Keystone XL Pipeline Project

Plan of Development

Prepared for:

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POD Content Checklist

	Checklist Entry	Location of Discussion
1.	Purpose and Need	2.0
1a.	What will be constructed	1.0, 3.0
1b.	Commodity to be transported and for what purpose	1.0, 3.0
1c.	Is the pipeline for a gathering system, trunkline, or distribution line	1.0, 3.0
1d.	Will it be surface or subsurface	1.0, 3.0, 6.2, 6.4, 6.5
1e.	Length and width of right-of-way and area for related facilities	3.0, 3.1, 3.3.5, 3.3.7, 4.1
1f.	Is this ancillary to an existing right-of-way	3.2, 3.2.1, 3.4
1g.	List alternative routes or locations	3.4, 3.4.1, 3.4.2
2.	Right-of-way Location	3.0, Appendix B
2a.	Legal Description	3.1, Appendix B
2b.	Site-specific engineering surveys for critical areas (note: in addition to normal centerline surveys)	To be developed based on BLM consultation
2c.	Maps and drawings showing river crossings	Appendix E
2d.	Acre calculation of right-of-way by land status	Introduction, 1.0, 3.14, 4.1, 4.2, 4.3
3.	Facility Design Factors	6.7
3a.	Pipeline pressure standards	6.7
3a1.	Pipe wall thickness and pounds per square inch (psi) rating	6.7
3b.	Toxicity of pipeline product	6.7, 9.0
3c.	Anticipated operating temperatures	To be provided
3d.	Depth of pipeline	6.7
3e.	Permanent width or size	1.0, 3.0, 4.1, 4.2
3f.	Temporary areas needed	1.0, 3.0, 3.3.8, 4.1, 4.3
4.	Additional Components of the Right-of-way	3.3
4a.	Connection to an existing right-of-way	1.0, 3.0, 3.4
4a1.	Existing components on or off public land	1.0, 3.0
4a2.	Possible future components	3.8
4b.	Location of pumping and/or compressor stations	3.3.3
4c.	Need for sand and gravel and location of sources	3.3.10
4d.	Location of equipment storage areas	3.0, 3.3.9, Appendix B
5.	Government Agencies Involved	5.2, 5.3
5a.	FERC, USFWS	5.2, 5.3, 7.7.3, 7.8.3, Appendix P
5b.	Copy of FERC Section 7c application, if applicable	N/A
5c.	State and local agencies that may be involved	5.2, 5.4
6.	Construction of the Facilities	6.0 -6.10
6a.	Construction (brief description)	6.0 - 6.10
6a1.	Major facilities (including vehicles and number of tons and loads)	6.2, 6.4

Checklist Entry		Location of Discussion
6a2.	Ancillary facilities (including vehicles and number of tons and loads)	NA
6b.	Work force (number of people and vehicles)	6.2, 6.6
6c.	Flagging and staking the right-of-way	6.2.1
6d.	Clearing and grading	6.2.2
6e.	Facility construction data	6.0 – 6.10
6e1.	Description of the construction process	6.2, 6.3
6f.	Access to and along the right-of-way during construction	3.0, 3.3.7, 4.1, 6.4, 8.4, Appendix B
6g	Engineering drawings and specifications for site-specific problems relating to surface use or special mitigation	To be developed based on BLM consultation
6h	Diagrams, drawings, and cross sections to help visualize the scope of the project	figures in 1.0, 3.0, 6.0, Appendix B
6i.	Special equipment that will be utilized	6.2, 6.3
6j.	Contingency planning	6.8. 9.0
6j1.	Holder contacts	Cover
6j2.	BLM contacts	Cover Letter
6k.	Safety requirements	5.3, 7.12, 9.0, 9.11
6l.	Industrial waste and toxic substances	6.2.9, 6.2.2.1, 6.8, 7.6.1.1, 7.12.1, Appendix C
7.	Resource Values and Environmental Concerns	7.0, 9.0
7a.	Address the level commensurate with anticipated impacts	7.0 - 7.12, 9.0 - 9.11
7a1.	Location with regard to existing corridors	3.2.1, 3.4.3
7b.	Anticipated Conflicts with Resources or Public Health and Safety	7.12, 9.11
7b1.	Air, noise, geologic hazards, minerals and energy resources paleontological resources, soils, water, vegetation, wildlife, threatened and endangered species, cultural resources, visual resources, BLM projects, recreation activities, wilderness, etc.	7.0 - 7.12, 9.0 - 9.11
8.	Stabilization and Rehabilitation	8.0
8a.	Soil replacement and stabilization	6.3, 8.1, Appendix C
8b.	Disposal of vegetation	6.2.2.1, Appendix C
8c.	Seeding Specifications	6.2.9, 6.3.2, 7.7.1, 8.2
8d.	Fertilizer	8.2
8e.	Limiting access to the right-of-way	8.3
8f.	Will road built during construction be reclaimed	8.4
9.	Operation and maintenance	9.0 – 9.11
9a	Will new or expanded access be need for operation and maintenance	3.3.7, 9.0
9b.	Will there be hydrostatic testing and subsequent release of water and what is the anticipated volume	6.2.6
9c.	Will removal and/or addition of pipe and/or pumps be required as part of pipeline maintenance	9.0, 9.11
9d.	Will all maintenance activities be confined within the right-of-way	9.0, 9.11

