.

Table 3.9-12 Recreation and Special Interest Areas Likely to be Crossed by Power Distribution Lines

State[a]	Name/Ownership	Miles Crossed
Montana	BLM: Resource Management Area, Malta District	17.1
	U.S. Forest Service (USFS): Bankhead-Jones Lands[b]	18.5
	USFWS: Charles M. Russell National Wildlife Refuge	2.1
	Montana State Trust Lands	7.7
South Dakota	USFS: Custer National Forest	2.6
	South Dakota State Trust Lands	10.1

Source: exp Energy Services, Inc. 2012b, USGS 2011.

[a] The location of electrical distribution lines in Nebraska and Kansas have not been determined.
[b] These lands are administered by USFS under the provisions of the Bankhead-Jones Farm Tenant Act of 1937 (7 United States Code 1000). This law "directs the Secretary of Agriculture to develop a program of land conservation and utilization in order to correct maladjustments in land use and thus assist in such things as control of soil erosion, reforestation, preservation of natural resources and protection of fish and wildlife" (USFWS 2012b).

Visual Resources

The BLM uses the VRM system (see Existing Visual Setting) to manage visual resources on its lands, while the USFS uses the Scenery Management System (SMS) to manage visual conditions on its lands. The SMS is comparable to the VRM system; Agriculture Handbook 701 (1995) provides guidance for implementation of the SMS. Within SMS, lands are determined to have High, Medium, or Low Scenic Integrity Objectives (USDA 1995). The specific VRM and SMS classes crossed by the power distribution lines would be dependent on the final alignment of those lines.

3.9.4 References

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3.10 SOCIOECONOMICS

3.10.1 Introduction

This section describes existing socioeconomic resources in the proposed Project area. The resource topics used to describe the existing socioeconomic conditions include the following:

- Population;
- Housing;
- Local economic activity;
- Environmental justice;
- Public services, tax revenues, and property values; and
- Traffic and transportation.

The description of socioeconomic resources is based on information provided in the 2011 Final Environmental Impact Statement (Final EIS) as well as new circumstances or information relevant to environmental concerns that have become available since the publication of the Final EIS, including the proposed reroute in Nebraska. The information that is provided here builds on the information provided in the Final EIS and in many instances replicates that information with relatively minor changes and updates. Other information is entirely new or substantially altered from that presented in the Final EIS. Specifically, the following information, data, methods, and/or analyses have been substantially updated in this section from the 2011 document:

- Socioeconomic data from the 2010 U.S. Census regarding population, housing units, and minority populations;
- Socioeconomic data from the American Community Survey, the U.S. Bureau of Labor Statistics, and the U.S. Bureau of Economic Analysis including household income, low-income populations, employment and unemployment, labor force, and earnings;
- Earnings and employment data by county from the U.S. Bureau of Economic Analysis to provide baseline for the detailed economic impacts assessment in Chapter 4, Environmental Consequences;
- Temporary housing, such as rental units, hotel/motel rooms, and RV sites; and
- Tax revenues and property values from state departments of revenue in the proposed Project area.

These data form the basis for the analysis presented in the affected environment section below. For a discussion of oil market issues related to Canadian crude please refer to Section 1.4, Market Analysis, of this Supplemental Environmental Impact Statement (Supplemental EIS).

In this section, as well as in Section 4.10, Socioeconomics, different geographies are used when referring to different socioeconomic resources. These geographies are defined as follows:

Pipeline corridor	The counties that the proposed pipeline route would go through. There are 28 of these counties: six in Montana, 10 in South Dakota, and 12 in Nebraska.
Project area	The pipeline corridor right-of-way plus the area around the two pump stations in Kansas. The project area would include access roads and ancillary facilities such as pump stations, construction camps, and contractor yards. The pipe yard in Bowman County, North Dakota, is included, but is not addressed under each socioeconomic resource because it would be temporary, with minimal economic impacts.
Economic corridor	The counties that are likely to experience daily spending by construction workers[1]. In most cases, the counties through which the proposed pipeline route passes are those expected to see this type of spending. However, because of easier road access to goods and services, some counties outside the pipeline corridor would be affected economically by the pipeline on a daily basis. Conversely some pipeline corridor counties would not experience daily spending. There are 32 of these counties: six in Montana, seven in South Dakota, and 19 in Nebraska. Section 3.10.2.3, Local Economic Activity, lists the economic corridor counties and explains why certain counties are included or excluded. Clay and Butler counties in Kansas are not included in the economic corridor because daily spending by construction workers in these counties would be negligible. However, baseline data for these counties are presented because the proposed Project would result in economic impacts. Bowman County, North Dakota, is not included in the economic corridor because the one ancillary pipe yard facility in this county would be temporary, with minimal economic impacts.
Rest of state	Counties outside the economic corridor, but within the same states as the economic corridor counties. These counties may offer construction materials and services, as well as opportunities for occasional spending by construction workers.

[1] Because most construction materials would come from non-pipeline corridor states, during construction spending by construction workers would have by far the greatest impact on earnings and gross state product within the economic corridor.

Socioeconomic analysis area	A 4-mile-wide corridor extending a distance of 2 miles on either side of the proposed Project pipeline centerline. This area is used to identify communities and minority and low-income populations (environmental justice) that could be affected by the proposed Project. The socioeconomic analysis area also includes the two proposed pump stations in Kansas and the pipe yard in Bowman County, North Dakota. However, Bowman County is not addressed under each socioeconomic resource because the pipe yard would be temporary, with minimal economic impacts. The U.S. Department of State (Department) established the size of the 4-mile-wide analysis area in the Final EIS as a conservatively large area that would identify minority or low-income populations that would be affected in the event of a crude oil discharge. This Supplemental EIS applies the same size analysis area to the proposed Project.
Communities	Incorporated places such as cities, towns, or villages wholly or partially within the socioeconomic analysis area.

3.10.2 Environmental Setting

From its point of entry into the United States in Phillips County, Montana, the proposed pipeline would cross 28 counties in three states. From north to south, the states are Montana, South Dakota, and Nebraska. One new pump station would be constructed and one expanded in Kansas along the existing Keystone Cushing Extension, and a temporary pipe storage yard would be located in North Dakota. Table 3.10-1 lists the counties that the proposed Project area affects.

Table 3.10-1 Project Area States and Counties

Segment/State	Number of Counties	Counties
Montana	6	Phillips, Valley, McCone, Dawson, Prairie, Fallon
South Dakota	10	Harding, Butte, Perkins, Meade, Pennington, Haakon, Jones, Lyman, Tripp, Gregory
Nebraska	12	Keya Paha, Boyd, Holt, Antelope, Boone, Nance, Merrick, Polk, York, Fillmore, Saline, Jefferson
Bowman Pipe Yard		
North Dakota	1	Bowman
Cushing Extension Pump Stations		
Kansas	2	Clay, Butler

The proposed Project route in Montana and South Dakota is largely unchanged from that presented in the Final EIS. The proposed pipeline route covers approximately 286 miles in Montana, 315 miles in South Dakota, and 274 miles in Nebraska, as depicted in Table 3.10-2. Within each county, local communities[2] would be expected to incur most of the direct socioeconomic impacts of the proposed Project, both positive and negative. The 17 communities located within 2 miles of the project area are shown on Figure 3.10.2-1 and listed in Table 3.10-3.

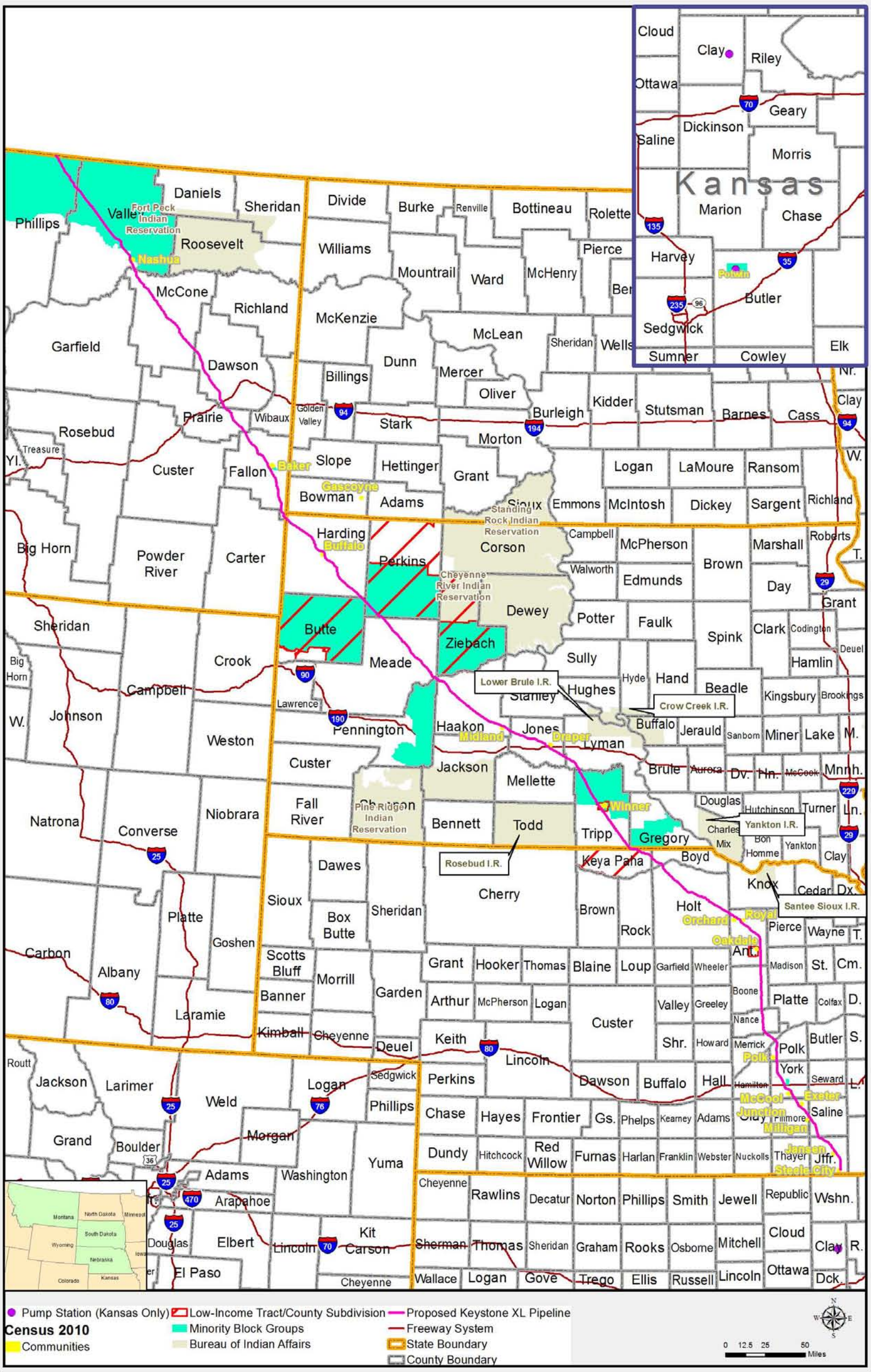
Table 3.10-2 Proposed Pipeline Route Length by County and State

County	State	Route Length (miles)[a]
Phillips	Montana	25.3
Valley	Montana	65.1
McCone	Montana	66.8
Dawson	Montana	42.8
Prairie	Montana	20.9
Fallon	Montana	65.3
Montana Subtotal		*285.7*
Harding	South Dakota	73.3
Butte	South Dakota	3.3
Perkins	South Dakota	15.3
Meade	South Dakota	52.4
Pennington	South Dakota	1.4
Haakon	South Dakota	58.7
Jones	South Dakota	39.6
Lyman	South Dakota	11.9
Tripp	South Dakota	60.2
Gregory	South Dakota	0.1
South Dakota Subtotal		*315.3*
Keya Paha	Nebraska	16.0
Boyd	Nebraska	9.0
Holt	Nebraska	54.6
Antelope	Nebraska	43.0
Boone	Nebraska	28.3
Nance	Nebraska	15.3
Merrick	Nebraska	7.8
Polk	Nebraska	13.8
York	Nebraska	28.4
Fillmore	Nebraska	15.2
Saline	Nebraska	14.7
Jefferson	Nebraska	27.8
Nebraska Subtotal		*274.4*
Total Pipeline		**875.4**

Source: exp Energy Services Inc. 2012a.

[a] State subtotals may not sum due to rounding.

[2] Incorporated places such as cities, towns, or villages (see Section 3.10.1, Introduction).



Source: U.S. Census Bureau, Geography Division 2010.

Figure 3.10.2-1 Communities within 2 Miles of the Project Area

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Table 3.10-3 Communities within Two Miles of the Project Area[a]

Community	Distance from Centerline (miles)	County
Montana		
Nashua Town	0.9	Valley
Baker Village	1.6	Fallon
North Dakota		
Gascoyne City	0.5	Bowman
South Dakota		
Buffalo Town	0.7	Harding
Midland Town	1.0	Haakon
Draper Town	1.3	Jones
Winner City	1.1	Tripp
Nebraska		
Royal Village	1.7	Antelope
Orchard Village	1.9	Antelope
Oakdale Village	1.9	Antelope
Polk Village	1.6	Polk
McCool Junction Village	1.0	York
Milligan Village	2.0	Fillmore
Exeter Village	1.6	Fillmore
Steele City Village	0.9	Jefferson
Jansen Village	1.6	Jefferson
Kansas		
Potwin City	1.6	Butler

Source: U.S. Census Bureau, Geography Division 2010.

[a] As a result of pipeline route modifications since the Final EIS, Circle Town, Montana, and Ericson Village, Nebraska, are no longer within 2 miles of the proposed pipeline centerline. St. Edward, Boone County, Nebraska, is also not included, as it is approximately 2.4 miles from the proposed pipeline centerline.

3.10.2.1 Population

Tables 3.10-4 and 3.10-5 show population and population density for states and counties that would be affected by the proposed Project, as well as for the United States. The U.S. population increased by 10 percent between 2000 and 2010. All four states that would be affected by the proposed Project grew in population, but at a rate equal to or less than that of the United States as a whole.[3] The population density (number of persons per square mile) in 2010 in each of the four states was at or less than 40 percent of the density for the United States as a whole, which was approximately 87 persons per square mile.

[3] North Dakota is not included, as the proposed pipe yard would be temporary, with minimal economic impacts.

Table 3.10-4 United States and State Populations and Population Densities, 2000 and 2010

State	2000 Population	2010 Population	Annual Average % Change	2010 Population Density (per square mile)
United States	281,421,906	308,745,538	0.9	87.4
Montana	902,195	989,415	0.9	6.8
South Dakota	754,844	814,180	0.8	10.7
Nebraska	1,711,263	1,826,341	0.7	23.8
Kansas	2,688,418	2,853,118	0.6	34.9

Sources: 2000 Population (U.S. Census Bureau, American FactFinder 2012h); 2010 Population (U.S. Census Bureau, American FactFinder 2012g).

Table 3.10-5 County Populations and Population Densities, 2000 and 2010[a]

County	2000 Population	2010 Population	Annual Avg % Change	2010 Population Density (per square mile)
Pipeline Corridor Counties (MT, SD, NE)	**262,454**	**267,569**	**0.2**	**7.7**
Montana	**902,195**	**989,415**	**0.9**	**6.8**
Phillips	4,601	4,253	-0.8	0.8
Valley	7,675	7,369	-0.4	4.5
McCone	1,977	1,734	-1.3	0.7
Dawson	9,059	8,966	-0.1	3.8
Prairie	1,199	1,179	-0.2	0.7
Fallon	2,837	2,890	0.2	1.8
Montana Counties Subtotal	*27,348*	*26,391*	*-0.4*	*2.1*
South Dakota	**754,844**	**814,180**	**0.8**	**10.7**
Harding	1,353	1,255	-0.7	0.5
Butte	9,094	10,110	1.1	4.5
Perkins	3,363	2,982	-1.2	1.0
Meade	24,253	25,434	0.5	7.3
Pennington	88,565	100,948	1.3	36.4
Haakon	2,196	1,937	-1.2	1.1
Jones	1,193	1,006	-1.7	1.0
Lyman	3,895	3,755	-0.4	2.3
Tripp	6,430	5,644	-1.3	3.5
Gregory	4,792	4,271	-1.3	4.2
South Dakota Counties Subtotal	*145,134*	*157,342*	*0.8*	*6.2*
Nebraska	**1,711,263**	**1,826,341**	**0.7**	**23.8**
Keya Paha	983	824	-1.7	1.1
Boyd	2,438	2,099	-1.5	3.9
Holt	11,551	10,435	-1.0	4.3
Antelope	7,452	6,685	-1.1	7.8
Boone	6,259	5,505	-1.3	8.0
Nance	4,038	3,735	-0.8	8.5
Merrick	8,204	7,845	-0.4	16.2
Polk	5,639	5,406	-0.4	12.3
York	14,598	13,665	-0.7	23.9
Fillmore	6,634	5,890	-1.2	10.2
Saline	13,843	14,200	0.3	24.7
Jefferson	8,333	7,547	-1.0	13.2
Nebraska Counties Subtotal	*89,972*	*83,836*	*-0.7*	*14.9*

County	2000 Population	2010 Population	Annual Avg % Change	2010 Population Density (per square mile)
Cushing Extension Pump Stations				
Kansas	**2,688,418**	**2,853,118**	**0.6**	**34.9**
Clay	8,822	8,535	-0.3	13.2
Butler	59,482	65,880	1.0	46.1
Kansas Counties Subtotal	*68,304*	*74,415*	*0.9*	*29.7*

Sources: 2000 Population (U.S. Census Bureau, American FactFinder 2012h); 2010 Population (U.S. Census Bureau, American FactFinder 2012g); Population Density (U.S. Census Bureau, American FactFinder 2012j).

[a] The pipe yard in North Dakota is not included because it is a temporary facility, with minimal economic impacts.

The pipeline corridor counties are predominantly rural and sparsely populated. The total population of the 28 pipeline corridor counties in 2010 was approximately 267,500 (Table 3.10-5). The population densities of only three of the 28 counties exceeded the population densities for the respective states as a whole (Pennington County, South Dakota, and York and Saline counties, Nebraska). Pennington County, South Dakota, has the highest density (36.4) of all pipeline corridor counties. However, only 1 mile of the proposed pipeline route crosses Pennington County, and Rapid City, the county's main population center, is over 100 miles from the pipeline route. Most of the pipeline corridor counties (23 of 28) lost population between 2000 and 2010 (Table 3.10-5). The losses ranged from 1 to 16 percent, with the five northernmost counties of Nebraska experiencing population losses between 10 and 16 percent. In Kansas, Butler County's population increased by 11 percent between 2000 and 2010 (to 65,880). Clay County, which is very rural, lost population over the same time period.

Table 3.10-6 shows the populations of the 17 communities within in the socioeconomic analysis area (the 4-mile-wide corridor defined in Section 3.10.1, Introduction). The total population of these communities was approximately 9,000 in 2010 (approximately 3 percent of the total population of the pipeline corridor counties). Most of the communities are small (population less than 300). The largest communities are Baker Village, Montana (population 1,741) and Winner City, South Dakota (population 2,897). All but two of the 17 communities lost population between 2000 and 2010. Several pipeline corridor counties within each state have no communities within the socioeconomic analysis area. These include Phillips, McCone, Dawson, and Prairie in Montana; Butte, Perkins, Meade, Pennington, Lyman, and Gregory in South Dakota; and Keya Paha, Boyd, Holt, Boone, Nance, Merrick, and Saline in Nebraska.

Table 3.10-6 Community Populations, 2000 and 2010

County[a]	Community	2000 Population	2010 Population	Annual Average % Change
Project Area Communities		**9,060**	**8,484**	**-0.6**
Montana				
Valley	Nashua Town	325	290	-1.1
Fallon	Baker Village	1,695	1,741	0.3
Montana Subtotal		*2,020*	*2,031*	*<0.1*
North Dakota				
Bowman	Gascoyne	23	16	-30.4
North Dakota Subtotal		*23*	*16*	*-30.4*
South Dakota				
Harding	Buffalo Town	380	330	-1.4
Haakon	Midland Town	179	129	-3.2

County[a]	Community	2000 Population	2010 Population	Annual Average % Change
Jones	Draper Town	92	82	-1.1
Tripp	Winner City	3,137	2,897	-0.8
South Dakota Subtotal		*3,788*	*3,438*	*-1.0*
Nebraska				
Antelope	Royal Village	75	63	-1.7
Antelope	Orchard Village	391	379	-0.3
Antelope	Oakdale Village	345	322	-0.7
Polk	Polk Village	322	322	0
York	McCool Village	385	409	0.6
Fillmore	Exeter Village	712	591	-1.8
Fillmore	Milligan Village	315	285	-1.0
Jefferson	Steele City Village	84	61	-3.1
Jefferson	Jansen Village	143	118	-1.9
Nebraska Subtotal		*2,772*	*2,550*	*-0.8*
Cushing Extension Pump Stations				
Kansas				
Butler	Potwin City	457	449	-0.2
Kansas Subtotal		*457*	*449*	*-0.2*

Sources: 2000 Population (U.S. Census Bureau, American FactFinder 2012h); 2010 Population (U.S. Census Bureau, American FactFinder 2012g).

[a] Counties not listed do not have any communities (see definition in Section 3.10.1, Introduction) within the proposed pipeline corridor.

3.10.2.2 Housing

Available housing to serve the proposed Project needs is a function of the housing stock, especially rental and other short-term accommodations, recent economic and population growth, and demand for housing from other sources. The housing need would be primarily during construction, as TransCanada Keystone XL Pipeline, LP (Keystone) states it would need very few new workers (approximately 35 U.S. workers) for proposed Project operation. Table 3.10-7 shows the existing housing resources, including rentals, hotel/motel rooms, and recreational vehicle (RV) sites, as a basis for determining the availability of accommodation for workers. The table shows housing resources for all counties in the proposed project area (pipeline corridor counties plus the two counties in Kansas). The boundaries of most of the proposed pipeline corridor counties extend at least 50 miles from the pipeline centerline, although some, such as Pennington, South Dakota, extend several hundred miles from the pipeline centerline.

Table 3.10-7 Housing Resources for Counties in the Proposed Project Area

	Total Housing Units 2010	Total Rental Units 2010	Rental Vacancy Rate 2010 (percent)[a]	Available Rental Units[b]	Hotel/ Motel Rooms[c]	RV Sites[d]
Project Area Total	**155,526**	**42,072**	**9**	**3,668**	**9,834**	**3,891**
Pipeline Corridor Total	**125,426**	**34,917**	**9**	**3,040**	**9,291**	**3,855**
Montana						
Phillips County	2,335	511	7	34	128	40
Valley County	4,879	929	9	80	315	44
McCone County	1,008	169	6	10	0	0
Dawson County	4,233	1,168	7	77	300	94

	Total Housing Units 2010	Total Rental Units 2010	Rental Vacancy Rate 2010 (percent)[a]	Available Rental Units[b]	Hotel/ Motel Rooms[c]	RV Sites[d]
Prairie County	673	117	3	4	0	9
Fallon County	1,470	368	9	35	78	18
Montana Subtotal	*14,598*	*3,262*	*7*	*240*	*821*	*205*
South Dakota						
Harding County	731	152	6	9	20	0
Butte County	4,621	1,296	12	150	169	93
Perkins County	1,739	362	10	37	30	0
Meade County	11,000	1,931	13	241	406	465
Pennington County	44,949	15,464	7	1,005	5,959	1,895
Haakon County	1,013	229	14	31	20	21
Jones County	589	144	11	16	231	200
Lyman County	1,704	478	9	41	411	166
Tripp County	3,072	780	11	89	178	20
Gregory County	2,503	601	16	94	21	NA
South Dakota Subtotal	*71,354*	*21,435*	*8.0*	*1,713*	*7,437*	*2,860*
Nebraska						
Keya Paha County	549	114	19	22	0	20
Boyd County	1,390	228	10	22	0	11
Holt County	5,215	1,319	8	107	186	19
Antelope County	3,284	756	9	67	0	253
Boone County	2,649	656	10	68	34	0
Nance County	1,801	396	10	41	16	0
Merrick County	3,698	940	14	128	33	0
Polk County	2,731	572	9	51	0	0
York County	6,231	1,908	14	261	574	4
Fillmore County	2,913	639	11	69	26	0
Saline County	5,762	1,716	9	151	77	483
Jefferson County	3,918	976	10	100	79	0
Nebraska Subtotal	*39,474*	*10,220*	*11*	*1,087*	*1,025*	*790*
Cushing Extension Pump Stations Total	**30,100**	**7,155**	**9**	**628**	**551**	**36**
Kansas						
Clay County	4,042	1,007	12	124	54	36
Butler County	26,058	6,148	8	504	489	0
Kansas Subtotal	*30,100*	*7,155*	*9*	*628*	*543*	*36*

Sources: Housing, Rental Units (U.S. Census Bureau, American FactFinder 2012g); Hotel/Motel Rooms (Smith Travel Research 2012); RV Sites (exp Energy Services Inc. 2012a).

[a] The rental vacancy rate is the proportion of the rental inventory that is vacant *for rent*. It is computed by dividing the total number of vacant units *for rent* by the sum of the renter-occupied units, vacant units that are *for rent*, and vacant units that have been rented but not yet occupied; and then multiplying by 100. The number is a snapshot that will vary over time but gives a sense of the approximate vacancy rate. For reference, many real estate professionals consider 10 percent to be a normal vacancy rate.

[b] Available Rental Units is calculated by multiplying the vacancy rate by the total rental units.

[c] Hotel/Motel Rooms are a custom report by Smith Travel Research (see Sources). This data source provided a consistent methodology for the entire proposed Project area. The numbers of rooms are slightly different (+/- 100) than in Nebraska's Keystone XL Pipeline Evaluation (Nebraska Department of Environmental Quality [NDEQ] 2012), which used a methodology that included identifying the number of rooms in specific hotels/motels based on internet research.

[d] The RV site count for most of the counties was taken from the Final EIS. Other counties' counts were taken from Supplemental Environmental Report for the Nebraska Reroute (exp Energy Services Inc. 2012a). Where the counts in the Final EIS differed from the Environmental Report, the higher count numbers were used. RV sites in Gregory County, South Dakota, were not included in the Final EIS or the exp Environmental Report.

Based on the vacancy rate, rental availability for the pipeline corridor totals 3,040 units, of which 8 percent is in Montana, 56 percent is in South Dakota, and 36 percent is in Nebraska. The county with the largest number of available rental units is Pennington, South Dakota, with approximately 1,000 units (33 percent of the total 3,040 units). As noted above, only 1.1 miles of the proposed pipeline route would pass through the far northeastern corner of the county, and nearly all these rentals would be in Rapid City, over 100 miles from the proposed pipeline centerline and thus not considered relevant for use by proposed Project construction workers.

The proposed pipeline corridor counties have approximately 9,300 hotel rooms; however, of these, almost 6,000 (64 percent) are in Pennington County, South Dakota, where they serve visitors to the Black Hills, Badlands, Mount Rushmore, and other attractions.

The pipeline corridor counties have approximately 3,900 RV sites, with almost 50 percent in Pennington County, South Dakota. The Montana counties have approximately 200 and the Nebraska counties approximately 800. Clay County, Kansas, has approximately 40.

Subtracting the rental units and RV sites in Pennington County, there are approximately 2,000 available rentals, 3,300 hotel/motel rooms, and 2,000 RV sites within reasonable proximity to the proposed pipeline corridor.

3.10.2.3 Local Economic Activity

This section focuses on earnings[4] and employment within economic areas that would be influenced by the proposed Project. Profiling these areas in terms of earnings and employment establishes the context for assessing impacts to economic activity at different levels of economic geography. This section focuses on the following:

- Socioeconomic conditions;
- Growth from 2000 to 2010;
- The share that a local area, such as a county or group of counties, represents compared to the larger area containing it; and
- The industry composition of total earnings and employment for each area in 2010.

Growth, expressed as the average annual rate of change for the period, represents local economic vitality and performance. The local area's share of a reference area indicates its importance to the larger economy. Industry composition indicates which activities contribute the most to the local economy as a whole.

Economic activity is discussed in this section in the context of the economic corridor counties, the rest of the states through which the proposed pipeline would pass, and the United States as a whole.

[4] *Earnings*, also called *earnings by place of work* or *labor income*, is the sum of wage and salary disbursements, supplements to wages and salaries, and proprietors' income. The earnings concept is an attribute of the region where a job or proprietorship is located. It measures the value of the labor input at the place where the output is produced. The total earnings amount for a region is different from the total income amount for a region because income is measured according to where the recipients live. Income is calculated by adjusting earnings for the net effect of inter-regional commuting and for sources of income not related to job holding.

Counties in the Economic Corridor

The counties that define the economic corridor are listed in Table 3.10-8. The economic corridor comprises the counties that are likely to experience daily spending by construction workers (see definitions in Section 3.10.1, Introduction). For purposes of economic analysis, based on proposed construction activity and local economic geography, the economic corridor is divided into four parts: Montana, South Dakota, Nebraska North, and Nebraska Central/South based on Keystone's proposed construction spreads (lengths of pipeline that would be built under one contract or set of contracts).

Table 3.10-8 Economic Corridor Counties

State/Construction Spread	County
Montana (Construction Spreads 1, 2, and 3a)	Phillips Valley McCone Dawson Prairie Fallon
South Dakota (Construction Spreads 3b, 4, 5, 6, 7, and 8a)	Harding Perkins Haakon Jones Lyman Tripp Gregory
Nebraska—North (Construction Spreads 8b and 9a)	Keya Paha Boyd Holt
Nebraska—Central/South (Construction Spreads 9b and 10)	Antelope Pierce Madison Stanton Boone Platte Nance Howard Merrick Polk Hall York Fillmore Saline Jefferson Gage

Butte, Meade, and Pennington counties in South Dakota are not included in the economic corridor because their economic centers are too distant from where pipeline and worker activity would occur. Pierce, Madison, Stanton, Platte, Hall, Howard, and Gage counties in Nebraska are not in the proposed pipeline corridor, but are included in the economic corridor because they contain economic centers such as Norfolk, Columbus, Grand Island, and Beatrice that are within a reasonable commuting distance of the pipeline route. Clay and Butler counties in Kansas are

not included in the economic corridor because daily spending by construction workers in these counties would be negligible. However, baseline data for these counties are presented in several tables because the proposed Project would result in economic impacts.

Socioeconomic Conditions

Employment and income patterns provide insight into local economic conditions, including the strength of the local economy and the well-being of its residents. Table 3.10-9 shows median household income, unemployment rate, and labor force data for each county. For reference, data are included for each of the economic corridor states and for the United States as a whole. Median household income in all four economic corridor states was lower than the median for the United States as a whole. Median household income in 28 of the 34 economic corridor counties was lower than for their respective states. Despite the relatively lower level of income for most of the economic corridor counties, the unemployment rate in each state was equal to or lower than the U.S. level for the same time period (8 percent), and economic corridor county unemployment rates were generally equal to or less than their respective state unemployment rates.

Earnings and Employment in the Economic Corridor

From 2000 to 2010, earnings and employment changed in the economic corridor as a whole (i.e., for the corridor counties combined for all three states) at rates that were similar to the rates in the rest of each state. The data and rates that characterize these areas are presented in Table 3.10-10. Total nominal earnings (i.e., measured in dollars not adjusted for inflation) grew at rates ranging from 1 percent per year in Perkins County, South Dakota, to more than 9 percent per year in Fallon County, Montana. This compares to growth in total earnings of 3 percent per year for the United States as a whole from 2000 to 2010.

In contrast to earnings, total employment did not grow everywhere in the economic corridor. Change in total employment ranged from a fall of 1 percent per year on average in Boyd County, Nebraska, to a rise of almost 3 percent per year in Fallon County, Montana. This compares to total employment growth of less than 1 percent per year for the United States as a whole from 2000 to 2010.[5] Moderate to low price change, or inflation, accounts for the earnings growth depicted on Table 3.10-10, as employment remained relatively flat at all levels of the economy from 2000 to 2010, even as earnings grew.

The economic corridor within each state makes up a small percentage of the overall economic activity in the state. Likewise, the economic corridor combined across Montana, South Dakota, and Nebraska makes up a small percentage of the economic activity in the United States as a whole. These percentage shares only changed a little from 2000 to 2010, as shown on Table 3.10-10. In Montana and South Dakota, the economic corridor counties contained nearly 3 percent of total employment in each state in 2010, down slightly but almost unchanged from 2000 in both states. The Nebraska economic corridor counties as a whole (north plus central/south) contained 14 percent of total employment in the state in 2010, down slightly but almost unchanged from 2000.

[5] Like earnings, total employment is measured at the place of work as opposed to place of residence. It is the average over the entire year of all full-time and part-time jobs held at places of employment in a county or group of counties, as reported on a monthly basis.

Table 3.10-9 Median Household Income, Unemployment Rates, and Labor Force by County

		Median Household Income			Unemployment Rate		Labor Force
State Construction Spread	**County**	**2000 (nominal dollars)[a]**	**2010 (nominal dollars)[a]**	**2010 Higher/ Lower (-) than State (percent)**	**2010 (percent)**	**2010 Higher/ Lower (-) than State (percent)**	**2011**
Montana (Construction Spreads 1, 2, and 3a)	Phillips	28,702	36,453	-15	5	-3	2,223
	Valley	30,979	42,050	-1	3	-5	3,713
	McCone	29,718	48,167	13	3	-5	1,112
	Dawson	31,393	50,752	19	3	-5	4,343
	Prairie	25,451	34,896	-18	1	-7	564
	Fallon	29,944	52,529	23	3	-5	2,048
	Montana	*33,024*	*42,666*	*NA[b]*	*8*	*NA*	*504,495*
South Dakota (Construction Spreads 4, 5, 6, 7, and 8a)	Harding	25,000	34,792	-25	2	-1	825
	Perkins	27,750	33,361	-28	<1	-2	1,547
	Haakon	29,894	46,281	-<1	1	-2	1,132
	Jones	30,288	49,464	7	2	-1	704
	Lyman	28,509	36,323	-22	8	5	2,013
	Tripp	28,333	40,221	-13	3	-<1	2,884
	Gregory	22,732	33,940	-27	5	2	2,464
	South Dakota	*33,282*	*46,369*	*NA*	*3*	*NA*	*446,483*
Nebraska—North (Construction Spread 8b and 9a)	Keya Paha	24,911	32,000	-35	0	-5	401
	Boyd	26,075	34,906	-29	1	-3	1,163
	Holt	30,738	43,452	-12	2	-3	6,401
Nebraska—Central/South (Construction Spreads 9b and 10)	Antelope	30,114	37,058	-25	3	-2	3,803
	Pierce	32,239	48,318	-2	2	-3	3,966
	Madison	35,807	44,089	-11	4	-1	19,457
	Stanton	36,676	47,713	-3	6	<1	3,427
	Boone	31,444	40,703	-18	3	-2	3,503
	Platte	39,359	49,523	0	5	-<1	18,791
	Nance	31,267	41,610	-16	5	<1	2,183
	Howard	33,305	45,453	-8	5	-<1	3,568
	Merrick	34,961	46,116	-7	6	2	4,257
	Polk	37,819	48,444	-2	5	0	3,022
	Hall	36,972	46,138	-6	5	-<1	33,412
	York	37,093	47,689	-3	1	-3	7,169
	Fillmore	35,162	43,167	-13	2	-3	3,225

		Median Household Income			Unemployment Rate		Labor Force
State Construction Spread	**County**	**2000 (nominal dollars)[a]**	**2010 (nominal dollars)[a]**	**2010 Higher/ Lower (-) than State (percent)**	**2010 (percent)**	**2010 Higher/ Lower (-) than State (percent)**	**2011**
	Saline	35,914	45,469	-8	5	<1	8,474
	Jefferson	32,629	42,665	-14	7	2	4,493
	Gage	34,908	43,311	-12	6	1	12,023
	Nebraska	*39,250*	*49,342*	*NA*	*5*	*NA*	*1,011,688*
Kansas	Clay	33,965	56,290	33	1	-3	5,007
	Butler	45,474	49,424	16	4	0	31,609
	Kansas	*40,624*	*42,490*	*NA*	*4*	*NA*	*1,505,437*
	United States	*41,994*	*51,914*	*NA*	*7.9*	*NA*	*153,617,000*

Sources: 2000 Median Household Income (U.S. Census Bureau, American FactFinder 2012i); 2010 Median Household Income (U.S. Census Bureau, American FactFinder 2012b, 2012d); Unemployment Rate (U.S. Census Bureau, American FactFinder 2012a); Labor Force (U.S. Bureau of Labor Statistics 2012).

[a] Nominal dollars are not adjusted for inflation.
[b] NA = not applicable.

Table 3.10-10 Earnings and Employment in the Economic Corridor[a]

Areas (Counties are listed from north to south)	Total Earnings (in thousands of nominal dollars)			Total Employment (in full-time and part-time jobs)		
	2000	2010	Average Annual Rate of Change	2000	2010	Average Annual Rate of Change
Montana Economic Corridor	370,732	620,027	5.3%	16,777	17,445	0.4%
Phillips	50,349	83,689	5.2%	2,745	2,783	0.1%
Valley	112,591	172,397	4.4%	4,635	4,681	0.1%
McCone	24,929	42,095	5.4%	1,272	1,368	0.7%
Dawson	129,430	201,192	4.5%	5,606	5,425	-0.3%
Prairie	11,296	14,660	2.6%	642	733	1.3%
Fallon	42,137	105,994	9.7%	1,877	2,455	2.7%
Rest of Montana	14,431,369	22,770,262	4.7%	538,175	606,203	1.2%
Montana Total	**14,802,101**	**23,390,289**	**4.7%**	**554,952**	**623,648**	**1.2%**
Montana Economic Corridor Share of State Total	**2.5%**	**2.7%**		**3.0%**	**2.8%**	
South Dakota Economic Corridor	348,467	520,188	4.1%	14,930	14,795	-0.1%
Harding	19,406	36,002	6.4%	900	1,128	2.3%
Perkins	53,448	59,017	1.0%	2,330	2,174	-0.7%
Haakon	53,321	60,378	1.3%	1,601	1,560	-0.3%
Jones	22,408	29,106	2.6%	922	926	0.0%
Lyman	53,607	98,758	6.3%	2,255	2,427	0.7%
Tripp	86,389	139,490	4.9%	4,031	3,694	-0.9%
Gregory	59,888	97,437	5.0%	2,891	2,886	0.0%
Rest of South Dakota	14,436,662	22,448,097	4.5%	500,639	541,672	0.8%
South Dakota Total	**14,785,129**	**22,968,285**	**4.5%**	**515,569**	**556,467**	**0.8%**
South Dakota Economic Corridor Share of State Total	**2.4%**	**2.3%**		**2.9%**	**2.7%**	
Nebraska Economic Corridor	4,406,801	6,866,935	4.5%	168,285	171,275	0.2%
Nebraska Economic Corridor North	199,400	344,014	5.6%	9,492	9,539	0.0%
Keya Paha	7,098	16,170	8.6%	571	648	1.3%
Boyd	21,830	46,586	7.9%	1,445	1,289	-1.1%
Holt	170,472	281,258	5.1%	7,476	7,602	0.2%
Nebraska Economic Corridor Central-South	4,207,401	6,522,921	4.5%	158,793	161,736	0.2%
Antelope	112,816	220,512	6.9%	4,872	4,962	0.2%
Pierce	77,065	146,718	6.7%	3749	3671	-0.2%

Areas (Counties are listed from north to south)	Total Earnings (in thousands of nominal dollars)			Total Employment (in full-time and part-time jobs)		
	2000	2010	Average Annual Rate of Change	2000	2010	Average Annual Rate of Change
Madison	724,313	1,036,192	3.6%	27,377	27,546	0.1%
Stanton	83,413	126,806	4.3%	2624	2572	-0.2%
Boone	87,053	155,734	6.0%	3,670	3,773	0.3%
Platte	657,437	1,031,631	4.6%	22,879	24,000	0.5%
Nance	36,922	77,544	7.7%	1,981	2,014	0.2%
Merrick	83,209	137,532	5.2%	3,659	3,676	0.0%
Hall	1,117,905	1,759,714	4.6%	39303	42038	0.7%
Howard	61,403	98,010	4.8%	3112	3173	0.2%
Polk	68,354	136,357	7.1%	2,856	2,923	0.2%
York	306,065	410,769	3.0%	10,560	9,796	-0.7%
Fillmore	111,769	159,891	3.6%	4,141	3,927	-0.5%
Saline	223,419	369,359	5.2%	8,538	8,815	0.3%
Jefferson	115,421	162,084	3.5%	4,810	4,885	0.2%
Gage	340,837	494,068	3.8%	14,662	13,965	-0.5%
Rest of Nebraska	33,473,276	48,660,903	3.8%	1,007,333	1,054,392	0.5%
Nebraska Total	**37,880,077**	**55,527,838**	**3.9%**	**1,175,618**	**1,225,667**	**0.4%**
Nebraska Economic Corridor Share of State Total	**11.6%**	**12.4%**		**14.3%**	**14.0%**	
Economic Corridor Total	5,126,000	8,007,150	4.6%	199,992	203,515	0.2%
Kansas Total [a]	57,941,635	81,542,890	3.5%	1,757,875	1,805,242	0.3%
Kansas Share of United States	0.9%	0.9%		1.1%	1.0%	
Rest of United States	6,537,300,374	8,896,238,142	3.1%	163,402,068	171,741,463	0.5%
United States	6,600,633,000	8,986,229,000	3.1%	165,370,800	173,767,400	0.5%
Economic Corridor Share of United States	0.08%	0.09%		0.12%	0.12%	
Economic Corridor plus Kansas Share of United States	1.0%	1.0%		1.2%	1.2%	

Source: Tables CA04 and SA04, U.S. Bureau of Economic Analysis 2010.

[a] Kansas is not part of the defined economic corridor, but earnings and employment data for Kansas are presented, as the proposed Project would have economic impacts on the state as a whole.

Tables 3.10-11 and 3.10-12 show the contribution of each industry to total earnings and employment within the economic corridor. The tables also compare how earnings and employment are distributed among industries in the economic corridor compared to the industry distribution in the rest of each state. This comparison highlights the importance of just two sectors, farming and government, to the economic activity of the economic corridor in Montana, South Dakota, and Nebraska.

For 2010, farm earnings were 13 percent of total earnings for the economic corridor in Montana, 14 percent for the economic corridor in Nebraska (north and central/south sections), and 36 percent for the economic corridor in South Dakota (Table 3.10-11). For 2010, farm employment was 8 percent of total employment for the economic corridor in Nebraska, 15 percent in Montana, and 19 percent in South Dakota (Table 3.10-12).

For 2010, government earnings (which include all levels of government agencies and enterprises) were 17 percent of total earnings for the economic corridor in Nebraska, 18 percent in South Dakota, and 21 percent in Montana. For 2010, government employment was 15 percent in the economic corridor in Nebraska and 16 percent in the economic corridors of Montana and South Dakota.

Earnings in the transportation industry—which includes interstate pipelines—ranged from a 3 percent share of total earnings in the South Dakota economic corridor to a 10 percent share in the Montana economic corridor. Transportation employment ranged from a 3 percent share of the total in the South Dakota economic corridor to 5 percent in the Montana economic corridor.

Earnings and Employment in the Rest of Montana, South Dakota, and Nebraska

Areas termed the *rest of state* are the counties in Montana, South Dakota, and Nebraska outside of the economic corridor. All of the metro areas[6] in each state are located in the *rest of state* counties. The rest of state area would offer construction materials and services available only from larger distribution centers, and would likely capture spillover spending by construction workers. Keystone estimates that approximately 10 percent of the pipeline construction workforce would be recruited from Montana, South Dakota, and Nebraska.