Checklist Entry		Location of Discussion
9e.	Safety	7.12, 9.0, 9.11
9f.	Will industrial waste and toxic substances be generated or stored on the right-of-way	6.8, 7.12.1, Appendix C
9g.	Inspection and maintenance schedules	9.0
9g1.	Will inspections be conducted on-the-ground and/or by aircraft	9.0
9g2.	If by aircraft, will the aircraft require landing strips and/or heliports	9.0
9h.	Work schedules	6.6
9j.	Fire control	6.10
9j.	Contingency planning	6.8, 9.0
10.	Termination and reclamation	8.0, 10.0
10a.	Removal of structures	10.0
10b.	Will pipe be removed or cleaned and left in the ground	10.0
10c.	Obliteration of roads	8.4, 10.0
10d.	Stabilization and revegetation of disturbed areas	8.0 – 8.4

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Acronyms and Abbreviations

amsl	above mean sea level
APE	area of potential effect
APHIS	Animal and Plant Health Inspection Service
API	American Petroleum Institute
ARMP	Approved Resource Management Plan
ARPA	Archaeological Resource Protection Act
ATWS	Additional Temporary Workspace
bgs	below ground surface
BIA	Bureau of Indian Affairs
BO	Biological Opinion
BLM	Bureau of Land Management
BMP	Best Management Practice
BOR	U.S. Bureau of Reclamation
bpd	barrels per day
CA	Confirmed Active
CAA	Clean Air Act
CAPP	Canadian Association of Petroleum Producers
CBM	coal bed methane
CFR	Code of Federal Regulations
CI	Confirmed Inactive
CMRP	Construction, Mitigation, and Reclamation Plan
CO_2	carbon dioxide
CWA	Clean Water Act
dBA	decibels on an A-weighted scale
DEIS	Draft Environmental Impact Statement
DEQ	Division of Environmental Quality
DNRC	Department of Natural Resources and Conservation
DOD	Department of Defense
DOS	Department of State
DSEIS	Draft Supplemental Environmental Impact Statement
EIA	Energy Information Administration
EIS	Environmental Impact Statement
ERCB	Energy Resources Conservation Board
ER	Environmental Report
ERP	Emergency Response Plan
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FHA	Federal Highway Administration
FLPMA	Federal Land Policy and Management Act
FSEIS	Final Supplemental Environmental Impact Statement
GHG	greenhouse gas
gpm	gallons per minute

HCA	High Consequence Area
HDD	horizontal directional drill
HPRCC	High Plains Regional Climate Center
IMLV	Intermediate Mainline Valve
Keystone	TransCanada Keystone Pipeline, LP
L_{dn}	day-night average sound levels
LB	Legislative Bill
MAR	Mainline Alternative Route
MBTA	Migratory Bird Treaty Act
MCS	Motor Carrier Services
MDEQ	Montana Department of Environmental Quality
Memorandum	Presidential Memorandum Regarding Construction of the Keystone XL Pipeline
MEPA	Montana Environmental Policy Act
MFSA	Montana Major Facilities Siting Act
MFWP	Montana Fish, Wildlife, and Parks
mg/L	milligrams per liter
MLA	Mineral Leasing Act
MLV	mainline valve
MOP	maximum operating pressure
MP	milepost
MPDES	Montana Pollutant Discharge Elimination System
MT	Montana
MUTCD	Manual on Uniform Traffic Control Devices for Streets and Highways
NCA	Never Confirmed Active
NDEQ	Nebraska Department of Environmental Quality
NDT	non-destructive testing
NEPA	National Environmental Policy Act
NHP	Natural Heritage Program
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NRC	National Response Center
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSO	no surface occupancy
NTP	Notice to Proceed
NWI	National Wetland Inventory
NWR	National Wildlife Refuge
OCC	Operations Control Center
PFYC	Potential Fossil Yield Classification
PHMSA	Pipeline and Hazardous Materials Safety Administration
PI	point of intersection
POD	Plan of Development
ppmw	parts per million by weight
Project	Keystone XL Project
PSC	Public Service Commission

psig	pounds per square inch gauge
PSRP	Pipeline Spill Response Plan
PUC	Public Utilities Commission
ROW	right-of-way
RUS	Rural Utilities Service
SCADA	Supervisory Control and Data Acquisition
SDEIS	Supplemental Draft Environmental Impact Statement
SDGFP	South Dakota Game and Fish Department
SEIS	Supplemental Environmental Impact Statement
SHPO	State Historic Preservation Office(r)
SPCC Plan	Spill Prevention, Control, and Countermeasure Plan
SSURGO	Soil Survey Geographic database
SWCA	SWCA Environmental Consultants
TDS	total dissolved solid
THPO	Tribal Historic Preservation Officer
TSS	total suspended solids
TUP	Temporary Use Permit
UC	Unconfirmed
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
ULSD	ultra-low sulfur diesel
VRM	Visual Resource Management
WCSB	Western Canadian Sedimentary Basin
Western	Western Area Power Administration
WRCC	Western Regional Climate Center
WSA	wilderness study area

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Table of Contents

1.0 Introduction 1
1.1 Project Summary 3
1.1.1 Background 3
2.0 Purpose and Need 8
3.0 Project Description 13
3.1 Affected Federal Lands 15
3.2 Connection to an Existing Right-of-Way 17
3.2.1 Location in Regard to Existing Corridors 17
3.3 Additional Components of the Right-of-Way 17
3.3.1 Aboveground Facilities 18
3.3.2 Delivery Facilities 18
3.3.3 Pump Stations and Power Lines 18
3.3.4 Densitometer Sites 18
3.3.5 Pigging Facilities 18
3.3.6 Access Roads 18
3.3.7 Temporary Extra Workspace and Staging Areas 19
3.3.8 Pipe Storage and Contractor Yards 19
3.3.9 Borrow Pits 19
3.4 Alternatives 20
3.4.1 Definition of Control Points 20
3.4.2 Constraints and Opportunities 20
3.4.3 Major Route Alternatives 21
3.4.4 Route Changes Since FSEIS Publication 25
4.0 ROW Grant Application and Temporary Use Permit 27
4.1 Affected Federal Lands 27
4.2 Right-of-Way Grant 31
4.3 Temporary Use Permit 32
5.0 Plan of Development 33
5.1 Relationship to Other Environmental Documents 33
5.2 Federal and State Agencies Involved 33
5.3 Permits and Relationship to Federal Policies, Plans, and Programs 33
5.3.1 USACE Section 408 Permitting 38
5.4 Permits and Relationship to Non-Federal Policies, Plans, and Programs 39
6.0 Construction 41
6.1 Construction Impact Mitigation Procedures 41
6.2 Pipeline Construction Process 41
6.2.1 Survey and Staking 42
6.2.2 Clearing, Topsoil Salvage, and Grading 42
6.2.3 Disposal of Vegetation Removed During Construction 42
6.2.4 Trenching 42
6.2.5 Pipe Stringing, Bending, and Welding 44
6.2.6 Lowering in and Backfilling 44
6.2.7 Hydrostatic Testing 45
6.2.8 Final Tie-ins 45
6.2.9 Commissioning 45
6.2.10 Cleanup and Reclamation 45
6.2.11 Additional Construction Spread Requirements 46
6.3 Special Construction Procedures 46
6.3.1 Road, Highway, and Railroad Crossings 46
6.3.2 Steep Terrain 47