As shown on Table 3.10-13, the metro area shares of earnings and employment in rest of state areas in 2010 were 42 percent and 38 percent, respectively, in Montana, 50 percent and 49 percent, respectively, in South Dakota, and 73 percent and 68 percent, respectively, in Nebraska. The metro area shares in the rest of state areas of Montana, South Dakota, and Nebraska changed little or not at all from 2000 to 2010.

[6] A metro area, also called a Metropolitan Statistical Area, is defined for use by federal statistical agencies. A metro area contains a core urban area of 50,000 or more population. Each metro area consists of one or more counties and includes the counties containing the core urban area, as well as any adjacent counties that have a high degree of social and economic integration with the urban core as measured by commuting to work.

Table 3.10-11 Earnings by Industry in the Economic Corridor

	Total Earnings 2010 (in thousands of nominal dollars)											
Industry	**Montana[a]**				**South Dakota[a]**				**Nebraska[a]**			
	Economic Corridor (EC)		**Rest of State (ROS)**		**Economic Corridor (EC)**		**Rest of State (ROS)**		**Economic Corridor (EC)**		**Rest of State (ROS)**	
	Earnings	**Share of EC Total**	**Earnings**	**Share of ROS Total**	**Earnings**	**Share of EC Total**	**Earnings**	**Share of ROS Total**	**Earnings[b]**	**Share of EC Total**	**Earnings**	**Share of ROS Total**
Farm	83,324	13%	500,789	2%	185,586	36%	2,222,872	10%	943,803	14%	2,496,413	5%
Forestry, Fisheries, and Support, including Farm Support	3,124	1%	159,450	1%	4,298	1%	117,261	1%	27,484	<1%	186,843	<1%
Mining	47,294	8%	616,708	3%	2,708	1%	52,267	<1%	8,492	<1%	71,616	<1%
Utilities	18,207	3%	336,169	1%	9,003	2%	190,049	1%	7,502	<1%	437,889	1%
Construction	33,649	5%	1,678,350	7%	19,891	4%	1,326,373	6%	324,147	5%	2,888,932	6%
Manufacturing	5,493	1%	1,025,839	5%	13,710	3%	1,976,980	9%	858,253	12%	4,506,533	9%
Trade	63,952	10%	2,821,825	12%	55,253	11%	2,758,352	12%	885,391	13%	5,212,303	11%
Transportation and Warehousing	63,102	10%	849,905	4%	14,555	3%	685,349	3%	256,548	4%	3,625,615	7%
Information	10,621	2%	382,384	2%	5,034	1%	340,736	2%	52,033	1%	1,149,745	2%
Finance and Insurance	24,385	4%	1,044,513	5%	24,295	5%	1,512,746	7%	373,751	5%	3,625,807	7%
Real Estate and Rental	6,104	1%	357,053	2%	3,078	1%	288,587	1%	146,566	2%	412,293	1%
Professional Services and Management of Companies	12,863	2%	1,573,935	7%	11,082	2%	1,216,568	5%	178,370	3%	5,061,442	10%
Administrative and Waste Services (private only)	8,977	1%	687,134	3%	3,491	1%	448,795	2%	254,627	4%	1,340,343	3%
Educational Services (private only)	969	<1%	143,919	1%	1,124	<1%	235,134	1%	64,672	1%	611,163	1%

	Total Earnings 2010 (in thousands of nominal dollars)											
Industry	**Montana[a]**				**South Dakota[a]**				**Nebraska[a]**			
	Economic Corridor (EC)		**Rest of State (ROS)**		**Economic Corridor (EC)**		**Rest of State (ROS)**		**Economic Corridor (EC)**		**Rest of State (ROS)**	
	Earnings	**Share of EC Total**	**Earnings**	**Share of ROS Total**	**Earnings**	**Share of EC Total**	**Earnings**	**Share of ROS Total**	**Earnings[b]**	**Share of EC Total**	**Earnings**	**Share of ROS Total**
Health and Social Services (private only)	63,029	10%	3,100,262	14%	42,949	8%	3,122,999	14%	641,016	9%	5,384,913	11%
Arts, Entertainment, and Recreation Services	3,240	1%	291,239	1%	2,794	1%	247,027	1%	81,677	1%	215,498	0%
Accommodations and Food Services	12,699	2%	916,526	4%	10,362	2%	679,598	3%	325,337	5%	921,464	2%
Other Services	30,273	5%	971,942	4%	16,690	3%	788,261	4%	255,919	4%	1,693,350	3%
Government and Government Enterprises	128,722	21%	5,312,320	23%	94,285	18%	4,238,143	19%	1,181,348	17%	8,818,741	18%
Total	620,027	100%	22,770,262	100%	520,188	100%	22,448,097	100%	6,866,935	100%	48,660,903	100%

Source: Table CA05N, U.S. Bureau of Economic Analysis 2010, with estimates for industries where original data are suppressed to avoid disclosure of confidential information and with percentages calculated from original data and estimates.

[a] Earnings in the respective state's economic corridor counties that are attributed to the respective industry. The numbers are all estimates except for the industry rows labeled *Farm* and *Government & Government Enterprises*, which are original U.S. Bureau of Economic Analysis (BEA) data. The estimates are necessary because the BEA does not publish an earnings or employment number for an industry if the number does not represent enough establishments to preclude attribution to and disclosure of information about a specific establishment. The unpublished numbers in each column were estimated by pro-rating the sum of the unpublished numbers in the column (calculated as the remainder after subtracting the published numbers from the column total, which is always given). The pro-rating is in proportion to the corresponding array of numbers found in the IMPLAN model for the same area. The IMPLAN model for each area is the same model as is used to estimate earnings and employment impacts (see discussion of IMPLAN in Section 4.10, Socioeconomics).

[b] This column is the sum of the data for the north and central-south sections of the Nebraska economic corridor.

Table 3.10-12 Employment by Industry in the Economic Corridor

	Total Employment 2010 (in full-time and part-time jobs by place of work)											
Industry	**Montana[a]**				**South Dakota[a]**				**Nebraska[a]**			
	Economic Corridor (EC)		**Rest of State (ROS)**		**Economic Corridor (EC)**		**Rest of State (ROS)**		**Corridor (EC)**		**Rest of State (ROS)**	
	Earnings	**Share of EC Total**	**Earnings**	**Share of ROS Total**	**Earnings**	**Share of EC Total**	**Earnings**	**Share of ROS Total**	**Earnings[b]**	**Share of EC Total**	**Earnings**	**Share of ROS Total**
Farm	2,612	15%	26,205	4%	2,795	19%	28,981	5%	12,984	8%	38,583	4%
Forestry, Fisheries, and Support, including Farm Support	132	1%	6,664	1%	136	1%	4,546	1%	720	<1%	8,752	1%
Mining	616	4%	9,751	2%	104	1%	1,879	<1%	222	<1%	2,406	<1%
Utilities	183	1%	2,986	<1%	120	1%	2,060	<1%	202	<1%	1,624	<1%
Construction	954	5%	40,730	7%	767	5%	31,450	6%	8,445	5%	55,946	5%
Manufacturing	180	1%	20,290	3%	366	2%	38,785	7%	22,199	13%	72,946	7%
Trade	2,225	13%	86,569	14%	2,399	16%	81,057	15%	27,520	16%	146,089	14%
Transportation and Warehousing	930	5%	16,721	3%	458	3%	14,545	3%	6,728	4%	53,889	5%
Information	271	2%	8,748	1%	180	1%	7,456	1%	1,362	1%	17,764	2%
Finance and Insurance	785	4%	25,422	4%	834	6%	36,938	7%	9,763	6%	70,529	7%
Real Estate and Rental	497	3%	28,624	5%	400	3%	17,589	3%	3,875	2%	33,426	3%
Professional Services and Management of Companies	488	3%	34,954	6%	389	3%	22,940	4%	4,644	3%	74,175	7%
Administrative and Waste Services (private only)	524	3%	26,537	4%	203	1%	18,739	3%	6,611	4%	50,537	5%
Educational Services (private only)	88	1%	7,835	1%	71	<1%	10,212	2%	1,682	1%	21,134	2%
Health and Social Services (private only)	1,823	10%	66,498	11%	1,460	10%	63,235	12%	16,736	10%	114,079	11%

Total Employment 2010 (in full-time and part-time jobs by place of work)												
Industry	**Montana[a]**				**South Dakota[a]**				**Nebraska[a]**			
	Economic Corridor (EC)		**Rest of State (ROS)**		**Economic Corridor (EC)**		**Rest of State (ROS)**		**Economic Corridor (EC)**		**Rest of State (ROS)**	
	Earnings	**Share of EC Total**	**Earnings**	**Share of ROS Total**	**Earnings**	**Share of EC Total**	**Earnings**	**Share of ROS Total**	**Earnings[b]**	**Share of EC Total**	**Earnings**	**Share of ROS Total**
Arts, Entertainment and Recreation Services	290	2%	18,218	3%	187	1%	11,122	2%	2,131	1%	19,725	2%
Accommodations and Food Services	1,055	6%	48,641	8%	914	6%	39,492	7%	8,488	5%	65,758	6%
Other Services	1,046	6%	36,371	6%	694	5%	27,349	5%	8,541	5%	58,394	6%
Government and Government Enterprises	2,747	16%	94,438	16%	2,318	16%	83,297	15%	24,342	15%	152,716	14%
Total	17,445	100%	606,203	100%	14,795	100%	541,672	100%	167,196	100%	1,058,471	100%

Source: Table CA25N, U.S. Bureau of Economic Analysis 2010, with estimates for industries where original data are suppressed to avoid disclosure of confidential information and with percentages calculated from original data and estimates.

[a] Employment in the respective state's economic corridor counties are attributed to the respective industry. The numbers in this column are all estimates except for the industry rows labeled *Farm* and *Government and Government Enterprises*, which are original BEA data. The estimates are necessary because the BEA does not publish an earnings or employment number for an industry if the number does not represent enough establishments to preclude attribution to and disclosure of information about a specific establishment. The unpublished numbers in each column were estimated by pro-rating the sum of the unpublished numbers in the column (calculated as the remainder after subtracting the published numbers from the column total, which is always given). The pro-rating is in proportion to the corresponding array of numbers found in the IMPLAN model for the same area. The IMPLAN model for each area is the same model as is used to estimate earnings and employment impacts (see discussion of IMPLAN in Section 4.10, Socioeconomics).
[b] This column is the sum of the data for the north and central-south sections of the Nebraska economic corridor.

Table 3.10-13 Earnings and Employment in the Rest of Montana, South Dakota, and Nebraska

Areas	Total Earnings (in thousands of nominal dollars)			Total Employment (in full-time and part-time jobs)		
	2000	2010	Average Annual Rate of Change	2000	2010	Average Annual Rate of Change
Rest of Montana	14,431,369	22,770,262	4.7%	538,175	606,203	1.2%
Billings Metro Area	2,767,882	4,378,496	4.7%	93,301	105,517	1.2%
Missoula Metro Area	1,946,321	2,884,889	4.0%	66,444	75,585	1.3%
Great Falls Metro Area	1,413,654	2,235,479	4.7%	48,105	50,598	0.5%
Remainder	8,303,512	13,271,398	4.8%	330,325	374,503	1.3%
Total in Metro Areas	6,127,857	9,498,864	4.5%	207,850	231,700	1.1%
Metro Area Share	42%	42%		39%	38%	
Rest of South Dakota	14,171,671	22,007,279	4.5%	489,774	524,492	0.7%
Sioux Falls Metro Area	4,763,626	7,600,733	4.8%	148,014	172,050	1.5%
Rapid City Metro Area	2,166,732	3,354,865	4.5%	80,148	83,119	0.4%
Remainder	7,241,313	11,051,681	4.3%	261,612	269,323	0.3%
Total in Metro Areas	6,930,358	10,955,598	4.7%	228,162	255,169	1.1%
Metro Area Share	49%	50%		47%	49%	
Rest of Nebraska	33,473,276	48,660,903	3.8%	1,007,333	1,054,392	0.5%
Omaha Metro Area[a]	18,436,923	26,274,886	3.6%	479,955	508,302	0.6%
Lincoln Metro Area	6,518,234	9,010,700	3.3%	193,696	210,453	0.8%
Remainder	8,518,119	13,375,317	4.6%	333,682	335,637	0.1%
Total in Metro Areas	24,955,157	35,285,586	3.5%	673,651	718,755	0.7%
Metro Area Share	75%	73%		67%	68%	

Source: Tables CA04 and SA04, U.S. Bureau of Economic Analysis 2010.

[a] This area includes only the Nebraska part of the Omaha-Council Bluffs NE-IA metro area.

Earnings and Employment in the United States

Specialized equipment and some construction inputs would likely come from outside Montana, South Dakota, and Nebraska. The economy outside the economic corridor states is termed the *rest of United States* and comprises the remaining 47 states. Keystone estimates that 90 percent of the construction workforce would be recruited from the rest of United States area. Workers from the rest of United States area are expected to reside temporarily in communities close to construction spreads or in construction camps installed expressly for the proposed Project wherever accommodations are lacking.

The economic consequence of temporary workforce residency and the use of construction camps is that a large percentage of the household spending that would be supported by the earnings of the proposed Project workforce would be captured at the rest of United States level of the analysis. Statistics for the rest of United States, presented in Table 3.10-10, show that the rest of United States data are very close in magnitude to that of the United States as a whole because the states of Montana, South Dakota, and Nebraska have relatively small economies.

Earnings and Employment in Kansas

The proposed Project would include pump stations in Clay County and Butler County, Kansas. Clay County is a non-metro area, 100 miles from the Topeka metro area. Butler County is part of the Wichita metro area. The proximity of Clay and Butler counties to interstate highway corridors and to large metro areas, combined with the economic dominance of the large metro areas within the states, means that the Kansas pump stations are best evaluated in the context of the Kansas economy as a whole. Table 3.10-10 shows growth in earnings and employment from 2000 to 2010 in Kansas. Measured in terms of earnings and employment, Kansas makes up about 1 percent of the total earnings and employment in the United States. The industry composition of Kansas is diverse and not very different from that of the United States as a whole.

3.10.2.4 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” (U.S. Environmental Protection Agency [USEPA] 2007). The Council on Environmental Quality (CEQ) has provided guidance for addressing environmental justice (CEQ 1997).

The Supplemental EIS follows the Final EIS in considering effects including potential dust and noise generated by construction, disruption to traffic patterns associated with the movement of construction materials and equipment, and potential health impacts in the unlikely event of a substantial spill from the proposed Project during operation. In the Final EIS, the Department evaluated census block groups within a 4-mile-wide analysis area centered on the pipeline and associated pump stations, in an effort to identify potential environmental justice populations. The Supplemental EIS updates the evaluation in the Final EIS based on data from the 2010 census and from the 2006-2010 American Community Survey (ACS). The Supplemental EIS adjusts the

geographies used in the Final EIS based on changes in data availability and in census geography. This is further discussed below under Methodology. The Final EIS included all the data relevant to the environmental justice analysis in its Section 3.10. This section of the Supplemental EIS includes summary data and key findings. Appendix O, Socioeconomics, contains the complete set of data.

Methodology to Identify and Locate Minority and Low-Income Populations

Geographic Unit Criteria

To assess the potential impacts to minority and low-income populations from construction and operation of the proposed Project, the Department considered the types of effects and the spatial distribution of these effects as a function of distance from the proposed Project pipeline centerline to establish a potentially affected area for analysis. The Final EIS noted that a particular concern would be any potential health effects to minority or low-income populations resulting from a crude oil spill from the proposed Project facilities. Based, in part, on the example of the area affected by a discharge near Bemidji, Minnesota, the Department defined a 4-mile-wide affected analysis area for environmental justice (extending 2 miles on either side of the proposed Project centerline) as a conservatively large area of potential effects that would adequately address the uncertainty inherent in the Bemidji analysis (see Final EIS section 3.10.1.1). The Supplemental EIS keeps the 4-mile-wide analysis area to be consistent with the Final EIS. In this section, populations in the socioeconomic analysis area are analyzed; this includes the 4-mile-wide corridor extending a distance of 2 miles on either side of the proposed pipeline centerline, as described above, and a 2-mile radius around the two pump stations in Kansas (see definitions in Section 3.10.1, Introduction). The socioeconomic analysis area covers portions of 32 counties in four states; this includes 30 of the 31 proposed Project area counties[7] (see Table 3.10-1) plus Carter County, Montana, and Ziebach County, South Dakota. These two counties are not proposed Project area counties, but are within 2 miles of the proposed pipeline centerline.

Census Data and Geography

For minority populations, the analysis uses data from the 2010 U.S. decennial census. For low-income populations, the analysis uses poverty data reported in the U.S. Census Bureau's 2006-2010 ACS.[8] The U.S. Census Bureau provides data for a variety of geographies ranging from the smallest unit (blocks) up through block groups (groups of blocks) to census tracts (groups of block groups) and county subdivisions to larger geographies such as counties, regions, and states[9].

[7] The pipe yard in Bowman County, North Dakota, is not analyzed because 1) it is a temporary facility for construction only, with minimal economic impacts, 2) the yard will not have crude oil, and 3) the nearest population center, Gascoyne City, (population 16) is over 0.5 mile from the yard.

[8] Beginning in 2010, the decennial census no longer includes information about income. The ACS now collects income data on a revolving survey basis.

[9] A census block group is the smallest geographic area for which the Census Bureau provides consistent sample data and generally contains a population between 600 and 3,000 individuals. A census tract (generally 1,200-8,000 people) is a group of block groups used for census purposes, the boundaries of which generally coincide with town and city limits. A county usually consists of multiple census tracts. County subdivisions are smaller geographic areas within a county. In the state of Nebraska, county subdivisions are precincts, townships, or districts.

The environmental justice analysis focuses on census geography, block groups, and census tracts that represent, as closely as possible, the geographic area of interest, in this case the 4-mile-wide socioeconomic analysis area. For the Supplemental EIS, the analysis uses different geographies for the minority population analysis versus the low-income population analysis; this is because census data on minorities are available at the block and block group level, while data on income from the ACS are currently only available for census tracts and larger geographies[10]. The analysis is inherently conservative since portions of most of the census block groups and census tracts analyzed lie outside the socioeconomic analysis area.

Note that the changes in geography, demographics, and data sources in the Supplemental EIS result in changes among the areas that the Final EIS identified as having potential environmental justice populations.

Minority Populations

Minority individuals were characterized as belonging to one or more of the following races: African-American, American Indian, Alaska Native, Asian, Native Hawaiian, Other Pacific Islander, or Other race (CEQ 1997). To remain consistent with NDEQ, data were collected from the U.S. Census Bureau's American FactFinder for every block group that intersected the socioeconomic analysis area. Table P1: Race, taken from the 2010 Census Redistricting Summary File 1, provides a breakdown of race by geographic area.

The summation of the number of individuals belonging to each of the racial groups described above yielded a minority race total. The 2010 total populations for each geographic area were also obtained from Table P1. Table QT-P3: Race and Hispanic or Latino Origin provided ethnic minority data for each census tract, while Table P7: Hispanic or Latino Origin by Race provided Hispanic and Latino population demographics for each block group. People who identify their origin as Hispanic, Latino, or Spanish may be any race.

Low-Income Populations

Low-income populations were identified using data from the U.S. Census Bureau's ACS. Table S1701: Poverty Status in the Past 12 Months, provided 5-year estimates (2006-2010) from the ACS for census tracts. The ACS defines an individual as *below poverty level* if that individual's income, or family's total income, is below a pre-defined threshold. The poverty threshold is determined yearly by multiplying the 1982 base-year threshold by a monthly inflation factor based on the current Consumer Price Index (Poverty Methodology, U.S. Census Bureau 2012). Poverty data were analyzed on a census tract basis, as ACS does not currently publish income data for smaller geographies. As with block groups, data were collected for every census tract that intersects the socioeconomic analysis area.

[10] For Nebraska's Keystone XL Pipeline Evaluation (NDEQ 2012), NDEQ analyzed data on minorities using county subdivision geography, specifically precincts and townships. This census geography is appropriate for the proposed reroute through Nebraska that affects 9 largely rural counties in one state, but is less applicable to the more varied socioeconomic analysis area for the Supplemental EIS that covers portions of 32 counties in four states.

Evaluation Criteria

To assess potential environmental justice concerns related to the proposed Project in accordance with CEQ guidance, the Department performed two separate analyses:

- A *50 percent criterion* population analysis to determine those small area geographies (census block groups or census tracts) in the socioeconomic analysis area where minority and/or low-income individuals were equal to or exceeded 50 percent of the population of the geography (census block group or census tract).
- A *meaningfully greater criterion* population analysis in which minority and/or low-income population percentages within individual geographies (census block groups or census tracts) were compared to state-wide reference populations. A meaningfully greater population was defined as a minority and/or low-income population within a geography that was equal to or greater than 120 percent (1.2 times) of the state-wide reference population. This criterion level is consistent with the Final EIS and was selected based upon a suggestion from the USEPA and because it is commonly used for National Environmental Policy Act (NEPA) compliance by other federal agencies.

As noted in the Final EIS (Section 3.10.1.1), the Department considers comparisons to the statewide percentage a much more appropriate comparison than comparisons to nationwide percentages for determining potential environmental justice concerns for linear energy projects. Comparisons to nationwide percentages are more appropriate for assessing impacts associated with facility siting where alternatives to the proposed facility are very widely dispersed geographically.

Minority Populations

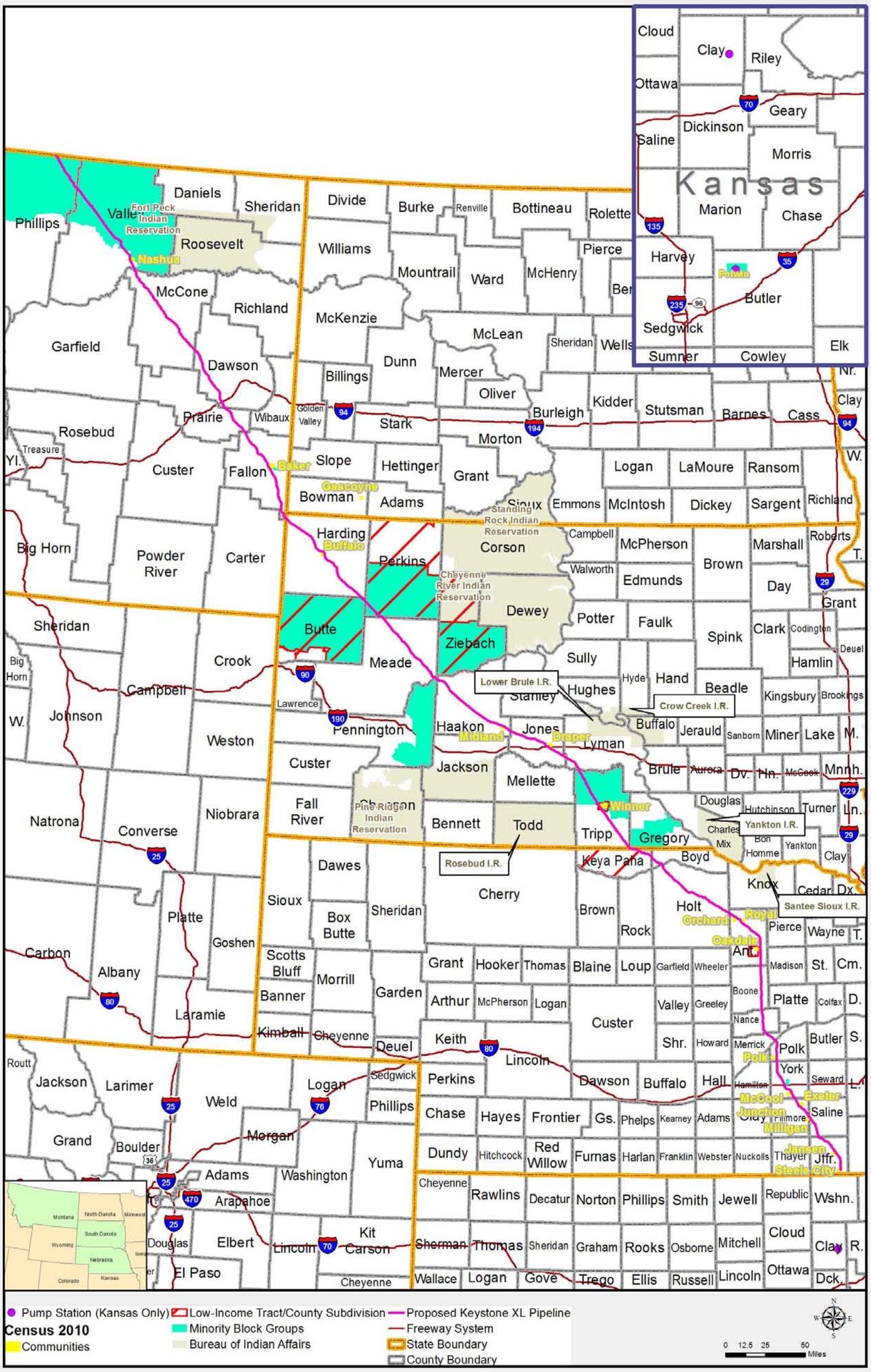
The minority populations assessment considered 68 census block groups encompassed by or intersecting with the socioeconomic analysis area across four states. The percentage of each block group's population represented by each minority classification (each racial group, aggregate race minority population, and Hispanic/Latino ethnic origin) was calculated and the results were compared to the criteria above. This section presents the summary results of the assessment. Appendix O, Socioeconomics, contains data for all 68 areas, as well as reference data for the 32 counties in the socioeconomic analysis area.

50 Percent Criterion

Of the 68 block groups, a total of two had individual racial group minority populations and aggregate minority populations that met the 50 percent criterion. These were American Indian/Alaskan Native populations in Valley County, Montana, and in Ziebach County, South Dakota. The Valley County population is part of the Fort Peck Indian Reservation and the Ziebach County population is part of the Cheyenne River Indian Reservation (Figure 3.10.2-2). No block groups with minority populations exceeding 50 percent of the total population were identified in Nebraska or Kansas.

Meaningfully Greater Criteria

Of the 68 block groups, a total of 16 met the meaningfully greater criterion for one or more racial groups (see Appendix O, Socioeconomics). Table 3.10-14 presents the data for these areas and shows the relevant exceedance criteria for the states.



Source: U.S. Census Bureau, American FactFinder 2012e; U.S. Census Bureau, American FactFinder 2012c.

Figure 3.10.2-2 Minority and Low-Income Populations within the Socioeconomic Analysis Area

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Table 3.10-14 Block Groups with Meaningfully Greater Minority Populations

	Total Population	African American		American Indian/Alaskan Native		Asian/Pacific Islander		Other		Two or More Races		Aggregate (Total) of Racial Minorities		Hispanic or Latino[a]	
	#	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Montana															
Phillips County															
Block Group 4, Census Tract 602	1,139	0	0.0%	**88**	**7.7%**	3	0.3%	**11**	**1.0%**	**36**	**3.2%**	138	12.1%	25	2.2%
Valley County															
Block Group 1, Census Tract 1001	659	0	0.0%	3	0.5%	1	0.2%	**6**	**0.9%**	7	1.1%	17	2.6%	8	1.2%
Block Group 1, Census Tract 9406	808	7	**0.9%**	30	3.7%	**9**	**1.1%**	2	0.2%	15	1.9%	63	7.8%	11	1.4%
Block Group 2, Census Tract 9406	1,003	2	0.2%	**499**	**49.8%**	**15**	**1.5%**	2	0.2%	18	1.8%	**536**	**53.4%**	10	1.0%
Block Group 3, Census Tract 1	873	0	0.0%	4	0.5%	**11**	**1.3%**	3	0.3%	10	1.1%	28	3.2%	11	1.3%
Montana Exceedance Criteria	*NA*	*0.5%*		*7.6%*		*0.8%*		*0.7%*		*3.0%*		*12.7%*		*4.0%*	
South Dakota															
Butte County															
Block Group 1, Census Tract 9676	1,177	8	0.7%	22	1.9%	5	0.4%	5	0.4%	**37**	**3.1%**	77	6.5%	36	3.1%
Perkins County															
Block Group 2, Census Tract 9683	981	0	0.0%	7	0.7%	1	0.1%	**13**	**1.3%**	14	1.4%	35	3.6%	10	1.0%
Ziebach County															
Block Group 1, Census Tract 9416	1,805	5	0.3%	**1,529**	**84.7%**	2	0.1%	1	0.1%	**62**	**3.4%**	**1,599**	**88.6%**	**64**	**3.5%**
Pennington County															
Block Group 1, Census Tract 116	1,123	9	0.8%	62	5.5%	4	0.4%	1	0.1%	**44**	**3.9%**	120	10.7%	12	1.1%
Tripp County															
Block Group 2, Census Tract 9716	1,226	0	0.0%	**140**	**11.4%**	4	0.3%	5	0.4%	29	2.4%	178	14.5%	11	0.9%

	Total Population	African American		American Indian/Alaskan Native		Asian/Pacific Islander		Other		Two or More Races		Aggregate (Total) of Racial Minorities		Hispanic or Latino[a]	
	#	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Block Group 1, Census Tract 9717	1,411	0	0.0%	**323**	**22.9%**	2	0.1%	4	0.3%	**37**	**2.6%**	**366**	**25.9%**	28	2.0%
Block Group 2, Census Tract 9717	1,074	3	0.3%	**189**	**17.6%**	5	0.5%	3	0.3%	**43**	**4.0%**	**243**	**22.6%**	27	2.5%
Block Group 3, Census Tract 9717	898	3	0.3%	**103**	**11.5%**	1	0.1%	1	0.1%	20	2.2%	128	14.3%	8	0.9%
Gregory County															
Block Group 2, Census Tract 9712	1,379	1	0.1%	61	4.4%	0	0.0%	2	0.1%	**37**	**2.7%**	101	7.3%	7	0.5%
South Dakota Exceedance Criteria	*NA*	*1.5%*		*10.6%*		*1.2%*		*1.1%*		*2.5%*		*16.9%*		*3.2%*	
Nebraska															
York County															
Block Group 2, Census Tract 9698	1840	78	4.2%	18	1.0%	4	0.2%	**96**	**5.2%**	26	1.4%	222	12.1%	147	8.0%
Nebraska Exceedance Criteria	*NA*	*5.4%*		*1.2%*		*2.2%*		*5.2%*		*2.6%*		*16.7%*		*11.0%*	
Kansas															
Butler County															
Block Group 2, Census Tract 206	691	1	0.1%	**11**	**1.6%**	4	0.6%	10	1.4%	21	3.0%	47	6.8%	25	3.6%
Kansas Exceedance Criteria	*NA*	*7.1%*		*1.2%*		*2.9%*		*4.6%*		*3.6%*		*19.4%*		*13.6%*	

Sources: Total population and minority populations for each racial group (U.S. Census Bureau, American FactFinder 2012e), Hispanic and Latino populations (U.S. Census Bureau, American FactFinder 2012f).

Notes: Minority geographical areas identified in the table may not be the same as those identified in the Final EIS. The Final EIS used 2000 census data, while this analysis used 2010 census data. In some cases, discrepancies are due to changes in demographics between 2000 and 2010. For instance, the Final EIS identified block group 1-2 in Fallon County, Montana, as minority in 2000, but 2010 data show that the minority population in this block group has declined. Other differences can be attributed to the geographic reconfiguration of block groups between 2000 and 2010 by the U.S. Census Bureau. For example, a block group in Meade County, South Dakota, that met the minority population criterion in 2000 does not meet the criterion based on 2010 data because the block group configuration changed to incorporate areas with a different racial breakdown.

[a] Hispanic and Latino populations are not included in the aggregate minority count.

Block groups meeting the criteria are shown in bold on the table and are shown on Figure 3.10.2-2. For reference, the figure also shows the locations of communities per Table 3.10-3. For example, in Montana, statewide, the African-American population in 2010 was 0.4 percent. One hundred and twenty percent of this is 0.5 percent (as indicated on the table in the row labeled Montana Exceedance Criteria). The African-American population in Valley County Block Group 1, Census Tract 9406 exceeds this number and meets the meaningfully greater criterion. Of the 16 block groups meeting the criteria, five showed exceedances for their aggregate minority populations. These five were one area in each of Valley County, Montana, Ziebach County, South Dakota, and York County, Nebraska; and two in Tripp County, South Dakota.

The analysis identified meaningfully greater minority populations in five individual census block groups in Montana. In South Dakota, 16 meaningfully greater minority populations were identified in nine individual census block groups. One meaningfully greater American Indian/Alaskan Native population was identified in Ziebach County on the Cheyenne River Indian Reservation, and four were identified in Tripp County within Winner and New Witten, northeast of the Rosebud Indian Reservation. One block group in York County, Nebraska showed exceedances for some Other race.

Low-Income Populations

The low-income populations assessment considered 43 census tracts encompassed by or intersecting with the socioeconomic analysis area across four states. As with 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. The number of low-income persons in each census tract was divided by the total population for that area to obtain a percentage of low-income individuals. If a census tract's percentage was more than 120 percent of the corresponding state percentage, then the area was identified as containing a low-income population. State exceedance criteria are listed in the data table for reference. This section presents the summary results of the assessment (see Table 3.10-15. Appendix O, Socioeconomics, contains data for all 43 areas, as well as reference data for the 32 counties in the socioeconomic analysis area.

Table 3.10-15 Census Tracts with Meaningfully Greater Low-Income Populations

Census Tract	Population for Whom Poverty Status is Determined	Aggregate (Total) of Low-Income Populations	Percent
Census Tract 9676, Butte Co., SD	2,932	573	19.5%
Census Tract 9683, Perkins Co., SD	2,904	543	18.7%
Census Tract 9416, Ziebach Co., SD	2,742	1,260	46.0%
Census Tract 9717, Tripp Co., SD	3,309	567	17.1%
		South Dakota Exceedance Criteria	*16.5%*
Census Tract 9754, Keya Paha Co., NE	740	168	22.7%
		Nebraska Exceedance Criteria	*14.2%*

Source: U.S. Census Bureau, American FactFinder 2012c

Notes: Low-income geographic areas identified in the table may not be the same as those identified in the Final EIS. The Final EIS used data from the U.S. 2000 census (1999 data), while this Supplemental EIS analysis used 2006-2010 ACS data. In some

cases, discrepancies are due to changes in demographics between 1999 and 2010. Additional discrepancies can be attributed to the reconfiguration of block groups and census tracts over time. For instance, Valley County, Montana, had a small low-income block group surrounded by non-low-income block groups in 2000. The Final EIS identified it as having a low-income population, but after 2000 this block group was merged into the surrounding groups and the resulting census tract does not meet the low-income criterion. Additionally, the Final EIS analyzed low-income data on a block group level, while the Supplemental EIS uses census tracts since block group-level data are not currently available. In some cases, the Final EIS identified a block group as having a meaningfully greater low-income population, but its corresponding census tract does not have one.

50 Percent Criterion

None of the geographic areas in the socioeconomic analysis area had low-income populations that exceeded the 50 percent criterion.

3.10.2.5 Public Services, Tax Revenues, and Property Values

Public Services

A range of providers provide public services to the proposed Project area. Police and fire protection and medical facilities are the services most pertinent to the proposed Project.[11] Table 3.10-16 shows selected information for these public services. Generally, the extent of public service resources in a region is a function of its size, population, and number of established communities. Accordingly, public service infrastructure is typically not as developed in remote rural areas as in urban areas. There are multiple law enforcement service providers in the proposed Project area, including state patrols, county sheriff departments, local police departments, and special law enforcement agencies such as college police. In many cases, mutual aid or cooperative agreements allow one agency to provide support to other agencies in emergencies. On average, from one to five law enforcement agencies serve the counties in the proposed Project area. Larger counties like Butler County, Kansas, and Pennington County, South Dakota, have more. A network of fire departments and districts provides fire protection and suppression services to the proposed Project area. Many of these organizations are staffed by volunteers, particularly in rural areas. In larger urban areas, fire protection staff typically is housed in fire stations. At the county level, the number of fire departments is approximately the same as the number of law enforcement agencies.

Table 3.10-16 Existing Public Services and Facilities in the Project Area

State/County[a]	Police/Sheriff Departments[b]	Fire Departments[b]	Nearest Medical Facilities[c]
Montana			
Phillips	1	2	Phillips County Hospital (Malta)
Valley	4	3	Frances Mahon Deaconess Hospital (Glasgow)
McCone	2	1	McCone County Health Center (Circle)
Dawson	2	4	Glendive Medical Center (Glendive)
Prairie	2	1	Prairie Community Health Center (Terry)
Fallon	2	2	Fallon Medical Complex (Baker)
South Dakota			
Harding	2	3	

[11] Education facilities are not addressed in the section because most construction workers are not expected to relocate with school-aged children; therefore, impacts on schools would be negligible.

State/County[a]	Police/Sheriff Departments[b]	Fire Departments[b]	Nearest Medical Facilities[c]
Butte	2	3	
Perkins	3	2	
Meade	4	6	Sturgis Regional Hospital (Sturgis)
Pennington	5	14	Rapid City Regional Hospital (Rapid City)
Haakon	2	3	Hans P. Peterson Memorial Hospital (Philip)
Jones	2	1	
Lyman	1	3	
Tripp	2	1	Winner Regional Healthcare Center (Winner)
Nebraska			
Keya Paha	1	2	Rock County Hospital (Bassett)
Boyd	2	3	Niobrara Valley Hospital (Lynch)
Holt	5	2	Avera St. Anthony's Hospital (O'Neil)
Antelope	1	1	Antelope Memorial Hospital (Neligh)
Boone	4	3	Boone County Health Center (Albion)
Nance	1	2	Boone County Health Center (Albion)
Merrick	4	3	Litzenberg Memorial County Hospital (Central City)
Polk	1	2	Annie Jeffrey Memorial County Health Center (Osceola)
York	2	3	York General Hospital (York)
Fillmore	3	6	Fillmore County Hospital (Geneva)
Saline	4	5	Crete Area Medical Center (Crete); Warren Memorial Hospital (Friend)
Jefferson	3	5	Jefferson Community Health Center (Fairbury); Thayer County Health Services (Hebron)
Cushing Extension Pump Stations			
Kansas			
Clay[d]	4	3	Clay County Medical Center (Clay Center); *Mercy Regional Health Center (Manhattan)
Butler[d]	8	12	*Newton Medical Center (Newton); *Susan B. Allen Memorial Hospital (El Dorado); *Via Christi Riverside Medical Center (Wichita); *Wesley Medical Center (Wichita)
Pipe Yard Stockpile			
North Dakota			
Bowman	1	3	Southwest Medical Clinic (Bowman)

[a] States and counties are listed geographically from north to south.
[b] Includes special law enforcement units for universities. Includes volunteer, district, city, and town fire departments.
[c] All facilities listed are critical access facilities within approximately 50 miles of the proposed Project route; those marked with an asterisk (*) are non-federal, short-term, acute care facilities (American Hospital Directory 2012).
[d] Construction in these counties would be related to pump stations only.

Table 3.10-16 also shows the nearest medical facilities to the proposed Project, specifically all critical access facilities that are located within approximately 50 miles of the proposed pipeline route. Non-federal, short-term, acute care facilities nearest the route are distinguished in the table based upon their likelihood of serving proposed Project-related medical needs. In every county along the proposed pipeline route, there is at least one acute care facility within the county or nearby in a neighboring county. These facilities would provide emergency medical care and, in some cases, would serve as the base for local emergency medical response and transport services for construction accidents or operating concerns.

The Final EIS (Section 3.13.5.5, Potential Releases) notes that there are multiple Local Emergency Planning Committees along the proposed pipeline route that were established under the Emergency Planning and Community Right-to-Know Act of 1986. These committees exist in cities and counties in the Project area where the handling of hazardous or toxic materials in existing facilities or the transport of these materials through the committee areas of responsibility are known to occur based on reporting requirements included within Emergency Planning and Community Right-to-Know Act and the Superfund Amendments and Reauthorization Act of 1986.

Tax Revenues, and Property Values

This section focuses on property taxes at the county level for situs counties (i.e., counties actually containing proposed Project facilities within their legal boundary). The following details the purpose of this section:

- Present summary statistics that depict the relative contribution of property tax revenue to state and local government general revenue in each state;
- Describe the 2010 tax base and amount of property tax revenue generated; and
- Estimate the effective rate of property taxation in 2010.

Property taxes are the focus of a state and local government revenue analysis because property taxes would be the public revenue source most affected by the proposed Project. Describing the importance of the property tax to local government general revenue and profiling the current size of local tax bases establishes a context for assessing the impacts of the proposed Project. The effective rate of property taxation is presented as an index of the rate at which proposed Project property would generate property tax revenue once the proposed Project was in place and added to a county's tax roll. The situs counties profiled here are listed in Table 3.10-1, except that Bowman County, North Dakota, is not included because any property taxes for the pipe yard would be temporary, with minimal economic impacts.

Overview of the Property Tax for State and Local Government in Project Area States: Montana, South Dakota, Nebraska, and Kansas

On average, local property tax is the source of 27 percent of general revenue for local government, measured as a national average during the years 2008 and 2009. Property tax ranked second to intergovernmental revenue, which is the transfer of state revenue and of federal revenue channeled through the states. Table 3.10-17 depicts this relationship for situs states, with the United States as a whole included in the table for comparison. The table uses statistics summarized from the Census Bureau's annual survey of government finances.

Table 3.10-17 Overview of General Revenue Resources for State and Local Government in the Proposed Project Area, 2008-2009

Area	Level of Government	General Revenue (in thousands of nominal dollars)						
		Total	Inter-governmental	Property Tax	Sales and Gross Receipts Tax	Other Taxes	Charges and Miscellaneous General Revenue	Revenue from Utilities or Liquor Stores[a]
United States	State	1,518,578,222	495,623,675	12,964,188	344,567,991	357,964,040	284,610,425	22,847,903
	% of Row Total	100%	33%	1%	23%	24%	19%	2%
	Local	1,536,444,074	531,514,788	411,049,982	88,988,024	55,821,768	320,657,452	128,412,060
	% of Row Total	100%	35%	27%	6%	4%	21%	8%
Montana	State	5,779,048	2,097,188	235,150	529,392	1,642,858	1,207,205	67,255
	% of Total	100%	36%	4%	9%	28%	21%	1%
	Local	3,482,388	1,438,412	1,040,073	4,893	35,480	845,776	117,754
	% of Total	100%	41%	30%	<1%	1%	24%	3%
South Dakota	State	3,745,652	1,542,361	NA	1,083,611	250,224	869,456	NA[b]
	% of Total	100%	41%	NA	29%	7%	23%	NA
	Local	2,953,741	854,374	891,916	298,609	30,448	583,044	295,350
	% of Total	100%	20%	24%	4%	3%	18%	31%
Nebraska	State	8,403,141	2,770,131	1,964	2,015,283	1,983,692	1,632,071	NA
	% of Total	100%	33%	<1%	24%	24%	19%	NA
	Local	10,863,085	2,216,708	2,590,932	411,725	348,406	1,935,504	3,359,810
	% of Total	100%	20%	24%	4%	3%	18%	31%
Kansas	State	13,575,933	3,815,931	80,137	3,044,904	3,569,589	3,065,372	NA
	% of Row Total	100%	28%	1%	22%	26%	23%	NA
	Local	13,362,947	4,285,846	3,736,049	940,404	99,991	3,068,666	1,231,991
	% of Total	100%	32%	28%	7%	1%	23%	9%

Source: U.S. Census Bureau 2009. Annual Surveys of State and Local Government Finances. Summary totals and percentages calculated from the original data.

[a] Montana and South Dakota have state government liquor store operations.
[b] NA = not applicable.

The local government revenues in Table 3.10-17 fund current operations and capital outlays for public education (mainly elementary and high schools), local administration of social services, income maintenance programs (including some but little of direct payments to individuals), transportation (mainly local roads but also local airports), community services (such as police, fire, and emergency services, natural resources, parks and recreation, housing, wastewater, and solid waste), and local government administration.