6.3.3 Waterbody Crossings – Perennial 47
6.3.4 Wetland Crossings 49
6.3.5 Blasting 50
6.3.6 Residential and Commercial Construction 50
6.3.7 Fences and Grazing 50
6.3.8 Fueling 50
6.3.9 Access Roads 50
6.4 Aboveground Facilities Construction 51
6.5 Construction Work Force and Schedule 51
6.5.1 Work Force 51
6.5.2 Work Schedules 52
6.6 Facility Design Factors 52
6.7 Spill Prevention and Contingency Plan 54
6.8 Snow Removal 54
6.9 Fire Prevention Plan 54
7.0 Resource Concerns During Construction 55
7.1 Air Resources 55
7.1.1 Air Quality Regulation Applicability to Project Facilities on Federal Lands 55
7.1.2 Climate 56
7.2 Noise 56
7.3 Geology Resources 57
7.3.1 Mineral Resources 59
7.3.2 Seismic Hazards 67
7.3.3 Landslides 67
7.3.4 Subsidence 73
7.3.5 Flooding 73
7.3.6 Swelling Clays 73
7.3.7 Blasting 73
7.4 Paleontological Resources 73
7.5 Soil Resources 74
7.5.1 Soils on the Project Route 76
7.6 Water Resources 77
7.6.1 Surface Water 77
7.6.2 Groundwater 85
7.6.3 Water Supplies and Wells 88
7.6.4 Floodplains 88
7.6.5 Wetlands and Riparian Areas 88
7.7 Vegetation Resources 90
7.7.1 General Vegetation Types 90
7.7.2 Sensitive, Rare, Threatened, and Endangered Plant Species 92
7.7.3 Noxious and Invasive Weeds 92
7.8 Wildlife Resources 93
7.8.1 Terrestrial Wildlife Species 93
7.8.2 Aquatic Resources 105
7.8.3 Wildlife and Aquatic Species 111
7.9 Land Use 116
7.9.1 Traffic Control Plan 118
7.9.2 Visual Resources 118
7.9.3 Wilderness Areas 121
7.9.4 Transportation 121
7.10 Cultural Resources 121
7.10.1 Results of Records Search 121
7.11 Native American Consultation 126

7.11.1 Keystone Tribal Engagement 126
7.11.2 DOS Tribal Consultation 128
7.12 Health and Safety 131
7.12.1 Industrial Waste and Toxic Substances 131
8.0 Stabilization and Reclamation 133
8.1 Soil Stripping, Replacement, and Stabilization 133
8.2 Seeding Specifications 134
8.2.1 Mixture, Rate, Mulch, Fertilizer, Pesticide/Herbicide Use 134
8.2.2 Criteria to Determine Revegetation Success 135
8.3 Limitation of ROW Access 135
8.4 Reclamation of Access Roads 135
9.0 Operation and Maintenance 137
9.1 Guidelines 137
9.2 Definitions 137
9.2.1 Normal Operations and Routine Maintenance 137
9.2.2 Abnormal Operations 138
9.2.3 SCADA and Leak Detection 138
9.2.4 Emergency Procedures 139
9.2.5 Remediation 140
9.3 Air Resources 140
9.3.1 Air Quality Regulation Applicability to Project Facilities on Federal Lands 140
9.3.2 Climate 140
9.4 Noise 140
9.5 Geology Resources 141
9.6 Paleontological Resources 141
9.7 Water Resources 141
9.7.1 Surface Water 141
9.7.2 Groundwater 141
9.8 Vegetation 142
9.9 Wildlife 142
9.10 Soil Resources 143
9.11 Land Use 143
9.12 Cultural Resources 143
9.13 Human Health and Safety 143
10.0 Termination and Rehabilitation 145
11.0 References 147