In the situs states, as in the United States as a whole, the property tax is second to intergovernmental revenue as a source of general revenue. The property tax is 30 percent of local government general revenue in Montana as a whole, 28 percent in Kansas, and 24 percent in Nebraska and South Dakota. Local governments in the situs states, as in the United States, rely heavily on direct charges for services and miscellaneous revenues, which typically are fees, fines, and interest income. This category of revenue makes up 18 percent to 24 percent of general revenue for local government in the situs states, and 21 percent for local government in the United States overall.

In the aggregate, sales and other taxes are a small share of local government revenue in the situs states and the United States as a whole. However, municipalities as a subcategory of local government generally rely heavily on sales and other taxes, except in Montana, which does not have a general sales tax. Note that the share of revenue that municipalities derive from sales taxes and other taxes is not depicted in Table 3.10-17 because the table combines all types of local government, most of which do not levy their own sales taxes.

Property Tax in Counties within the Project Area

Table 3.10-18 describes the 2010 tax base for the situs counties (counties that would contain property of the proposed Project), the amount of property tax revenue generated by the tax base, and the *effective*[12] tax rate, which is implied by dividing tax revenue by the tax base. The term *property* refers to all types of property including real and personal.

Table 3.10-18 Property Tax in Project Area Counties, 2010

County	Total Property Value (in nominal dollars)	Total Property Tax Revenue (in nominal dollars)	Effective Property Tax Rate
Montana			
Phillips	401,090,831	8,062,381	2.0%
Valley	551,323,709	14,706,595	2.7%
McCone	246,556,992	3,892,575	1.6%
Dawson	467,623,239	13,204,292	2.8%
Prairie	106,386,478	2,613,113	2.5%
Fallon	436,070,972	7,123,109	1.6%
Total	*2,209,052,221*	*49,602,065*	*2.2%*
South Dakota			
Harding	215,566,625	2,731,191	1.3%

[12] The term effective tax rate is used as the ratio of property tax receipts to actual value as reported for a particular county in the period selected to represent existing conditions in the affected environment. The rates calculated here are used in Chapter 4, Environmental Consequences, to estimate revenue the property of the proposed Project may yield to a county, assuming little change in the legal and economic factors used to determine official values and set tax levies.

County	Total Property Value (in nominal dollars)	Total Property Tax Revenue (in nominal dollars)	Effective Property Tax Rate
Butte	595,452,581	9,498,634	1.6%
Perkins	318,254,493	4,468,261	1.4%
Meade	1,662,772,219	28,166,408	1.7%
Pennington	7,649,711,805	133,409,959	1.7%
Haakon	336,585,980	3,049,053	0.9%
Jones	229,359,183	1,982,019	0.9%
Lyman	409,288,275	4,240,216	1.0%
Tripp	583,522,735	7,413,209	1.3%
Gregory	415,399,835	5,549,265	1.3%
Total	*12,415,913,731*	*200,508,215*	*1.6%*
Nebraska			
Keya Paha	245,812,674	3,170,822	1.3%
Boyd	260,126,338	4,281,178	1.6%
Holt	1,631,618,747	25,510,470	1.6%
Antelope	1,162,155,447	17,676,402	1.5%
Boone	1,037,271,278	16,562,417	1.6%
Nance	511,150,656	9,021,512	1.8%
Merrick	920,338,590	16,488,968	1.8%
Polk	862,382,052	14,458,146	1.7%
York	1,763,598,787	27,568,396	1.6%
Fillmore	1,068,882,294	16,955,782	1.6%
Saline	1,235,103,379	23,050,519	1.9%
Jefferson	983,483,004	16,698,237	1.7%
Total	*11,681,923,246*	*191,442,849*	*1.6%*
Kansas			
Butler	3,906,384,545	88,195,610	2.3%
Clay	436,830,884	10,846,974	2.5%
Total	*4,343,215,429*	*99,042,584*	*2.3%*

Sources: Montana Department of Revenue 2010; SSDOR 2010a, 2010b; Nebraska Department of Revenue 2010; State of Kansas 2010.

Note: Totals and effective tax rates calculated from the original data.

The tax base used here is the *actual* or *market* value of property on the tax roll as determined by the respective state and county appraisal system. This is a common starting point for local property taxation, though each state proceeds somewhat differently from that point forward to arrive at the amount of property tax due.

The tax base of situs counties ranges widely from a little more than $100 million in actual value in Prairie County, Montana, to nearly $4 billion in Butler County, Kansas. The effective tax rate among situs counties is in the range of 1.6 percent to 2.8 percent in Montana, 0.9 percent to 1.7 percent in South Dakota, 1.3 percent to 1.9 percent in Nebraska, and 2.3 percent and 2.5 percent in the two counties in Kansas.

The largest share of local property tax revenue is typically raised for school funding. However, property taxes for local public schools in all of the situs states and counties, as in the United States generally, are part of integrated systems of intergovernmental transfers that equalize per pupil spending and spread the tax burden statewide.

3.10.2.6 Traffic and Transportation

Highways, Major Roads, and Rural Roads

The proposed Project would meet or intersect many local, state, federal, and interstate roads and highways along its length. This section uses geographic information systems data to provide information about these roads and highways.[13] The roads and highways have been classified into four categories, based upon the U.S. Census Feature Class Codes:

- Category I: Local, Neighborhood, Rural or City Roads;
- Category II: Secondary State and County Highways;
- Category III: Primary U.S. and State Highways; and
- Category IV: Primary Limited Access or Interstate.

Table 3.10-19 lists the Category II, III, and IV roads crossed by the proposed pipeline route including pump stations (Category I roads are too numerous to list individually). Table 3.10-20 summarizes the number of roads crossed by state and by category. Divided highways (i.e., a freeway with a landscaped median) are counted as two separate road crossings. The proposed Project would cross a total of 840 roads, including Interstate Highways I-94, I-90, and I-80. The largest number of crossings would be in Nebraska (323), followed by Montana (297) and South Dakota (220). The two Kansas pump stations would be adjacent to the alignment of the Steele City to Cushing segment of the existing Keystone pipeline, and thus would not cross any public roads. In addition to the pipeline, the proposed Project includes ancillary facilities such as contractor yards, pipe yards, rail sidings, and construction camps. Table 3.10-21 summarizes the roads adjacent to these facilities.

Table 3.10-19 Intersections of Proposed Project with Roads, by State

State	Road Category	Road Name	Number of Road Intersections
Montana	Category I		281
	Category II	Marsh Rd	1
		Old US Hwy 10	1
		River Rd	1
		Rock Creek Rd	1
		State Route (SR) 117	1
		SR 24	1
		SR 243	1
		SR 7	1
		Weldon Rd	1

[13] Geographic information systems data used are accurate to plus or minus (+/-) 167 feet (ESRI 2008). Consequently, while the data are not intended for survey positional accuracy, they nonetheless provide adequate information to describe the number and type roads and highways crossed by the proposed Project.

State	Road Category	Road Name	Number of Road Intersections
	Category III	SR 13	1
		SR 200	1
		SR 200 South	1
		US Route (US) 12	1
		US 2	1
	Category IV	Interstate 94 (I-94)	2
Subtotal Montana			297
South Dakota	Category I		201
	Category II	Bad River Rd	1
		County Road (CR) 35	1
		CR 867	1
		CR S6 Jones	1
		CR S9 Jones	1
		SR 16	1
		SR 20	1
		SR 34	1
		SR 53	1
		SR 73	1
		SR 79	1
	Category III	US 14	1
		US 18	1
		US 183	2
		US 212	1
		US 85	1
	Category IV	I 90	2
Subtotal South Dakota			220
Nebraska	Category I		298
	Category II	SR 4	1
		SR 8	1
		SR 11	1
		SR 12	1
		SR 14	1
		SR 15	1
		SR 22	1
		SR 32	1
		SR 39	1
		SR 41	1
		SR 56	1
		SR 66	1
		SR 74	1
		SR 91	1
	Category III	SR 92	1
		US 6	1
		US 20	1
		US 30	1
		US 34	1

State	Road Category	Road Name	Number of Road Intersections
		US 81	1
		US 136	1
		US 275	1
		US 281	1
	Category IV	I 80	2
Subtotal Nebraska			323
Total Intersections With Proposed Project			**840**

Sources: exp Energy Services Inc. 2012a, 2012b; ESRI 2008.

Table 3.10-20 Intersections of Proposed Project with Roads, by State

	Number of Roads Crossed				
State	**Category I**	**Category II**	**Category III**	**Category IV**	**Total**
Montana	281	9	5	2	297
South Dakota	201	11	6	2	220
Nebraska	298	14	9	2	323
Total	**780**	**34**	**20**	**6**	**840**

Sources: exp Energy Services Inc. 2012a, 2012b; ESRI 2008.

Table 3.10-21 Major Roads Adjacent to Ancillary Facilities

State	County	Facility	Adjacent Roads	Road Category
Montana	Phillips	Pipe Yard 1	SR 243	II
	Valley	Pipe Yard 2	Britch Road	I
	Valley	Pipe Yard 3	Old Smokey Road	I
	Valley	Pipe Yard – St. Marie	Unknown Local Road	I
	Valley	Contractor Yard 1	US 2	III
	Valley	Contractor Yard 2	SR 117	II
	Valley	Construction Camp 1	SR 117	II
	McCone	Pipe Yard 4	Shade Creek Road	I
	McCone	Pipe Yard 5	McKean Road	I
	McCone	Contractor Yard 3	SR 200	III
	McCone	Construction Camp 1a	SR 200	III
	Dawson	Pipe Yard 6	SR 467	II
	Dawson	Pipe Yard 7	Unknown Local Road	I
	Dawson	Contractor Yard 4	I-94	IV
	Fallon	Pipe Yard 8	Unknown Local Road	I
	Fallon	Pipe Yard 9	Unknown Local Road	I
	Fallon	Contractor Yard 5	US 12	III
	Fallon	Construction Camp 2	US 12	III
North Dakota	Bowman	Pipe Yard	US 12	III
South Dakota	Harding	Pipe Yard 10	CR 867	II
	Harding	Pipe Yard 11	SR 20	II
	Harding	Contractor Yard 6	SR 20	II
	Harding	Construction Camp 2a	SR 20	II
	Butte	Pipe Yard 12	SR 79	II

State	County	Facility	Adjacent Roads	Road Category
	Meade	Pipe Yard 13	US 212	III
	Meade	Pipe Yard 14	Marcus Road	I
	Meade	Contractor Yard 7	US 212	III
	Meade	Contractor Yard 7a	SR 34	II
	Meade	Construction Camp 3	SR 73	II
	Haakon	Pipe Yard 15	SR 34	II
	Haakon	Pipe Yard 16	221st Street	I
	Haakon	Contractor Yard 8	SR 73	II
	Jones	Pipe Yard 17	Unnamed Local Road	I
	Jones	Pipe Yard 18	Unnamed County Road	I
	Jones	Contractor Yard 9	US 83	III
	Tripp	Pipe Yard 19	US 183	III
	Tripp	Pipe Yard 20	US 183	III
	Tripp	Contractor Yard 10	US 183	III
	Tripp	Contractor Yard 10a	SR 49	II
	Tripp	Construction Camp 4	US 183	III
Nebraska[a]	TBD[b]	TBD	TBD	TBD

Sources: exp Energy Services Inc. 2012a, 2012b; ESRI 2008.

[a] Locations of ancillary facilities in Nebraska have not yet been determined. Information is pending and will be included in the Final Supplemental EIS, as available.
[b] TBD = to be determined.

Railroads

The proposed Project would cross several railway service tracks. Table 3.10-22 lists the railroad names and owners. As shown, there would be 19 total intersections, including five in Montana, two in South Dakota, and 12 in Nebraska. The two Kansas pump stations would be adjacent to the alignment of the Steele City to Cushing segment of the existing Keystone pipeline, and thus would not cross any railroads. The contractor yard and rail siding in North Dakota would include a rail siding that connects to the BNSF Railway Company (BNSF) Glendive (Montana) to Aberdeen (South Dakota) line near Gascoyne, North Dakota.

Table 3.10-22 Intersection of Proposed Project with Railroads, by State

State	Railroad Name	Number of Rail Intersections
Montana	BNSF	5
South Dakota	Dakota, Minnesota & Eastern (DME) Railroad	1
	South Dakota State Railroad	1
Nebraska	BNSF	5
	Union Pacific Railroad Company (UP)	5
	DME	1
	Other	1
Total		**19**

Sources: exp Energy Services Inc. 2012a, 2012b; ESRI 2008.

BNSF has main, branch, and spur tracks in the states that the proposed pipeline would traverse (BNSF 2012). The proposed Project route would cross the BNSF main tracks near Glasgow, Marsh, and Baker in the Montana Operating Division, and near York and Exeter in the Nebraska Operating Division. UP has main, branch, and spur tracks throughout Nebraska (UP 2012).

In Nebraska, the proposed route would cross UP main tracks near Steele City, Jansen, and Central City.

3.10.3 Connected Actions

3.10.3.1 Bakken Marketlink Project

The Bakken Marketlink Project would affect Fallon County, Montana, as well as Payne and/or Lincoln counties in Oklahoma. Fallon County is a proposed pipeline corridor county and is discussed above under the proposed Project. Limited information is available regarding the location of the facilities in Oklahoma, so these areas are not discussed in this section. There are no additional counties within 2 miles of the Bakken Marketlink Project that the connected action could potentially affect.

Population and Housing

Tables 3.10-5 and 3.10-7, above, list population and housing data for Fallon County, Montana.

Local Economic Activity

Socioeconomic Conditions

Income, unemployment, and labor force data for Fallon County, Montana, is shown in Table 3.10-9 above.

Earnings and Employment

Earnings and employment data for Fallon County, Montana are presented in Table 3.10-10 above.

Environmental Justice

As discussed in Section 3.10.2.4, Environmental Justice, there are no minority or low-income populations that fall within the socioeconomic analysis area in Fallon County, Montana.

Public Services, Tax Revenues, and Property Values

Public Services

Table 3.10-16 above lists public services data for Fallon County, Montana.

Tax Revenues and Property Values

The baseline property tax data for Fallon County, Montana is described in Section 3.10.2.5, Public Services, Tax Revenues, and Property Values, above.

Traffic and Transportation

The proposed Bakken Marketlink Project pipeline segment near Baker, Montana, would cross four Category I roads. It would also cross the BNSF tracks in one location.

3.10.3.2 Big Bend to Witten 230-kV Transmission Line

The Big Bend to Witten 230 kilovolt (kV)-Transmission Line would be in Lyman and Tripp Counties in South Dakota. Both of these counties are also proposed pipeline corridor counties and are discussed above under the proposed Project.

Population and Housing

Tables 3.10-5 and 3.10-7 above list population data for Lyman and Tripp counties, as well as for the State of South Dakota.

Local Economic Activity

Income, unemployment, and labor force data for Tripp and Lyman counties in South Dakota are shown in Table 3.10-9 above.

Environmental Justice

The data and methodology for determination of environmental justice areas is above in Section 3.10.2.4, Environmental Justice. Several minority populations and a low-income population were identified in the northern part of Tripp County. While no environmental justice populations were identified in Lyman County within the socioeconomic analysis area, a portion of the Big Bend to Witten 230-kV Transmission Line would be located within the Lower Brule Indian Reservation. The route would also pass near several American Indian Tribal Subdivisions[14] near the Rosebud and Lower Brule Indian Reservations. Thus, there is the potential that this connected action could affect a variety of environmental justice populations, especially Native Americans.

Public Services, Tax Revenues, and Property Values

Table 3.10-16 above lists public services data for Lyman and Tripp counties. Table 3.10-17 and 3.10-19 give an overview of the revenue resources and property taxes in all project area counties, including Lyman and Tripp.

Traffic and Transportation

Table 3.10-23 lists the roads that would be crossed by the Big Bend to Witten 230-kV Transmission Line. This route would not cross an active rail line.

[14] American Indian Tribal Subdivisions are divisions of federally recognized American Indian reservations and off-reservation trust land areas.

Table 3.10-23 Roads that would be Crossed by the Big Bend to Witten 230-kV Transmission Line

County	Road Category	Road Name	Number of Road Intersections
Tripp	Category I	Various	29
	Category II	SR 49	1
	Category III	US 183	1
		US 18	1
Subtotal Tripp County			32
Lyman	Category I	Various	20
	Category II	SR 47	1
		SR 278	1
		SR 49	1
	Category III	NA	0
	Category IV	I-90	2
Subtotal Lyman County			25
Total Intersections			**57**

Source: Basin Electric Power Cooperative 2011 (Appendix J, Basin Electric Big Bend to Witten 230-kVTransmission Project Routing Report), ESRI 2008.

3.10.3.3 Electrical Distribution Lines and Substations

Table 3.10-24 lists the situs states and counties the electrical distribution lines and substations would affect. The table also notes counties within 2 miles of the connected actions, to identify potential environmental justice communities that the electrical distribution lines and substations could potentially affect. All of the counties containing or within 2 miles of the electrical distribution lines and substations are also proposed pipeline corridor counties with the exception of Carter County, Montana.

Table 3.10-24 Electrical Distribution Lines and Substations States and Counties

State	Connected Actions Situs Counties	Additional Counties within 2 miles of Connected Actions[a]
Montana	Phillips; Valley; McCone; Dawson; Prairie; Fallon	Carter
South Dakota	Harding; Perkins; Meade; Haakon; Jones; Tripp; Gregory	NA
Nebraska[b]—North	Holt	NA[c]
Nebraska[b]—Central/South	Antelope; Nance; York; Fillmore; Jefferson	Boone; Saline
Kansas	Clay, Butler	

[a] Counties were included if they were within a 4-mile-wide area centered on the connected action centerline.
[b] Nebraska electrical line locations have not yet been determined. The counties were estimated with lines based on the location of the proposed pump stations.
[c] NA = not applicable.

Population and Housing

Tables 3.10-5 and 3.10-7, above, list population and housing data for the states and counties that are also proposed pipeline corridor states/counties. Table 3.10-25 provides data for Carter County, Montana. Carter County experienced a 15 percent decrease in population between 2000 and 2010, while the state of Montana's population decreased by 3 percent. Carter County has just over 800 total housing units, equivalent to approximately 5.5 percent of the Montana pipeline corridor total.

Table 3.10-25 Population and Housing for Non-Pipeline Corridor Counties

	Population				Housing
	2000	2010	Change (percent)	2010 Density (persons per square mile)	Total Units, 2010
Carter, Montana	1,360	1,160	-15	0.3	810

Sources: Population (U.S. Census Bureau, American FactFinder 2012h); 2010 Population (U.S. Census Bureau, American FactFinder 2012g); Population Density (U.S. Census Bureau, American FactFinder 2012j); Housing (U.S. Census Bureau, American FactFinder 2012g).

Local Economic Activity

Income, unemployment, and labor force data for connected action counties that are proposed Project area counties are shown in Table 3.10-9 above. Data for Carter County, Montana are shown in Table 3.10-26. Carter County's unemployment rate in 2010 was 5 percent lower than the rate for Montana (see Table 3.10-9). However, despite the low unemployment rate, the county had a median household income 16 percent lower than the state's rate.

Table 3.10-26 Median Household Income, Unemployment Rate, and Labor Force for Connected Action Counties

	Median Household Income		Unemployment Rate		Labor Force
State	2010 (nominal dollars)[a]	2010 Higher / Lower (-) than State (percent)	2010 (percent)	2010 Higher / Lower (-) than State (percent)	2011
Carter, Montana	35,703	-16	<1	-5	723

Sources: 2000 Median Household Income (U.S. Census Bureau, American FactFinder 2012i); 2010 Median Household Income (U.S. Census Bureau, American FactFinder 2012d); Unemployment Rate (U.S. Census Bureau, American FactFinder 2012a); Labor Force (U.S. Bureau of Labor Statistics 2012).

[a] Nominal dollars are not adjusted for inflation.

Environmental Justice

Environmental justice for pipeline corridor counties is discussed in Section 3.10.2.4, Environmental Justice, above. Carter County, Montana, was also included in the environmental justice analysis because it is within the socioeconomic analysis area. In summary, eight of the counties with electrical distribution lines or substations contain at least one environmental justice population.

Public Services, Tax Revenues, and Property Values

Table 3.10-16 above lists public services data for proposed Project area counties. Table 3.10-27 provides data for Carter County, Montana. Tables 3.10-18 and 3.10-19 give an overview of the revenue resources and property taxes in the project area counties with electrical distribution lines and substations. Data for Carter County are not provided as it is not a connected action situs county and would not receive tax revenues.

Table 3.10-27 Existing Public Services and Facilities for Non- Pipeline Corridor Counties

State/County	Police/Sheriff Departments[a]	Fire Departments[a]	Nearest Medical Facilities[b]
Carter, Montana	1	1	Missouri River Medical Center (Fort Benton); *Great Falls Clinic Medical Center (Great Falls)

[a] Includes special law enforcement units for universities. Includes volunteer, district, city, and town fire.
[b] All facilities listed are critical access facilities within approximately 50 miles of the project; those marked with an asterisk (*) are non-federal, short-term, acute care facilities (American Hospital Directory 2012).

Traffic and Transportation

Table 3.10-28 lists the roads that would be crossed by electrical distribution lines. In addition, the distribution lines would cross the BNSF tracks at three locations in Montana, and the DME railroad at one location in South Dakota.

Table 3.10-28 Roads that would be Crossed by Electrical Distribution Lines

State	Road Category	Road Name	Number of Road Intersections
Montana	Category I		124
	Category II	Marsh Rd	1
		CR 340	1
		SR 24	1
		Yellowstone Rd	1
		SR 117	1
	Category III	SR 200	1
		US 2	3
	Category IV	NA	0
Subtotal Montana			133
South Dakota	Category I		23
	Category II	CR 733	1
		CR 797	1
		CR 867	1
		SR 20	2
		SR 79	1
	Category III	NA	0
	Category IV	NA	0
Subtotal South Dakota			29

State	Road Category	Road Name	Number of Road Intersections
Nebraska	Category I		TBD[a]
	Category II		TBD
	Category III		TBD
	Category IV		TBD
Subtotal Nebraska			TBD
Total Intersections With Proposed Project			**TBD**

Source: exp Energy Services Inc. 2012b, ESRI 2008

[a] TBD = to be determined. Information is pending and will be included in the Final Supplemental EIS, as available.

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3.11 CULTURAL RESOURCES

3.11.1 Introduction

This section discusses cultural resources in the proposed Project area. The description of cultural resources is based on information provided in the 2011 Final Environmental Impact Statement (Final EIS) as well as new circumstances or information relevant to environmental concerns that have become available since the publication of the Final EIS, including the proposed reroute in Nebraska. The information provided here builds on the information provided in the Final EIS, and in many instances, replicates that information with relatively minor changes and updates. Other information is entirely new or substantially altered from that presented in the Final EIS. Specifically, the following information, data, methods, and/or analyses have been substantially updated in this section from the 2011 document:

- An updated description is provided of the cultural resources identified, to date, within the proposed Project. Specific to Nebraska, this section provides new information within the previously unsurveyed, proposed reroute; and
- An updated description is provided of the agency and tribal consultation efforts conducted for the proposed Project to date.

Cultural resources include the locations of human activity, occupation, or usage that contain materials, structures, or landscapes that were used, built, or modified by people. For example, for the proposed TransCanada Keystone Pipeline, LP (Keystone) Project, cultural resources include, but are not limited to, precontact period Native American archaeological sites, historic period farmsteads, and a district of historic buildings. For the purposes of the proposed Project, field studies to identify cultural resources assess archaeological resources (sites), historic resources (buildings, structures, objects, and districts), and properties of religious and cultural significance, including Traditional Cultural Properties (TCPs). The Department does recognize that some Native American tribes view cultural resources and paleontological resources as being one in the same. Paleontological resources identified during construction will be treated, and appropriate parties consulted with, according to the requirements set forth in the Paleontological Monitoring and Mitigation Plan. Paleontological resources are discussed in Section 3.1, Geology.

3.11.2 Regulatory Framework

3.11.2.1 Section 106 National Historic Preservation Act

The proposed Project is considered an *undertaking* consistent with Section 106 of the National Historic Preservation Act (NHPA). The U.S. Department of State (the Department), as the lead federal agency consistent with Section 106, as amended, must consider effects on historic properties before an undertaking occurs. The intent of Section 106 is for federal agencies to take into account the effects of a proposed undertaking on any historic properties situated within the Area of Potential Effect (APE) and to consult with the Advisory Council on Historic Preservation (ACHP), State Historic Preservation Officers (SHPOs), federally recognized Native American tribes and their Tribal Historic Preservation Officers (THPOs), other federal agencies with concurrent undertakings as a result of the proposed Project, local governments, and any other interested parties regarding the proposed undertaking and its potential effects on historic

properties. For this proposed Project, the Department is acting in parallel with its process consistent with the National Environmental Protection Act (NEPA) (see Notice of Intent [NOI], 77 Federal Register 36032).

In this section, the effects on historic properties are analyzed consistent with the regulations of Section 106 as proposed Project *effects*. A *historic property* is defined as any district, archaeological site, building, structure, or object that is either listed, or eligible for listing, in the National Register of Historic Places (NRHP). Under this definition, cultural resources present within a Project's APE are not historic properties if they do not meet the eligibility requirements for listing in the NRHP. For the purposes of this section, the term *historic resource* refers to buildings, structures, objects, and districts that may or may not meet NRHP criteria of evaluation. Likewise, *archaeological resource* refers to a site that may or may not meet the NRHP criteria of evaluation. The term *sites of religious and/or cultural significance* refers to areas of concern to Native American tribes and other consulting parties that, in consultation with the respective party(ies), may or may not be eligible for listing in the NRHP. These sites may also be considered TCPs. To be considered eligible for listing in the NRHP, a property must retain its integrity and be greater than 50 years of age, although there are provisions for listing cultural resources of more recent origin if they are of *exceptional* importance.

The implementing regulation of Section 106 is Title 36 of the Code of Federal Regulations (CFR) Part 800 (2004). This regulation establishes a process of identifying historic properties that may be affected by the proposed undertaking; assessing the undertaking's effects on those resources; and engaging in consultation that seeks ways to avoid, reduce, or mitigate, to the extent practicable, any adverse effects on NRHP-listed or eligible properties. Adverse effects include, but are not limited to, destruction or alteration of all or part of a property; isolation from or alteration of its surrounding environment; introduction of visual, audible, or atmospheric elements that are out of character with the property or that alter its setting; transfer or sale of a federally owned property without adequate conditions or restrictions regarding preservation, maintenance, or use; and neglect of a property resulting in its deterioration or destruction.

When applicable, CFR Title 36 Part 800 specifies that several state, tribal, and federal agencies must be consulted. This includes each SHPO whose state would physically include any portion of the APE. The SHPO is appointed by each state to protect the interests of its citizens with respect to issues of cultural heritage. Section 101(b)(3) of the NHPA provides each SHPO a role in advising the responsible federal agencies. In addition to the SHPO, the lead federal agency works with state and local governments, private organizations, and individuals during the initial planning and development of a process consistent with Section 106.

On non-tribal lands, the Department, in consultation with the SHPOs, federally recognized tribes, and other consulting parties, assesses the need for historic and archaeological resource investigations in the proposed Project APE; generates and approves methodologies for undertaking such investigations within the given state; evaluates the NRHP status of any historic or archaeological resources identified during survey; assesses any potential effects to historic properties; and determines and implements avoidance or other mitigation of adverse effects, to the extent practicable, to historic properties.

On June 15, 2012, the Department issued an NOI to prepare a Supplemental Environmental Impact Statement (Supplemental EIS) consistent with NEPA for the proposed Project. Along

with the NOI, the Department notified the public of its intent to conduct a parallel process consistent with Section 106 along with the process consistent with NEPA.

On September 21, 2012, the Department invited federally recognized tribes to become consulting parties for the proposed Project and notified them that the Department would be the lead federal agency. Section 3.11.4, Consultation, includes information on all of the consulting parties and the consultation process.

The Department is consulting with Native American tribes and the SHPOs regarding the identification, evaluation, and mitigation of historic properties located on non-tribal lands. Additionally, Keystone provided analyses and recommendations to help inform the Department in the process.

3.11.2.2 National Register of Historic Places

Not all archaeological resources, historic resources, or sites of religious and traditional significance are considered historic properties under Section 106. To be designated as a historic property, the resource must be listed, or eligible for listing, in the NRHP. The criteria (36 CFR 60.4 [a–d]) used to evaluate the significance of a resource are as follows:

a. It is associated with events that have made a significant contribution to the broad patterns of American history; or

b. It is associated with the lives of past significant persons; or

c. It embodies 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. It has yielded, or may be likely to yield, information important in history or prehistory.

Properties also need to exhibit integrity of location, materials, setting, design, association, workmanship, and feeling and must also be at least 50 years old. However, a property achieving significance within the past 50 years is eligible if it is of exceptional importance.

The analysis in this Supplemental EIS consists of a summary of cultural resources known to the Department for the proposed Project. This includes cultural resources assessed as being eligible and not eligible for listing in the NRHP, and cultural resources for which NRHP eligibility has not yet been evaluated or will not be evaluated but will be avoided, to the extent practicable. The reported cultural resources are divided into three main time periods: precontact period, historic period, and multi-component. Precontact period resources are sites that contain material evidence of Native American activities before Europeans entered the proposed Project area. Examples of precontact period sites include, but are not limited to: rock art; camp or village sites; rock shelters; and scatters of stone, bone, or ceramic tool-making debris. Historic period resources can include recent Native American activity locations but generally reflect Euro-American activities of the last 250 years. These can include residential, government, or commercial structures; farmsteads; mining sites; roads or railways; and ceramic, metal, and glass artifact scatters. Multi-component period resources are locations where both precontact and historic period cultural resources are present.

3.11.2.3 Properties of Religious and Cultural Significance (Including TCPs)

Historic properties include sites of religious or cultural significance (including TCPs) that meet the NRHP criteria of eligibility but that do not necessarily have physical evidence of human activity. National Register Bulletin 38 defines TCPs as locations that embody the "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" that are essential for continuing the cultural identity of the community. In some tribal cultures, culture and religion are intertwined, in which case a historic property may have both cultural and religious significance (National Park Service [NPS] 1998).

Typically, knowledgeable groups and individuals, particularly those groups that are native to an area or have a particular interest in the area, are directly involved in the TCP studies performed for a project. Funding for TCP studies was previously offered to consulting tribes as part of the process consistent with Section 106 for the route evaluated in the Final Environmental Impact Statement (Final EIS). The Native American tribes that have completed TCP studies under this program for the portions of the proposed Project that were also evaluated in the Final EIS are discussed in Section 3.11.4.3. The Department has consulted and will continue to consult with Native American tribes to assist in determining the best ways to identify, evaluate, and mitigate potential effects to TCPs, as demonstrated in the TCP study program, Tribal Monitoring Plan, Unanticipated Discovery Plans, and PA. This tribal consultation is summarized in Section 3.11.4.3, Tribal Consultation.

3.11.2.4 Archaeological Resources Protection Act and Native American Graves Protection and Repatriation Act

The Archaeological Resources Protection Act of 1979 (ARPA) (16 United States Code 470; 43 CFR 7) requires federal land-owning agencies to issue ARPA permits to qualified individuals, institutions, or firms that conduct archaeological surveys within federal and Native American lands[1]. The proposed Project has the potential to be within federally controlled, maintained, managed, or owned lands, including Bureau of Land Management (BLM) lands and those lands managed by the NPS and Bureau of Reclamation (BOR).

The Native American Graves Protection and Repatriation Act (NAGPRA 1990) applies to all federal and tribal lands. NAGPRA effectively protects tribal burial sites and rights to items of cultural significance, including human remains, funerary objects, sacred objects, and objects of cultural patrimony (25 United States Code 3001[3]; 43 CFR 10). On federal lands, intentional excavation and removal of Native American human remains and objects from federal or tribal lands for discovery, study, or removal is permissible only if an ARPA permit is issued by a federal land-holding agency. Consultation with Native Americans must occur prior to the issuance of an ARPA permit and removal of human remains and objects requires the consent of the applicable Native American tribe. NAGPRA applies to all federal and tribal lands affected by the proposed Project.

[1] The proposed Project route does not cross any "Indian Land" as designated by the federal government.

Montana, South Dakota, Nebraska, North Dakota, and Kansas each have statutes that govern the inadvertent discovery and/or excavation of human remains as well as associated artifacts on private lands.

3.11.3 Cultural Setting

3.11.3.1 Cultural Context

The proposed Project area contains cultural resources resulting from human settlement and other activities since the time when the region was glaciated. These include archaeological sites, special activity areas such as food processing sites, cemeteries, and sites of spiritual and traditional use. Later historic features include mining-related resources, railroads, commercial buildings, domestic residences, and agricultural buildings. Many of these cultural resources are associated with mineral exploration, transportation, settlement, logging, and agricultural production. Lands and resources within and outside the respective Native American reservations are important to Native American peoples for subsistence gathering, collection of plants for medicines, spiritual and ceremonial purposes, and everyday life. This section, therefore, summarizes the cultural resources aspects of the proposed Project in relation to each individual affected state.

3.11.3.2 Area of Potential Effect

The APE is defined as the "geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist" (36 CFR 800.16(d)). For the purposes of the proposed Project and consistent with Section 106 of the NHPA, the APE for Montana and South Dakota is a 300-foot-wide survey area that includes a 110-foot-wide construction right-of-way (ROW). A 50-foot-wide permanent ROW would be retained to accommodate proposed Project operations and maintenance. The 300-foot-wide corridor allows for minor adjustments or route variations as they become known. For the proposed route in Nebraska, the APE consists of a 300-foot-wide survey corridor in areas consistent with the route evaluated in the Final EIS. Within those areas outside the route evaluated in the Final EIS, the APE consists of a 500-foot-wide survey corridor, centered on the proposed pipeline centerline. Other areas that may lie outside of the proposed construction ROW, but that are considered a part of the proposed APE, include construction camps, temporary work spaces, access roads, storage/warehouse yards, pump stations, and valves. For these parts of the proposed Project outside of the construction ROW, the APE is the actual construction footprint.

Where access was available, cultural resource surveys were conducted within the APE for the proposed Project by consultants employed by Keystone. The titles and authors of the cultural resource surveys are listed below in Section 3.11.3.3, Cultural Resources Surveys, in the state-by-state descriptions. The survey results were submitted by Keystone to the Department, reviewed, and either approved or sent back to Keystone for additional information. Once the Department was satisfied with the content of individual survey reports, a preliminary determination of NHPA eligibility and effects was completed, and reports were then sent to the SHPOs and consulting parties for their review and concurrence. For areas where surveys are ongoing, the Department will continue to consult with state and federal agencies and Native American tribes about the significance of the sites and work to avoid, to the extent practicable,

any adverse effects to the resources. The proposed Project APEs through each state and the respective counties are described in Table 3.11-1.

Table 3.11-1 Area of Potential Effect for the Proposed Project by State

State	Counties	Area of Potential Effect
Montana	Dawson, Fallon, McCone, Phillips, Prairie, Roosevelt, Sheridan, and Valley	300 feet plus ancillary facilities
South Dakota	Butte, Gregory, Haakon, Harding, Hughes, Jones, Lyman, Meade, Pennington, Perkins, and Tripp	300 feet plus ancillary facilities
Nebraska	Antelope, Boone, Boyd, Fillmore, Holt, Jefferson, Keya Paha, Merrick, Nance, Polk, Saline, and York	300 feet (in areas evaluated in the Final EIS) and 500 feet (in all others) plus ancillary facilities
North Dakota	Bowman	Area of soil disturbance related to rail siding and pipe storage location
Kansas	Butler and Clay	Area of soil disturbance related to two pumping stations

3.11.3.3 Cultural Resources Surveys

Montana

Within Montana, the proposed Project would cross private and state lands in Dawson, Fallon, McCone, Phillips, Prairie, Roosevelt, Sheridan, and Valley counties, in addition to BLM and U.S. Army Corps of Engineers (USACE) lands and NPS-managed lands. Prior to initiation of Montana fieldwork, literature searches were conducted for the proposed Project route. These pre-fieldwork literature searches occurred as follows:

- On April 14-18, 2008; May 23, 2008; and November 29, 2011, using Montana SHPO Cultural Resources Annotated Bibliography System Report and the Cultural Resource Information Systems Report under SHPO Project Numbers 2008052306 and 2010112303, respectively;
- On April 23, 2008, using records at the BLM Miles City Field Office; and
- In 2009 and 2010 prior to each addendum report field survey program.

Cultural resource surveys in Montana summarized in this Supplemental EIS were conducted between 2008 and 2012. Since the issuance of the Final EIS, Keystone has incorporated a total of 64 route modifications, as recommended by the Montana Department of Environmental Quality (MDEQ), and based on discussions with agencies and landowners. All route modifications outside the 300-foot-wide APE have been or will be surveyed. Cultural resources reports documenting these surveys are submitted to the Department upon completion; those submitted as of October 2012 are listed below:

- Berg, Caryn, Judith Cooper, Jennifer Long, Zonna Barnes, Nelson Klitzka, Thomas Witt, Ryan Byerly, Daniel Shosky, Vanesa Zietz, Carolyn Riordan, Sean Doyle, Jason Burkard, Andrew Kincaid, Norma K. Crumbley, Erin Salisbury, Scott A. Slessman, Michael Retter, and Rebecca Schwendler. 2008a. Class III Cultural Resources Survey for the Steele City Segment in Montana of the Keystone XL Project, Dawson, Fallon, McCone, Phillips, Prairie, and Valley Counties, Montana. SWCA Environmental Consultants. Broomfield, CO.
- Cooper, Judith, Zonna Barnes, Caryn M. Berg, Nelson Klitzka, Ashley Fife, Courtney Higgins, Ryan Byerly, Jennifer Long, Thomas Witt, Sean Doyle, Scott A. Slessman, and Erin Salisbury. 2009. Addendum 1: Additional Fieldwork Results. Class III Cultural Resources Survey for the Steele City Segment in Montana of the Keystone XL Project, Dawson, Fallon, McCone, Phillips, Prairie, and Valley Counties, Montana. SWCA Environmental Consultants. Broomfield, CO.
- Zietz, Vanesa, Judith Cooper, Zonna Barnes, Nelson Klitzka, Courtney Higgins, Carolyn Riordan, Nicole Kromarek, Thomas Witt, Sean Doyle, Scott A. Slessman, Erin Salisbury, and Michael Retter. 2009. Addendum 2: Additional Fieldwork Results. Class III Cultural Resources Survey for the Steele City Segment in Montana of the Keystone XL Project, Dawson, Fallon, McCone, Phillips, Prairie, and Valley Counties, Montana. SWCA Environmental Consultants. Broomfield, CO.
- Baer, Sarah Baer, Zonna Barnes, Vanesa Zietz, Nicole Hurlburt, Thomas Witt, Sean Doyle, Karen Reed, and Erin Salisbury. 2009. Addendum 3: Additional Fieldwork Results. Class III Cultural Resources Survey for the Steele City Segment in Montana of the Keystone XL Project, Dawson, Fallon, McCone, Phillips, Prairie, and Valley Counties, Montana. SWCA Environmental Consultants. Broomfield, CO.
- Marmor, Jason, Thomas Witt, Sean Doyle, Zonna Barnes and Erin Salisbury. 2010a. Addendum 4: Architectural Field Inspection and Visual Impact Analysis. Class III Cultural Resources Survey for the Steele City Segment in Montana of the Keystone XL Project, Dawson, Fallon, McCone, Phillips, Prairie, and Valley Counties, Montana. SWCA Environmental Consultants. Broomfield, CO.
- Crossland, Nicole, Zonna Barnes, Erin Salisbury, Jason Burkard, Thomas Witt, Sean Doyle, Noelle Boyer, and Nicole Hurlburt. 2010. Addendum 5: Additional Fieldwork Results. Class III Cultural Resources Survey for the Steele City Segment in Montana of the Keystone XL Project, Dawson, Fallon, McCone, Phillips, Prairie, and Valley Counties, Montana. SWCA Environmental Consultants. Broomfield, CO.
- Burkard, Jason, Zonna Barnes, Erin Salisbury, Sarah Johnson, and Sean Doyle. 2011a. Class III Cultural Resources Survey for the Steele City Segment in Montana of the Keystone XL Project, Turtle Mountain Route Variation, Phillips County, Montana. SWCA Environmental Consultants. Broomfield, CO.
- Johnson, Sarah, Jason Burkard, Sean Doyle, Thomas Witt, Zonna Barnes, and Erin Salisbury. 2012. Addendum 6: Additional Fieldwork Results. Class III Cultural Resources Survey for the Keystone XL Project, Dawson, Fallon, McCone, Phillips, Prairie, Roosevelt, Sheridan, and Valley Counties, Montana. SWCA Environmental Consultants. Broomfield, CO.

- Phillips, Scott, Jason Burkard, Katie Dumm, Sarah Baer, and Erin Salisbury. 2012. Archaeological Test Excavations at Five Cultural Resource Sites Associated with the Steele City Segment of the Keystone XL Pipeline, Valley County, Montana. SWCA Environmental Consultants. Broomfield, CO.
- Salisbury, Erin. 2012. Letter Report to Jon Schmidt, exp. RE: Keystone XL Pipeline Project: Saint Marie/Glasgow Air Force Base Pipe Yard in Valley County, Montana. August 22.

Cultural resources surveys conducted through October 2012 within Montana included the following:

- Approximately 500 miles of the proposed Project corridor (including route modifications);
- Approximately 150 miles of access roads; and
- Approximately 2,737 acres of proposed ancillary facility sites (e.g., access roads, pump stations, and construction camps).

To date, 148 cultural resources have been identified during the cultural resources surveys within the proposed Project APE in Montana, including 110 archaeological sites and 38 historic structures. Of these, 139 are new and nine were previously identified. Of the 148 cultural resources, 30 are eligible for inclusion on the NRHP, 56 are not eligible, and 62 have not been evaluated. The results of the surveys performed, recommendations of eligibility by Keystone's consultants, determinations of eligibility by the Department, and concurrences from SHPO are shown in Table 3.11-2.

Table 3.11-2 Cultural Resources Identified in Montana within the Project APE

Site #	Description	NRHP Eligibility Recommendation from Applicant	NRHP Determination by the Department	Montana SHPO/THPO Concurrence with Department Findings
C001DA003	Historic isolate	Not Eligible	Not Eligible	Concur
C57DA001	Precontact isolate	Not Eligible	Not Eligible	Concur
C57DA008	Historic isolate	Not Eligible	Not Eligible	Concur
C277DA002	Precontact isolate	Not Eligible	Pending	Pending
24DE0555	Historic berm	Not Eligible	Pending	Pending
24DW0289 (five segments)	Previously recorded historic canal	Eligible	Eligible,	Pending
24DW0419 (two segments)	Previously recorded historic railroad	Eligible	Eligible	Pending
24DW0426 (four segments)	Previously recorded historic railroad	Eligible	Eligible,	Pending
24DW0524	Historic transportation corridor	Not Eligible	Not Eligible	Concur
24DW0530	Historic homestead	Not Eligible	Not Eligible	Concur
24DW0531	Historic homestead	Not Eligible	Not Eligible	Concur
24DW055*	Pending	Not Eligible	Pending	Pending
24DW0551	Precontact open camp	Eligible	Eligible	Pending
24DW0552	Historic homestead/ farmstead	Not Eligible	Not Eligible	Concur
24DW0553	Historic road	Not Eligible	Not Eligible	Concur

Site #	Description	NRHP Eligibility Recommendation from Applicant	NRHP Determination by the Department	Montana SHPO/THPO Concurrence with Department Findings
24DW0555	Historic berm	Not Eligible	Pending	Pending
C711DW001	Pending	Unevaluated	Pending	Pending
C711DW005	Pending	Unevaluated	Pending	Pending
C711DW006	Pending	Unevaluated	Pending	Pending
24FA0382	Previously recorded historic railroad	Eligible	Eligible,	Pending
24FA0749	Historic pump house	Not Eligible	Not Eligible	Concur
24FA0750	Precontact lithic scatter	Unevaluated	Pending	Pending
24FA0751	Historic debris scatter	Not Eligible	Not Eligible	Concur
24FA0756	Historic berm/dam	Not Eligible	Not Eligible	Concur
24FA076*	Pending	Not Eligible	Pending	Pending
24FA0760	Historic well	Not Eligible	Not Eligible	Concur
24FA0761	Historic windmill/well pump	Not Eligible	Not Eligible	Concur
24FA0763	Historic rock cairn	Not Eligible	Not Eligible	Concur
24FA0770	Historic artifact scatter	Not Eligible	Not Eligible	Concur
C001FA003	Precontact isolate	Not Eligible	Not Eligible	Concur
C57FA006	Historic isolate	Not Eligible	Not Eligible	Concur
C58FA001	Precontact isolate	Not Eligible	Not Eligible	Concur
C58FA002	Precontact isolate	Not Eligible	Not Eligible	Concur
C58FA003	Precontact isolate	Not Eligible	Not Eligible	Concur
C58FA004	Precontact isolate	Not Eligible	Not Eligible	Concur
C104FA002	Precontact isolate	Not Eligible	Not Eligible	Concur
C210FA001	Precontact isolate	Not Eligible	Not Eligible	Concur
C711FA001	Pending	Unevaluated	Pending	Pending
C711FA002	Precontact isolate	Not Eligible	Pending	Pending
24MC0461	Precontact stone circle	Potentially Eligible	Pending	Pending
24MC0462	Undated stone cairn	Potentially Eligible	Eligible	Pending
24MC0463	Precontact stone feature and lithic scatter	Potentially Eligible	Eligible	Pending
24MC0464	Historic homestead	Unevaluated	Pending	Pending
24MC0465	Precontact stone feature and lithic scatter	Potentially Eligible	Eligible	Pending
24MC0466	Precontact stone feature	Potentially Eligible	Pending	Pending
24MC0467	Precontact stone alignment and lithic scatter	Potentially Eligible	Pending	Pending
24MC0476	Precontact stone circle	Potentially Eligible	Pending	Pending
24MC0480	Undated stone cairns	Potentially Eligible	Not Eligible	Concur
24MC0481	Undated stone cairns	Potentially Eligible	Pending	Pending
24MC0483	Historic windmill	Not Eligible	Not Eligible	Concur
24MC0485	Precontact open camp	Eligible	Pending	Pending
24MC0486	Precontact open camp	Eligible	Pending	Pending
24MC0628	Historic farmstead	Unevaluated	Pending	Pending
C001MC003	Precontact isolate	Not Eligible	Not Eligible	Concur
C54MC001	Precontact isolate	Not Eligible	Not Eligible	Concur
C56MC006	Precontact isolate	Not Eligible	Not Eligible	Concur
C56MC007	Precontact isolate	Not Eligible	Not Eligible	Concur
C56MC009	Precontact isolate	Not Eligible	Not Eligible	Concur

Site #	Description	NRHP Eligibility Recommendation from Applicant	NRHP Determination by the Department	Montana SHPO/THPO Concurrence with Department Findings
C104MC001	Historic isolate	Not Eligible	Not Eligible	Concur
C277MC001	Precontact isolate	Not Eligible	Not Eligible	Pending
C700MC001	Pending	Unevaluated	Pending	Pending
C711MC001	Precontact isolate	Not Eligible	Pending	Pending
C711MC002	Precontact isolate	Not Eligible	Pending	Pending
C711MC003	Pending	Unevaluated	Pending	Pending
24PE0720	Historic farmstead	Unevaluated	Not Eligible	Pending
24PE0723	Historic ranch complex	Unevaluated	Pending	Pending
24PH0037	Previously recorded undated stone cairn and depression	Potentially Eligible	Pending	Pending
24PH008/ 1781/1801	Previously recorded precontact stone circle	Potentially Eligible	Eligible	Pending
24PH1759	Previously recorded precontact stone circle	Potentially Eligible	Eligible	Pending
24PH1790	Previously recorded historic rock cairns/ depression/artifact scatter	Unevaluated	Eligible	Pending
24PH1805	Previously recorded historic homestead	Unevaluated	Pending	Pending
24PH4161	Undated stone cairns	Potentially Eligible	Eligible	Pending
24PH4162	Precontact/historic stone features	Potentially Eligible	Eligible	Pending
24PH4218	Previously recorded precontact stone feature	Potentially Eligible	Eligible	Pending
24PH4265	Precontact stone circle	Potentially Eligible	Eligible	Pending
24PH4267	Historic farmstead	Eligible	Eligible	Concur
24PH4269	Precontact stone circle	Potentially Eligible	Eligible	Pending
24PH4313	Precontact stone circle	Potentially Eligible	Pending	Pending
24PH4367	Precontact stone feature	Potentially Eligible	Pending	Pending
24PH4368	Precontact stone cairn	Potentially Eligible	Pending	Pending
24PH4369	Precontact stone circle and artifact scatter	Potentially Eligible	Pending	Pending
24PH4370	Precontact stone cairn	Potentially Eligible	Pending	Pending
24PH4371	Precontact stone cairn	Potentially Eligible	Pending	Pending
24PH4372	Precontact stone cairns	Potentially Eligible	Pending	Pending
24PH4373	Precontact stone cairn	Potentially Eligible	Pending	Pending
24PH4374	Historic irrigation ditch	Not Eligible	Pending	Pending
C54PH002	Precontact isolate	Not Eligible	Not Eligible	Concur
C63PH006	Historic isolate	Not Eligible	Not Eligible	Concur
C001PR002	Precontact isolate	Not Eligible	Not Eligible	Concur
C58PR002	Precontact isolate	Not Eligible	Not Eligible	Concur
C58PR004	Precontact isolate	Not Eligible	Not Eligible	Concur
C58PR005	Precontact isolate	Not Eligible	Not Eligible	Concur
C58PR006	Precontact isolate	Not Eligible	Not Eligible	Concur
C54VA006	Historic isolate	Not Eligible	Not Eligible	Concur
C54VA008	Historic isolate	Not Eligible	Not Eligible	Concur
C55VA005	Precontact isolate	Not Eligible	Not Eligible	Concur

Site #	Description	NRHP Eligibility Recommendation from Applicant	NRHP Determination by the Department	Montana SHPO/THPO Concurrence with Department Findings
C55VA006	Precontact isolate	Not Eligible	Not Eligible	Concur
C55VA007	Historic isolate	Not Eligible	Not Eligible	Concur
C55VA013	Precontact isolate	Not Eligible	Not Eligible	Concur
C512VA002	Historic Isolate	Not Eligible	Pending	Pending
C711VA004	Pending	Unevaluated	Pending	Pending
C711VA008	Precontact isolate	Not Eligible	Pending	Pending
C711VA010	Pending	Unevaluated	Pending	Pending
C711VA014	Pending	Unevaluated	Pending	Pending
24VL0041	Previously recorded historic homestead	Eligible	Eligible	Pending
24VL0099 (nine segments)	Previously recorded historic railroad	Eligible	Eligible	Pending
24VL0805	Previously recorded undated stone cairn	Potentially Eligible	Pending	Pending
24VL0938	Previously recorded precontact stone circle	Unevaluated	Pending	Pending
24VL0962	Previously recorded precontact/historic stone feature site, lithic scatter, historic artifact scatter	Potentially Eligible	Pending	Pending
24VL0972	Previously recorded precontact/historic stone circle and cairn, historic fence line	Potentially Eligible	Pending	Pending
24VL0979	Historic homestead	Eligible	Eligible	Concur
24VL1194	Previously recorded historic canal	Eligible	Eligible	Concur
24VL1269/ 24VL1274	Previously recorded precontact stone circle	Potentially Eligible	Pending	Pending
24VL1298	Previously recorded historic homestead/ precontact stone circle	Potentially Eligible	Eligible	Pending
24VL1628 (two segments)	Previously recorded historic railroad	Eligible	Eligible	Concur
24VL1700	Precontact stone feature	Potentially Eligible	Pending	Pending
24VL1701	Pending	Unevaluated	Pending	Pending
24VL1712	Previously recorded precontact stone feature	Potentially Eligible	Eligible	Pending
24VL1889	Historic canal	Not Eligible	Not Eligible	Concur
24VL1890	Historic artifact scatter	Not Eligible	Not Eligible	Concur
24VL1892	Historic artifact scatter	Not Eligible	Not Eligible	Concur
24VL1900	Undated stone cairn	Potentially Eligible	Not Eligible	Concur
24VL1901	Historic fence line and associated debris	Not Eligible	Not Eligible	Concur
24VL1902	Precontact stone circle	Potentially Eligible	Eligible	Pending
24VL1903	Precontact stone circle	Potentially Eligible	Eligible	Pending
24VL1905	Undated stone cairn	Potentially Eligible	Not Eligible	Concur
24VL1906	Undated stone feature	Potentially Eligible	Pending	Pending
24VL1910	Precontact stone circle	Potentially Eligible	Eligible	Pending

Site #	Description	NRHP Eligibility Recommendation from Applicant	NRHP Determination by the Department	Montana SHPO/THPO Concurrence with Department Findings
24VL1911	Undated stone cairn	Potentially Eligible	Not Eligible	Concur
24VL1912	Historic homestead	Potentially Eligible	Pending	Pending
24VL1913	Undated stone cairn	Potentially Eligible	Pending	Pending
24VL1919	Precontact stone circle	Potentially Eligible	Pending	Pending
24VL1920	Historic artifact scatter	Unevaluated	Pending	Pending
24VL1928	Undated stone cairn	Potentially Eligible	Not Eligible	Concur
24VL1929	Precontact stone feature	Potentially Eligible	Eligible	Pending
24VL1933	Precontact stone circle	Potentially Eligible	Pending	Pending
24VL1936	Precontact stone feature	Potentially Eligible	Pending	Pending
24VL1938	Historic ranch complex	Unevaluated	Pending	Pending
24VL1940	Historic farmstead	Unevaluated	Pending	Pending
24VL1942	Historic artifact scatter/ precontact stone circle	Potentially Eligible	Pending	Pending
24VL1946	Precontact stone circle	Potentially Eligible	Eligible	Pending
24VL1965	Precontact stone circle	Unevaluated	Pending	Pending
24VL1968	Precontact stone circle	Unevaluated	Pending	Pending
24VL1969	Historic stone alignment	Not Eligible	Not Eligible	Concur
24VL1972	Historic ditch	Not Eligible	Not Eligible	Concur
24VL1985	Historic road grade	Not Eligible	Pending	Pending
24VL1991	Saint Marie/Glasgow Air Force Base	Eligible	Pending	Pending
Lewis and Clark National Historic Trail (two segments)	Historic trail	Eligible	Eligible	Pending

As of October 2012, the following areas remain unsurveyed, and are the subject of ongoing field studies:

- Approximately 65 acres of proposed Project corridor;
- Approximately 13 acres of access roads; and
- No ancillary facilities.

Additional cultural resource surveys for the proposed Project corridor and access roads are ongoing. These reports will be reviewed by the Department and then forwarded to the applicable consulting parties consistent with 36 CFR 800. Cultural resources in Montana are further separated by type (e.g., archaeological sites, stone circles sites, historic structures, and historic trails) and discussed below.

Archaeological Sites

Within the APE, 110 sites were identified including the following:

- Six previously recorded precontact stone feature sites;
- Fifty-nine newly recorded precontact sites, of which 28 are isolated finds, 27 are stone features, and 4 are artifact scatters;
- One previously recorded historic stone feature site;

- Sixteen newly recorded historic sites, of which nine are isolated finds, two are stone features, and five are artifact scatters;
- Two previously recorded multicomponent sites, including evidence of both precontact and historic activity;
- Two newly recorded multicomponent sites; and
- Twenty-four sites that are undetermined concerning a time period.

Of these, 18 are eligible for inclusion in the NRHP, 42 are not eligible, and 50 are unevaluated or pending eligibility determinations/concurrence. By definition, the isolated finds are not eligible for listing in the NRHP. Of the 110 archaeological sites, 50 remain unevaluated and may be eligible for inclusion in the NRHP. The Department will continue to consult with state and federal agencies and Native American tribes about the significance of the sites and work to avoid any detrimental adverse effects to the resources, to the extent practicable. If impacts to sites can be avoided, further evaluation of their NRHP eligibility may not be completed. For a list of dates regarding Department consultation with Native American tribes, please refer to Appendix E, Record of Consultation.

Stone Circle Sites

Stone circles are stone features that represent a precontact-period Native American settlement in Montana. Stone circles are made up of stones assembled in concentric rings and were used by Native Americans to anchor their dwellings. Sites can consist of a single ring to many dozen. Stone circle sites often include additional features such as pits and hearths, and may include artifacts such as fire cracked rock, animal bone, and stone artifacts. The proposed Project APE contains 33 stone circle sites that were identified during cultural resource surveys that are either potentially eligible or unevaluated (Table 3.11-2). The recordation and evaluation of these sites are guided by the *Recordation Standards and Evaluation Guidelines for Stone Circle Sites* (Montana SHPO 2002). The Department will continue to work with the Native American tribes, BLM, Montana SHPO, and Keystone to avoid or mitigate, to the extent practicable, sites that could be adversely affected by the proposed Project. Previously, the Department conducted site visits with the Blackfeet and Chippewa-Cree tribes and BLM and MDEQ along the proposed Project route in Montana to consult on and discuss stone circle sites, identify avoidance options, and describe proposed Project effects. For a list of dates regarding Department consultation with Montana Native American tribes, please refer to Appendix E, Record of Consultation.

Historic Structures

Within the APE, 38 historic structures were identified, including the following:

- Eleven structures were previously recorded, including homesteads, railroads, a canal, and a trail; and
- Twenty-seven structures were newly recorded, including homesteads, farmsteads, agricultural structures, canals/irrigations features, roads, and an air force base.

Avoidance is recommended for all eligible or unevaluated sites, to the extent practicable. Twelve historic structures are eligible for inclusion in the NRHP, 14 are not eligible, and 12 are unevaluated or pending eligibility determinations/concurrence. Additional research will be

conducted to determine NRHP eligibility and proposed Project effects. For those historic properties where avoidance is not feasible, a mitigation plan would be prepared consistent with the stipulations of the Programmatic Agreement (PA) (see Section 3.11.3.4, Programmatic Agreement).

Historic Trail

The proposed Project route crosses the Lewis and Clark National Historic Trail (LCNHT) at two locations. Although cultural resources investigations conducted in the vicinity of the trail did not identify any archaeological remains, historic artifacts, or culturally constructed features associated with the LCNHT, the Missouri River and the Yellowstone River corridors are within a BLM Special Resource Management Area established for the LCNHT. Also, the LCNHT is not generally defined by physical trail remains. The tangible elements of the LCNHT along the proposed Project corridor are defined by the rivers and river banks that the Lewis and Clark route followed, with the maintenance of the historic setting of this route along these river ways, comparable to the natural descriptions found in expedition journals, being integral to the resource. There is no adverse effect to the LCNHT route since it is not possible to define an exact location or any physical trail remains where the expedition crossed the proposed Project route. The Department will continue to work with the NPS to determine and implement avoidance or other mitigation of adverse effects, to the extent practicable, to historic properties potentially to be affected by the proposed Project.

South Dakota

Within South Dakota, the proposed Project would cross state and private lands in Butte, Gregory, Haakon, Harding, Hughes, Jones, Lyman, Meade, Pennington, Perkins, and Tripp counties. Prior to the initiation of South Dakota fieldwork, literature searches were conducted for the proposed Project route. These pre-fieldwork literature searches occurred as follows:

- On May 7 and 8, 2008; and May 26, 2011, at the South Dakota State Archaeological Resource Center; and
- In 2009 and 2010 prior to each addendum report field survey program.

Cultural resources surveys in South Dakota summarized in this Supplemental EIS were conducted between 2008 and 2012. Since the issuance of the Final EIS, Keystone has made 51 route modifications in South Dakota based on discussions with agencies and landowners. All route modifications outside the 300-foot-wide APE have been or will be surveyed. Cultural resources reports documenting these surveys were submitted to the Department upon completion and are listed below:

- Berg, Caryn M., Judith Cooper, Zonna Barnes, Jennifer Long, Ryan Byerly, Daniel Shosky, Vanesa Zietz, Norma K. Crumbley, Courtney Higgins, Noelle Boyer, Jason Burkard, Thomas Witt, Sean Doyle, Erin Salisbury, Scott A. Slessman, and Michael Retter. 2008b. Level III Cultural Resources Survey for the Steele City Segment in South Dakota of the Keystone XL Project, Butte, Haakon, Harding, Jones, Lyman, Meade, Perkins, and Tripp Counties, South Dakota. SWCA Environmental Consultants. Broomfield, CO.

- Barnes, Zonna, Nelson Klitzka, Thomas Witt, Sean Doyle, Judith Cooper, Erin Salisbury, Guy Hepp, Caryn M. Berg, Scott A. Slessman, and Michael Retter. 2009. Addendum 1: Additional Fieldwork Results. Level III Cultural Resources Survey for the Steele City Segment in South Dakota of the Keystone XL Project, Butte, Haakon, Harding, Jones, Lyman, Meade, Perkins, and Tripp Counties, South Dakota. SWCA Environmental Consultants. Broomfield, CO.
- Doyle, Sean, Zonna Barnes, Vanesa Zietz, Nelson Klitzka, Thomas Witt, Judith Cooper, Carolyn Riordan, Erin Salisbury, and Elizabeth Kreider. 2009. Addendum 2: Additional Fieldwork Results. Level III Cultural Resources Survey for the Steele City Segment in South Dakota of the Keystone XL Project, Butte, Haakon, Harding, Jones, Lyman, Meade, Perkins, Tripp, and Gregory Counties, South Dakota. SWCA Environmental Consultants. Broomfield, CO.
- Salisbury, Erin, Zonna Barnes, Sarah Baer, Vanesa Zietz, Nicole Hurlburt, Thomas Witt, and Sean Doyle. 2010. Addendum 3: Additional Fieldwork Results. Level III Cultural Resources Survey for the Steele City Segment in South Dakota of the Keystone XL Project, Butte, Haakon, Harding, Jones, Lyman, Meade, Perkins, Tripp, and Gregory Counties, South Dakota. SWCA Environmental Consultants. Broomfield, CO.
- Marmor, Jason, Thomas Witt, Sean Doyle, Zonna Barnes and Erin Salisbury. 2010b. Addendum 4: Architectural Field Inspection and Visual Impact Analysis. Level III Cultural Resources Survey for the Steele City Segment in South Dakota of the Keystone XL Project, Butte, Haakon, Harding, Jones, Lyman, Meade, Perkins, Tripp, and Gregory Counties, South Dakota. SWCA Environmental Consultants. Broomfield, CO.
- Boyer, Noelle, Erin Salisbury, Zonna Barnes, and Sean Doyle. 2010. Addendum 5: Additional Fieldwork Results. Level III Cultural Resources Survey for the Steele City Segment in South Dakota of the Keystone XL Project, Butte, Haakon, Harding, Jones, Lyman, Meade, Perkins, Tripp, and Gregory Counties, South Dakota. SWCA Environmental Consultants. Broomfield, CO.
- Burkard, Jason, Erin Salisbury, and Zonna Barnes. 2010. Addendum 6: Additional Fieldwork Results. Level III Cultural Resources Survey for the Steele City Segment in South Dakota of the Keystone XL Project, Butte, Haakon, Harding, Jones, Lyman, Meade, Perkins, and Tripp Counties, South Dakota. SWCA Environmental Consultants. Broomfield, CO.
- Zietz, Vanesa, Sarah Johnson, Noelle Boyer, Sean Doyle, Thomas Witt, Zonna Barnes and Erin Salisbury. 2012. Addendum 7: Additional Fieldwork Results. Level III Cultural Resources survey for the Keystone XL Pipeline in South Dakota of the Keystone XL Project, Butte, Haakon, Harding, Hughes, Jones, Lyman, Meade, Perkins, and Tripp Counties, South Dakota. SWCA Environmental Consultants. Broomfield, CO.
- Salisbury, Erin. 2011. Letter to Dr. Schmidt: RE Keystone XL Pipeline Project—Additional Subsurface Testing of Three Isolated Finds in Harding County, South Dakota. SWCA Environmental Consultants. Broomfield, CO.

Cultural resources surveys conducted through October 2012 within South Dakota included:

- Approximately 343 miles of the proposed Project corridor;
- Approximately 41 miles of access roads; and
- Approximately 2,798 acres of proposed ancillary facility sites.

To date, 137 cultural resources have been identified during the cultural resources surveys within the Project APE in South Dakota, including 112 archaeological sites and 25 historic structures. Of these, one is new and 136 were previously identified. Of the 137 cultural resources, nine are eligible for inclusion on the NRHP, 82 are not eligible, and 46 have not been evaluated. The results of the surveys performed, recommendations of eligibility by Keystone's consultants, determinations of eligibility by the Department, and concurrences from SHPO are shown in Table 3.11-3.

Table 3.11-3 Cultural Resources Identified in South Dakota within the Project APE

Site #	Description	NRHP Eligibility Recommendation from Applicant	NRHP Determination by the Department	South Dakota SHPO/THPO Concurrence with Department Finding
39BU0039	Precontact stone circle	Potentially Eligible	Pending	Pending
39BU0447	Precontact isolate	Not Eligible	Not Eligible	Concur
39BU0448	Historic artifact scatter/ precontact isolate	Unevaluated	Pending	Pending
39BU0449	Undated stone cairn	Potentially Eligible	Pending	Pending
39GR0159	Precontact isolate	Not Eligible	Not Eligible	Concur
39GR0160	Historic artifact scatter	Not Eligible	Not Eligible	Concur
39GR0161	Precontact isolate	Not Eligible	Not Eligible	Concur
39GR0162	Precontact isolate	Not Eligible	Not Eligible	Concur
39GR0163	Historic well and artifact scatter/ precontact artifact scatter	Not Eligible	Not Eligible	Concur
39GR0164	Historic isolate	Not Eligible	Not Eligible	Concur
39GR0165	Historic farmstead	Eligible	Eligible	Concur
39GR0166	Historic farmstead	Unevaluated	Pending	Pending
39GR0167	Historic isolate	Not Eligible	Not Eligible	Concur
39GR0168	Historic farmstead	Unevaluated	Pending	Pending
39GR0169	Historic farmstead	Eligible	Eligible	Concur
39GR0170	Historic foundation and artifact scatter	Not Eligible	Not Eligible	Concur
39GR0171	Historic farmstead	Unevaluated	Pending	Pending
39GR0172	Historic farmstead	Unevaluated	Pending	Pending
39GR0173	Precontact isolate	Not Eligible	Not Eligible	Concur
C710HA001	Historic can scatter	Unevaluated	Pending	Pending
C710HA003	Precontact site	Unevaluated	Pending	Pending
C710HA004	Precontact site	Unevaluated	Pending	Pending
C710HA005	Precontact site	Unevaluated	Pending	Pending
C710HA009	Precontact site	Unevaluated	Pending	Pending
C710HA010	European-American rock art	Unevaluated	Pending	Pending
C710HA011	Historic irrigation system	Unevaluated	Pending	Pending
C710HA013	Pending	Unevaluated	Pending	Pending

Site #	Description	NRHP Eligibility Recommendation from Applicant	NRHP Determination by the Department	South Dakota SHPO/THPO Concurrence with Department Finding
C710HA014	Precontact isolate	Unevaluated	Pending	Pending
C710HA015	Fire cracked rock	Unevaluated	Pending	Pending
C710HA016	Precontact isolate	Unevaluated	Pending	Pending
39HK0136	Historic isolate	Not Eligible	Not Eligible	Concur
39HK0137	Historic isolate	Not Eligible	Not Eligible	Concur
39HK0138	Historic homestead	Unevaluated	Pending	Pending
39HK0139	Historic well and artifact scatter	Not Eligible	Not Eligible	Concur
39HK0140	Historic farmstead	Unevaluated	Pending	Pending
39HK0141	Historic trash dump	Unevaluated	Pending	Pending
39HK0142	Historic isolate	Not Eligible	Not Eligible	Concur
39HK0143	Precontact isolate	Not Eligible	Not Eligible	Concur
39HK0144	Historic isolate	Not Eligible	Not Eligible	Concur
39HK2257	Historic road and artifact scatter	Not Eligible	Pending	Pending
39HN003	Historic Homestead	Unevaluated	Pending	Pending
39HN0998	Precontact artifact scatter	Not Eligible	Not Eligible	Pending
39HN1078	Undated stone cairn	Potentially Eligible	Pending	Pending
39HN1079	Undated stone cairn	Potentially Eligible	Pending	Pending
39HN1080	Precontact stone features	Unevaluated	Pending	Pending
39HN1081	Historic artifact scatter/ precontact isolate	Not Eligible	Not Eligible	Concur
39HN1082	Precontact isolate	Not Eligible	Not Eligible	Concur
39HN1083	Historic isolate/precontact isolate	Not Eligible	Not Eligible	Concur
39HN1129	Precontact isolate	Not Eligible	Not Eligible	Concur
39HN1130	Precontact isolate	Not Eligible	Not Eligible	Pending
39HN1131	Historic depressions and artifact scatter	Not Eligible	Not Eligible	Concur
39HN1132	Precontact isolate	Not Eligible	Not Eligible	Concur
39HN1133	Precontact artifact scatter	Not Eligible	Not Eligible	Concur
39HN1134	Historic rock art	Not Eligible	Not Eligible	Concur
39HN1135	Historic isolate	Not Eligible	Not Eligible	Concur
39HN1136	Precontact isolate	Not Eligible	Not Eligible	Pending
39HN1137	Precontact isolate	Not Eligible	Not Eligible	Concur
39HN1138	Precontact isolate	Not Eligible	Not Eligible	Pending
39HN1139	Precontact isolate	Not Eligible	Not Eligible	Concur
39HN1140	Historic artifact scatter	Not Eligible	Not Eligible	Concur
39HN1141	Precontact isolate	Not Eligible	Not Eligible	Concur
39HN1142	Precontact isolate	Not Eligible	Not Eligible	Concur
39HN1143	Precontact isolate	Not Eligible	Not Eligible	Pending
39HN1144	Precontact stone cairn	Unevaluated	Pending	Pending
39HN1145	Precontact isolate	Not Eligible	Not Eligible	Pending
39HN1146	Precontact isolate	Not Eligible	Not Eligible	Pending
39HN1147	Historic homestead	Eligible	Eligible	Pending
39HN1148	Undated stone cairn	Unevaluated	Pending	Pending
39HN1149	Precontact isolate	Not Eligible	Not Eligible	Pending
39HN1150	Historic homestead	Unevaluated	Pending	Pending
39HN1151	Undated stone cairn	Unevaluated	Pending	Pending
39HN1152	Undated stone cairn	Unevaluated	Pending	Pending

Site #	Description	NRHP Eligibility Recommendation from Applicant	NRHP Determination by the Department	South Dakota SHPO/THPO Concurrence with Department Finding
39HN1153	Historic homestead	Unevaluated	Pending	Pending
39HN1156	Precontact isolate	Not Eligible	Not Eligible	Concur
39HN1157	Historic isolate	Not Eligible	Not Eligible	Concur
39HN1158	Historic isolate	Not Eligible	Not Eligible	Concur
39HN1159	Precontact isolate	Not Eligible	Not Eligible	Concur
39HN1160	Historic isolate	Not Eligible	Not Eligible	Concur
39HN1164	Precontact lithic scatter	Not Eligible	Not Eligible	Pending
39HN1165	Precontact lithic scatter	Not Eligible	Not Eligible	Concur
39HN1166	Precontact isolate	Not Eligible	Not Eligible	Pending
39HN1167	Undated stone cairn	Potentially Eligible	Potentially Eligible	Concur
39HN1174	Precontact isolate	Not Eligible	Pending	Pending
39JN0050	Historic stock pond and trash scatter	Not Eligible	Not Eligible	Concur
39JN0051	Historic farm/ranch	Eligible	Eligible	Concur
39JN0052	Historic trash dump	Not Eligible	Not Eligible	Concur
39JN0053	Precontact isolate	Not Eligible	Not Eligible	Concur
39JN0054	Historic train passenger car	Not Eligible	Not Eligible	Concur
39JN0055	Historic isolate	Not Eligible	Not Eligible	Concur
39JN0056	Historic farmstead/precontact isolate	Unevaluated	Pending	Pending
39JN0057	Historic isolate	Not Eligible	Not Eligible	Concur
39JN0064	Historic artifact scatter	Not Eligible	Pending	Pending
39JN2007	Previously recorded historic railroad	Eligible	Eligible	Concur
C710JO001	Pending	Unevaluated	Pending	Pending
39LM009	Historic farmstead	Unevaluated	Pending	Pending
39LM0518	Historic trash scatter	Not Eligible	Not Eligible	Concur
39LM0519	Historic burial place	Eligible	Eligible	Concur
39MD000*	Pending	Unevaluated	Pending	Pending
39MD0820	Historic isolate	Not Eligible	Not Eligible	Concur
39MD0821	Precontact isolate	Not Eligible	Not Eligible	Concur
39MD0822	Precontact isolate	Not Eligible	Not Eligible	Concur
39MD0823	Precontact lithic scatter	Not Eligible	Not Eligible	Concur
39MD0824	Historic artifact scatter	Not Eligible	Not Eligible	Concur
39MD0825	Historic isolate	Not Eligible	Not Eligible	Concur
39MD0826	Historic isolate	Not Eligible	Not Eligible	Concur
39MD0827	Historic isolate	Not Eligible	Not Eligible	Concur
39MD0834	Historic isolate/precontact isolate	Not Eligible	Not Eligible	Concur
39MD0835	Historic artifact scatter	Eligible	Eligible	Concur
39MD0849	Historic grave	Not Eligible	Not Eligible	Concur
39MD0850/ MD00000335	Historic schoolhouse	Eligible	Eligible	Pending
39MD0851	Historic isolate	Not Eligible	Not Eligible	Concur
39MD0852	Historic isolate	Not Eligible	Not Eligible	Concur
39MD0871	Precontact isolate	Not Eligible	Not Eligible	Concur
39MD0894	Historic trash dump	Not Eligible	Pending	Pending

Site #	Description	NRHP Eligibility Recommendation from Applicant	NRHP Determination by the Department	South Dakota SHPO/THPO Concurrence with Department Finding
MD01900001	Historic church	Not Eligible	Not Eligible	Concur
39PE0398	Precontact isolate	Not Eligible	Not Eligible	Concur
39PE0399	Historic isolate	Not Eligible	Not Eligible	Concur
39PE0400	Undated rock alignment	Unevaluated	Pending	Pending
39PE0402	Historic artifact scatter	Unevaluated	Pending	Pending
39PE0405	Precontact isolate	Not Eligible	Not Eligible	Concur
39PE0406	Historic depression and artifact scatter	Not Eligible	Not Eligible	Concur
39PE0414	Precontact isolate	Not Eligible	Not Eligible	Pending
39PE0415	Historic homestead	Unevaluated	Pending	Pending
39PE0418	Precontact isolate	Not Eligible	Not Eligible	Pending
C710PE001	Precontact site	Unevaluated	Pending	Pending
39TP0056	Historic isolate	Not Eligible	Not Eligible	Concur
39TP0057	Historic isolate	Not Eligible	Not Eligible	Concur
39TP0058	Historic artifact scatter	Not Eligible	Not Eligible	Concur
39TP0059	Historic isolate	Not Eligible	Not Eligible	Concur
39TP0060	Historic isolate	Not Eligible	Not Eligible	Concur
39TP0061	Historic isolate	Not Eligible	Not Eligible	Concur
39TP0062	Precontact isolate	Not Eligible	Not Eligible	Concur
39TP0063	Historic farmstead	Eligible	Eligible	Concur
39TP0064	Historic isolate	Not Eligible	Not Eligible	Pending
39TP0065	Precontact isolate	Not Eligible	Not Eligible	Pending
39TP0066	Historic artifact scatter	Not Eligible	Not Eligible	Pending
39TP0067	Historic stone wall and scatter	Unevaluated	Pending	Pending

As of October 2012, the following areas remain unsurveyed, and are the subject of ongoing field studies:

- Approximately 571 acres of Project corridor;
- Approximately 2 acres of access roads; and
- Approximately 100 acres of ancillary facilities.

Additional cultural resources surveys within the proposed Project corridor, access roads, and ancillary facilities are ongoing. These reports will be reviewed by the Department and then forwarded to the applicable consulting parties consistent with 36 CFR 800.

Archaeological Sites

Within the APE, 112 newly recorded sites were identified including the following:

- Fifty precontact sites, of which 36 are isolated finds, three are stone features, and 11 are artifact scatters;
- Forty-six historic sites, of which 25 are isolated finds, two rock art sites, two are burials/cemeteries, and 17 are artifact scatters;

- Five multicomponent sites, including evidence of both precontact and historic activity; and
- Eleven sites that are undetermined concerning a time period, including eight stone features and three undetermined sites.

Avoidance is recommended for all eligible or unevaluated sites, to the extent practicable. Of these, two are eligible for inclusion in the NRHP, 79 are not eligible, and 31 are unevaluated or pending eligibility determinations/concurrence. By definition, the isolated finds are not eligible for listing in the NRHP. The Department will continue to consult with state and federal agencies and Native American tribes about the significance of the sites and work to avoid any adverse effects to the resources, to the extent practicable. If impacts to sites can be avoided, further evaluation of their NRHP eligibility may not be completed. For a list of dates regarding Department consultation with Native American tribes, please refer to Appendix E, Record of Consultation.

Historic Structures

Within the APE, 25 historic structures were identified including the following:

- One structure was a previously recorded historic railroad; and
- Twenty-four structures were newly recorded, including homesteads, farmsteads, agricultural, commercial, and industrial structures, railroads, a church, and a schoolhouse.

Avoidance is recommended for all eligible or unevaluated sites, to the extent practicable. Seven historic structures are eligible for inclusion in the NRHP, three are not eligible, and 15 are unevaluated or pending eligibility determinations/concurrence. Additional research will be conducted to determine NRHP eligibility and determination of proposed Project effects. For those historic properties where avoidance is not feasible, a treatment plan will be prepared consistent with the stipulations of the PA.

Nebraska

Within Nebraska, the proposed Project would cross state and private lands in Antelope, Boone, Boyd, Fillmore, Holt, Jefferson, Keya Paha, Merrick, Nance, Polk, Saline, and York counties, in addition to NPS-managed lands. Prior to initiation of Nebraska fieldwork, literature searches were conducted for the proposed Project route. These pre-fieldwork activities occurred as follows:

- On April 11, April 22, and May 22, 2008; and April 10, 2012, at the Nebraska State Historical Society in Lincoln, Nebraska;
- During April 2008, as part of submittal of a research design and methodology for cultural resources field studies to the Nebraska SHPO.

Cultural resource surveys in Nebraska summarized in this Supplemental EIS were conducted between 2008 and 2012. Since issuance of the Final EIS, Keystone has made extensive changes to the proposed route through Nebraska, including three significant route modifications. All route modifications and new routes outside the original 300-foot-wide APE have been or will be surveyed. Cultural resources reports documenting these surveys were submitted to the Department upon completion and are listed below:

- Fink, Margaret, Monica Shah Lomas, Cally Lence, Jeff Anderson, and Jeff Myers. 2008. A Phase I Cultural Resources Survey of the Steele City Segment in Nebraska of the Proposed Keystone XL Pipeline Project in Keya Paha, Rock, Holt, Garfield, Wheeler, Greeley, Boone, Nance, Merrick, Hamilton, York, Fillmore, Saline, and Jefferson Counties, Nebraska. American Resources Group, Ltd. Carbondale, IL.
- Lomas, Monica Shah, 2009a. Addendum No. 1: A Phase I Cultural Resources Survey of the Steele City Segment in Nebraska of the Proposed Keystone XL Pipeline Project in Keya Paha, Rock, Holt, Garfield, Wheeler, Greeley, Boone, Nance, Merrick, Hamilton, York, Fillmore, Saline, and Jefferson Counties, Nebraska. American Resources Group, Ltd. Carbondale, IL.
- Anderson, Jeff, and Monica Shah Lomas. 2009. Addendum No. 2: A Phase I Cultural Resources Survey of the Steele City Segment in Nebraska of the Proposed Keystone XL Pipeline Project in Keya Paha, Rock, Holt, Garfield, Wheeler, Greeley, Boone, Nance, Merrick, Hamilton, York, Fillmore, Saline, and Jefferson Counties, Nebraska. American Resources Group, Ltd. Carbondale, IL.
- Lomas, Monica Shah, and Kevin Lomas. 2009. Addendum No. 3: A Phase I Cultural Resources Survey of the Steele City Segment in Nebraska of the Proposed Keystone XL Pipeline Project in Keya Paha, Rock, Holt, Garfield, Wheeler, Greeley, Boone, Nance, Merrick, Hamilton, York, Fillmore, Saline, and Jefferson Counties, Nebraska. American Resources Group, Ltd. Carbondale, IL.
- Titus, Steve, and Monica Shah Lomas. 2010a. Addendum No.4: A Phase I Cultural Resources Survey of the Steel City Segment in Nebraska of the proposed Keystone XL Pipeline Project in Keya Paha, Rock, Holt, Garfield, Wheeler, Greeley, Boone, Nance, Merrick, Hamilton, York, Filmore, Saline, and Jefferson Counties, Nebraska. American Resources Group, Ltd. Carbondale, IL.
- Lomas, Monica Shah, Jeff Anderson, and Bob Sadler. 2010. Addendum No. 5: A Phase I Cultural Resources Survey of the Steele City Segment in Nebraska of the Proposed Keystone XL Project in Keya Paha, Rock, Holt, Garfield, Wheeler, Greeley, Boone, Nance, Merrick, Hamilton, York, Fillmore, Saline, and Jefferson Counties, Nebraska. American Resources Group, Ltd. Carbondale, IL.
- Lomas, Monica Shah. 2011. Addendum No. 6: A Phase I Cultural Resources Survey of the Steele City Segment in Nebraska of the Proposed Keystone XL Pipeline Project in Keya Paha, Rock, Holt, Garfield, Wheeler, Greeley, Boone, Nance, Merrick, Hamilton, York, Fillmore, Saline, and Jefferson Counties, Nebraska. American Resources Group, Ltd. Carbondale, IL.
- Lomas, Monica Shah, John Schwegman, and Gail White. 2011. Addendum No. 7: A Phase I Cultural Resources Survey of the Steele City Segment in Nebraska of the Proposed Keystone XL Pipeline Project in Keya Paha, Rock, Holt, Garfield, Wheeler, Greeley, Boone, Nance, Merrick, Hamilton, York, Fillmore, Saline, and Jefferson Counties, Nebraska. American Resources Group, Ltd. Carbondale, IL.

- Lence, Cally, Jeff Anderson, and Monica Shah Lance. 2011. Addendum No. 8: A Phase I Cultural Resources Survey of the Steele City Segment in Nebraska of the Proposed Keystone XL Pipeline Project in Keya Paha, Rock, Holt, Garfield, Wheeler, Greeley, Boone, Nance, Merrick, Hamilton, York, Fillmore, Saline, and Jefferson Counties, Nebraska. American Resources Group, Ltd. Carbondale, IL.
- Lomas, Monica Shah, and Bob Sadler. 2011. Addendum No. 9: A Phase I Cultural Resources Survey of the Steele City Segment in Nebraska of the Proposed Keystone XL Pipeline Project in Keya Paha, Rock, Holt, Garfield, Wheeler, Greeley, Boone, Nance, Merrick, Hamilton, York, Fillmore, Saline, and Jefferson Counties, Nebraska. American Resources Group, Ltd. Carbondale, IL.
- Lomas, Monica Shah, Cally Lence, Jeff Myers, Jeff Anderson, Chip Perkins, Bob Sadler, and Steve Titus. 2012. Addendum 10 to A Phase I Cultural Resources Survey in Nebraska for the Proposed Keystone XL Pipeline Project in Keya Paha, Boyd, Holt, Antelope, Boone, Nance, Merrick, Polk, York, Fillmore, Saline, and Jefferson Counties, Nebraska. American Resources Group, Ltd. Carbondale, IL.

Cultural resources surveys conducted through October 2012 within Nebraska included the following:

- Approximately 393 miles of the proposed Project corridor;
- Seventeen miles of access roads; and
- Nine hundred eighty-seven acres of proposed ancillary facility (e.g., access roads, pump stations, and construction camps) sites.

To date, 118 cultural resources have been identified during the cultural resources surveys within the proposed Project APE in Nebraska, including 29 archaeological sites and 89 historic structures. Of these, 112 are new and six were previously identified. Of the 118 cultural resources, six are eligible for inclusion on the NRHP, 67 are not eligible, and 45 unevaluated or pending eligibility determinations/concurrence. The results of the surveys performed, recommendations of eligibility by Keystone's consultants, determinations of eligibility by the Department, and concurrences from SHPO are shown in Table 3.11-4.

Table 3.11-4 Cultural Resources Identified in Nebraska within the Project APE

Site #	Description	NRHP Eligibility Recommendation from Applicant	NRHP Eligibility Determination by the Department	Nebraska SHPO/THPO Concurrence with the Department
25AP74	Precontact limited activity site	Not Eligible	Pending	Pending
25AP75	Historic farmstead/ precontact isolate	Not Eligible	Pending	Pending
25AP78	Historic dump	Not Eligible	Pending	Pending
25AP79	Historic farmstead	Not Eligible	Pending	Pending
25AP83	Historic farmstead	Not Eligible	Pending	Pending
25AP84	Historic dump	Not Eligible	Pending	Pending
25AP88	Precontact field camp	Not Eligible	Pending	Pending

Site #	Description	NRHP Eligibility Recommendation from Applicant	NRHP Eligibility Determination by the Department	Nebraska SHPO/THPO Concurrence with the Department
25AP89	Precontact camp/ unidentified historic	Potentially Eligible	Pending	Pending
25AP90	Historic dump	Not Eligible	Pending	Pending
25AP93	Historic farmstead	Not Eligible	Pending	Pending
25AP94	Historic farmstead	Potentially Eligible	Pending	Pending
C502AT005FS	Precontact isolate	Not Eligible	Pending	Pending
C504AT005FS	Precontact isolate	Not Eligible	Pending	Pending
C504AT007AT	Historic Trail	Not Eligible	Pending	Pending
25BO54	Historic farmstead	Potentially Eligible	Pending	Pending
25BO60	Historic farmstead	Not Eligible	Pending	Pending
25BO61	Historic farmstead	Potentially Eligible	Pending	Pending
25BO63	Historic farmstead	Not Eligible	Pending	Pending
25BO64	Historic farmstead	Not Eligible	Pending	Pending
25BO65	Historic farmstead	Not Eligible	Pending	Pending
25BO67	Historic farmstead	Not Eligible	Pending	Pending
C501BO003	Historic Trail	Not Eligible	Pending	Pending
25BU69	Historic railroad	Not Eligible	Eligible	Pending
25FM23	Historic farmstead	Not Eligible	Not Eligible	Concur
25FM24	Historic railroad	Not Eligible	Not Eligible	Concur
25FM25	Historic railroad bed	Not Eligible	Not Eligible	Concur
25FM26	Historic farmstead	Not Eligible	Not Eligible	Concur
25FM27	Precontact limited activity site	Not Eligible	Not Eligible	Concur
25FM28	Historic farmstead	Not Eligible	Not Eligible	Concur
25GF16	Historic isolate	Not Eligible	Not Eligible	Concur
C203GR002AP	Historic building	Unevaluated	Pending	Pending
25GY51	Historic farmstead	Not Eligible	Not Eligible	Concur
25GY52	Historic farmstead	Not Eligible	Not Eligible	Concur
25GY53	Historic livestock feed lot	Not Eligible	Not Eligible	Concur
25HM24	Precontact limited activity site	Not Eligible	Not Eligible	Concur
25HM25	Historic burial ground	Unevaluated	Pending	Pending
25HM26	Historic road	Not Eligible	Not Eligible	Concur
25HM27	Historic dump	Not Eligible	Not Eligible	Concur
25HM28	Historic farmstead	Not Eligible	Not Eligible	Concur
25HM29	Historic railroad	Not Eligible	Not Eligible	Concur
25HM30	Historic farmstead	Not Eligible	Not Eligible	Concur
25HM31	Historic dump	Not Eligible	Not Eligible	Concur
25HM32	Historic railroad	Not Eligible	Eligible	Pending
25HT44	Historic railroad bed	Not Eligible	Not Eligible	Concur
25HT45	Historic road	Not Eligible	Not Eligible	Concur
25HT46	Historic road	Not Eligible	Not Eligible	Concur
25HT52	Historic railroad	Not Eligible	Eligible	Pending
25HT53	Historic railroad bed	Not Eligible	Not Eligible	Pending
25HT54/25HT505	Commercial/industrial railroad buildings and structures	Not Eligible	Not Eligible	Pending
25HT62	Historic farmstead	Not Eligible	Pending	Pending
HT 13-001	C&NW railway depot	Eligible	Eligible	Pending

Site #	Description	NRHP Eligibility Recommendation from Applicant	NRHP Eligibility Determination by the Department	Nebraska SHPO/THPO Concurrence with the Department
HT13-040	Railway freight depot	Not Eligible	Not Eligible	Pending
C201JE003AP	Historic farmstead	Unevaluated	Pending	Pending
C201JE004AP	Historic farmstead	Unevaluated	Pending	Pending
C201JE005AP	Historic farmstead	Not Eligible	Pending	Pending
25JF43	Previously recorded historic windmill structure	Not Eligible	Not Eligible	Pending
25JF45	Historic farmstead	Not Eligible	Not Eligible	Concur
25JF46	Historic railroad	Not Eligible	Not Eligible	Concur
25JF47	Historic railroad bed	Not Eligible	Not Eligible	Concur
25JF48	Historic farmstead	Not Eligible	Not Eligible	Concur
25JF49	Historic farmstead	Not Eligible	Not Eligible	Concur
25JF50	Historic railroad bed	Not Eligible	Not Eligible	Concur
25JF51	Historic farmstead	Not Eligible	Not Eligible	Concur
25JF52	Precontact field camp	Potentially Eligible	Pending	Pending
25JF53	Historic farmstead	Not Eligible	Not Eligible	Concur
25JF54	Historic farmstead	Not Eligible	Not Eligible	Concur
25JF55	Historic railroad	Not Eligible	Eligible	Pending
25JF56	Historic agricultural building	Not Eligible	Pending	Pending
25JF507	Steam roller mill site	Unevaluated	Pending	Pending
25KP150	Precontact field camp	Potentially Eligible	Pending	Pending
25KP151	Precontact field camp	Potentially Eligible	Pending	Pending
25KP339	Historic dump	Not Eligible	Not Eligible	Concur
25KP345	Precontact rock circle	Potentially Eligible	Pending	Pending
25MK17	Historic dump	Not Eligible	Not Eligible	Concur
25MK18	Historic farmstead	Not Eligible	Not Eligible	Concur
25MK19	Historic farmstead	Not Eligible	Not Eligible	Concur
25MK20	Previously recorded historic farmstead	Potentially Eligible	Pending	Pending
25MK21	Historic farmstead	Not Eligible	Not Eligible	Concur
25MK22	Historic railroad bed	Not Eligible	Not Eligible	Concur
25MK23	Historic dump	Not Eligible	Not Eligible	Concur
25MK24	Historic farmstead	Not Eligible	Not Eligible	Concur
C502NA005FS	Historic isolate	Not Eligible	Pending	Pending
C502NA017	Historic artifact scatter	Not Eligible	Pending	Pending
25NC143	Historic farmstead	Not Eligible	Not Eligible	Concur
25NC144	Historic farmstead	Not Eligible	Not Eligible	Concur
25NC145	Historic farmstead	Not Eligible	Not Eligible	Concur
25NC146	Historic canal	Not Eligible	Not Eligible	Concur
NC00-042	Historic building	Not Eligible	Not Eligible	Pending
C102RK001	Historic farmstead	Unevaluated	Pending	Pending
25RO13	Historic road	Not Eligible	Not Eligible	Concur
25SA73	Kasak cemetery	Not Eligible/ Protected	Not Eligible/ Protected	Concur
25SA86	Precontact limited activity site	Not Eligible	Not Eligible	Concur
25SA87	Historic farmstead	Not Eligible	Not Eligible	Concur
25SA88	Historic railroad bed	Not Eligible	Not Eligible	Concur
25SA89	Historic farmstead	Not Eligible	Not Eligible	Concur

Site #	Description	NRHP Eligibility Recommendation from Applicant	NRHP Eligibility Determination by the Department	Nebraska SHPO/THPO Concurrence with the Department
25SA90	Historic farmstead	Not Eligible	Pending	Pending
25VY56	Historic railroad	Not Eligible	Eligible	Pending
25WH4	Historic farmstead	Not Eligible	Not Eligible	Concur
25WH5	Historic farmstead	Not Eligible	Not Eligible	Concur
25YK17	Precontact field camp	Potentially Eligible	Pending	Pending
25YK18	Historic farmstead	Not Eligible	Not Eligible	Concur
25YK19	Historic farmstead	Not Eligible	Not Eligible	Concur
25YK20	Historic railroad	Not Eligible	Not Eligible	Concur
25YK21	Historic farmstead	Not Eligible	Not Eligible	Concur
25YK22	Historic farmstead	Not Eligible	Not Eligible	Concur
25YK23	Historic artifact scatter	Potentially Eligible	Pending	Pending
25YK24	Historic farmstead	Not Eligible	Not Eligible	Concur
25YK25	Historic railroad bed	Not Eligible	Not Eligible	Concur
25YK26	Precontact limited activity site	Not Eligible	Not Eligible	Concur
25YK27	Historic farmstead	Not Eligible	Not Eligible	Concur
25YK28	Precontact field camp	Not Eligible	Not Eligible	Concur
25YK30	Historic farm outbuilding/ historic activity area	Not Eligible	Not Eligible	Concur
25YK31	Historic farmstead	Not Eligible	Not Eligible	Concur
25YK33	Historic farmstead	Not Eligible	Not Eligible	Concur
Oregon National Historic Trail	Historic trail	Unevaluated	Pending	Pending
California, National Historic Trail	Historic trail	Unevaluated	Pending	Pending
Mormon Pioneer, National Historic Trail	Historic trail	Unevaluated	Pending	Pending
Pony Express National Historic Trail	Historic trail	Unevaluated	Pending	Pending

As of October 2012, the following areas remain unsurveyed, and are the subject of ongoing field studies:

- Approximately 7,567 acres of proposed Project corridor;
- Approximately 151 acres of access roads (for known roads);
- Approximately 45 acres of pump stations; and
- Undetermined acreage of ancillary facilities (e.g., access roads, pump stations, and construction camps).

Additional cultural resources surveys within the proposed Project corridor, access roads, and ancillary facilities are ongoing. These reports will be reviewed by the Department and then forwarded to the applicable consulting parties consistent with 36 CFR 800.

Archaeological Sites

Within the APE, 29 newly recorded sites were identified including the following:

- Fourteen precontact sites, of which two are isolated finds, one is a stone feature, and 11 are artifact scatters;
- Fourteen historic sites, of which two are isolated finds, 10 are artifact scatters, and two are cemeteries/burial grounds; and
- One multicomponent sites, including evidence of both precontact and historic activity.

Avoidance is recommended for all eligible or unevaluated sites, to the extent practicable. Of these, 12 are not eligible for inclusion on the NRHP and 17 are unevaluated or pending eligibility determinations/concurrence. By definition, the isolated finds are not eligible for listing in the NRHP. The Department will continue to consult with state and federal agencies and Native American tribes about the significance of the sites and work to avoid any adverse effects to the resources, to the extent practicable. If impacts to sites can be avoided, further evaluation of their NRHP eligibility may not be completed. For a list of dates regarding Department consultation with Native American tribes, please refer to Appendix E, Record of Consultation.

Historic Structures

Within the APE, 89 historic structures were identified:

- Six structures were previously recorded, including a farmstead, agricultural structure, and four trails; and
- Eighty-three structures were newly recorded, including farmsteads, agricultural, commercial, and industrial structures, railroads, trails/roads, and a canal.

Avoidance is recommended for all eligible or unevaluated sites, to the extent practicable. Six historic structures are eligible for inclusion in the NRHP, 55 are not eligible, and 28 are unevaluated or pending eligibility determinations/concurrence. Additional research will be conducted to determine NRHP eligibility and determination of proposed Project effects. For those historic properties where avoidance is not feasible, a treatment plan will be prepared consistent with the stipulations of the PA.

Historic Trails

The proposed Project route crosses the Oregon, California, Mormon Pioneer, and Pony Express National Historic Trails. Thus far, cultural resources surveys conducted in the vicinity of the trails have not identified any archaeological remains, historic artifacts, or culturally constructed features associated with the trails. There is no adverse effect to the trail routes since it is not possible to define an exact location or any physical trail remains where the trails cross the proposed Project route. The Department will continue to work with the NPS to determine and implement avoidance or other mitigation of adverse effects, to the extent practicable, to historic properties potentially to be affected by the proposed Project.

North Dakota

Within North Dakota, the proposed Project includes a 56-acre ancillary facility that will be used as a rail siding and pipe storage location on private lands in Bowman County. The ancillary

facility was used previously as part of TransCanada Pipelines Limited's Bison Pipeline Project. As part of that previous project, the area was surveyed and cleared for use by Federal Energy Regulatory Commission, BLM, and the North Dakota SHPO. Additionally, since the ancillary facility was previously disturbed from its use as a rail siding and pipe storage location, no cultural resources survey was completed for the proposed Project.

For a list of dates regarding Department consultation with Native American tribes, please refer to Appendix E, Record of Consultation.

Kansas

Within Kansas, the proposed Project includes two pump stations on private lands in Butler and Clay counties. Prior to initiation of Kansas fieldwork, two literature searches were conducted for the proposed ancillary facility. This pre-fieldwork activity occurred on August 11, 2008, and September 23, 2009, using the Kansas Historic Resources Inventory administered by the State Historic Preservation Office at the Kansas Historical Society. The literature search was conducted to identify previously recorded cultural resources and previously completed cultural resource investigations within a 1-mile radius around the proposed pump stations.

The cultural resources surveys conducted in Kansas summarized in this Supplemental EIS were conducted in 2008 and 2009. The cultural resources reports documenting these surveys were submitted to the Department upon completion and are listed below:

- Lomas, Monica Shah. 2009b. A Phase II Cultural Resources Survey of Pump Stations 27 and 29 for the Proposed Keystone XL Pipeline Project, Clay and Butler Counties, Kansas. American Resources Group, Ltd. Carbondale, IL.
- Titus, Steve, and Monica Shah Lomas. 2010b. Addendum No. 1: A Phase II Cultural Resources Survey of Pump Stations 27 and 29 for the Proposed Keystone XL Pipeline Project, Clay and Butler Counties, Kansas. American Resources Group, Ltd. Carbondale, IL.

The cultural resources survey conducted within Kansas covered approximately 15 acres for the two proposed pumping stations. The literature search for Kansas identified one previously recorded historic farmstead site (14BU131). The survey completed within the APE relocated 14BU131, but did not identify any new cultural resources. Site 14BU131 was identified to be outside the construction footprint of the proposed pumping station. Additionally, the site was recommended as not eligible for inclusion in the NRHP. The results of the surveys performed, recommendations of eligibility by Keystone's consultants, determinations of eligibility by the Department, and concurrences from SHPO are shown in Table 3.11-5. For a list of dates regarding Department consultation with Native American tribes, please refer to Appendix E, Record of Consultation.

Table 3.11-5 Cultural Resources Identified in Kansas within the Project APE

Site	Description	NRHP Eligibility Recommendation from Keystone	NRHP Determination by Department	KS SHPO Concurrence with Department Findings
14BU131	Historic artifact scatter	Not Eligible	Not Eligible	Concur

3.11.3.4 Programmatic Agreement

As part of the Final EIS route evaluation process, a PA was developed, finalized, and signed over a 2-year period between 2009 and 2011. Signatory parties to this agreement included the Department, BLM, USACE, U.S. Bureau of Reclamation, NPS, Western Area Power Administration, U.S. Department of Agriculture Rural Utilities Service (RUS), U.S. Department of Agriculture (USDA) Natural Resources Conservation Service, USDA Farm Service Agency, U.S. Bureau of Indian Affairs (BIA), and the SHPOs of Montana, South Dakota, Nebraska, Kansas, Oklahoma, and Texas. Invited signatories included the Montana Department of Natural Resources and Conservation, MDEQ, and Keystone. Both signatory parties and invited signatories have retained the same rights within the agreement in regard to seeking amendments or termination of the agreement. Additional parties, such as Native American tribes that retained an interest in the proposed Project and that agreed to the contents of the PA, called "concurring parties," were also invited to sign the PA, but these parties would not retain the same rights to amend or terminate the agreement. Native American tribes that signed the PA included the Alabama-Coushatta Tribes of Texas; Arapahoe Tribe of the Wind River Reservation, Wyoming; Blackfeet Tribe of the Blackfeet Indian Reservation of Montana; Fort Belknap Indian Community of the Fort Belknap Reservation of Montana; Iowa Tribe of Kansas and Nebraska; Miami Tribe of Oklahoma; and Pawnee Nation of Oklahoma (Appendix S of the Final EIS).

The use of the PA for the proposed Project is consistent with 36 CFR 800.4(b)(2), which provides that when "alternatives under consideration consist of corridors or large land areas, or where access to properties is restricted, the agency official may use a phased process to conduct identification and evaluation efforts." The PA will allow the Department and the consulting parties to continue and eventually complete the identification and evaluation of historic properties pursuant to the provisions in the PA, should the proposed Project receive all necessary certifications and permits. The proposed Project design continues to evolve as a result of the NEPA and Section 106 consistent processes, continuing engineering analysis, federal and state permitting, and ongoing landowner and land manager negotiations. The evaluation of historic properties for the proposed Project will not be completed until full access to all parcels along the proposed corridor is obtained. The PA, therefore, will ensure that appropriate consultation procedures are followed and that cultural resources surveys would be completed prior to construction. Appendices to the PA will include Unanticipated Discovery Plans for each state and a Tribal Monitoring Plan. These plans are more specifically described in sections 3.11.6, Unanticipated Discovery Plans, and 3.11.7, Tribal Monitoring Plan.

When the Final EIS route was revised to the proposed Project route, the status of the Final EIS PA was undetermined. Several federal and state agencies, along with Native American tribes, have expressed an interest in the status of a PA for the proposed Project. The Department is actively consulting with the previous Final EIS PA signatory agencies and Native American tribes to determine how the Final EIS PA or a revised version will be implemented for the proposed Project.

3.11.4 Consultation

3.11.4.1 Introduction

Consistent with Section 106 of the NHPA, the lead federal agency shares proposed Project information and consult with consulting parties. This includes Native American tribes, SHPOs,

local governments, and applicants for federal permits. For the proposed Project, the Department is consulting with SHPOs, Native American tribes, numerous federal and state agencies, and local governments, and is seeking the views of the public. Government-to-government Section 106 consultation meetings, direct mailings, teleconferencing, direct telephone communications, and email have been used to keep consulting party members informed and to solicit comments on the proposed Project. Appendix E, Record of Consultation, includes a more extensive Correspondence Table that summarizes the Department's consultation concerning cultural resources for the proposed Project.

3.11.4.2 Federal and State Agency Consultation

Consistent with NEPA and Section 106, the Department is consulting with federal agencies whose participation in the proposed Project was considered an undertaking. These agencies include U.S. Department of Interior, NPS, U.S. Fish and Wildlife Service, BLM, U.S. Bureau of Reclamation, USACE, U.S. Department of Transportation, Pipeline and Hazardous Material Safety Administration, Natural Resources Conservation Service, USDA Farm Service Agency, RUS, U.S. Environmental Protection Agency, U.S. Department of Energy, and Western Area Power Administration[2]. The ACHP has also formally entered into consultation with the Department. In coordination with the Department, each of these agencies is reviewing the cultural resource findings as appropriate given their responsibilities as discussed in Chapter 1.0, Introduction. The Department is also consulting with state agencies, including the SHPOs in the states affected by the proposed Project as well as the Montana Department of Natural Resources and Conservation and the MDEQ, who is the lead for the Montana Environmental Policy Act. Appendix E, Record of Consultation, includes a more extensive Master Correspondence Table that summarizes the Department's federal and state agency consultation for the proposed Project.

3.11.4.3 Tribal Consultation

Consistent with 36 CFR 800, the Department has engaged Native American tribes in government-to-government consultation. The list of Native American tribes that were notified for this proposed Project was derived from lists maintained by the Department, NPS, BLM, USACE, SHPOs, state tribal liaisons, THPOs, BIA, and recommendations from other Native American tribes. During the Final EIS tribal consultation process, the Department engaged 95 Native American tribes and tribal groups. Following these invitations, 45 Native American tribes notified the Department that they would like to become consulting parties. Additionally, two Native American tribes were undecided as to whether they would become consulting parties, but nevertheless participated in calls and meetings. Twenty-one Native American tribes notified the Department that they did not wish to consult on the proposed Project and had no objection to the proposed Project, but would like to be notified should human remains be found. Twenty-seven Native American tribes did not respond to requests for consultation.

When the Final EIS route was revised to the proposed Project route, the Department engaged Native American tribes that had previously expressed an interest in the states/areas crossed by

[2] In addition to the tribal consultation process conducted by the Department, it should be noted that other federal agencies with individual permitting and authorization responsibilities would be conducting separate government-to-government tribal consultation efforts. For instance, prior to any work taking place on USACE lands, the notification and consultation procedures spelled out in the Missouri River Programmatic Agreement would be followed.

the proposed Project route or whose interests have not been expressed. As a result, 80 Native American tribes initially were invited to consult regarding the proposed Project by letters dated September 21, 2012. Follow-up phone calls and emails were sent to these tribes to determine their interest in consulting on the proposed Project. Three government-to-government consultation meetings were held in October 2012 to ensure that the tribes were fully aware of their role in the consultation process and to ensure that their issues of concern were understood in the consultation process. Meetings were held in Billings, Montana, Pierre, South Dakota, and Lincoln, Nebraska. The Department will continue to consult with the Native American tribes to ensure that their issues of concern are addressed in the consultation process. Appendix E, Record of Consultation, includes a more extensive Master Correspondence Table that summarizes the Department's tribal consultation for the proposed Project. Native American tribes that the Department contacted are listed in Table 3.11-6.

Table 3.11-6 Tribes Consulted for the Proposed Project

	Interested/Consulting Party	Tribe
1	Undecided	Absentee-Shawnee Tribe of Indians of Oklahoma
2	Undecided	Alabama-Coushatta Tribes of Texas
3	Not Consulting	Alabama-Quassarte Tribal Town, Oklahoma
4	Undecided	Apache Tribe of Oklahoma
5	Consulting	Arapahoe Tribe of the Wind River Reservation, Wyoming (aka Northern Arapaho Tribe)
6	Consulting	Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation, Montana (aka Fort Peck Tribes)
7	Consulting	Blackfeet Tribe of the Blackfeet Indian Reservation of Montana
8	Undecided	Cherokee Nation, Oklahoma
9	Undecided	Cheyenne and Arapaho Tribes, Oklahoma
10	Consulting	Cheyenne River Sioux Tribe of the Cheyenne River Reservation, South Dakota
11	Not Consulting	Chickasaw Nation, Oklahoma
12	Consulting	Chippewa-Cree Indians of the Rocky Boy's Reservation, Montana
13	Not Consulting	Choctaw Nation of Oklahoma
14	Not Consulting	Comanche Nation, Oklahoma
15	Consulting	Confederated Salish & Kootenai Tribes of the Flathead Indian Nation, Montana
16	Consulting	Crow Creek Sioux Tribe of the Crow Creek Reservation, South Dakota
17	Consulting	Crow Tribe of Montana
18	Undecided	Delaware Tribe of Indians, Oklahoma
19	Undecided	Eastern Band of Cherokee Indians of North Carolina
20	Not Consulting	Eastern Shawnee Tribe of Oklahoma
21	Consulting	Flandreau Santee Sioux Tribe of South Dakota
22	Not Consulting	Forest County Potawatomi Community, Wisconsin
23	Undecided	Fort Belknap Indian Community of the Fort Belknap Reservation of Montana (aka Gros Ventre and Assiniboine Tribe of Ft. Belknap)

	Interested/Consulting Party	Tribe
24	Undecided	Hannahville Indian Community, Michigan
25	Consulting	Ho-Chunk Nation of Wisconsin
26	Not Consulting	Iowa Tribe of Kansas and Nebraska
27	Consulting	Iowa Tribe of Oklahoma
28	Undecided	Jena Band of Choctaw Indians, Louisiana
29	Consulting	Kaw Nation, Oklahoma
30	Undecided	Kialegee Tribal Town, Oklahoma
31	Undecided	Kickapoo Traditional Tribe of Texas
32	Undecided	Kickapoo Tribe of Indians of the Kickapoo Reservation in Kansas
33	Undecided	Kiowa Indian Tribe of Oklahoma
34	Consulting	Lower Brule Sioux Tribe of the Lower Brule Reservation, South Dakota
35	Undecided	Lower Sioux Indian Community in the State of Minnesota
36	Undecided	Match-e-be-nash-she-wish Band of Pottawatomi Indians of Michigan (aka Gun Lake Potawatomi)
37	Consulting	Mille Lacs Band of Minnesota Chippewa Tribes, Minnesota
38	Undecided	Modoc Tribe of Oklahoma
39	Undecided	Nez Perce Tribe, Idaho
40	Consulting	Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana
41	Undecided	Nottawaseppi Huron Band of the Potawatomi, Michigan (aka Huron Potawatomi Nation)
42	Consulting	Oglala Sioux Tribe of the Pine Ridge Reservation, South Dakota
43	Undecided	Omaha Tribe of Nebraska
44	Undecided	Osage Nation, Oklahoma
45	Undecided	Otoe-Missouria Tribe of Indians, Oklahoma
46	Consulting	Pawnee Nation of Oklahoma
47	Undecided	Poarch Band of Creek Indians of Alabama
48	Consulting	Pokagon Band of Potawatomi Indians, Michigan and Indiana
49	Undecided	Ponca Tribe of Indians of Oklahoma
50	Consulting	Ponca Tribe of Nebraska
51	Consulting	Prairie Band of Potawatomi Nation, Kansas
52	Not Consulting	Prairie Island Indian Community in the State of Minnesota
53	Undecided	Red Lake Band of Chippewa Indians, Minnesota
54	Consulting	Rosebud Sioux Tribe of the Rosebud Indian Reservation, South Dakota
55	Undecided	Sac & Fox Nation of Missouri in Kansas and Nebraska
56	Undecided	Sac & Fox Nation, Oklahoma
57	Consulting	Sac & Fox Tribe of the Mississippi in Iowa
58	Undecided	Santee Sioux Nation, Nebraska
59	Not Consulting	Seneca-Cayuga Tribe of Oklahoma

	Interested/Consulting Party	Tribe
60	Undecided	Shakopee Mdewakanton Sioux Community of Minnesota
61	Undecided	Shoshone Tribe of the Wind River Reservation, Wyoming (aka Eastern Shoshone Tribe)
62	Undecided	Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho
63	Undecided	Sisseton-Wahpeton Oyate of the Lake Traverse Reservation, South Dakota
64	Consulting	Southern Ute Indian Tribe of the Southern Ute Reservation, Colorado
65	Undecided	Spirit Lake Tribe, North Dakota
66	Consulting	Standing Rock Sioux Tribe of North & South Dakota
67	Not Consulting	Stockbridge Munsee Community, Wisconsin
68	Undecided	Thlopthlocco Tribal Town, Oklahoma
69	Undecided	Three Affiliated Tribes of the Fort Berthold Reservation, North Dakota
70	Consulting	Tonkawa Tribe of Indians of Oklahoma
71	Undecided	Turtle Mountain Band of Chippewa Indians of North Dakota
72	Not Consulting	United Keetoowah Band of Cherokee Indians in Oklahoma
73	Undecided	Upper Sioux Community, Minnesota
74	Undecided	Ute Indian Tribe of the Uintah & Ouray Reservation, Utah (aka Ute Indian Tribe, also Northern Ute Tribe)
75	Undecided	Ute Mountain Tribe of the Ute Mountain Reservation, Colorado, New Mexico and Utah
76	Not Consulting	White Earth Band of Minnesota Chippewa Tribes, Minnesota
77	Undecided	Wichita and Affiliated Tribes (Wichita, Keechi, Waco & Tawakonie), Oklahoma
78	Not Consulting	Winnebago Tribe of Nebraska
79	Consulting	Yankton Sioux Tribe of South Dakota
80	Consulting	Ysleta Del Sur Pueblo of Texas

The following are general issues and concerns commonly expressed by the tribes through letters, emails, phone calls, and at consultation meetings to date:

- The Department's tribal consultation process and plan;
- Previous and future TCP studies;
- Previous and future cultural resources surveys;
- Tribal role in identification and evaluation of cultural resources;
- Status of the PA and how it may or may not be amended;
- Non-cultural resources impacts of the proposed Project (e.g., potential spills, surface and groundwater, socioeconomics, environmental justice);
- Impacts to the environment and tribes in Canada; and
- Economic opportunities for tribal members during construction of the proposed Project.

The Department has gathered these issues and concerns and is currently evaluating opportunities to address them as part of the tribal consultation and cultural resources processes and within the Final Supplemental EIS.

Seven tribes listed in Table 3.11-7 have completed TCP studies within the proposed Project APE. The Department has reviewed and approved the reports and continues to consult with the tribes regarding recommendations made in these reports concerning eligibility of a historic property and/or proposed Project effects. The Department will make determinations of eligibility and proposed Project effects. A draft Tribal Monitoring Plan has been developed as a result of the TCP studies to account for areas where tribes might have a concern. The draft Tribal Monitoring Plan will be shared with the consulting tribes for their comment. The Department has consulted with tribes in identifying areas along the APE that will be monitored during construction if the proposed Project is permitted.

Table 3.11-7 List of Tribes Participating in Traditional Cultural Property Studies within the Proposed Project

Tribe	Date of Contact	Date SOW Received	Date of Response	Date TCP Received	Date TCP Accepted
Arapahoe Tribe of the Wind River Reservation, Wyoming	10/26/2009	1/8/2010	1/20/2010	10/10/2010	12/01/2010
Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation, Montana	8/10/2009	11/20/2009	11/30/2009	Not Finalized	N/A
Blackfeet Tribe of the Blackfeet Indian Reservation of Montana	8/18/2009	8/24/2009	9/14/2009	12/15/2009	1/25/2010
Cheyenne and Arapaho Tribes, Oklahoma	8/14/2009	8/24/2009	9/14/2009	1/01/2010	4/16/2010
Lower Sioux Indian Community in the State of Minnesota	8/4/2009	8/11/2009	9/14/2009	Not Finalized	N/A
Pawnee Nation of Oklahoma	9/11/2009	9/1/2009	9/14/2009	4/12/2010	5/25/2010
Rosebud Sioux Tribe of the Rosebud Indian Reservation, South Dakota	11/12/2009	11/20/2009	11/30/2009	Not Finalized	N/A
Spirit Lake Tribe, North Dakota	8/11/2009	8/11/2009	9/14/2009	10/01/2010	3/17/2010
Turtle Mountain Band of Chippewa Indians of North Dakota	8/11/2009	9/22/2009	9/24/2009	6/2010	8/30/2010
Yankton Sioux Tribe of South Dakota	8/13/2009	1/13/2010	1/20/2010	3/17/2011	4/18/2011

SOW = Scope of Work

3.11.5 Public Involvement

Consistent with 36 CFR 800.2(d)(1–3), the Department has followed ACHP guidance in its efforts to seek the views of the public in the Section 106-consistent process and through its

NEPA-consistent process. For the proposed Project, the Department placed notices in the Federal Register (including the Receipt of Application and Scoping Notices) and made public and available Keystone's application and environmental report via a project-specific website. The NOI informed the public about the proposed action, announced plans for public scoping opportunities, invited public participation in the scoping process, and solicited public comments for consideration in establishing the scope and content of the Supplemental EIS. The scoping period extended from June 15 to July 30, 2012. As of October 2012, the Department has received over 408,000 public comments, many of which reflected cultural resources issues.

These efforts specific to the modifications in Nebraska are in addition to public involvement efforts conducted for the Final EIS. After the Draft Supplemental EIS is published, the Department will hold public meetings in Nebraska in December 2012. The Department will also receive comments from the public on the Draft Supplemental EIS by phone, mail, fax, and web, and respond to and incorporate comments into the Final Supplemental EIS.

3.11.6 Unanticipated Discovery Plans

Unanticipated Discovery Plans are plans approved by the Department for the proper response and treatment of any discoveries that are made during construction. Examples of this are human remains and other cultural artifacts. The plans will be prepared for Montana, South Dakota, Nebraska, North Dakota, and Kansas, and would apply to federal, state, and private lands. They will be prepared with collaboration from consulting parties including Native American tribes and agencies. Keystone would implement these plans, with the Department's oversight, in the event that unanticipated cultural materials or human remains are encountered during the construction phase of the proposed Project.

3.11.7 Tribal Monitoring Plan

The Tribal Monitoring Plan describes how construction will be monitored for compliance with Section 106 of the NHPA in areas of tribal concern. Monitoring plans will be prepared to assist in identifying and minimizing proposed Project adverse effects on important cultural resources and would be implemented through the PA. A draft Tribal Monitoring Plan was developed for the proposed Project and sent out for review in June 2010. Comments from tribes and agencies were incorporated into a second draft that was submitted to consulting parties for review on November 23, 2010. The Tribal Monitoring Plan was included as a confidential appendix to the PA.

The Tribal Monitoring Plan has been prepared in consultation with the consulting parties for the proposed Project that includes the SHPOs of the affected states, Native American tribes, as well as state and federal agencies. Keystone would implement this plan, with the Department's oversight, in the event that unanticipated cultural materials or human remains are encountered during the construction phase of the proposed Project. The plan would apply to federal, state, and private lands. This plan, along with the unanticipated discovery plans, is stipulations of the PA.

3.11.8 Connected Actions

3.11.8.1 Bakken Marketlink Project

Construction and operation of the proposed Bakken Marketlink Project would include the pipeline, metering and pumping systems, and three new storage tanks near Baker, Montana, and two storage tanks within the boundaries of the proposed Cushing tank farm in Oklahoma. Within Fallon County, Montana, the proposed Bakken Marketlink Project facilities near Pump Station 14 would be located within private land currently used as pastureland and hayfields. A previous cultural resources survey of the area did not identify any cultural resources. The proposed Bakken Marketlink Project facilities located within the boundaries of the Cushing tank farm would consist of areas that have been previously disturbed due to tank farm construction. As a result, no cultural resources surveys are needed for the proposed Bakken Marketlink Project in Oklahoma.

3.11.8.2 Big Bend to Witten 230-kV Transmission Line

An additional and separate NHPA consistency review of the proposed Big Bend to Witten 230-kilovolt (kV) Transmission Line Project is currently being conducted. The project design and cultural resources review of the proposed transmission project are on a different schedule than the proposed Project itself. Regional transmission system reliability concerns are not associated with the initial operation of the proposed pump stations, but rather with later stages of proposed Project operation at higher levels of crude oil throughput.

RUS is the lead federal agency for the proposed transmission project and will assume Section 106 responsibilities. Since a portion of the proposed transmission line and a proposed substation would cross the Lower Brule Sioux Reservation, BIA would be responsible for supplying ARPA permits for cultural resources surveys on reservation land[3], while BLM and USACE would be responsible for supplying ARPA permits on their respective lands. Additionally, RUS would lead the effort for the potential development of a separate PA between RUS, BLM, USACE, Lower Brule Sioux Tribe of the Lower Brule Reservation, South Dakota, and the project applicant, Basin Electric Power Cooperative.

No cultural resources surveys specific to the proposed Big Bend to Witten 230-kV Transmission Line Project have been completed to date. Review of aerial photographs shows that the proposed transmission line corridor includes undeveloped agricultural land with level topography and proximity to water resources. Existing transportation corridors are also present. These factors suggest that the APE for the proposed transmission project has the potential to include intact cultural resources. The authorizations and permit applications required for the proposed project would be reviewed and acted on by other federal agencies. In addition to RUS, as the lead federal agency, these agencies would have their own Section 106 responsibilities. Additionally, these agencies would require that cultural resource surveys be performed by the applicant, and would conduct more detailed cultural resources of the proposed transmission project.

[3] An ARPA permit can be granted by BIA only with the consent of the Lower Brule Sioux Tribe of the Lower Brule Reservation, South Dakota. Terms and conditions may be added to the permit by the Tribe. Tribal conditional permits to conduct cultural resources surveys on reservation lands may also be required by the Tribe.

3.11.8.3 Electrical Distribution Lines and Substations

The Department has consulted with the ACHP concerning the Department's role with regard to the proposed electrical distribution lines that would provide the power to proposed Project pump stations. These lines would be designed and constructed by local power providers along the proposed Project corridor. This connected action is progressing under different schedules than the proposed Project, and in many cases the alignments for the required facilities have not yet been firmly established and cultural resources surveys of the routes have not been conducted.

Cultural resources surveys have started and are currently ongoing for the proposed electrical distribution lines and substations. A general review of aerial photographs shows that the proposed footprints of the electrical distribution lines and substations include undeveloped agricultural land with level topography and proximity to water resources; existing transportation corridors are also present. These factors suggest that the APE for the proposed electrical distribution lines and substations has the potential to include intact cultural resources. The authorizations and permit applications required for the proposed project would be reviewed and acted on by other federal agencies. In addition to the Department, these agencies would have their own Section 106 responsibilities. Additionally, these agencies would require that cultural resources surveys be performed by the applicant, and would conduct more detailed cultural resources of the proposed electrical distribution line and substations.

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3.12 AIR QUALITY AND NOISE

3.12.1 Introduction

This section discusses air quality and noise resources in the proposed Project area and describes applicable federal and state air quality and noise regulations. The description of air quality and noise resources is based on information provided in the 2011 Final Environmental Impact Statement (Final EIS) as well as new circumstances or information relevant to environmental concerns that have become available since the publication of the Final EIS, including the proposed reroute in Nebraska. The information that is provided here builds on the information provided in the Final EIS and in many instances replicates that information with relatively minor changes and updates. Other information is entirely new or substantially altered from that presented in the Final EIS. Specifically, the following information, data, methods, and/or analyses have been substantially updated in this section from the 2011 document:

- Historic regional climate data were revised to reflect changes in the proposed Project route in Nebraska (i.e., historic climate data from weather stations in close proximity to the reroute in Nebraska were used);
- The ambient air quality standards (AAQS) have been updated to include Montana AAQS;
- The regional background air quality concentrations have been updated (previously 2008 data) to include more recent data (i.e., December 2011data);
- Greenhouse gas (GHG) regulatory requirements have been updated to supplement previous information and include recent state and federal regulatory programs that have been implemented to address increasing levels of GHG emissions in the United States; and
- Information on background noise levels using population density of each county crossed by the proposed pipeline is presented to supplement previous information and allow for more representative baseline noise levels.

The proposed Project would include installation of pipeline and construction and operation of 18 pump stations in Montana, South Dakota, and Nebraska. The proposed Project also would include the construction and operation of two pump stations in Kansas, making a total of 20 pump stations. The proposed Project would include the construction and operation of approximately 55 mainline valve (MLV) stations along the proposed pipeline route and approximately eight construction camps: four in Montana, three in South Dakota, and one in Nebraska. All construction camps, pump stations, and MLV stations along the proposed pipeline route would be operated with electricity provided by local utilities. Each camp, pump station, and MLV station would contain one back-up emergency diesel generator, which would only be operated during times of power interruption.[1]

[1] In the event a pump station experiences a utility power outage, the back-up emergency generator is automatically started. When a utility power outage occurs at a pump station, the mainline pump motors are shut down and are not restarted until utility power is restored. The pipeline is designed to continue operating safely at a reduced throughput when any one pump station is out of service.

The back-up emergency diesel generators at the pump stations and MLV stations would have integrated[2] fuel tanks with capacities of approximately 693 and 132 gallons, respectively (exp Energy Services Inc. 2012). The diesel fuel tank at each construction camp would have a capacity of approximately 10,000 gallons, which would be used for operating the camp back-up emergency generator and fueling the camp contractor's vehicles. Depending on daily fuel requirements at construction sites, approximately three 10,000 gallon skid mounted tanks (diesel) and one 9,500 gallon fuel trailer/tank (gasoline) would be established at approved contractor yards and pipe yards in Montana, North Dakota, South Dakota, and Nebraska.

The composition of the commodities (synthetic crude oil [SCO]), diluted bitumen [dilbit], and Bakken shale oil) transported by the proposed Project are discussed in Section 3.13, Potential Releases. In general, heavy crude/bitumen is usually composed of a low proportion of volatile hydrocarbon molecules with high boiling points (over 662 degree Fahrenheit (˚F) and over 70 carbon atoms in the molecule[3]. On the other hand, diluents (e.g., natural gas liquids, fuel gas) which would be mixed with the bitumen/heavy crude to reduce its viscosity and make it transportable via pipelines, are typically composed of higher proportion of volatile hydrocarbon molecules with very low boiling point (-256 to 68 ˚F) and four carbon atoms or less (e.g., butanes, propane, ethane, and methane). The lower the number of carbon atoms and boiling point of a hydrocarbon molecule, the higher its volatility. This means the diluents have a higher potential to emit fugitive volatile organic compounds (VOCs) and methane than the heavy crudes/bitumen.

The proposed Project would be located in regions of the United States designated as attainment for all criteria pollutant. For further discussion about attainment status, see Section 3.12.2.1, Environmental Setting. As currently configured, the construction and operation of the proposed Project components, including pump stations, construction camps, back-up emergency diesel generators, and the pipe stockpile yards/contractor yards, are either exempt from or below the emission thresholds of applicable federal and state air quality regulations, including those specific to GHG emissions. A detailed discussion of regulatory applicability is presented in Section 3.12.2.2, Regulatory Requirements.

For the majority of its proposed route, the proposed Project would be constructed in rural agricultural areas, away from residences and businesses that could be disrupted by the noise generated during construction and operation activities. A few residences are located within 25 to 500 feet of the pipeline right-of-way (ROW) and within 0.5 to 1 mile of the pump stations in Montana, South Dakota, Nebraska, and Kansas[4]. None of the states to be traversed by the proposed Project have regulatory noise limits, although some local ordinances governing noise from construction or industrial activities may apply.

The proposed Project would cross five national historic trails and would be located approximately 12 miles from the Niobrara National Scenic River in Nebraska. The National Park Service has certain noise-related limitations on the use of construction equipment. There are no noise sensitive areas, such as state and national parks or national wilderness areas, present within 1 mile of the proposed Project pump stations.

[2] The tanks are embedded within the back-up emergency generators. There are no stand-alone fuel tanks built specifically for these generators.
[3] http://www.docbrown.info/page04/OilProducts02.htm
[4] A larger distance is used for the pump stations relative to the pipeline (0.5 to 1.0 mile versus 25 to 500 feet) because the noise impacts at the pump stations would occur over a long term period (at least 50 years).

3.12.2 Air Quality

3.12.2.1 Environmental Setting

Regional Climate

The proposed Project would be constructed within a zone characterized by a humid continental climate that occurs where polar and tropical air masses collide. The humid continental climate zone is noted for its variable weather patterns and large temperature ranges, with summer high temperatures averaging over 89 ˚F, and winter low temperatures averaging between 12 to 20˚F. Representative climate data for Circle, Montana; Bowman Court House, North Dakota; Philip, South Dakota; Lincoln, Nebraska; and Marion Lake, Kansas, are presented in Table 3.12-1. These stations were chosen because they were the closest monitoring stations to the proposed pipeline route.

Ambient Air Quality

Federal, state, and local agencies regulate ambient air quality standards. The U.S. Environmental Protection Agency (USEPA) has established national ambient air quality standards (NAAQS) for six criteria pollutants: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), lead (Pb), and particulate matter (PM). PM includes particles with aerodynamic diameter of 10 microns and less (PM_{10}) and particles with an aerodynamic diameter of 2.5 microns and less ($PM_{2.5}$). The NAAQS were developed to protect human health (primary standards) and human welfare (secondary standards). State air quality standards cannot be less stringent than the NAAQS. North Dakota[5], South Dakota, Nebraska[6], and Kansas have adopted ambient air quality standards equivalent to the NAAQS for all six criteria pollutants. Montana has its own AAQS for criteria pollutants as described above and non-criteria pollutants such as fluoride in forage, hydrogen sulfide, settleable particulate, and visibility. Table 3.12-2 lists the federal (NAAQS) and Montana AAQS.

USEPA defines the relative air quality within specified zones in the United States as either in attainment, nonattainment, maintenance, or unclassifiable. Areas meeting the NAAQS are termed attainment areas (i.e., areas with good air quality); areas not meeting the NAAQS are termed nonattainment areas (i.e., areas with poor air quality). Maintenance areas are areas previously designated as nonattainment areas that have recently demonstrated compliance with the NAAQS. These former nonattainment areas are treated as attainment areas for the purposes of permitting stationary sources (individual states may have specific provisions to ensure that the area would continue to comply with the NAAQS). Areas that have insufficient data to make a determination of attainment or nonattainment are unclassified or are not designated, but are treated as being in attainment for permitting purposes. The proposed Project is located in an area designated as attainment for all criteria pollutants. The attainment status of the proposed Project is also discussed in Section 3.12.2.2, Regulatory Requirements.

[5] In addition to the NAAQS, the State of North Dakota has ambient air quality standards for hydrogen sulfide (10 parts per million [ppm] maximum instantaneous concentration, 0.2 ppm 1-hour average concentration, 0.1 ppm maximum 24-hour concentration, and 0.02 maximum arithmetic mean concentration). Unlike the NAAQS, North Dakota has no ambient air quality standards for $PM_{2.5}$ (annual and 24-hour standards).

[6] In addition to the NAAQS, the State of Nebraska has ambient air quality standards for Total Reduced Sulfur (10 ppm for maximum 1-hour concentration and 0.10 ppm for maximum 30 minute rolling average).

Table 3.12-1 Representative Climate Data in the Vicinity of the Proposed Pipeline

Location/Measurement (Average)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Annual
Circle, Montana[a]													
Maximum temperature (ºF)	26.2	32.7	43.6	57.8	68.5	78.0	86.9	85.8	73.6	59.7	42.3	29.7	57.1
Minimum temperature (ºF)	4.1	10.3	19.6	31.0	41.2	50.1	55.8	53.9	42.9	31.9	19.1	7.9	30.7
Total precipitation (inches)	0.45	0.32	0.56	1.27	2.15	2.55	1.97	1.34	1.26	0.85	0.36	0.49	13.56
Total snowfall (inches)	5.4	3.2	3.3	2.0	0.3	0.0	0.0	0.0	0.1	0.9	2.4	5.0	22.8
Bowman Court House, North Dakota[b]													
Maximum temperature (ºF)	25.5	30.2	39.8	54.5	66.0	75.2	84.2	83.2	71.8	58.5	41.2	30.0	55.0
Minimum temperature (ºF)	4.1	8.5	17.5	29.7	40.7	50.1	56.1	53.7	43.0	31.9	19.0	8.9	30.3
Total precipitation (inches)	0.47	0.40	0.67	1.37	2.39	3.44	2.08	1.45	1.26	1.07	0.47	0.36	15.43
Total snowfall (inches)	6.8	5.6	7.0	4.0	1.0	0.1	0.0	0.0	0.3	2.4	5.4	5.1	37.5
Philip, South Dakota[c]													
Maximum temperature (ºF)	31.5	37.2	45.3	60.3	70.5	80.1	89.7	89.2	77.9	65.0	47.5	36.3	60.9
Minimum temperature (ºF)	6.4	11.7	20.1	32.3	43.3	53.2	59.1	57.5	46.0	34.1	21.0	11.2	33.0
Total precipitation (inches)	0.30	0.40	0.89	1.63	2.96	3.41	2.00	1.63	1.17	1.04	0.43	0.33	16.19
Total snowfall (inches)	4.4	6.2	6.5	3.2	0.4	0.0	0.0	0.0	0.0	0.4	3.1	4.3	28.7
Lincoln, Nebraska[d]													
Maximum temperature (ºF)	33.8	39.7	51.3	63.9	73.9	84.5	89.2	86.8	78.5	66.4	50.0	37.2	62.9
Minimum temperature (ºF)	12.2	17.6	27.8	38.9	50.2	60.8	66.1	63.7	53.0	40.4	27.5	16.2	39.5
Total precipitation (inches)	0.70	0.87	1.96	2.91	4.25	3.93	3.32	3.46	2.92	1.99	1.47	0.88	28.67
Total snowfall (inches)	6.5	5.6	4.6	1.3	0.0	0.0	0.0	0.0	0.0	0.5	2.3	5.8	26.6
Marion Lake, Kansas[e]													
Maximum temperature (ºF)	38.1	43.8	55.3	66.2	75.1	85.1	91.5	90.1	81.0	69.1	54.0	41.5	65.9
Minimum temperature (ºF)	17.1	21.3	31.9	42.6	52.8	62.8	67.8	65.7	56.0	43.8	31.9	21.5	42.9
Total precipitation (inches)	0.69	0.99	2.31	3.14	4.66	4.97	3.82	3.72	3.42	2.77	1.67	1.17	33.33
Total snowfall (inches)	1.3	1.1	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.4	4.8

[a] Source: Western Regional Climate Center (WRCC 2012), Circle, Montana, Station 241758, average data from September 1, 1963, to August 26, 2012.
[b] Source: High Plains Regional Climate Center (HPRCC 2012a), Bowman Court House, North Dakota, Station 320995, average data from January 2, 1915, to April 30, 2012.
[c] Source: High Plains Regional Climate Center (HPRCC 2012b), Philip, South Dakota, Station 396552, average data from November 1, 1907, to April 30, 2012.
[d] Source: High Plains Regional Climate Center (HPRCC 2012c), Lincoln WSO Airport, Nebraska, Station 254795, average data from June 1, 1948, to April 30, 2012.
[e] Source: High Plains Regional Climate Center (HPRCC 2012d), Marion Lake, Kansas, Station 145039, average data from January 1, 1966, to April 30, 2012.

Table 3.12-2 Federal and Montana Ambient Air Quality Standards

Pollutant	Time Frame	Federal (NAAQS) Primary	Federal (NAAQS) Secondary	Montana (AAQS)
Particulate matter less than 10 microns in diameter	Annual[a]	Revoked[a]	Revoked[a]	50 μg/m^3
	24-hour[b]	150 μg/m^3[q]	150 μg/m^3	150 μg/m^3
Particulate matter less than 2.5 microns in diameter	Annual[c]	15 μg/m^3	15 μg/m^3	NA
	24-hour[d]	35 μg/m^3	NA	NA
Sulfur dioxide	Annual[e]	Revoked[e]	Revoked[e]	0.02 ppm
	24-hour[e]	Revoked[e]	Revoked[e]	0.10 ppm
	3-hour[b]	NA[r]	0.5 ppm	NA
	1-hour[f]	0.075 ppm[s]	NA	0.50 ppm
Carbon monoxide	8-hour[g]	9 ppm	NA	9 ppm
	1-hour[g]	35 ppm	NA	23 ppm
Nitrogen dioxide	Annual[h]	0.053 ppm	0.053 ppm	0.05 ppm
	1-hour[i]	0.100 ppm	NA	0.30 ppm
Ozone	8-hour[j]	0.075 ppm	0.075 ppm	NA
	1-hour[k]	Revoked[k]	Revoked[k]	0.10 ppm
Lead	3-month rolling[l]	0.15 μg/m^3	0.15 μg/m^3	NA
	Quarterly[m]	1.5 μg/m^3	1.5 μg/m^3	1.5 μg/m^3
Fluoride in Forage	Monthly[n]	NA	NA	50 μg/g[t]
	Grazing season[n]	NA	NA	35 μg/g
Hydrogen Sulfide	1-hour[o]	NA	NA	0.05 ppm
Settleable Particulate	30-day[n]	NA	NA	10 g/m^2 [u]
Visibility	Annual[p]	NA	NA	3 x 10^{-5}/m[v]

Source: USEPA 2012a (http://www.epa.gov/air/criteria.html/) and Administrative Rules of the State of Montana, Rule Chapter 17.8.210 to 17.8.230 - Air Quality Standards.

[a] Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, the USEPA revoked the annual PM_{10} standard of 50 μg/m^3 in 2006 (effective December 17, 2006). For the Montana AAQS, the 3-year average of the arithmetic means over a calendar year, averaged over 3-years must not be exceeded.
[b] Federal and state standards not to be exceeded more than once per year.
[c] To attain this federal standard, the 3-year average of the weighted annual mean particulate matter less than 2.5 microns in diameter concentrations from single- or multiple community-oriented monitors must not exceed 15.0 μg/m^3.
[d] To attain this federal standard, 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 (effective December 17, 2006).
[e] As of June 2, 2010, USEPA revoked the 1971 annual and 24-hour SO_2 standards in all areas. For the Montana AAQS, the arithmetic average for annual SO_2 over any four consecutive quarters must not exceed the standard. The 24-hour SO_2 concentrations in Montana must not be exceeded more than once over any 12 consecutive months.
[f] To attain this federal 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 (effective June 2, 2010). For the Montana AAQS, the 1-hour SO_2 standard must not be exceeded more than eighteen times in any 12 consecutive months.
[g] Federal standard not to be exceeded more than once per year. For Montana AAQS, the 1-hour and 8-hour CO concentrations must not be exceeded more than once over any 12 consecutive months.
[h] Federal standard must not exceed the annual arithmetic mean concentration for a calendar year. For Montana AAQS, the arithmetic average over any four consecutive quarters must not be exceeded.
[i] To attain this federal 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 0.1 ppm (effective January 22, 2010). For Montana AAQS, the 1-hour NO_2 concentrations must not be exceeded more than once over any 12 consecutive months.
[j] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations, measured at each monitor within an area over each year, must not exceed 0.075 ppm (effective May 27, 2008).
[k] As of June 15, 2005, USEPA revoked the 1-hour ozone federal standard in all areas, except the fourteen 8-hour ozone nonattainment Early Action Compact Areas. For Montana AAQS, the 1-hour ozone concentrations must not be exceeded more than once over any 12 consecutive months.
[l] Federal standard not to be exceeded for the averaging time period. Final rule signed October 15, 2008.
[m] Federal or Montana AAQS not to be exceeded for the averaging time period.
[n] Montana AAQS not to be exceeded for the averaging time period.

[o] Montana AAQS not to be exceeded more than once every 12 consecutive months.
[p] For Montana AAQS, the arithmetic average over any four consecutive quarters must not be exceeded.
[q] microgram(s) per cubic meter (μg/m^3).
[r] not applicable (NA).
[s] part(s) per million (ppm).
[t] microgram(s) per grams (μg/g).
[u] gram(s) per square meter (g/m^2).
[v] per meter (/m).

The USEPA and state and local agencies have established a network of ambient air quality monitoring stations to measure and track the background concentrations of criteria pollutants across the United States. The major sources of criteria pollutant emissions within the proposed Project area include motor vehicles, industrial facilities, agricultural activities, electric utilities, and fuel storage facilities. A summary of the available regional background air quality concentrations within the proposed Project vicinity for 2011 is presented in Table 3.12-3. These stations were chosen because they represented the closest monitoring stations to the proposed pipeline route. Annual NO_2 and 3-hour SO_2 data were not available at any of the affected states.

Table 3.12-3 2011 Regional Background Air Quality Concentrations for the Proposed Project[a]

	PM_{10} (μg/m^3)	$PM_{2.5}$ (μg/m^3)		SO_2 (ppm)		CO (ppm)		NO_2 (ppm)		O_3 (ppm)	
Location	**24-Hr[b]**	**Annual**	**24-Hr[c]**	**1-Hr[d]**	**3-Hrb**	**8-Hr[b]**	**1-Hr[b]**	**Annual**	**1-Hr[e]**	**8-Hr[f]**	**1-Hr[b]**
Montana											
Flathead County	34	7.2	19	ND	ND	ND	NA	ND	ND	0.055	0.06
Rosebud County	ND[g]	ND	ND	0.012	ND	ND	NA	ND	0.065	0.052	0.061
Yellowstone County	ND	ND	ND	0.074	ND	1.3	2.5	ND	ND	ND	ND
North Dakota											
Billings County	ND	4.1	10	0.005	ND	ND	ND	ND	NA	0.057	0.063
Dunn County	ND	ND	ND	0.010	ND	ND	ND	ND	0.008	0.054	0.06
Mercer County	ND	5.1	11	0.038	ND	ND	ND	ND	0.022	0.059	0.064
South Dakota											
Jackson County	ND	ND	ND	0.006	ND	ND	ND	ND	0.004	0.052	0.061
Meade County	41	ND	ND	ND	ND	ND	ND	ND	NA	0.057	0.068
Pennington County	58	5.4	12	0.008	ND	ND	ND	ND	0.047	NA	NA
Nebraska											
Douglas County	58	10.6	21	0.066	ND	1.6	2.4	ND	ND	0.066	0.081
Hall County	ND	7	18	ND	ND	ND	ND	ND	ND	ND	ND
Lancaster County	ND	8.5	22	ND	ND	1.5	2.9	ND	ND	0.053	0.089
Kansas											
Sedgwick County	56	9.6	28	ND	ND	3.4	3.6	ND	0.069	0.08	0.098
Shawnee County	35	9.9	21	ND	ND	ND	ND	ND	ND	0.076	0.094
Sumner County	ND	9.1	26	0.008	ND	ND	ND	ND	0.029	0.078	0.091

Source: USEPA 2012b (http://www.epa.gov/airdata/).

[a] The values shown are the highest reported during the year by all monitoring sites in a county.
[b] Data represent the second-highest daily maximum concentrations.
[c] Data represent the 98th percentile of 24-hour average $PM_{2.5}$ concentrations.
[d] Data represent the 99th percentile of 1-hour daily SO_2 concentrations, averaged over 3 years.
[e] Data represent the 98th percentile of 1-hour average NO_2 concentrations averaged over 3 years.
[f] Data represent the fourth-highest daily maximum 8-hour average ozone concentrations.
[g] No data (ND).

3.12.2.2 Regulatory Requirements

The Clean Air Act (CAA) and its implementing regulations (42 United States Code 7401 et seq., as amended in 1977 and 1990) are the basic federal statutes and regulations governing air pollution in the United States. Additionally, the following requirements have been reviewed for applicability to the proposed Project:

- New Source Review (NSR)/Prevention of Significant Deterioration (PSD);
- Air Quality Control Regions (AQCRs);
- New Source Performance Standards (NSPS);
- National Emission Standards for Hazardous Air Pollutants (NESHAPs)/Maximum Achievable Control Technology (MACT);
- Chemical Accident Prevention Provisions;
- Title V Operating Permits/State Operating Permits;
- Other Applicable State Permits;
- General Conformity Rule; and
- Greenhouse gases standards.

New Source Review/Prevention of Significant Deterioration

The NSR permitting program was established as part of the 1977 Clean Air Act Amendments (CAAA). NSR is a preconstruction permitting program that is designed to ensure that air quality is not significantly degraded from the addition of new or modified major emissions sources.[7] In poor air quality areas, NSR requires that new emissions do not inhibit progress toward cleaner air. In addition, the NSR program requires that any large new or modified industrial source would be as clean as possible, and that the best available pollution control is utilized. The NSR permit establishes allowable construction procedures, emission source operations, and applicable emission limits relevant to the permitted action. If construction or modification of a major stationary source would result in emissions greater than the established significance threshold for a pollutant within an attainment area, the proposed Project must be reviewed in accordance with PSD regulations under Title 40 of the Code of Federal Regulations (CFR) 51.166 (Prevention of Significant Deterioration of Air Quality). Construction or modification of a major or, in some jurisdictions, non-major stationary source in a designated nonattainment or designated maintenance area (Section 175A) requires that the proposed Project be reviewed in accordance with nonattainment NSR regulations. During construction, local utilities would provide commercial electrical power at the construction camps; however, back-up emergency diesel-fired generator engines would be used at the camps during upset conditions when commercial electrical power is interrupted (Table 4.12-4). These camps would be located within designated attainment areas as follows: four in Montana (one in McCone County, two in Valley County, and one in Fallon County), three in South Dakota (one in Tripp County, two in Harding County, and one in Meade County), and one in Nebraska (Holt County). The back-up emergency diesel-fired

[7] A major stationary pollutant source in a nonattainment area has the potential to emit more than 100 tons per year (tpy) of any criteria pollutant. In PSD areas, the threshold level may be either 100 or 250 tpy, depending on whether the source is classified as one of the 28 named source categories listed in Section 168 of the CAAA.

generator engines would be considered non-road engines under 40 CFR 89.2 (Control of Emissions from New and In-use Non-road Compression Ignition Engines - Definitions) if they meet the definitions of portable or transportable and are on location for less than 12 consecutive months. The determination of "potential to emit" would exclude non-road engine emissions for applicability purposes in accordance with the CAA. Current plans are for each construction camp to be used for less than 12 months, so that the back-up emergency diesel generators would be onsite for less than 12 months. Therefore, the camp generator engines would qualify as non-road engines per 40 CFR 89.2 and determination of "potential to emit" would not apply. Consequently, emissions would be less than the 250 tons per year (tpy) significance threshold level, and PSD and NSR review would not be triggered (Tables 3.12-4).

Table 3.12-4 Estimated Criteria Pollutant Emissions Per Back-up Emergency Generator at Construction Camps

Pollutant	Maximum Output per Camp (hp[h])[a]	Annual Hours of Operation per Camp (hr/yr[i])[b]	Maximum Heat Input per Camp, HHV[j] (MMBtu/hr[k])	Emission Factors[c, d, e] (lb/MMBtu[l])	Emission Factors[c, d, e] (g/hp-hr[m])	Emissions Rates per Camp (tpy)	Emission Rates for all Seven Camps (tpy)
Nitrogen Oxides	536.4	500	3.75	0.864	2.74	0.81	5.68
Carbon monoxide	536.4	500	3.75	0.822	2.61	0.77	5.40
Nonmethane hydrocarbon	536.4	500	3.75	0.075	0.24	0.071	0.49
Particulate Matter	536.4	500	3.75	0.047	0.15	0.044	0.31
Sulfur Oxides	536.4	500	3.75	0.0016	0.0049	0.0015	0.010
Lead	536.4	500	3.75	0.0000090	NA[n]	0.0000084	0.000059

[a] Maximum output was based on one 400-kW back-up emergency generator engine operating at each construction camp during upset conditions when commercial power is interrupted (assumed Tier 3 engines).
[b] The back-up emergency generators at each camp were assumed to operate for 500 hours per year.
[c] Maximum heat input was estimated based on the maximum hp at each construction camp and a brake-specific fuel consumption of 7,000 Btu/hp-hr.
[d] Emission factors (g/hp-hr) for all criteria pollutants except sulfur oxides and lead were based on NSPS Subpart IIII emission standards (40 CFR 89); converted from g/kwh to g/hp-hr. NOx emission factor (g/hp-hr) assumed equal to 92% of Subpart IIII NMHC + NO_x emission standard. Emission factor (g/hp-hr) for NMHC or VOCs assumed equal to 8% of Subpart III NMHC + NOx emission standard. The percent values were based on the ratio of NOx to VOC rates obtained from the USEPA AP-42, Section 3.3, Gasoline and Diesel Industrial Engines, October 1996 (USEPA 1996b).
[e] Sulfur oxides (SO_x) emission factors were calculated based on a sulfur content of 0.0015% (ultra-low-sulfur diesel), heat content of 19,300 Btu/lb and maximum heat input in MMBtu/hr, and a brake-specific fuel consumption of 7,000 Btu/hp-hr (assume $SO_x = SO_2$).
[f] Lead (Pb) emission factors (lb/MMBtu) taken from USEPA AP-42, Section 1.3, Fuel Oil Combustion, October 1996 (USEPA 1996a). Pb emission factors for diesel industrial engines were not available.
[g] Based on four construction camps in Montana, three in South Dakota, and one in Nebraska
[h] Horsepower (hp)
[i] Hours per year (hr/yr)
[j] High Heating Value (HHV)
[k] Million British Thermal Units per hour (MMBtu/Hr)
[l] pounds per million British Thermal Units (lb/MMBtu)
[m] grams per horsepower-hour (g/hp-hr)
[n] not applicable (NA)

During operation, the proposed Project would use skid-mounted back-up emergency diesel generators with integrated fuel tanks at pump stations and MLV stations during upset conditions when commercial power supply is interrupted weather. Specifically, each pump station would have one 113 kilowatt (kW) back-up emergency diesel generator with an integrated 693-gallon tank and each MLV station would have one 38-kW back-up emergency diesel generator with an integrated 132-gallon tank. Emissions would be negligible since the units would only operate for approximately half-hour per week, or about 30 hours per year. Consequently, emissions would be less than the 250 tpy significance threshold level, and PSD and NSR review would not be triggered.

The determination of *potential to emit* only applies to stationary sources (40 CFR 51.166), so mobile source emissions from construction activities would not trigger PSD or NSR review.

Air Quality Control Region

AQCRs are categorized as Class I, II, or III. Class I areas (commonly called *pristine areas*) include the following:

- International parks;
- National wilderness areas that exceed 5,000 acres in size;
- National memorial parks that exceed 5,000 acres in size; and
- National parks that exceed 6,000 acres and were in existence on August 7, 1977 (the effective date of the 1977 Amendments).

If a new source (or a major modification to an existing source) is subject to the PSD program requirements and is within 62 miles (100 kilometers) of a Class I area, the proposed facility must notify the appropriate federal officials and assess the impacts of the proposed Project on the Class I area. The following Class I areas are within 62 miles (100 kilometers) of the proposed Project ROW: Fort Peck Indian Reservation in Montana; Theodore Roosevelt National Park in North Dakota; and Badlands/Sage Creek Wilderness and Badlands National Park in South Dakota. There are no federal Class I areas in Nebraska. The proposed Project does not include construction or operation of significant stationary sources of air pollutants subject to the PSD program requirements. Therefore, the proposed Project would not trigger a federal Class I area impact assessment.

Class II areas include all attainment and not classifiable areas not designated as Class I areas (unless subsequently redesignated). The Niobrara National Scenic River located approximately 11 miles west of the proposed pipeline route in Nebraska is designated as a Class II area.[8] Since the scenic river is not designated as a Class I area, the proposed Project would not trigger any special impact assessment such as the federal Class I area impact assessment.

[8] The proposed pipeline crosses the Niobrara River in Nebraska; however, the portion of the river that is scenic (Niobrara National Scenic River) ends at U.S. Route 137, which is approximately 12 miles west of the proposed pipeline route and 19 miles south of the closest pump station (Pump Station 21) (http://www.nps.gov/common/commonspot/customcf/apps/maps/showmap.cfm?alphacode=niob&parkname=Niobrara).

Class III areas are not defined in the statute, which includes areas that a state decides not to protect with either the pristine or Class II areas designation. Class III designations are intended for heavily industrialized zones, must meet all requirements outlined in 40 CFR 51.166, and can be made only on request.

New Source Performance Standards

NSPS, codified at 40 CFR Part 60, establishes requirements for new, modified, or reconstructed units in specific source categories. NSPS requirements include emission limits, monitoring, reporting, and record keeping.

The regulation at 40 CFR 60 Subpart Kb applies to each storage vessel (not aggregate) containing volatile organic liquids with a capacity greater than or equal to 75 cubic meters (m^3) (approximately 19,800 gallons). The proposed Project would not require any permanent fuel storage vessels/tank farm or surge relief tanks. During construction, temporary fuel storage systems would be located at contractor yards and pipe yards. Each system would consist of temporary, aboveground on-road and off-road, diesel, skid-mounted tanks (approximately three 10,000 gallon tanks) and/or 9,500-gallon gasoline fuel trailers. Normally, a 2- to 3-day supply of fuel would be maintained in storage, resulting in approximately 30,000 gallons in storage volume at each fuel storage location. Fuel tanks smaller than 75 m^3 that were constructed after July 23, 1984 would be exempt from the requirements of 40 CFR 60 Subpart Kb. Since each temporary storage vessel at the pipe yards and contractor yards would be smaller than 75 m^3, the requirements of 40 CFR 60 Subpart Kb would not apply to these units. The regulatory applicability of 40 CFR 60 Subpart XX (Standards of Performance for Bulk Gasoline Terminals) depends on the gasoline throughput of transfer facilities. Transfer facilities whose gasoline throughputs are less than 75,700 liters per day (i.e., 19,998 gallons per day) are exempt from Subpart XX. The proposed Project gasoline transfer facilities at the pipeline yards and contractor yards are expected to be less than 75,700 liters per day and as such, would be exempt from Subpart XX. Construction camp generator engines that are on-site less than 12 months and that qualify as non-road engines per 40 CFR 89.2 would not be considered stationary units and would not be subject to 40 CFR 60 Subpart IIII (Standards of Performance for Stationary Compression Ignition Internal Combustion Engines). During construction, current plans are for each camp to be used for less than 12 months, so that the back-up emergency diesel generators would be onsite for less than 12 months. Therefore, the camp generator engines would qualify as non-road engines per 40 CFR 89.2 and would not be subject to 40 CFR 60 Subpart IIII.

During operation, back-up emergency generators at pump stations and MLV stations would be located on-site for longer than 12 months and as such, would qualify as stationary units subject to 40 CFR 60 Subpart IIII. The regulations at 40 CFR 60 Subpart IIII apply to stationary compression ignition internal combustion engines (i.e., diesel internal combustion engines) manufactured after April 1, 2006, or modified or reconstructed after July 11, 2005. Subpart IIII requires that these engines be certified to meet the emission standards in 40 CFR 60.4201 for NOx, PM, CO, and non-methane hydrocarbons. In addition, owners and operators of the engines must use ultra-low-sulfur diesel fuel. The regulation has specific provisions for back-up emergency engines which would apply to the proposed Project's back-up emergency engines (40 CFR 60.4202).

No other subparts would apply because the proposed Project does not include construction or operation of any other specific source category of air pollutants.

National Emission Standards for Hazardous Air Pollutants/Maximum Achievable Control Technology

NESHAPS/MACT, codified in 40 CFR Parts 61 and 63, regulate hazardous air pollutant (HAP) emissions. Part 61 was promulgated prior to the 1990 CAAA and regulates only eight types of hazardous substances (asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride). The proposed Project would not include facilities that fall under one of the source categories regulated by Part 61; therefore, the requirements of Part 61 are not applicable.

The 1990 CAAA established a list of 189 additional HAPs, resulting in the promulgation of Part 63. Also known as the MACT standards, Part 63 regulates HAP emissions from major sources, area sources, and specific source categories. Part 63 considers any source with the potential to emit 10 tpy of any single HAP or 25 tpy of HAPs in aggregate as a major source of HAPs. Area sources are defined by USEPA as sources that emit less than 10 tons of a single HAP or less than 25 tons of a combination of HAPs annually. During operations, the proposed pump stations and MLV stations along the pipeline corridor would be electrically driven and, therefore, would not emit any HAPs. However, the proposed Project would require the use of back-up emergency generators at the pump stations and MLV stations during upset conditions when commercial power supply is interrupted. HAP emissions would be negligible since the units would be expected to only operate on average for approximately half-hour per week, or about 30 hours per year. Consequently, none of the proposed Project facilities would have the potential to emit HAP emissions greater than 10 tpy for a single HAP, nor would they have the potential to emit multiple HAPs at a quantity equal to or greater than 25 tpy. The proposed Project facilities therefore would not be considered a major source of HAP emissions.

During construction, all construction camps along the pipeline route would be operated with electricity provided by local utilities. Each camp would contain one back-up emergency diesel generator, which would only be operated during times of power interruption. Those back-up emergency diesel engines would be subject to area source provisions in 40 CFR 63 Subpart ZZZZ for stationary reciprocating internal combustion engines.[9] Back-up emergency generator engines that are located onsite for less than 12 months are considered non-road engines per 40 CFR 89.2. Such engines are not considered stationary units and are not subject to 40 CFR 63 Subpart ZZZZ. Current plans are for each camp to be used for less than 12 months, so that the back-up emergency diesel generators would be onsite for less than 12 months. Therefore, these camp back-up emergency generator engines would not be subject to 40 CFR 63 Subpart ZZZZ. As indicated before, these back-up emergency generator engines would only operate during times of commercial power interruption and as such, would have emissions less than 10 tpy for any single HAP or 25 tpy total for all HAPs (see Table 3.12-5).

[9] Stationary reciprocating internal combustion engines are stationary relatives of motor vehicle engines and include spark ignition, compression ignition, rich-burn, and lean-burn engine types. In a reciprocating engine, combustion of a compressed fuel-air mixture is used to drive pistons in one or more cylinders, with the linear piston motion converted to rotary motion with a crankshaft. In general industry, these engines provide shaft power to drive process equipment, compressors, pumps, standby generator sets, and other machinery.

Table 3.12-5 Estimated HAP Emissions per Back-up Emergency Diesel Generator at Construction Camps

Hazardous Air Pollutants	Maximum Output per Camp (hp)[a]	Annual Hours of Operation per Camp (hr/yr)[b]	Maximum Heat Input per Camp, HHV (MMBtu/hr[c]	Emission Factors[d] (lb/MMBtu)	Emissions Rates per Camp (tpy)	Emission Rates for all Seven Camps[e] (tpy)
Benzene	536.4	500	3.75	0.00093	0.00088	0.0061
Toluene	536.4	500	3.75	0.00041	0.00038	0.0027
Xylenes	536.4	500	3.75	0.00029	0.00027	0.0019
Acrolein	536.4	500	3.75	0.000093	0.000087	0.00061
PAHs*	536.4	500	3.75	0.00017	0.00016	0.0011
1,3-Butadiene	536.4	500	3.75	0.000039	0.000037	0.00026
Formaldehyde	536.4	500	3.75	0.0012	0.0011	0.0078
Acetaldehyde	536.4	500	3.75	0.00077	0.00072	0.0050
Total HAPs					**0.0036**	**0.025**
Maximum Individual HAP—Formaldehyde					**0.0011**	**0.0078**

[a] Maximum output was based on one 400 kW operating at each construction camp during upset conditions when commercial power is interrupted (assumed Tier 3 engines).
[b] The back-up emergency generators at each camp were assumed to operate for 500 hours per year.
[c] Maximum heat input was estimated based on the maximum hp per construction camp and a brake-specific fuel consumption of 7,000 Btu/hp-hr.
[d] HAP emission factors (lb/MMBtu) were taken from EPA AP-42, Section 3.3, Table 3.3-2 (USEPA 1996b).
[e] Based on four construction camps in Montana, three in South Dakota, and one in northern Nebraska.
[f] polycyclic aromatic hydrocarbons (PAHs).

Chemical Accident Prevention Provisions

The chemical accident prevention provisions, codified in 40 CFR 68, are federal regulations designed to prevent the release of hazardous materials in the event of an accident and to minimize potential impacts if a release did occur. The regulations contain a list of substances and threshold quantities for determining applicability to stationary sources (40 CFR 68.130, List of Regulated Toxic Substances and Threshold Quantities for Accidental Release Prevention). If a stationary source stores, handles, or processes one or more substances on this list in a quantity equal to or greater than specified in the regulation, the facility must prepare and submit a Risk Management Plan. If a facility does not have a listed substance on site, or if the quantity of a listed substance is below the applicability threshold, the facility does not need to prepare a Risk Management Plan.

No known hazardous materials subject to 40 CFR 68 would be stored at the proposed Project aboveground facilities. The materials that would be stored at the contractor yards include gasoline, diesel fuel, lubricating oil, greases, hydraulic fluid, engine oil, and other substances common to maintaining construction equipment. The thresholds in 40 CFR 68.130 are 1,000 pounds or gallons and above (exempting gasoline and diesel fuel). None of the contractors would have containers or quantities approaching these volumes.

Title V Operating Permits/State Operating Permits

Title V of the federal CAA requires individual states to establish an air operating permit program. The requirements of Title V are outlined in 40 CFR 70 (State Operating Permit Programs) and 40 CFR 71 (Federal Operating Permit Program), and the permits required by these regulations are often referred to as Part 70 or 71 permits. The federal and state Title V operating permits for air emissions include air pollution requirements that apply to an emissions source, including emissions limits and monitoring, record keeping, and reporting requirements. It also requires that the emissions source report its permit compliance status to the permitting authority. The Title V operating permits are required for all major stationary sources. What constitutes a major source varies according to what pollutant(s) are being emitted and the attainment designation of the area where the source is located. In general, a source is considered to be a major source under Title V if it emits or has the potential to emit:

- One hundred tpy or more of any criteria air pollutant in an attainment area[10];
- Ten tpy or more of a single HAP; or
- Twenty-five tpy of cumulative HAPs.

During construction, temporary diesel-fired generator engines could be used at any of seven temporary construction camps if commercial electrical power is unavailable. If commercial electrical power is acquired from local utilities, these locations might still use back-up emergency, temporary, diesel-fired generator engines. In Montana, the State of Montana Department of Environmental Quality (MDEQ) has authority to implement the Title V program, but does not have the authority to implement operating permit programs for minor sources not subject to Title V. Regulations are contained in the Administrative Rules of Montana, Title 17, Chapter 8, Subchapter 12. The back-up emergency generators at each camp in Montana would not have emissions that exceed the Title V threshold of 100 tpy (Tables 3.12-4). Consequently, proposed temporary construction camps in Montana (four camps) would not trigger Title V permitting in that state. During operations, the back-up emergency generators used at the pump stations and MLV stations due to commercial power loss in Montana would also not exceed the Title V permitting thresholds because of the minimal annual hours of operation (approximately 30 hours per year).

In South Dakota, the State of South Dakota Department of Environment and Natural Resources (SD DENR) has authority to implement the Title V program and the operating permit program for minor sources not subject to Title V. Regulations are contained in the Administrative Rules of South Dakota, Chapters74:36:04-05. The SD DENR exempts sources from the requirements for a minor operating permit as described in Chapter 74:36:04:03, including facilities that have the potential to emit 25 tpy or less of any criteria pollutant. Potential emissions from the back-up emergency generators at each camp in South Dakota would not exceed the Title V threshold of 100 tpy (Tables 3.12-4). Similarly, the generator engines at the camps, pump stations, and MLV stations would have potential emissions less than the minor operating permit threshold. Consequently, proposed Project camp generators in South Dakota would not trigger Title V or minor source permitting. During operations, the back-up emergency generators used at the pump

[10] Lower thresholds apply in nonattainment areas (but only for the pollutant that is in nonattainment). All the counties within the proposed pipeline corridor in Montana, South Dakota, and Nebraska are in attainment areas for all criteria pollutants.

stations and MLV stations due to commercial power loss in South Dakota would also not exceed the Title V and minor source permitting thresholds because of the minimal annual hours of operation (approximately 30 hours per year).

In Nebraska, the State of Nebraska Department of Environment Quality (NDEQ) has authority to implement the Title V program and the operating permit program for minor sources not subject to Title V. Regulations are contained in the Nebraska Administrative Code (NAC) Title 129, Chapters 5 (Operating Permits). The NDEQ exempts sources from the requirements for a minor operating permit as described in NAC 129.5.001.03B under a condition known as the *Low Emitter Rule*, including facilities that have the potential to emit 50 tpy or less of any criteria pollutant except lead, 2.5 tpy or less for lead, 5 tpy or less of any individual HAP, or 12.5 tpy or less for total HAPs. Potential emissions from the back-up emergency generators at the camp in northern Nebraska would not exceed the Title V threshold of 100 tpy (Tables 3.12-4 and 3.12-5). The proposed Project camp in Nebraska would not trigger Title V or minor source permitting. During operations, the back-up emergency generators used at the pump stations and MLV stations due to commercial power loss in Nebraska would also not exceed the Title V and minor source permitting thresholds because of the minimal annual hours of operation (approximately 30 hours per year). In addition, under NAC 129.5.002.02D, none of the back-up emergency generators at the camp, pump stations, and MLV stations would be required to obtain Nebraska air quality permits due to their intended purpose as emergency equipment used only under instances of power loss (exp Energy Services Inc. 2012). The back-up emergency generator engines that would be used at the pump stations and MLV stations when commercial power is interrupted would be subject to 40 CFR 60 Subpart IIII and 40 CFR 63 Subpart ZZZZ.

In Kansas, the State of Kansas Department of Health and Environment has authority to implement the Title V program, but does not have the authority to implement operating permit programs for minor sources not subject to Title V. Regulations are contained in the Kansas Administrative Regulations 28-19-500 (Operating Permits). During operations, the back-up emergency generators used at the two pump stations in Kansas under instances of commercial power loss would not exceed the Title V permitting thresholds because of the minimal annual hours of operation (approximately 30 hours per year). Consequently, the two proposed pump stations in Kansas would not trigger Title V permitting in that state.

The single pipe yard and contractor yard site in North Dakota (pre-existing industrial site) may have temporary fuel storage tanks (approximately three 10,000-gallon tanks for diesel and one 9,500-gallon tank for gasoline) but fugitive VOCs from such tanks are not expected to be significant[11]. Consequently, the storage tanks at the single pipeline yard in North Dakota would not trigger Title V operating permits.

State Preconstruction Permits

In Montana, MDEQ requires preconstruction air quality permits under the Administrative Rules of Montana, Title 17, Chapter 8, Subchapter 7. Permitting is required for sources that have

[11] Fugitive VOCs were not estimated for the fuel storage tanks at the pipe yards and contractor yards. However, one of the Connected Actions, the Bakken Marketlink Project in Baker, Montana, would have the potential to emit 21.9 tpy VOC emissions from crude oil tanks with storage capacities of 250,000 barrels (throughput of 65,000 barrels per day) (see Keystone's Response to Data Request 2.0, October 1, 2012 [Keystone 2012]). The fuel storage tanks at the pipe yards and contractor yards are much smaller than the Bakken Marketlink tanks; therefore, the fugitive VOCs would likely be much smaller too.

potential emissions that exceed 25 tpy and are not excluded under the Administrative Rules of Montana 17.8.744 (i.e., back-up emergency generators). The back-up emergency generator engines at each construction camp, pump station and MLV station in Montana would be exempt under the Administrative Rules of Montana 17.8.744. Consequently, proposed construction camps, pump stations, and MLV stations in Montana would not trigger requirements for preconstruction permitting. In South Dakota, SD DENR does not require preconstruction air quality permits.

In Nebraska, NDEQ requires preconstruction air quality permits under the NAC, Title 129, Chapter 17, Subchapter 001. Permitting is required for sources that have potential emissions that exceed 50 tpy of CO; 40 tpy of SO_2, NO_2, or VOCs; 15 tpy of PM_{10}; 10 tpy of $PM_{2.5}$; 0.6 tpy of lead; and 0.6 tpy of any individual HAP; or 10 tpy of total HAPs. The back-up emergency generator engines at the camp in Nebraska would have potential emissions that are less than the preconstruction permit thresholds described above (Tables 3.12-4 and 3.12-5). Consequently, proposed construction camps, pump stations and MLV stations in Nebraska would not trigger requirements for preconstruction permitting.

In Kansas, the Kansas Department of Health and Environment requires preconstruction air quality permit under the Kansas Administrative Regulation 28-19-300(a). Permitting is required for new or modified existing sources (including incinerators) that have potential emissions that exceed 25 tpy of PM; 15 tpy of PM_{10}; 40 tpy of SOx, VOC, or NOx; 100 tpy of CO; 0.6 tpy of lead; 10 tpy of any individual HAP; or 10 tpy of total HAPs. The back-up emergency generator engines at both pump stations in Kansas would have potential emissions that are less than the preconstruction permit thresholds described above (Tables 3.12-4 and 3.12-5). The back-up emergency generators used at the two pump stations in Kansas under instances of commercial power loss would not exceed the preconstruction permitting thresholds because of the minimal annual hours of operation (approximately 30 hours per year). Consequently, proposed construction camps, pump stations, and MLV stations in Kansas would not trigger requirements for preconstruction permitting.

In North Dakota, the State of North Dakota Department of Health (Division of Air Quality) requires preconstruction air quality permit under the North Dakota Century Code 33-15-14-02. Permitting is required for new stationary sources that would cause or contribute to a violation of any applicable ambient air quality standard. A new stationary source will be considered to cause or contribute to a violation of an ambient air quality standard when such source would, at a minimum, exceed the following significance levels: 1.0 $\mu g/m^3$ of annual SO_2, annual PM_{10}, annual NO_2, and annual CO; 5 $\mu g/m^3$ of 24-hour SO_2 and 24-hour PM_{10}; 500 $\mu g/m^3$ of 8-hour CO; 25 $\mu g/m^3$ of 3-hour SO_2; 25 $\mu g/m^3$ of 1-hour SO_2 and 1-hour NO_2; and 2000 $\mu g/m^3$ of 1-hour CO.

The single pipe yard and contractor yard site in North Dakota would have temporary fuel storage tanks. While fugitive VOCs from the tanks are expected to be negligible, VOCs are not among the listed pollutants that trigger preconstruction air quality permitting in North Dakota. Further, North Dakota Century Code 33-15-14-02-13(i)(5) exempts containers used exclusively for storage of petroleum liquids except those containers, reservoirs, or tanks subject to the requirements of Chapter 33-15-12, Standards of Performance for New Stationary Sources. The requirements of Chapter 33-15-12 that are applicable to the temporary fuel (diesel and gasoline) storage tanks are the same as the NSPS standards described above in 40 CFR 60 subpart Kb and Subpart XX. As discussed in the NSPS regulations above, each temporary storage vessel at the

pipe yards and contractor yards would be smaller than 75 m^3, so the requirements of 40 CFR 60 Subpart Kb would not apply to these units. Similarly, the proposed Project gasoline transfer facilities at the pipeline yards and contractor yards are expected to be less than 75,700 liters per day and as such, would be exempt from Subpart XX. Consequently, the proposed Project temporary storage tanks at the single pipeline yard and contractor yard in North Dakota would not trigger requirements for preconstruction permitting.

General Conformity Rule

The General Conformity Rule was designed to compel federal agencies to require that federal actions conform to the applicable State Implementation Plan (SIP). General Conformity regulations apply for pollutant emissions within federal action areas designated as nonattainment for pollutant emissions (or, for O_3, its precursors NOx and VOCs) that are not subject to NSR and where pollutant emissions are greater than the General Conformity significance thresholds or exceed 10 percent of the total emissions budget for the entire nonattainment area. Federal agencies are able to make a positive conformity determination when one of the following occurs:

- Emissions from the federal action are specifically identified and accounted for in the SIP attainment or maintenance demonstration; or
- Emissions from the action are fully offset within the same area through a revision to the SIP, or a similarly enforceable measure that creates emissions reductions so that there is no net increase in emissions of that pollutant.

For the proposed Project, none of the counties within the proposed Project area are designated as nonattainment areas for any criteria pollutant (i.e., all the counties are in attainment areas). Therefore, the General Conformity Rule does not apply to this proposed Project.

Greenhouse Gas Regulatory Requirements and Standards

Beginning in 2007 with the U.S. Supreme Court's Endangerment Finding, GHGs were deemed air pollutants under the CAA. Since that time, several state and federal regulatory programs have been implemented to address increasing levels of GHG emissions in the United States. The USEPA has promulgated regulations for GHG reporting and permitting for stationary sources. States across the United States, including those where the proposed Project would be located, have joined regional climate initiatives and adopted standards to mandate an increase in the use of renewable energy sources. These programs are described in the subsections below.

Federal Programs

Endangerment Finding

On April 2, 2007, in Massachusetts v. U.S. EPA, 549 U.S. 497, the Supreme Court found that GHGs are air pollutants covered by the CAA. The Court held that the USEPA Administrator must determine whether or not emissions of GHGs from new motor vehicles cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare, or whether the science is too uncertain to make a reasoned decision. In making these decisions, the Administrator is required to follow the language of Section 202(a) of the CAA. The Supreme Court decision resulted from a petition for rulemaking under Section 202(a) filed by more than a dozen environmental, renewable energy, and other organizations. As a result of this decision, on

April 24, 2009, the USEPA proposed the Endangerment and Cause or Contribute Findings for Greenhouse Gases under the CAA to find that the current and projected concentrations of the mix of six key GHGs (CO_2, methane [CH_4], nitrous oxide [N_2O], hydrofluorocarbons [HFCs], perfluorocarbons [PFCs], and sulfur hexafluoride [SF_6]) in the atmosphere threaten the public health and welfare of current and future generations. This is referred to as the endangerment finding. The Administrator is further proposing to find that the combined emissions of CO_2, CH_4, N_2O, and HFCs from new motor vehicles and motor vehicle engines contribute to the atmospheric concentrations of these key GHGs and hence to the threat of climate change. This is referred to as the cause or contribute finding. The Endangerment Finding under Section 202(a) of the CAA was signed on December 7, 2009 (i.e., finalized).

GHG Mandatory Reporting Rule

On October 30, 2009, the USEPA promulgated the first comprehensive national system for reporting emissions of CO_2 and other GHGs produced by major sources in the United States. Through this new reporting, USEPA will have comprehensive and accurate data about the production of GHGs in order to confront climate change. Approximately 13,000 facilities, accounting for about 85 to 90 percent of industrial GHG emitted in the United States, are covered under the rule. The reporting requirements apply to suppliers of fossil fuels and industrial chemicals, manufacturers of certain motor vehicles and engines (not including light- and medium-duty on-road vehicles), as well as large, direct emitters of GHGs with emissions equal to or greater than a threshold of 25,000 metric tons per year. This threshold is equivalent to the annual GHG emissions from just over 4,500 passenger vehicles. The direct emission sources covered under the reporting requirement include energy intensive sectors, such as cement production, iron and steel production, electricity generation, and oil refineries, among others. The gases covered by the rule are CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and other fluorinated gases, including nitrogen trifluoride (NF_3) and hydrofluorinated ethers (HFEs), reported as carbon dioxide equivalents (CO_2e). Annual emissions reporting to USEPA for the majority of facilities covered by the initial rule began in 2011 for the 2010 calendar year.

According to the preamble of the rule, the U.S. petroleum and natural gas industry encompasses hundreds of thousands of wells, hundreds of processing facilities, and over a million miles of transmission and distribution pipelines. Crude oil is commonly transported by barge, tanker, rail, truck, and pipeline from production operations and import terminals to petroleum refineries or export terminals. Typical equipment associated with these operations includes storage tanks and pumping stations. The major sources of CH_4 and CO_2 fugitive emissions include releases from tanks and marine vessel loading operations.

In November 2010, the USEPA published a final rule extending the mandatory reporting rule to several new sectors, including petroleum and natural gas systems (Subpart W), requiring the reporting of calendar year 2011 GHG emissions in September 2012 (USEPA 2010). The industry segments that fall under Subpart W include onshore and offshore petroleum and natural gas production; natural gas processing, compression, and distribution; underground natural gas storage; and liquefied natural gas storage and import and export equipment with annual emissions of at least 25,000 metric tons CO_2e. The USEPA did not propose to include the crude oil transportation segment of the petroleum and natural gas industry in this rulemaking due to its small contribution to total petroleum and natural gas fugitive emissions (accounting for much less than 1 percent) and the difficulty in defining a facility. Under Subpart W, the reporting

responsibility lies with petroleum refineries and importers and exporters of petroleum products. Consequently, the proposed Project would not trigger GHG reporting requirements.

GHG Tailoring Rule

On June 2, 2010, the USEPA issued a final rule that establishes an approach to addressing GHG emissions from stationary sources under the CAA permitting programs. These stationary sources would be required to obtain permits that would demonstrate they are using the best practices and technologies to minimize GHG emissions. The rule sets thresholds for GHG emissions that define when the CAA permits under the NSR/PSD and the Title V Operating Permits programs are required for new or existing industrial facilities. The rule tailors the requirements to limit which facilities will be required to obtain NSR/PSD and Title V permits and cover nearly 70 percent of the national GHG emissions that come from stationary sources, including those from the nation's largest emitters (e.g., power plants, refineries, and cement production facilities).

For sources constructed from July 1, 2011, to June 30, 2013, the rule requires PSD permitting for first-time new construction projects that emit GHG emissions of at least 100,000 tpy, even if they do not exceed the permitting thresholds for any other pollutant. In addition, sources that emit or have the potential to emit at least 100,000 tpy CO_2e and that undertake a modification that increases net emissions of GHG by at least 75,000 tpy CO_2e are also subject to PSD requirements. Therefore, operating permit requirements for the first time apply to sources based on their GHG emissions, even if they would not apply based on emissions of any other pollutant. Facilities that emit at least 100,000 tpy CO_2e are subject to Title V permitting requirements. The proposed Project is not subject to PSD (see Section 3.12.2.2, Regulatory Requirements) and would have emissions of CO_2e less than the applicable thresholds for any of the stationary sources (i.e., construction camps and pump stations). Note that emissions from mobile sources (on-road and non-road) are not included in the emission estimates for permit applicability of a stationary source. Consequently, the proposed Project would not be subject to the federal GHG permitting rule.

On December 2, 2010, the USEPA released its guidance for limiting GHG emissions based on the CAA requirement for new and modified emission sources to employ Best Available Control Technology to limit regulated air pollutants. As a result, the guidance focuses on the process that state agencies will use as they are developing permits for individual sources to determine whether there are technologies available and feasible for controlling GHG emissions from those sources. The guidance is not a formal rulemaking and does not establish regulations, but it provides permitting authorities more detail on USEPA expectations for the implementation of its new GHG permitting requirements.

National Fuel Economy Standard

On April 1, 2010, the USEPA and U.S. Department of Transportation (USDOT) finalized a new joint regulation for GHG emissions and an equivalent 35.5 miles per gallon (mpg) fuel economy standard for cars and light duty vehicles from model years 2012 through 2016. The USEPA regulates GHG emissions from passenger vehicles up to 8,500 pounds gross vehicle weight rating (plus medium-duty sport-utility vehicles and passenger vans up to 10,000 pounds). The program sets standards for CO_2 emissions on the U.S. federal test procedure. Equivalent Corporate Average Fuel Economy regulations, measured in miles per gallon of fuel consumed,

were simultaneously established by the USDOT National Highway Traffic and Safety Administration.

Since the publication of the Final EIS, the USDOT and USEPA finalized new standards that will raise the fuel economy for cars and light-duty trucks to the equivalent of 54.5 mpg by Model Year 2025. According to the Final Rules published by the National Highway Traffic Safety Administration (NHTSA) in August 2012, the new standards were designed to build upon previous standards and achieve an overall doubling of current vehicle fuel efficiency (NHTSA 2012). This is projected to result in a decrease in foreign oil imports by a total of 12 billion barrels of oil from 2017 through 2025 and a reduction in oil consumption by more than 2 million barrels a day by 2025 and 6 billion metric tons fewer GHG emissions over the life of the program (2017 to 2025).

State Programs

Programs for GHG emissions are being adopted by some states along the proposed Project corridor. Montana collaborates with the Western Climate Initiative (WCI) and other U.S. states on a range of other climate and clean energy strategies through the North America 2050 Initiative (WCI 2012). The WCI is a collaborative effort of seven U.S. states and four Canadian provinces to identify, evaluate, and implement measures to reduce GHG emissions in participating jurisdictions. The WCI was formed in February 2007 by the Governors of Arizona, California, New Mexico, Oregon, and Washington. The Premiers of British Columbia, Manitoba, Ontario, and Quebec, and the Governors of Montana and Utah joined the original five states during the next year in their commitment to tackle climate change at a regional level. All 11 jurisdictions collaborated in the development of the Design for the WCI Regional Program, which was released in July 2010. British Columbia, California, Ontario, Quebec, and Manitoba are continuing to work together through the WCI to develop and coordinate their emissions trading programs. This initiative began in 2009 and is committed to developing policies that move toward a low-carbon economy while simultaneously creating jobs, enhancing energy independence, and protecting human health and the environment.

The WCI has a regional GHG target of 15 percent below 2005 levels by 2020 to be met through a regional market-based multi-sector mechanism, as well as other policies. The recommended cap-and-trade program has a broad scope that includes six GHGs (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) and will cover 90 percent of GHG emissions from the region when fully implemented. The first phase of the cap-and-trade program begins on January 1, 2013, covering emissions from electricity, electricity imports, industrial combustion at large sources, and industrial process emissions. The second phase will begin in 2015 and expands to transportation fuels and other commercial, residential, and industrial fuels not included in the initial phase.

The Governors of Nebraska, South Dakota, and Kansas, along with nine other Midwestern Governors and one Canadian province Premier, are members of the Energy Security and Climate Stewardship Platform for the Midwest. The Platform lists goals for energy efficiency improvements, low-carbon transportation fuel availability, renewable electricity production, and carbon capture and storage development. In addition to goals related to energy efficiency, renewable energy sources, and biofuel production, the Platform lays out objectives with respect to carbon capture and storage. Members agreed to have in place a regional regulatory framework for carbon capture and storage by 2010, and by 2012 to have sited and permitted a multi-jurisdiction CO_2 transport pipeline and have in operation at least one commercial-scale coal-

powered integrated gasification combined cycle power plant with carbon capture and storage, with additional plants to follow in succeeding years. By 2020, all new coal plants in the region are meant to capture and store CO_2 emissions. Numerous policy options are described for states to consider as they work towards these goals. The Platform also lays out six cooperative regional agreements. These resolutions establish a Carbon Management Infrastructure Partnership, a Midwestern Biobased Product Procurement System, coordination across the region for biofuels development, and a working group to pursue a collaborative, multi-jurisdictional transmission initiative. States adopting all or part of the Platform from the proposed Project area include South Dakota, Kansas, Nebraska, and North Dakota, as well as the Canadian Province of Manitoba.

Kansas, on November 15, 2007, joined five other states and one Canadian province to establish the Midwest Greenhouse Gas Reduction Accord. South Dakota, three other states, and one Canadian province are observers to the process. Under the Accord, members agree to establish regional GHG reduction targets, including a long-term target of 60 to 80 percent below current emissions levels, and to develop a multi-sector cap-and-trade system to help meet the targets. Participants also establish a GHG emissions reductions tracking system and implement other policies, such as low-carbon fuel standards, to aid in reducing emissions. While the Midwest Greenhouse Gas Reduction Accord has not been formally suspended, the participating jurisdictions are no longer actively pursuing it (C2ES 2012a).

In South Dakota, House Bill 1272, which established a voluntary Renewable Portfolio objective of 10 percent by 2015 was signed into law on February 21, 2008. Montana has enacted a Renewable Portfolio Standard with a goal of 15 percent renewable energy sources by 2015.

Low Carbon Fuel Standard

Low Carbon Fuel Standard (LCFS) policies have been adopted in California, British Columbia, the United Kingdom, and the European Union, and are in development in Oregon, Washington, and 11 states in the Northeast and Mid-Atlantic, according to Center for Climate and Energy Solutions (C2ES 2012b). These standards generally require that overall carbon values life-cycle GHG emissions for transportation fuels decrease by 10 percent over the next decade, although the definition of fuels and the percent reduction over time differ across jurisdictions. More carbon-intensive fuels include those derived from crude oil sources in the Western Canadian Sedimentary Basin, Venezuela, Nigeria, the Middle East, and California (IHS CERA 2010). The impact of LCFS on U.S. market demand for oil sands crude oil is speculative at this time since few jurisdictions have implemented these standards.

One concern regarding the adoption of LCFS in certain jurisdictions is that GHG-intensive crudes will simply be routed to other markets through “emissions leakage” or “shuffling,” which could result in no net reduction in GHG emissions (Yeh and Sperling 2010), or even a slight increase (Barr 2010). Adoption of LCFS policies more widely in United States and international markets would help mitigate the effect of crude shuffling and emissions leakage.[12] Additional

[12] According to Sperling and Yeh (2009), “a major challenge for the LCFS is avoidance of ‘shuffling’ or ‘leakage.’ Companies will seek the easiest way of responding to the new LCFS requirements. That might involve shuffling production and sales in ways that meet the requirements of the LCFS but do not actually result in any net change. For instance, a producer of low-GHG cellulosic biofuels in Iowa could divert its fuel to California markets and send its high carbon corn ethanol elsewhere. The same could happen with gasoline made from tar sands and conventional oil. Environmental regulators will need to account for this shuffling in their rule making. This problem is mitigated and eventually disappears as more states and nations adopt the same regulatory standards and requirements.”

analysis about the potential relationship between the proposed Project and separate regulatory or market measures aimed at improving fuel efficiency or promoting alternative energy sources for crude oil is included in Section 5, Alternatives.

Federal Initiatives

Council on Environmental Quality's National Environmental Policy Act Guidance Document on Climate Change

On February 18, 2010, the Council on Environmental Quality (CEQ) published a new document titled, Draft National Environmental Policy Act (NEPA) Guidance on consideration of climate change and GHG emissions, for public review and comment. At this time this guidance has not been finalized. These guidelines describe ways in which federal agencies can improve their consideration of GHG emissions and climate change effects during the evaluation of proposals for federal actions subject to NEPA review. The draft guidance suggests an annual direct emission threshold level of 25,000 metric tons or more of CO_2e for a proposed action as an indicator for agencies to consider that a qualitative assessment of the associated impacts may be meaningful to decision makers and the public. For long-term projects with lower annual emissions, CEQ's guidance encourages consideration of whether cumulative impacts warrant an evaluation. The suggested threshold emissions level is not intended as an indicator of significant effects.

The CEQ guidance does not recommend a comprehensive review of climate change impacts for all projects, but encourages agencies to consider the likely scale of impacts and to analyze impacts that can be readily quantified. The guidance also suggests that NEPA reviews address climate mitigation and adaptation measures when evaluating project alternatives; emissions from all stages in a project's lifecycle, including emissions from indirect sources, vehicles, and material supply where feasible; and impacts from climate change on a project's environment where relevant.

The proposed Project would result in GHG emissions that exceed the guidance document threshold (see Section 4.12.3.2, Greenhouse Gases); therefore, this Supplemental Environmental Impact Statement incorporates an analysis of GHG emissions for the proposed Project and alternatives, a comparison of these emissions to global and national GHG emission levels, as well as a discussion of global and regional climate change impacts, climate risk, and adaptation. See Sections 4.14, Climate Change Impacts on the Proposed Project, and 4.15.3.12, Air Quality and Noise, for further details.

Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants

On February 16, 2012, the U.S. Department of State (Department) announced the formation of the Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants, a new global initiative focusing on the reduction of black carbon, HFCs, and CH_4 (Department 2012). The founding coalition partners are Bangladesh, Canada, Ghana, Mexico, Sweden, and the United States, together with the United Nations Environment Programme. The pollutants that are the focus of this initiative have relatively short durations once emitted, on the order of a few days to a few years, but are responsible for up to one third of the global warming effects the Earth has experienced. Due to their shorter lifetime, actions to reduce emissions will quickly lower atmospheric concentrations of these pollutants, thereby yielding a relatively rapid climate

response. This initiative is meant to incentivize new actions as well as highlight and build upon existing efforts, such as the Global Alliance for Clean Cookstoves, the Arctic Council, the Montreal Protocol, and the Global Methane Initiative. It is also meant to complement global actions to reduce CO_2 emissions. The Department's announcement of the Coalition specifically named sources of black carbon that pertain to the proposed Project, including diesel trucks and agricultural burning (Department 2012).

3.12.3 Noise

3.12.3.1 Environmental Setting

The ambient sound level of a region is defined by the total noise generated within that specific environment and is usually comprised of sound emanating from natural and artificial sources. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of the day and throughout the week. This variation is caused in part by changing weather conditions and the effects of seasonal vegetative cover.

Two measurements used by federal agencies to relate the time-varying quality of environmental noise to its known effect on people are the 24-hour equivalent sound level [Leq(24)] and the day-night sound level (Ldn). The Leq(24) is the equivalent steady sound level of a noise energy averaged over a 24-hour period. The Ldn is the Leq(24) with 10 decibels on the A-weighted decibel scale (dBA) added to nighttime sound levels between the hours of 10 p.m. and 7 a.m. to account for people's greater sensitivity to sound during nighttime hours.

The proposed Project would be constructed in primarily rural agricultural areas. An area's existing noise level is generally based on its proximity to nearby major roadways or railroads or on population density (USDOT 2006). The majority of the proposed Pipeline 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). Existing noise levels for the proposed Project are presented in Table 3.12-6.

Table 3.12-6 shows that the existing ambient Leq levels in the proposed Project area are approximately 35 and 25 dBA during daytime and nighttime periods, respectively. Existing Ldn levels in the proposed Project area are approximately 35 dBA. Ambient (background) noise levels occur from infrequent roadway traffic, farm machinery on a seasonal basis, pets, and various other household noises.

Table 3.12-6 Existing Noise Levels for the Proposed Project

State	Affected County	Population Density[a] (People/Mile[c])	Existing Noise Levels (dBA)[b] Daytime Levels Leq	Nighttime Levels, Leq	Day-Night Levels, Ldn
Montana					
	Phillips	0.8	35	25	35
	Valley	1.5	35	25	35
	McCone	0.7	35	25	35
	Dawson	3.8	35	25	35
	Prairie	0.7	35	25	35
	Fallon	1.8	35	25	35

State	Affected County	Population Density[a] (People/Mile[c])	Existing Noise Levels (dBA)[b] Daytime Levels Leq	Nighttime Levels, Leq	Day-Night Levels, Ldn
South Dakota					
	Harding	0.5	35	25	35
	Butte	4.5	35	25	35
	Perkins	1.0	35	25	35
	Meade	7.3	35	25	35
	Pennington	36.4	35	25	35
	Haakon	1.1	35	25	35
	Jones	1.0	35	25	35
	Lyman	2.3	35	25	35
	Tripp	3.5	35	25	35
Nebraska					
	Keya Paha	1.1	35	25	35
	Boyd	3.9	35	25	35
	Holt	4.3	35	25	35
	Antelope	7.8	35	25	35
	Boone	8.0	35	25	35
	Nance	8.5	35	25	35
	Merrick	16.2	35	25	35
	Polk	12.3	35	25	35
	York	23.9	35	25	35
	Fillmore	10.2	35	25	35
	Saline	24.7	35	25	35
	Jefferson	13.2	35	25	35

[a] U.S. Census Bureau, 2010 Census Data (http://www.census.gov/prod/cen2010/index.html) (U.S. Census Bureau 2012).
[b] Existing noise levels were estimated based on population density of each county crossed by the proposed Pipeline using methodology described in USDOT's Transit Noise and Vibration Impact Assessment (USDOT 2006).
[c] People per miles squared.

Noise Receptors Near the Proposed Pipeline ROW

Aerial photography and field survey data were used to identify potential noise receptors within 25 feet and within 25 to 500 feet of the proposed Pipeline centerline (Table 3.12-7). Potential noise effects on wildlife are discussed in Section 3.6, Wildlife. There are approximately 27 structures within 25 feet and 417 structures within 25 to 500 feet of the proposed ROW. Of those totals, there are no residences (i.e., homes, mobile homes, cabins) within 25 feet and 31 residences within 25 to 500 feet of the proposed ROW. The closest residences are located approximately 200 feet from the proposed ROW. The proposed Project would not affect any national parks or national forests; however, the Project would cross five national historic trails (one in Montana and four in Nebraska) (see Recreation and Special Interest Areas in Section 3.9.2.3). The proposed Project is also located approximately 12 miles from the Niobrara National Scenic River in Nebraska.

Table 3.12-7 Structures Near the Proposed Project Construction ROW

State	County	Number of Structures within 25 Feet of the Construction ROW		Number of Structures >25 feet and ≤ 500 Feet from the Construction ROW	
		Structures[a]	Residences[b]	Structures[a]	Residences[b]
Montana	Phillips	0	0	9	2
	Valley	2	0	38	3
	McCone	2	0	21	0
	Dawson	3	0	21	0
	Prairie	0	0	3	0
	Fallon	2	0	25	2
South Dakota	Harding	3	0	19	0
	Butte	0	0	0	0
	Perkins	1	0	3	0
	Meade	2	0	22	0
	Pennington	0	0	0	0
	Haakon	4	0	26	0
	Jones	0	0	3	0
	Lyman	1	0	9	0
	Tripp	4	0	14	0
Nebraska	Keya Paha	0	0	1	0
	Boyd	0	0	0	0
	Holt	0	0	23	1
	Antelope	3	0	53	7
	Boone	0	0	33	4
	Nance	0	0	15	2
	Merrick	0	0	8	2
	Polk	0	0	19	0
	York	0	0	20	3
	Fillmore	0	0	7	1
	Saline	0	0	14	1
	Jefferson	0	0	11	3
Total		**27**	**0**	**417**	**31**

[a] Structure totals include residences, homes, cabins, mobile homes, bridges, barns, silos, garages, churches, etc.
[b] Residence totals include residences, home, cabins, and mobile homes.

Noise Receptors Near Pump Stations

Aerial photography and field survey data were used to identify potential noise receptors within 0.5 mile and 1 mile of the proposed Project pump stations (Table 3.12-8). A larger distance is used for the pump stations relative to the pipeline (0.5 to 1.0 mile versus 25 to 500 feet) because the noise impacts would occur over a long term period (at least 50 years). There are approximately 67 structures within 0.5 mile and 258 structures within 1 mile of proposed Project pump stations (the structures within 0.5 mile are also included in the number of structures within 1 mile). Of those totals, there are approximately 14 residences (i.e., homes, mobile homes, cabins) within 0.5 mile and 46 residences within 1 mile of the proposed Project pump stations. Noise sensitive areas, such as state or national parks and National wilderness areas, are not present within 1 mile of the proposed Project pump stations. The distance and direction of the closest residences to the pump stations in the affected states are as follows:

- Montana—0.5 miles south-southeast of Pump Station 13;
- South Dakota—0.35 miles southwest of Pump Station 21;
- Nebraska—0.25 miles north-northwest of Pump Station 25; and
- Kansas—0.35 miles southwest of Pump Station 27.

The remaining 16 pump stations in these states are farther away from residences.

Table 3.12-8 Structures within 0.5 and 1 Mile of Proposed Project Pump Stations

Pump Station No.[a]	Milepost (0 at U.S. border)	Number of Structures within 0.5 Mile		Number of Structures within 1 Mile	
		Structures[b]	Residence[c]	Structures[b]	Residence[c]
Montana					
PS-09	1.3	5	0	15	1
PS-10	49.5	0	0	4	0
PS-11	98.4	6	0	11	0
PS-12	149.1	0	0	13	1
PS-13	199.6	0	1	10	2
PS-14	237.1	0	0	9	1
South Dakota					
PS-15	285.6	0	0	0	0
PS-16	333.6	0	0	1	0
PS-17	387.3	0	0	7	1
PS-18	440.1	1	0	5	0
PS-19	496	4	1	15	3
PS-20	546.7	14	1	26	2
PS-21	591.9	5	2	23	2
Nebraska					
PS-22	TBD[e]	6	1	11	2
PS-23	TBD	3	1	17	3
PS-24	TBD	13	2	39	7
PS-25	TBD	10	1	27	3
PS-26	851.6	0	0	25	4
Kansas					
PS-27	49.7	10	4	17	8
PS-29	144.6	0	0	9	7
Total		**77**	**14**	**284**	**46**

[a] Although the proposed Project will also be located in North Dakota, no pump stations will be located in that state.
[b] Structure totals include residences, homes, cabins, mobile homes, bridges, silos, barns, garages, churches, etc.
[c] Residence totals include residences, home, cabins, and mobile homes.
[d] Distances to pump stations in Nebraska were assumed based on temporary pump station locations assumed in Figure 1.1-1 in the Supplemental Environmental Report dated September 5, 2012 (exp Energy Services Inc. 2012).
[e] To be determined (TBD).

3.12.3.2 Regulatory Requirements

In 1974, USEPA published "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety" (USEPA 1974). This document provides information for state and local agencies to use in developing their ambient noise standards. USEPA identified outdoor and indoor noise levels to protect public health and welfare. An Leq(24) of 70 dBA was identified as the level of environmental noise that would

prevent any measurable hearing loss over a lifetime. An Ldn of 55 dBA outdoors and an Ldn of 45 dBA indoors were identified as noise thresholds that would prevent activity interference or annoyance. These levels are not *peak* levels but are 24-hour averages over several years. Occasional high levels of noise may occur. An Ldn of 55 dBA is equivalent to a continuous Leq noise level of 48.6 dBA. Typical noise levels in the average home are as follows:

- Quiet room: 28–33 dBA
- Computer: 37–45 dBA
- Refrigerator: 40–43 dBA
- Forced hot air heating system: 42–52 dBA
- Microwave: 55–59 dBA
- Clothes dryer: 56–58 dBA

With regard to increases in decibels measured on the A-weighted noise level scale, the following relationships occur:

- A change of 1 dBA cannot be perceived by humans, except in carefully controlled laboratory environments;
- Outside of the laboratory, a 3 dBA change is considered a just-perceivable difference by humans;
- A change in level of at least 5 dBA is required before any noticeable change in human response would be expected; and
- A 10 dBA change is subjectively heard as approximately a doubling in loudness and can cause an adverse response.

None of the states that would be traversed by the proposed Project have regulatory noise limits, although some local governments have ordinances governing noise from construction or industrial activities.

As indicated in Section 3.12.3.1, Environmental Setting, the proposed Project would not affect any national parks or national forests; however, the proposed Project would cross five national historic trails (one in Montana and four in Nebraska). The proposed Project is also located approximately 11 miles from the Niobrara National Scenic River in Nebraska. The National Park Service prohibits the operation of motorized equipment or machinery such as an electric generating plant, motor vehicle, audio device in a manner that exceeds a noise level of 60 decibels at 50 feet; or if below that level, nevertheless makes noise that is unreasonable considering the nature and purpose of the actor's conduct, location, time of day or night, purpose for which the area was established, impact on park users, and other factors that would govern the conduct of a reasonably prudent person under the circumstances (NPS 2012).

3.12.4 Connected Actions

This section describes the baseline conditions for air quality and noise affected by actions connected to the proposed Project.

3.12.4.1 Bakken Marketlink Project

Construction and operation of the Bakken Marketlink Project would include metering systems, a five-mile pipeline segment (route not yet determined) and three new storage tanks near Baker, Montana (Fallon County), and two new storage tanks in an existing tank farm in Cushing, Oklahoma (Payne County). Similar to the proposed pipeline route, the Bakken Marketlink Project is located in an area (Fallon County and Payne County) designated as *attainment* for all criteria air pollutants (i.e., good air quality area). Further, this Connected Action is located mostly in a rural and agricultural area, so the existing air quality (including GHGs) and noise is expected to be similar to that of the proposed route.

3.12.4.2 Big Bend to Witten 230-kV Transmission Line

The Western Area Power Administration (Western) determined that a 230-kilovolt (kV) transmission line approximately 70 miles long would be required to ensure system reliability within the Western power grid given the power requirements for Pump Stations 20 and 21 in the Witten, South Dakota area. The transmission line would be located within or near five identified recreation areas managed by the Lower Brule Indian Reservation in the Lake Sharpe area: Good Soldier Creek Recreation Area, Trailwaters Recreation Area, Counselor Creek Recreation Area, Fort Thompson Recreation Area, and North Shore Recreation Area. These recreation areas are sensitive receptors for air quality and noise.

Similar to the proposed pipeline route, the Big Bend to Witten 230 kV Transmission Line corridors would pass through sparsely populated areas (Lyman and Tripp counties) which are designated as *attainment* for all criteria air pollutants (i.e., good air quality area). Further, this Connected Action is located mostly in a rural and agricultural area with some recreational activities (hiking, fishing, and hunting), so the existing air quality (including GHGs) and noise is expected to be similar to that of the proposed route.

3.12.4.3 Electrical Distribution Lines and Substations

The proposed Project would require electrical service from local power providers (see Section 2.2.4, Major Pipeline Route Alternatives, Connected Actions) for pump stations and other aboveground facilities. The electrical distribution lines would likely cross sensitive receptors such as recreation and special interest areas in Montana and South Dakota (see Table 3.9-12, Recreation and Special Interest Areas Likely to be Crossed by Power Distribution Lines). No recreation or special interest areas would be crossed by these features in Nebraska. In general, the transmission lines would be constructed in the vicinity of the proposed route, which are in areas designated as *attainment* (i.e., good air quality). As such, the existing air quality (including GHGs) and noise is expected to be similar to that of the proposed route.

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3.13 POTENTIAL RELEASES

3.13.1 Introduction

This section addresses the potential for releases of oil products or crude oil that could occur during construction and operation of the proposed Project. The purpose of this section is to discuss the types of threats to pipeline integrity that could result in such a release and identify the receptors that could be affected by a release. The description of potential releases is based on information provided in the 2011 Final Environmental Impact Statement (Final EIS) as well as new circumstances or information relevant to environmental concerns that have become available since the publication of the Final EIS, including the proposed reroute in Nebraska. The information that is provided here builds on the information provided in the Final EIS and in many instances replicates that information with relatively minor changes and updates. Other information is entirely new or substantially altered from that presented in the Final EIS. Specifically, the following information, data, methods, and/or analyses have been substantially updated in this section from the 2011 document:

- The discussion on the characteristics of diluted bitumen has been further developed;
- The descriptions of dilbit, synthetic crude oil, and Bakken shale oil have been further developed;
- A comparison has been made between the characteristics of crude oil from around the world;
- The discussion on threats to pipeline integrity, including corrosion, has been expanded; and
- The discussion on spill volume distribution has been revised based on Pipeline and Hazardous Materials Safety Administration (PHMSA) data.

3.13.2 Crude Oil Characteristics

The physical and chemical properties of the crude oils that would be transported by the proposed pipeline would not be unique to the proposed Project; petroleum quality requirements of crude oil would be specified by National Energy Board and the Federal Energy Regulatory Commission tariffs (18 Code of Federal Regulations [CFR] 341). A comparison of the crude oil that would be transported by the proposed pipeline with other conventional crude oils indicates that the characteristics of the proposed Project's crude oil are generally comparable to those of conventional crude oils (Been and Wolodko 2011). Comparison of incident data from Alberta pipeline systems with data from U.S. pipeline systems (Section 4.13.2.4, Pipeline Incident Information Sources) indicates that Alberta pipelines that have likely shipped diluted bitumen (dilbit), synthetic crude oil (SCO), or Bakken shale oil are not more prone to failure than other pipeline systems carrying conventional crude oils. Further discussion of crude oil characteristics and potential causes and frequencies of pipeline failure is provided below, as well as in Section 4.13, Potential Releases.

Petroleum is a naturally occurring mixture composed primarily of hydrocarbon compounds. Traditionally, petroleum referred only to liquid crude oil; however, current common usage of the term also includes gaseous and solid materials such as natural gas and bitumen. The composition of crude oil varies, depending on the source and processing. Most crude oils are more than

95 percent hydrocarbons, with nitrogen, oxygen, varying amounts of sulfur, and traces of other elements.

Light crude oil is a mixture that can flow through a pipeline without processing or dilution. Heavy crude oil is referred to as *heavy* because its density is higher than that of light crude oil. The American Petroleum Institute (API) has introduced the term *API gravity* to measure how heavy or light a petroleum liquid is compared to water. If an oil's API gravity is greater than 10°, the oil is less dense than water, and thus floats on water; if an oil's API gravity is less than 10°, the oil is more dense than water, and thus sinks in water. In this sense, API gravity is used to compare the relative densities of petroleum liquids. There are different definitions of light and heavy crude oil. Unless otherwise specified, in this section *light oil* is defined as any liquid petroleum with an API gravity greater than 31.1° (corresponding to a density less than 870 kilograms per cubic meter [kg/m^3]); *heavy oil* is defined as any liquid petroleum with an API gravity less than 22.3° (corresponding to a density greater than 920 kg/m^3); and *medium oil* is defined as any liquid petroleum with an API gravity between 22.3° and 31.1°.

In addition, Canadian heavy crude oil is also usually sour (i.e., has a higher sulfur content), with sulfur contents between 2.52 percent and 4.82 percent (mean of 3.27 percent) by weight based on the data from 25 types of heavy crude oils (Enbridge 2011). Typically, crude oil with a sulfur content greater than 2 percent by weight is considered sour.

Crude oils may differ in their solubility, toxicity, persistence, and other properties that affect their impact on the environment. The following characteristics are of particular importance with respect to environmental effects from a spill:

- Specific gravity: determines whether the unweathered oil would sink or float upon release to a waterbody. In the discussions of crude oil in this section of the Supplemental Environmental Impact Statement (Supplemental EIS), API gravity is used to describe this characteristic rather than specific gravity. If a crude oil has an API gravity greater than 10°, it is less dense than water and would float on water. If a crude oil has an API gravity less than 10°, it would sink in water.
- Viscosity: a measure of how easily the oil would flow. Typically, viscosity increases (meaning it does not flow as easily) as temperature decreases. This is an important consideration, as air temperatures along the length of the proposed pipeline corridor may range from well below freezing in winter to in excess of 100 degrees Fahrenheit (˚F) (38 degrees Celsius [˚C]) in summer.
- Pour point: an indicator of the temperature at which the oil changes from a free-flowing liquid to a material that does not flow freely.
- Proportions of volatile and semivolatile fractions: an indicator of: 1) the fraction of oil that would more readily evaporate; 2) the fraction of oil that would more likely physically persist in the environment as it weathers; and 3) the fraction of oil that could dissolve or disperse into an aquatic environment and cause potential toxicological effects to animals and plants.
- Proportion of polycyclic aromatic hydrocarbons, many of which are considered key toxic components of crude oils.
- Proportions of other elements and compounds including sulfur and metals.

3.13.3 General Description of Proposed Pipeline Transported Crude Oils

The crude oil that would be transported by TransCanada Keystone Pipeline, LP (Keystone) as part of the proposed Project would originate from a variety of different sources and locations. The crude oil types for the proposed Project would range from a light crude oil (such as those found in the Bakken formation) to a heavy crude oil (such as those found in the Western Canada Sedimentary Basin (WCSB), which is produced from a material called bitumen). Table 3.13-1 summarizes the general characteristics for the types of crude oil that would be transported by the proposed Project. Table 3.13-2 provides additional information on characteristics of potential Project crude oil types.

Table 3.13-1 Summary of General Characteristics for Types of Crude Oil That Would Be Transported by the Proposed Project

Characteristic	Synthetic Crude Oil[a]	Diluted Bitumen[b]	Bakken Shale Oil[c]
Density	na	na	827 kg/m^3
Specific gravity	0.84–0.86[g]	0.9–1.2	0.82–0.83
Viscosity	na	52 to 96 centistokes at 38°C	na
Flammability	na	Class B, Division 2: Flammable Liquids	Class B, Division 2: Flammable Liquids
Composition	Gas oils (petroleum), hydrodesulfurized 60% Naphtha (petroleum), hydrotreated heavy 10-30% Naphtha (petroleum), hydrotreated light, 3-7% Butane 1-5% Hydrogen sulfide (H_2S) 0.001-0.01% BTEX 1-1.5%	Bitumen 40-70% Light naphtha 15-40% Natural gas condensate 15-40% BTEX 1-1.5%	Light hydrocarbons <30% Pentanes 3-4% Hexanes 4-6% Heptanes 6-8% Octanes 6-8% Nonanes 4-6% Decanes 1-3% BTEX 1-3%
Flash point	68˚F (20°C)	-0.4˚F (-18°C)	na
Toxicity[d]	na	Class D, Division 2, Subdivision A: Very Toxic Material	na
Solubility in water[e]	Insoluble in cold water[f]	Insoluble[f]	Insoluble
Pour point	-5.8˚F (-21˚C)	-22˚F (-30˚C)	-25˚F(-32˚C)
Sulfur	0.25%	3.6%	0.17-0.20%
Other properties	Oxides of carbon, and nitrogen, aldehydes form upon combustion. Hazardous sulfur dioxide and related oxides of sulfur may be generated upon combustion.		

[a] Husky Energy 2011.
[b] Imperial Oil 2002.
[c] Crudemonitor 2012a. Five-year average was used for numbers.
[d] Table 3.13.5-12, Final Environmental Impact Statement (Final EIS).
[e] Table 3.13.5-12, Final EIS.
[f] Insoluble, but volatile organic compound and semivolatile organic compound constituents are soluble, (e.g., benzene, toluene, polycyclic aromatic hydrocarbons).
[g] Specific gravity for water = 1.0.
Notes: na = not available; kg/m^3 = kilograms per cubic meter; BTEX = benzene, toluene, ethylbenzene, and xylenes.

Bitumen is a form of petroleum that occurs naturally in a solid or semi-solid state. Bitumen includes a wide variety of reddish brown to black materials that are semi-solid and viscous to brittle in character. Canadian oil sand bitumen is a high boiling point substance with little material boiling below 350˚C (660˚F). Canadian oil sands are a mixture of roughly 90 percent clay, sand, and water, and 10 percent bitumen. The dark, sticky sands look similar to topsoil, but can flow when warmed. Colder temperatures reduce the ability of the bitumen to flow and can cause the bitumen to have the appearance of a semi-solid. Raw bitumen is solid under ambient conditions and therefore must be altered into a form that can be transported via pipeline. There are two basic methods used to render bitumen transportable by pipeline: 1) Bitumen is processed into SCO; and 2) Bitumen is mixed with a suitable diluent, as described below, creating what is known as dilbit. Either of these products may be transported by the proposed Project. Based on current production projections and the market demand at Gulf Coast refineries, the majority of crude oil that would likely be transported by the proposed Project is expected to be in the form of dilbit (EnSys Energy [EnSys] 2010).

3.13.3.1 Synthetic Crude Oil

SCO is produced from bitumen through a refinery conversion process that turns heavy hydrocarbons into lighter hydrocarbons. The conversion process typically includes the removal of sulfur, resulting in a *light sweet* SCO. The precise composition of SCO varies. Some composition information may be considered proprietary information by the shipper. Generic properties of SCO are listed in Table 3.13-1. The properties of one example of SCO, Suncor Synthetic A Crude Oil, are presented in Table 3.13-2. Representative Material Safety Data Sheets (Appendix P, Crude Oil Fact Sheets) were obtained from the 2012 TransCanada Nebraska Supplemental Environmental Report (exp Energy Services Inc. 2012). As shown in Table 3.13-2, the characteristics of WCSB SCO and dilbit are similar to those of conventional crude oils.[1]

3.13.3.2 Dilbit

Dilbit is bitumen mixed with a diluent so it can be transported by pipeline. The diluent is usually a natural gas liquid such as gas condensate. According to the Saskatchewan Condensate Monthly Report dated 1 September 2012 (Crudemonitor 2012b), the composition of gas condensate is mainly light hydrocarbons such as iso-butene, n-butane, iso-pentane, n-pentane, and hexanes. The exact composition of the dilbit is not publicly available because the particular type of bitumen and diluents blend produced is variable and is typically a trade secret. The bitumen-diluent mixture with bitumen from the oil sands is generally similar to heavy sour crude, which is discussed in more detail below. SCO may also be used as a diluent for bitumen, in which case the commodity is known as synbit (bitumen diluted with SCO). Properties of generic dilbit are shown in Table 3.13-1.

[1] The website crudemonitor.ca provides a library of current and historical crude oil stream characteristics and was a key source of the characteristic values used in the assessment of impacts that would result from a potential release.

Table 3.13-2 Comparison of Global Crude Oil Characteristics

Parameter	Unit	Bakken Crude (North Dakota) [b,d]	Mixed Sweet Blend (Canada)[a]	Ekofisk (Norway)[c]	Qua Iboe (Nigeria)[b]	Azeri Light (Azerbaijan)[c]	Suncor Synthetic A (Canada)[a,d]	Iranian Heavy[b]	Arabian Heavy (Saudi Arabia)[b]	Lloyd Blend (Canada)[a]	Western Canadian Select[a,d]	Western Canadian Blend[a]	Fosterton (Canada)[a]	Maya (Mexico)[b]	Hondo Monterey (California)[b]	Boscan (Venezuela)[b]
Gravity	API	42.1	39.5	38.42	35.8	34.8	33.1	30.0-31.0	27	20.8	20.6	20.6	20.5	20.2	18.3	10.9
Density	g/ml		0.83	0.832		0.85	0.86	0.89	0.89	0.93	0.93	0.93	0.93	0.93	0.94	1
Sulfur	wt%		0.44	0.22	0.12	0.15	0.19	1.20-1.65		3.52	3.49	3.17	3.24		4.7	4.6
MCR	wt%		1.94				ND			9.57	9.61	8.59	9.66			
Sediment	ppmv									333	360	299	207			
TAN	mgKOH/g			0.13		0.26			0.1	0.81	0.93	0.73	0.2			
Benzene	vol%	0.28	0.29	0.12		0.1	0.05	0.083	0.36	0.2	0.16	0.1	0.02	0.075	0.093	0.012
Toluene	vol%	0.92	0.85	0.64		0.33	0.24	0.25	1.89	0.35	0.29	0.18	0.11	0.278	0.21	0.018
Ethyl Benzene	vol%	0.33	0.25				0.14	0.13	1.11	0.06	0.06	0.06	0.17	0.11	0.075	0.012
Xylenes	vol%	1.4	1.1				0.51	0.51	3.46	0.32	0.29	0.25	0.3	0.374	0.2323	0.03
Salt	ptb									56.8	49.1	74.3	13			
Nickel	mg/L		4.3	2.3	3.3	3	ND	22.6		58.5	57.4	45.5	47.8	45.5		117
Vanadium	mg/L		8.3	2.1	0.3	0.7	ND	81		130.7	137.7	98.6	109	257		1320
Butanes	vol%	7.5	3.66				1.7			1.83	2.08	0.63	1.02			
Pentanes	vol%	6.4	3.47				2.96			4.48	4.21	3.69	0.89			
Hexanes	vol%	2.4	5.84				4.01			4.15	3.78	3.08	1.8			
Heptanes	vol%	10	7.19				3.51			2.97	2.74	2.51	2.13			
Octanes	vol%	8.9	7.24				4.47			2.12	2.13	2.16	3.05			
Nonanes	vol%	3.7	5.58				3.8			1.48	1.52	1.85	3			
Decanes	vol%		2.49				2.02			0.7	0.71	0.85	1.42			

Source: exp Energy Services Inc. 2012.

Note: Green columns illustrate representative characteristics of crude oil types similar to those that would be transported by the proposed Project.
[a] Five-year averages from CrudeMonitor.ca.
[b] Data from Environment Canada's Crude Oil Properties Database.
[c] Data from Statoil Crude Oil Assay.
[d] Western Canadian Select[2], Suncor Synthetic A and Bakken crude oils are representative types that would be transported by the proposed Project.
Notes: ND indicates measurement below instrument threshold; MCR = micro carbon residue; TAN = total acid number; g/ml = grams per milliliter; wt% = weight percent; ppmw = parts per million weight; mgKOH/g = milligrams potassium hydroxide per gram; vol% = percent volume; ptb = pounds per thousand barrels; mg/L = milligrams per liter.

[2] Diluted bitumen, or dilbit.

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3.13.3.3 Bakken Shale Oil

Shale oil is found in sedimentary rock formations that are characterized by very low permeability. In these formations, the flow of oil from the rock to an extraction well is limited by the low permeability, fine-grained nature of the rock, which is the basis for the common term tight oil. Recovery of oil trapped in these low-permeability rocks requires well stimulation techniques (physical or chemical actions performed on a well to improve the flow of oil or gas from the formation rock to the well bore).

The Bakken shale oil from Montana is light and sweet (containing less than 0.42 percent sulfur). The main properties of Bakken shale oil are shown in Table 3.13-1.

3.13.3.4 Flammability and Explosion Potential

Diluents used in dilbit are thoroughly mixed with the bitumen and, when mixed, no longer exhibit the same flammability as they would by themselves. Dilbit is capable of igniting at low temperatures (-0.4˚F [-18˚C]) (Imperial Oil 2002, exp Energy Services, Inc. 2012) and ceasing to flow at temperatures of -22˚F (-30˚C). SCO can produce flammable or explosive vapors when above its 68˚F (20˚C) flashpoint (Husky Energy 2011). Both dilbit and SCO are flammable petroleum products; however, for an ignition to occur, produced vapors from the oil must be above the lower flammability limit of the vapor and sufficient oxygen and an ignition source must be present. Given the liquid nature of dilbit, friction alone would not be an ignition source. Within a pipeline, oxygen conditions are typically too low and an ignition source is not present, so an explosion within a closed pipeline is unlikely. If crude oil is released outside the pipeline, and an ignition source is present, it could potentially ignite under specific conditions.

3.13.3.5 Acidity and Corrosivity Potential

Naphthenic acids are natural constituents in many petroleum sources, including bitumen from oil sands. (Naphthenic acids are not present in SCO.) Naphthenic acids can create corrosion problems. This type of corrosion is referred to as naphthenic acid corrosion (NAC). Because of the lack of available naphthenic acid concentration data for crude oil, the petroleum industry uses a measurement known as the total acid number (TAN) to qualitatively measure the potential for an oil to produce such corrosion problems. The measurement of TAN is an indicator, although not a direct measurement, of naphthenic acid content in crude oil. TAN values for heavy WCSB and dilbit are similar to TAN values measured in other crude oil from around the world (Aske et al. 2001, Table 4). This is consistent with information in presentations at the meeting organized by the National Academy of Sciences (NAS) in July 2012 (NAS 2012)[3], which reported that the TAN of dilbit overlaps with that of conventional crude. With a TAN greater than 1.0, dilbit is considered to be an acidic crude; heavy crude is moderately acidic (APEC 2005). Due to an extraction washing process used to separate bitumen from oil sands, it is expected that acids remaining in dilbit would not be higher than in conventional crude.

[3] Pursuant to the Pipeline Safety, Regulatory Certainty, and Jobs Creation Act of 2012, PHMSA contracted with NAS to study whether transportation of dilbit by transmission pipeline has an increased likelihood of release compared with pipeline transportation of other crude oils. NAS expects to complete this study in 2013. If NAS concludes that an increased likelihood of release it would make recommendations for changes to PHMSA regulations to address the increased risk. The references to the NAS 2012 presentations in this Supplemental EIS are done to present the most updated information on this topic; however, these presentations are preliminary and should not be interpreted to prejudge any conclusions NAS may reach.

Corrosion due to naphthenic acid is observed primarily at the very high temperatures found in refinery systems (typically, 644-700˚F [340-372˚C] for crude units, 716-788 ˚F [380-420 ˚C] for vacuum units). Pipelines may be exposed to NAC, but metal loss like that found in refinery crude systems is not typically observed because of the much lower operating temperature of pipeline systems.

Some oil sand bitumen crudes have been characterized as corrosive by the classical naphthenic models used in chemistry. However, after decades of cumulative operation, only a very few NAC cases have been observed in crude units in U.S. refineries. It has been proposed a new theory for the corrosivity of naphthenic acids in oil sand bitumen crudes in which two types of naphthenic acids are introduced: corrosive acids with low molecular weights, and non-corrosive and inhibitive acids with high molecular weights. The hot extraction wash of the raw oil sand mixture in dilbit appears to preferentially remove the higher water-soluble fraction of corrosive acids. The more benign fraction is left, being less corrosive and less water-soluble. The naphthenic acid type surviving the dilbit thermal hydro-processing tends to be of the inhibitive, non-corrosive type (Messer et al. 2004).

Dettman, 2012, and Friesen, et al. 2012, discuss two physicochemical characteristics of dilbit related to its corrosive behavior in pipelines: TAN and sulfur content. As discussed above, a diluent is added to bitumen to create dilbit and, therefore, the original organic acid found in bitumen would also be diluted. Bitumen naphthenic (organic) acid content prior to dilution is on the order of 3% by weight (TAN = 3 mg KOH/g) (Dettman, 2012). After dilution, the TAN could be reduced to 1.6 mg KOH/mg or less. The recent 5-year average assay of Western Canadian Select (dilbit) shows TAN at less than 1.0 mg KOH/g (Table 3-13-2).

A study conducted with crude oil data gathered in 1995, indicated a poor correlation between TAN numbers below 1.0 mg KOH/g and corrosion rates at ambient temperatures. Various TAN numbers produced unnoticeable changes in metal corrosion rates (Friesen, et al. 2012). Dilbit corrosivity rates could remain low even for higher TAN values unless temperature is increased close to the naphthenic acid boiling point (530°F [280°C]) (Dettman, 2012). The operating temperature of the proposed Project is expected to be approximately between 42-135°F (6-57°C).

Sulfur compounds like H_2S tend to form iron sulfides and therefore could threaten the pipeline steel walls. Although much of these are removed during the bitumen extraction/treatment process, some remain present in dilbit. Sulfur is mostly bound to the dilbit hydrocarbons, which could account for up to 3.9% by weight in a pipeline inventory (Dettman, 2012). The recent 5-year average assay of Western Canadian Select (dilbit) shows sulfur at less than 3.5% by weight (Table 3-13-2). However, iron sulfides produced by dilbit are insoluble in oil. Under controlled hydraulic conditions in the pipeline (low shear flow), a protective film could form on the pipeline walls to reduce internal corrosion effect. This is a documented industry practice (Dettman, 2012). The remaining sulfur compounds in dilbit would not be in free form, which means they would be strongly attached to hydrocarbons and not available to react until subjected to refinery-type process conditions.

3.13.4 Pipeline and Component Integrity Threats

For the discussion on pipeline component integrity threats, the terms release, leak, and spill are used as follows:

- A release is a loss of integrity from a pipeline;
- A leak is a release over time; and
- A spill is the liquid volume of a leak that escapes a containment system (if present) and enters the environment.

A loss of pipeline integrity can result in an unintentional release of crude oil. There are a number of failures that can result in a release. The failures may range from something very visible, such as an external crack in the pipe, to something subtle, like a sensor malfunctioning and transmitting spurious readouts resulting in improper pipeline operation. The term *threat* is preferred to cause to label a mechanism that could lead to a pipeline failure. The term *cause* is used once a mechanism for a release has been identified. In this sense, threats have the potential to create the conditions for a release (loss of integrity), and causes have created a release.

The American Society of Mechanical Engineers (ASME) B31.8S "Managing System Integrity of Gas Pipelines" and API 1160 "Managing System Integrity for Hazardous Liquid Pipelines" were used to identify potential pipeline and component integrity threats. The following threats could apply to the proposed Project during construction and operations, and are described in more detail below:

- External corrosion, such as oxidation of the metal surface in contact with humid air;
- Internal corrosion, such as NAC;
- Stress corrosion cracking (SCC), such as cracks caused by repeated expansion and contraction due to temperature changes;
- Manufacturing, such as defects in the pipe;
- Construction, such as welding defects;
- Equipment, such as wear and tear of valve seals;
- Third-party damage, such as from earth movement in nearby excavations;
- Incorrect operations, such as operating errors that lead to the over-pressurization of the pipeline or components; and
- Weather-related and other natural forces, such as earthquakes.

These threats are categorized into three time-related groups, according to ASME B31.8S:

- Time-dependent: primary threats that could be addressed by ongoing and periodic assessments; these include external corrosion, internal corrosion, and SCC.
- Stable: threats that remain consistent and benign unless activated by a change in operations or the surrounding environment; these include manufacturing, construction, and equipment.
- Time-independent: threats that do not fall under the preceding categories; these include third-party damage, incorrect operations, weather-related, and other natural forces.

3.13.4.1 Time-Dependent Threats

Time-dependent threats include corrosion and SCC. Corrosion is defined as the deterioration of a material, usually a metal, by reaction with its environment. The rate at which a metal will corrode is primarily governed by the environment. Corrosion is a process where the metal of the pipe oxidizes because a naturally occurring electric current flows through and induces the pipeline metal to combine with oxygen, creating a non-metallic by-product (known as rust). For corrosion to develop, an oxidizing agent (most commonly water) needs to be present to oxidize the steel used for pipelines. For a pipeline, water can be inside the pipe, originating from the fluid being transported, or it can be outside from soil moisture (API 1160). The characteristics of the water present (for example, acidity due to the corresponding presence of other chemicals/contaminants in the transported material) can also significantly affect the nature of the resulting corrosion. The following are typically successful methods of corrosion control and mitigation:

- Proper material selection;
- Controlling water and sediment content/accumulation in the pipeline;
- Exterior protective paints and coatings;
- Corrosion treatment chemicals;
- Dielectric insulation; and
- Cathodic protection.

Three corrosion threats commonly associated with pipelines (external corrosion, internal corrosion, and SCC) are discussed below.

External Corrosion

External corrosion occurs when pipeline walls or seam welds weaken from contact with moist soil or water. External corrosion can be accelerated by microbial activity (ASME B31.8S-2010). A pinhole is a term used to describe a very small hole (i.e., roughly the size of a pinhead) that could form in a pipe. This hole size is common in corrosion cases, and is typically associated with low leak-rate, long-duration spills. The following factors could affect the rate at which external corrosion occurs:

- Exposure time: external corrosion thins the pipeline wall and weakens the pipe material strength. If the pipeline wall is exposed to the corrosive conditions over a sufficient time, weakening of pipe strength and a loss of pipeline integrity could result in a breach of the pipeline wall or failure of a pipeline weld under normal operating conditions. This could then result in a leak or spill.
- Coating: industry standards require that all new steel pipelines, such as the pipeline that would be used for the proposed Project, are coated with fusion-bonded epoxy (FBE) to create a physical barrier between the pipe and the surrounding soil, significantly reducing or eliminating the mechanism for developing rust. Over time, this coating could incur damage, exposing the pipe to moisture, which could result in corrosion. The corrosion generally occurs evenly over a large portion of the pipeline surface. This type of external corrosion is referred to as general or uniform corrosion (NACE International 2012c).

- Cathodic protection: this counters the effect of stray electronic fields, reducing or eliminating the external corrosion rate if the external coating is damaged. The proposed pipeline would employ cathodic protection.
- Pitting: pitting is a type of external corrosion where there is a surface defect in the metal of the pipeline, a scratch in the coating, or an area where the coating has broken down. These small areas can then be exposed to moisture in the area surrounding the pipeline, causing the pipe to corrode (NACE International 2012a). This small area of corrosion, or pit, can develop into a larger area of corrosion and corrosion rates could increase. In both cases, the water or moisture connects the metal in the pipeline to the surrounding soil. From there, electric currents can flow naturally between the soil and the pipeline, inducing the pipeline metal to combine with oxygen, resulting in rust. The effects can be increased with pitting, as the current discharges tend to be localized at defects, scratches, or holes in the pipeline coating (Beavers and Thompson 2006). Man-made underground facilities (e.g., electric lines and piping) can also influence external corrosion rates as they distribute stray electric current fields. In the absence of mitigation measures, once corrosion is initiated, the presence of stray electric currents can result in a high rate of external corrosion, and can result in rapid perforation of the pipeline wall (Beavers and Thompson 2006). As a result of pitting, pinholes can form.
- Seasonal variability: local soil conditions (and corrosiveness) can vary from season to season.
- Long-line corrosion cells: pipelines passing through different types of soil may experience variable rates of corrosion (American National Standards Institute/NACE International [ANSI/NACE] 2008).
- Microbial activity: bacteria are commonly found in soil and water and can contribute to pipeline corrosion. The two basic categories of bacteria are aerobic (oxygen using) and anaerobic (non-oxygen using). Both types can be present in the same environment depending on temperature, moisture, nutrient supply, and other factors. Aerobic bacteria are more abundant where oxygen is plentiful, and anaerobic bacteria are more abundant in oxygen-deficient environments. Both types of bacteria can contribute to conditions that cause external and internal corrosion of pipelines (API 2001). Anaerobic bacteria are found in stagnant bodies of water, heavy clay soils, swamps, bogs, and in most areas that have moisture, organic materials, low oxygen, and some form of sulfates. Some anaerobic bacteria do not directly attack the steel but can create changes in soil chemistry that increase corrosion activity. Anaerobic bacteria are also found in salt water-bearing formations. Aerobic bacteria can also contribute to corrosion of buried steel structures. If sufficient organic matter or other biodegradable material resides on pipe coating scratches, crevices of pipe repairs, or other pipe surface deformities, bacteria may use these materials and produce carboxylic acids that could lead to corrosion. These bacterial processes may result in a pipe corrosion mechanism.

Internal Corrosion

Internal corrosion occurs when pipe walls or seam welds deteriorate due to contact with water, bacteria, or chemical contaminants contained in the material transported in the pipeline. Common contaminants, which include oxygen, hydrogen sulfide (H_2S), carbon dioxide, or

chlorides, can form types of acids. The nature and extent of the corrosion that may occur are a function of the concentration and combination of these various corrosive constituents within the pipe, as well as the operating conditions of the pipeline. Internal corrosion also includes physical scouring of the inside wall of the pipeline by sediment as well as turbulence-related erosion. Internal corrosion can cause thinning of the pipe wall and weakening of the pipeline's mechanical strength. A sufficient loss of mechanical strength can result in a breach of the pipeline wall or failure of a pipeline weld by loss of structural integrity.

The mechanisms for internal corrosion are similar to those of external corrosion, except that the source of internal corrosion is the product flowing through the pipeline rather than the pipeline's surrounding environment. Internal corrosion can occur at locations where sediment and water (basic sediment) can separate. Underneath deposited sediment, a corrosive water film can form on the pipe wall. It is this localized water that can foster corrosion. Typical dilbit diluents exhibit hydroscopic properties (i.e., they absorb water). The proposed pipeline design indicates that the flow of dilbit would be at pressures greater than 1,100 pounds per square inch when leaving a pump station and drop to 50 pounds per square inch at the inlet of the next pump station approximately 50 miles downstream. The continuous pumping and pressure gradient would create the conditions necessary for water to be carried with the flowing crude oil (entrainment), which would tend to reduce or eliminate the corrosion threat. This is consistent with the limited observance of internal corrosion incidents in Alberta pipelines. According to Been (2012), the nominal velocity of flow in the pipeline would be approximately 5.6 miles per hour. Detailed pipeline design data is required to perform entrainment velocity calculations.

Erosion-corrosion is a corrosion action arising from the combined action of electrochemical reaction and mechanical abrasion. Metal alloy pipes are susceptible to wear as a consequence of fluid motion. Increasing fluid motion increases the rate of erosion-corrosion, in particular with solutions when bubbles and particles are present (Callister 1999). Turbulent flow inside the pipeline also increases the corrosion rate. Mitigation to reduce erosion-corrosion effects includes system design to eliminate drastic pipe diameter reductions, elbows, and other areas of flow impingement. Minimization of particles and bubbles in pipeline contents also reduces the effects of this type of corrosion. The potential for this type of corrosion is not unique to dilbit and is also observed in pipelines transporting conventional crude, as documented in the PHMSA database.

Although a focused, peer-reviewed study of the potential corrosivity/erosivity of oil-sands-derived crude oils relative to other crude oils has not yet been conducted, review of the available data suggests that this potential for dilbit is similar to the potential for other crude oils transported in U.S. pipelines.

Based on the experiences obtained from the Enbridge Liquid Pipelines System, which has been transporting crude oil originating from the oil sands since 1968, constituents that potentially contribute to corrosion inside a pipeline include sediment and water that can enter the pipeline with the oil being transported. Internal corrosion can occur if these constituents settle on the pipe bottom and establish a corrosion point. Higher density/viscosity crudes have a greater propensity to carry sediment. However, dilbit and SCO, on average, typically carry approximately 25 percent less sediment than conventional heavy oils (Ironside 2012). Some of the available data regarding corrosion for dilbit-carrying and conventional-crude-carrying pipelines are listed below (Been 2011):

- Although the TAN in dilbit is higher than that of Western Canadian crude oil, based on averages of approximately 5 years, the acids are too stable to be corrosive under transmission pipeline temperatures.
- Dilbit sulfur content is comparable to the sulfur content in other crude oils, and the production of H_2S, which could increase the occurrence of corrosion, is not expected at the pipeline operating temperatures.
- No evidence of increased sediment erosion in dilbit pipelines, compared to other crude oil pipelines, has been observed in Alberta. Although some dilbit blends may contain more sediments than conventional crude oils, it would be well below the limit set by regulatory agencies and industry.
- Dilbit viscosity is comparable to those of conventional heavy crude oils and there is no evidence of increased corrosion or other potential pipeline threat due to viscosity.
- Higher temperatures in dilbit pipelines do not correlate to increased corrosion rates.
- Temperatures up to 60°C have indicated a higher rate and extent of coating failure, but it has also been shown that, in the presence of cathodic protection, the pipe will remain protected, and blistering and coating failure does not present an integrity threat to a pipeline. No stress corrosion cracking failures have been reported for FBE coatings in over 40 years of experience.[4]
- Transmission pipeline failure rates in Alberta are comparable to those in the United States.

Stress Corrosion Cracking

SCC is the cracking of a material produced by the combined action of corrosion and applied stress (Beavers and Thompson 2006, NACE International 2012b). SCC results when microscopic cracks form and coalesce under stress, forming a macroscopic crack (API 2001). The crack eventually expands to produce a failure that results in a breach of the pipeline integrity and subsequent release of pipeline contents. A characteristic of SCC is the development of groups of longitudinal surface cracks in the pipe that link up to form long, shallow flaws (Beavers and Thompson 2006).

Pipelines expand and contract slightly in response to temperature changes. This expansion and contraction can cause stress cracks to develop in the pipeline if they exceed the intended design range. External forces acting on the system may also apply stress, which could create metal fatigue. Examples are vibration sources (e.g., from an active railway crossing), frost heaving (depending on the soil and seasonal characteristics of the area), and operational cycling of the pipeline internal pressure.

SCC may progress in four stages. In Stage 1, the conditions for the initiation of SCC develop at the pipe surface. The pipe coating detaches, corrosion or rust develops, and the pipe surface may become pitted or uneven. Cracks begin to form in Stage 2, and continued initiation, growth, and crack coalescence occur in Stage 3. In Stage 4, large cracks coalesce and pipeline failure occurs, resulting in a leak.

[4] The Keystone XL pipeline would be coated with FBE, which is considered permeable to the cathodic protection current.

The effect of SCC is a weakening of the pipeline's mechanical strength. A sufficient loss of mechanical strength through growth and interlinking of the stress-corrosion cracks can result in a breach of the pipeline wall by loss of structural integrity under normal pipeline operating conditions. SCC is controlled by pipeline stress management during pipeline installation and operation in conjunction with external and internal corrosion controls. If stress-corrosion cracks develop, pipeline inspection can reduce the likelihood of a pipeline release by allowing repair or replacement of the affected sections of pipeline or modification of the pipeline operating conditions.

3.13.4.2 Stable Threats

Stable threats are those that exist constantly over time, and do not manifest unless activated by a change in operations or the surrounding environment.

Manufacturing

Manufacturing threats are defects in the mainline pipe or pipe seams created during manufacturing of the pipeline components. Pipe mill-related anomalies fall into this category (ASME 2010). Examples are lower steel grade, inclusions or imperfections in the steel, deformed joints, and substandard threading. The most common long-term scenarios for material-related pipeline leaks are those in which inadequate materials lead to corrosion. Manufacturing defects also may result in a weakening of the mechanical strength of the pipe body or weakening of the pipe welds over time. A sufficient loss of mechanical strength can result in a breach of the pipeline wall or failure of a pipeline weld under normal pipeline operating conditions. Manufacturing defects are controlled by pre-commissioning inspections and surveys after the pipeline is put into operation.

PHMSA (2009) has identified a manufacturing integrity issue with respect to high-grade mainline pipe. Tests that have been conducted on installed mainline pipe have shown that some of the pipe material has yield strengths, tensile strengths, and/or chemical compositions that do not meet the requirements of the API, Specification for Line Pipe—5L (API 5L), for PSL 2, and the specified pipe grade. Yield strengths below the minimum specified yield strength have been reported and yield strengths up to 15 percent lower than the strength values on the pipe manufacture-produced mill test report have also been reported. In some cases, the affected pipe may successfully pass strength testing methods contained in current specifications but may lead to a future pipeline integrity issue. The presence of low-yield-strength mainline pipe installed in a pipeline system may result in increased susceptibility to excessive pipe expansion or rupture during the pre-in-service field hydrostatic strength test. The revised Permit Application identifies that mainline pipe for the proposed Pipeline would be constructed of API 5L PSL2 X-70M high-strength steel. Per the application, the maximum operating pressure for the pipeline would be 72 percent of the minimum specified yield strength.

Construction

Construction threats are incidents that occur in the field during construction and up to the time of commissioning that may affect a pipeline's structural integrity. Construction threats can include: 1) a defective weld around the circumference of the pipe (girth weld); 2) a defective fabrication weld; 3) a pipe wrinkle, bend, or buckle; and 4) stripped threads, broken pipe, and coupling

failure (ASME 2010). Dents occurring during construction that may affect welds or pipe body integrity are also included in this category.

Residual stress present in the pipe body due to pipe bending, buckling, or incorrect pipe laying is a threat that may lead to a release event provided it is sufficient to locally weaken the pipeline integrity. Mechanical removal of metal during construction is considered a threat (e.g., gouges, cavities, or grooves) since corrosion tends to develop quickly in pipe areas with defects. The pipe-welding process and the pipe-laying process in general are factors that can affect pipe integrity. The PHMSA special conditions related to pre-commissioning quality inspection and detection of construction defects should ensure high-quality construction standards to minimize the potential for defects. Testing and inspection that take place during pre-commissioning reduce, but do not eliminate, the chance of a leak due to construction threats.

Equipment

An equipment threat is the potential for equipment to not accomplish its intended design, operational, or functional purpose. A malfunction may include repairable and unrepairable failures of pipeline (both linear and discrete) elements. Linear element failure includes any loss of containment from pipe body or weld seams that connect the pipe. Discrete element malfunction pertains to equipment above ground such as pumps, tanks, and non-pipe controls and valves. The equipment also comprises non-metal parts such as seals and rings, plus all the supervisory control and data acquisition (SCADA) components that assist in monitoring and controlling the pipeline system. The root causes of equipment malfunction could relate to failures in design, operation, or manufacturing if they are not clearly traceable to the construction phase. The following are some examples of potential equipment malfunctions:

- A pressure sensor may stop working and allow for abnormal pressures to develop without triggering alarms;
- Since the pipeline system is expected to be remotely operated, a SCADA malfunction, such as a level sensor that is not properly reading the content level, may also have the potential to result in a loss of containment by overfilling a tank to which the pipeline is connected; and
- Field power blackouts, software glitches, false alarms, and other factors may trigger an automated or human response that might lead to the accidental release of pipeline inventory.

A number of equipment malfunction scenarios could result in a pipeline leak. Wear and tear of valve seals or rings could result in immediate leaks, while the failure of SCADA controls at a critical time may result in an escalation scenario of varying consequences. For all these reasons, leaks from linear and discrete equipment may range from small (less than 50 barrels [bbl][5]) to large volumes (greater than 1,000 bbl).

[5] Forty-two U.S. gallons.

3.13.4.3 Time-Independent Threats

Time-independent threats include third-party damage, incorrect operations, and weather-related and other natural forces. These are discussed below.

Third-Party Damage

A third-party damage threat consists of potential actions of the pipeline operator and/or other parties that could create conditions affecting the pipeline system integrity. Three primary sub-threats comprise potential third-party damage threats: 1) unintentional damage; 2) intentional damage or vandalism; and 3) previously damaged pipe (such as dents or gouges created during manufacturing, construction, or operation) (ASME 2010). These threats may directly damage the pipeline system to the point of producing a leak. Excavation is a common action in which the pipeline is subject to an external mechanical force that could result in a pipe failure. Other less common actions include impact by a motor vehicle, detonation of an explosive substance, or earth movement related to nearby excavations or heavy traffic over a buried pipeline. Additionally, dents, gouges, and scratches to exposed pipe; loss of pipeline support; change in pipeline alignment; and loss of cover due to third-party activities are related third-party threats (API 2001).

Incorrect Operations

Although much of pipeline operations are automated, personnel still serve a primary role in those operations. Human errors made by a pipeline operator's involvement can lead to the incorrect operation of the system, which in turn may cause a release. One example of an operating error is personnel operating a line valve that will over-pressurize other discrete equipment, resulting in a failure. In addition, extensive delays or prolonged lack of adequate maintenance can lead to a leak. Incorrect SCADA readings may induce a controller to mistakenly divert inventory and overfill storage tanks. If a field inspection routine is bypassed or simply fails to identify a worn seal, a leak could occur. Transient pipeline hydraulic events (temporary change of pressure, volume, or temperature) are also included in this category if they are due to human error. These events may lead to large pressure forces and fluid acceleration into the system. The disturbances may result in pump and other equipment failures, component fatigue, and even pipe rupture.

Weather-Related and Other Natural Forces

Weather-related and other natural force threats include natural hazards whose magnitudes or characteristics might cause damage to the pipeline system[6]. This threat is comprised of four primary sub-threats: 1) natural earth movement and/or avalanche; 2) heavy rains or floods; 3) extreme ambient conditions, including ice-loading on exposed structures; and 4) lightning.

Some natural hazards, such as earthquakes, floods, and tornadoes, have the capacity to directly damage the pipeline and cause a leak. For example, an earthquake could affect the stability of the buried pipe. 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 even create corrosive conditions. Heavy rains, snow fall, and high winds may produce conditions that will affect the system integrity over time. Long-term exposure of

[6] Please refer to the Section 4.14, Climate Change.

aboveground facilities to these weather events could increase wear and tear or weathering, and potentially cause corrosion. Mud slides or soil washout may affect the foundation of exposed pipeline segments and the undistributed pipe weight may create stress that will cause linear elements to leak. Lightning and wild fires are unlikely to damage the system integrity directly, but could cause the loss of SCADA, crude oil overheating, or damage to the coating of exposed pipe at aboveground facilities.

3.13.4.4 Potential Spill Sources

For the purpose of this section, the following spill sizes are defined for spills related to construction activities, maintenance activities, and operation of the proposed pipeline:

- Small spill (< 50 bbl);
- Medium spill (50-1,000 bbl); and
- Large spill (>1,000 bbl).

Construction

The proposed Project, as with most construction projects, has the potential for a release of hazardous fluids during material handling (e.g., delivery or dispensing of fuels, lubricating oil, hydraulic fluid). The possibility exists that during construction a full gasoline or diesel tank truck could be involved in an accident (e.g., collision or roll-over) and release all or part of its cargo to the environment. Delivery vehicles carrying drums of lubricating or hydraulic fluids could also release hazardous fluids to the environment due to accidents. The areal extent of these types of spills would likely be limited unless they occurred near to or at an open water body.

The potential for small spills from construction machinery and operating equipment (e.g., small, intermittent leaks and drips of lubricating oil, hydraulic or transmission fluids, fuels, or similar products) would be almost certain to occur and are typical of most large construction projects. These types of spills, usually occurring in construction areas, equipment storage yards, and lay-down yards along the route, generally would be identified and managed by equipment operators and/or contractor personnel on site.

Operation

Operational spills from the proposed Project could originate from the pipeline, pump stations, mainline valves, delivery points, or at any location along the pipeline. As noted above, most small spills are related to pinhole-type corrosion leaks along the body of the pipe or by leaks from valves, flanges, pumps, or other equipment. However, crude oil exiting a pinhole may create a medium to large spill due to the difficulties for SCADA or aerial surveillance to detect such a leak. Many of these components would be located in pump stations or delivery points along the proposed pipeline route. A pinhole-sized leak resulting in drips from defects in materials or faulty construction/fabrication of the pipeline could occur along any segment of the pipeline. As the majority of the pipeline would be buried, these small, continuous-type releases may go unnoticed for an extended period until the spill volume is expressed on the surface. This volume of spill generally would remain within the pipeline right-of-way unless the oil was released adjacent to a channel or surface water body that could facilitate spreading.

Based on PHMSA data, medium spills (50-1,000 bbl) generally occur in association with physical damage to the pipeline (e.g., crack/tear, excavation damage, weld failure). The effects of corrosion or erosion (external or internal) on the proposed pipeline could cause a structural weakness to a section of pipe or pipe joint, which may lead to a pipeline failure along the route. Unauthorized excavation, construction, or drilling in the vicinity of the proposed pipeline could cause direct damage to the pipeline or other pipeline components at any location along the route; however, these types of activities are generally associated with urban or suburban areas. Soil erosion along the topographic highs and lows or near river or stream crossings along the route are also potential locations where spills may occur.

Large spills (>1,000 bbl) are generally associated with severe damage to or complete failure of a major pipeline component. While many of the causes listed above for medium spills could apply to large spills, it is the degree of damage and the location of the spill that generally differentiates medium spills from large spills.

For example, a full, 36-inch-diameter pipe contains roughly 6,660 bbl per mile of length. This means that the minimum volume for a large spill (1,000 bbl as defined above) exists in roughly every 800-foot section of 36-inch-diameter pipe, not considering response measures to stop the leak or the presence of design features such as mainline valves to mitigate the volume released.

Maintenance

Small spills may occur during maintenance activities (e.g., valve replacement, pump service, inspection [pigging], or cleanouts) and generally would be expected to occur in or near pump stations, metering facilities, or other aboveground infrastructure locations. Many of these releases are typically attributed to the spilling of residual product during the removal of a pipeline component or bleeding of pressure or product from lines prior to line-breaking type activities. Most small releases associated with maintenance activities are generally identified and managed in a timely fashion.

Medium or large-sized spills are generally not associated with maintenance events. A technician or mechanic performing maintenance on the pipeline is usually trained or supervised by person/persons familiar with the reporting or appropriate response actions needed to prevent medium or large releases from occurring.

3.13.5 Potential Spill Receptors

The magnitude of an oil spill impact would be influenced by the type of receptors that might be exposed to the oil. Below are the descriptions of identified spill receptors broken into two main categories: high consequence areas (HCAs) and other resources. Definitions for HCAs are from the U.S. Department of Transportation (USDOT) Federal Register, Title 49 of the CFR Part 195. Other resources are defined in this Supplemental EIS and described below. Figure 3.13.5-1 illustrates the organization of HCAs by the USDOT and how other resources are organized in this Supplemental EIS to evaluate potential spill impacts.

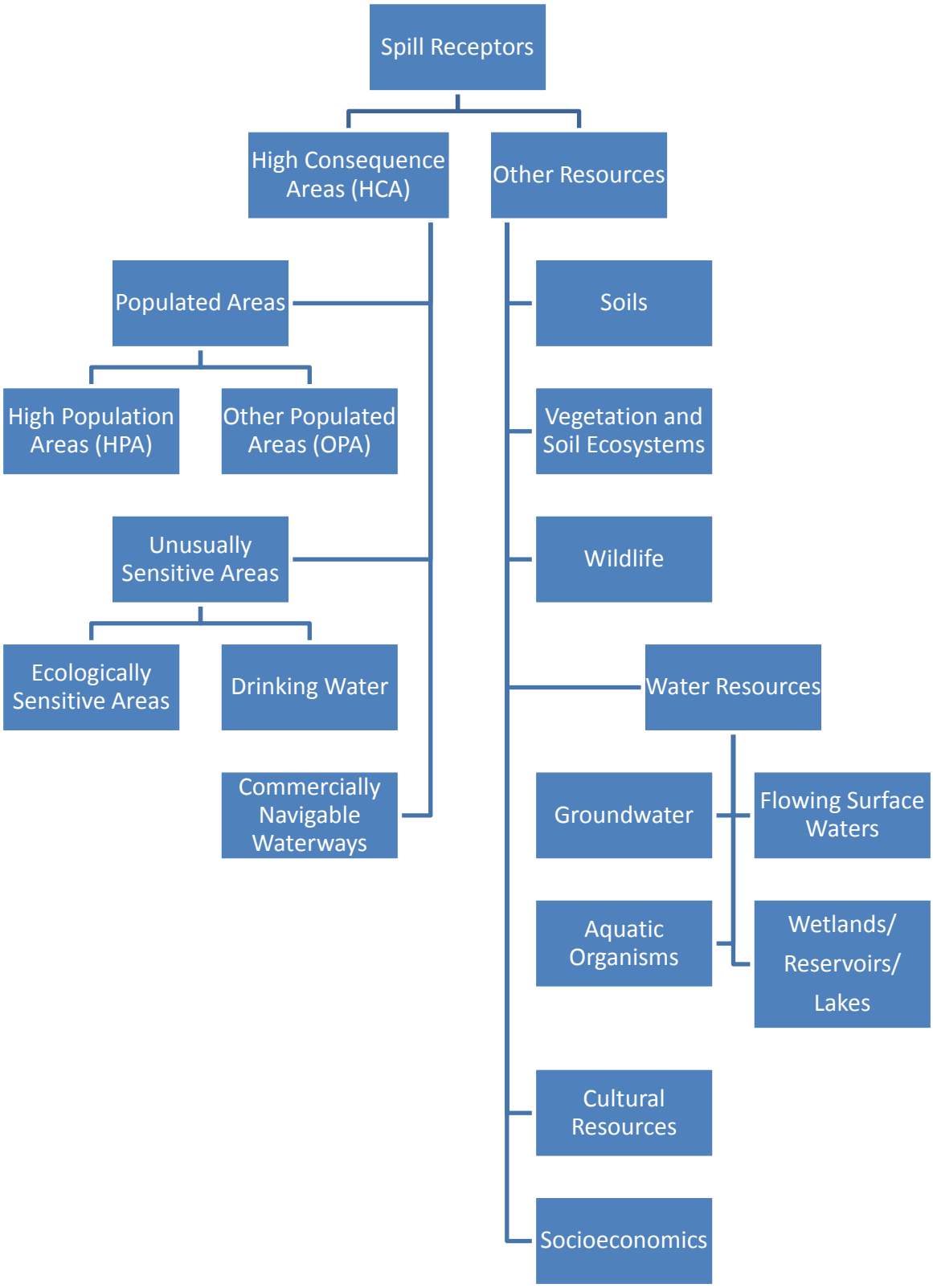

Figure 3.13.5-1 Identified Potential Spill Receptors

3.13.5.1 High Consequence Areas

HCAs are defined in 49 CFR 195 (Transportation of Hazardous Liquids by Pipeline) Subpart F for pipeline integrity management. An HCA is defined as a high-population area, other populated area, commercially navigable waterway, or unusually sensitive environmental area, including a sole-source drinking water supply.

Appendix Q, Pipeline Risk Assessment and Environmental Consequence Analysis, Table 4-12, identifies the types and lengths of HCAs crossed by the proposed Project route (HCA data for the rerouted portion of the proposed Project in Nebraska are currently unavailable and will be included in the Final Supplemental EIS as available). These HCA data are compiled from a variety of data sources, including federal (e.g., U.S. Environmental Protection Agency [USEPA]) and state (e.g., fish and wildlife, environmental quality, hydrology, etc.) agencies. Keystone has conducted a preliminary evaluation of HCAs crossed or located downstream of the proposed pipeline route. Portions of the proposed pipeline route in which a release could potentially affect HCAs would be subject to higher levels of inspection (per 49 CFR 195). As a result of the preliminary HCA evaluation, some proposed valve locations were moved and additional valves were added to protect HCAs from potential impact.

Populated Areas

In the event of a spill, the effects on populated areas would depend on the size of the spill and the size of the population in the impacted area. For this reason, populated areas are divided into two categories by the USDOT: High Population Areas and Other Populated Areas. High Population Areas contain 50,000 or more people and have a population density of at least 1,000 people per square mile. These areas are defined and delineated by the Census Bureau as urbanized areas. Other Populated Areas contain concentrations of people and include incorporated or unincorporated cities, towns, villages, or other designated residential or commercial areas, with population densities less than 1,000 people per square mile. The population data used in this report have been updated to include the results of the 2010 Census.

This population division is used to improve the risk analysis as more urban areas may be more susceptible to the impacts of an oil spill. Possible effects of a spill on populated areas include interruptions in daily activities such as access to safe drinking water, decreased air quality, socioeconomic effects, or temporary relocation of population in impacted areas during spill containment and cleanup procedures.

According to a 2003 report to USEPA on a comparison of the health effects of SCO with those of conventional crude oil, the following statement was made (API 2003, page 9):

> Synthetic crude oil, from upgraded tar sands, is compositionally similar to high quality conventional crude oil (>33º API). The conventional technologies such as delayed and fluid coking, hydrotreating, and hydrocracking, used to upgrade heavy crude oils and bitumens, are used to convert tar sands into a crude, consisting of blends of hydrotreated naphthas, diesel and gas oil without residual heavier oils . . . This information was supplied to USEPA . . . to support the position that tar sands-derived synthetic crude oil is comparable to conventional crude oils for health effects and environmental testing, a position with which EPA concurred.

It should also be noted that based on current production projections and the market demand at Gulf Coast refineries, the majority of crude oil that would likely be transported by the proposed Project would be dilbit (EnSys 2010).

Vapors from spilled oil could lead to human health effects depending on the intensity and duration of exposure. In particular, a human health risk could result from the inhalation of any H_2S emitted into the air column in the vicinity of the oil spill. Human health effects of exposure to H_2S, an irritant and an asphyxiant, depend on the concentration of the gas and the length of exposure. Background ambient levels of H_2S in urban areas reportedly range from 0.11 to 0.33 parts per billion, while in undeveloped areas concentrations can be as low as 0.02 to 0.07 parts per billion (Skrtic 2006). Olfactory perception of hydrogen sulfide occurs for most people at concentrations in the air of approximately 0.2 parts per million (ppm).

In an assessment of risk to first responders (local emergency services, emergency response contractors, spill management team) at crude oil spill sites, Thayer and Tell (1999) modeled atmospheric emissions of H_2S from crude oil spills using three different crude oil H_2S concentrations (1 ppm, 20 ppm, and 350 ppm), calm wind speeds, and temperatures typical of the southern United States. The results of their analysis indicate that H_2S levels in the immediate aftermath of a crude oil spill at the two higher levels of H_2S concentration (20 ppm and 350 ppm) could pose short-term health risks (shortness of breath) to first responders at the spill site. However, since initial responders do not typically arrive at spill sites immediately and model results indicate that even under worst-case conditions (no wind), modeled exposures drop to non-toxic levels in less than 4 minutes after oil leaves the pipeline and is exposed to air, H_2S exposures would not be expected to create substantive health hazards. Therefore, H_2S exposure is expected to be highest where oil has been spreading for the first 4 minutes immediately after discharge from the pipeline (adjacent to the pipeline and within the right-of-way). The rapid atmospheric dissipation of H_2S levels indicated by these model results suggests that risks to the general public would be very small to negligible.

In the event of a pipeline spill, Keystone has identified and prepared written procedures to address a response action. These activities are provided in Keystone's Draft Spill Prevention, Control, and Countermeasure Plan (Appendix I). More information describing spill response, including notification procedures, response actions, response teams, and spill impact considerations is discussed in Section 4.13.5.2, Spill Response.

Unusually Sensitive Areas

An unusually sensitive area includes a drinking water or ecological resource area that is especially sensitive to environmental damage from a hazardous liquid pipeline release. These areas have been defined by the USDOT. Unusually sensitive areas are separated from other water resources due to their increased potential of direct impact to human health or particularly sensitive wildlife. Other water or ecological resources identified, but not captured by the USDOT designated areas, are addressed below in the Other Resources discussion.

Drinking Water

PHMSA identifies certain surface water and groundwater resources as drinking water unusually sensitive areas (49 CFR 195.6 and 195.450). An example of a drinking water unusually sensitive area is the water intake for a Community Water System or a Non-Transient Non-Community Water System that obtains its water supply primarily from a surface water source and does not

have an adequate alternative drinking water source. The USEPA defines a Non-Transient Non-Community Water System as a public water system that regularly supplies water (but not year-round) to at least 25 of the same people for at least 6 months per year. A drinking water unusually sensitive area could also include a Source Water Protection Area for a Community Water Source or a Non-Transient Non-Community Water System if the water supply is obtained from a USDOT Class I or Class IIA aquifer and does not have an adequate alternative drinking water source. Where a state has yet to identify a Source Water Protection Area, a Wellhead Protection Area is used.

Some segments of the proposed Project route would cross areas that are considered HCAs due to potential risks to sensitive drinking water resources (Appendix Q, Pipeline Risk Assessment, Table 4-12). HCA drinking water data are pending and will be included in the Final Supplemental EIS.

Ecologically Sensitive Areas

An ecological unusually sensitive area is an area containing a critically imperiled species or ecological community, a multi-species assemblage area, or a migratory water bird concentration area. An ecologically sensitive area may also be defined as an area containing an imperiled species, threatened or endangered species, depleted marine mammal species, or an imperiled ecological community where the species or community is aquatic, aquatic-dependent, or terrestrial with a limited range. Finally, an ecologically sensitive area is an area containing an imperiled species, threatened or endangered species, depleted marine mammal species, or imperiled ecological community where the species or community occurrence is considered to be one of the most viable, highest quality, or in the best condition. HCA ecological data are pending and will be included in the Final Supplemental EIS.

Commercially Navigable Waterways

Commercially navigable waterways are waterways where a substantial likelihood of commercial navigation exists (PHMSA Section 195.452). These areas are included as HCAs because these waterways are a major means of commercial transportation and critical to interstate and foreign commerce, supply vital resources to many American communities, and are part of a national defense system.

3.13.5.2 Other Resources

Other resources that could be affected by a pipeline release are listed below; potential impacts to these resources are described in Section 4.13, Potential Releases:

- Soils and sediments;
- Terrestrial vegetation;
- Wildlife;
- Water resources (including groundwater, flowing surface waters, aquatic organisms, and wetlands/reservoirs/lakes);
- Cultural resources; and
- Socioeconomic resources.

3.13.6 Spill Magnitudes

For the purpose of assessing potential spill impact for this Supplemental EIS, the spill volumes defined and discussed in Section 3.13.2.1 of the Final EIS were simplified to three spill volumes—small, medium, and large. The entire range of mainline pipe spills in the PHMSA database are addressed by these three spill sizes but have been reduced from the original five categories to provide a comparison analysis to other current work being done for the State of Nebraska, simplify the range of reported spill volumes in the database including data under the revised reporting requirements, and facilitate assessment of the spill impact along the proposed Project route. The evaluation of small, medium, and large spill-size categories based on PHMSA data is shown in detail in Appendix K, Historical Pipeline Incident Analysis.

3.13.6.1 Small Spills

Small spills defined herein are less than 50 bbl (2,100 gallons). This spill category represents approximately 79 percent of 1,692 crude oil spills evaluated. Based on the database, this volume of release is typically the result of a pinhole-sized, underground leak. A small volume surface release may also develop from corrosion leaks around valves, flanges, pumps, or other equipment. Small spills may also occur from residual oil encountered during maintenance of pipeline equipment such as valve replacement, pump service, and clean outs.

Most small releases associated with maintenance activities are generally identified and managed in a timely fashion. Other small releases or pinhole-type releases could be identified during regular pipeline aerial inspections, ground patrols, or landowner or citizen observation. Small releases and spills can also be identified by investigating the source of petroleum odors reported by ground patrols, landowners, or citizens.

3.13.6.2 Medium Spills

Medium spills range from greater than 50 bbl (2,100 gallons) to 1,000 bbl (42,000 gallons). This spill category represents approximately 17 percent of 1,692 crude oil spills evaluated. Medium spills can be characterized as either underground releases or surface releases and generally are associated with physical damage to the pipeline, failure of a pipeline component, or operator error where the leak rate is more continuous than a drip. The effects of corrosion (external or internal) on the pipeline may cause a structural weakness that could lead to pipeline failure. Mechanical damage directly to the pipeline or external forces related to ground movement or flooding could cause direct damage to the pipeline. Incorrect operating procedures such as over-pressuring or mechanical vibration could exacerbate pipe weakness resulting in a release.

3.13.6.3 Large Spills

Large spills are defined as greater than 1,000 bbl (42,000 gallons) to 20,000 bbl (840,000 gallons). The 20,000 bbl spill is roughly the maximum reported spill volume within the data evaluated. This spill category (>1,000 bbl–20,000 bbl) represents approximately 4 percent of 1,692 crude oil spills evaluated. Large spills are generally characterized as a surface release. This is because the rate of the volume released usually exceeds the capacity at which soil can absorb the released oil. As a result, oil rises to the ground surface. Large spills are generally associated with severe damage to or complete failure of a major pipeline component or monitoring system.

While many of the causes listed in this section and Appendix Q, Pipeline Risk Assessment and Environmental Consequence Analysis, apply to large spills, it is the degree of damage and the response to the spill that differentiates medium spills from large spills. Pipeline operators are typically alerted to medium and large spills through the pipeline's electronic monitoring or leak detection system (e.g., SCADA). Medium and large spills are generally the result of mechanical damage such as excavation or construction activities and are typically immediately reported and have response actions implemented.

A pinhole may create a medium to large spill due to the difficulties for SCADA or aerial surveillance to detect such a leak. The SCADA system, in conjunction with Computational Pipeline Monitoring or model-based leak detection systems, would detect leaks to a level of approximately 1.5 percent to 2 percent of the pipeline flow rate. Keystone has stated it could detect a leak of this size within 102 minutes. Computer-based, non-real time, accumulated gain/loss volume trending would be used to assist in identifying low rate or seepage releases below the 1.5 percent to 2 percent by volume detection thresholds. Smaller leaks may also be identified by direct observations by Keystone or the public.

3.13.7 Connected Actions

There are three connected actions in the vicinity of the proposed Project route, including:

- The Bakken Marketlink Project;
- The Big Bend to Witten 230-kilovolt (kV) Transmission Line; and
- Electrical Distribution Lines and Substations.

The resources found along and in the proposed connected action project areas are similar to the resources described above for the proposed pipeline route itself.

The Bakken Marketlink Project would involve the construction and operation of metering systems, a 5-mile pipeline segment, three new storage tanks near Baker, Montana, and two new storage tanks within the boundaries of the proposed Cushing tank farm. The property proposed for the Bakken Marketlink Project facilities near Pump Station 14 is currently used as pastureland and hayfields; a survey of the property indicated that there were no waterbodies or wetlands on the property. However, the pipeline segment does have stream crossings and these crossings lead to larger surface water bodies. The Big Bend to Witten 230-kV Transmission Line would provide upgrades to the power grid in South Dakota to support power requirements for pump stations in South Dakota. The third connected action is associated with the electrical distribution lines and substations that would be required throughout the length of the proposed Project corridor to support pump stations and other integral Project-related ancillary facilities.

Of the three connected actions, the Bakken Marketlink Project could potentially result in a spill that would affect nearby resources because of the presence of crude oil containment systems (i.e., pipeline and storage tanks). The threats of a spill are the same as for the proposed Project, as are the sources of spills during construction, operation, and maintenance. However, because of the relatively short pipeline segment length, the maximum worst-case spill size would be much less than it would be for the proposed Project.

Spill volumes are based on reported mainline pipe spills. The PHMSA Database has reported spill volumes greater than 20,000 bbls for tanks.

3.13.8 References

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