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List of Appendices

Appendix A: BOR Canal and Waterline Crossings

Appendix B: Project Locations on Federal Lands (Pipeline and Access Roads)

Appendix C: BLM-Specific Construction, Mitigation, and Reclamation Plan

Appendix D: Power Lines on Federal Lands

Appendix E: Reports and Studies to Support Section 408 Review (FOIA Confidential)

Appendix F: Con-Rec Unit Specifications

Appendix G: Spill Prevention, Control, and Countermeasure (SPCC) Plan and Public version Emergency Response Plan

Appendix H: Keystone XL Fire Prevention and Suppression Plan

Appendix I: Paleontological Survey Reports (Privileged and Confidential)

Appendix J: Paleontological Mitigation Plan (Privileged and Confidential)

Appendix K: Soils Crossed by the Centerline on Federal Lands

Appendix L: Noxious Weed Management Plan

Appendix M: Sage Grouse Conservation Plan

Appendix N: Listed Species and Raptor Survey Reports (Privileged and Confidential)

Appendix O: Migratory Bird Conservation Plan

Appendix P: Contact Summaries and Survey Protocols

Appendix Q: Sensitive Species Potentially Occurring on Federal Lands Crossed by the Project

Appendix R: Cultural Survey Report, Tables and Maps – Montana (Privileged and Confidential)

Appendix S: Keystone XL's Reclamation Monitoring Plan for Federal Lands

Appendix T: Keystone XL Decommissioning Plan

Appendix U: U-1: Biological Assessment of the Keystone XL Pipeline, November 2019 (Privileged and Confidential)

U-2: Biological Opinion on the Effects of the Proposed Keystone XL Pipeline to the Federally Endangered American Burying Beetle

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List of Figures

Figure 1-1 Proposed Keystone XL Project Route and Overall Keystone Pipeline System 4
Figure 1-2 Proposed Keystone XL Project Overview in Montana.....8
Figure 3-1 Project Overview, Keystone XL and US Entry 16
Figure 3-2 Alternative Routes Evaluated– Keystone XL Route.....23
Figure 4-1 BLM Resource Management Plan Boundaries 30
Figure 6-1 Pipeline Construction Process – Typical Pipeline Construction Spread Layout 43
Figure 6-2 Typical Bored Road or Railroad Crossing 48
Figure 7-1 Physiographic Regions of Eastern Montana 65
Figure 7-2 General Geology.....66
Figure 7-3 Erosion Susceptibility – Water.....81
Figure 7-4 Erosion Susceptibility – Wind 82
Figure 7-5 Hydrologic Units – Keystone XL Project.....83
Figure 7-6 Aquifer Systems – Montana, Wyoming, South Dakota, and North Dakota.....84

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List of Tables

Table 1-1 BOR Canal Crossings on Federal Lands 2
Table 1-2 Disturbance of Federal Lands 2
Table 1-3 Mileage and Acreage Impacts of BLM Lands in Montana 7
Table 3-1 Surface Ownership Crossed by the Project ROW 13
Table 3-2 Summary of Federal Lands Affected by the Project 17
Table 3-3 Dimensions and Acreage of Typical Temporary Use Areas 20
Table 3-4 Lengths of the Project Route Options (Canadian Border to Cushing, Oklahoma) 25
Table 4-1 Pipeline to be Located on Federal Lands 27
Table 4-2 Access Roads to be Located on Federal Lands 31
Table 4-3 Summary of Land Requirements Associated with Federal Lands[1] on the Project in Montana 32
Table 5-1 Permits, Licenses, Approvals, and Consultation Requirements for the Project 33
Table 6-1 Construction Spreads Associated with Federal Lands on the Keystone XL Project 51
Table 6-2 Resulting Construction Times Based on Estimates of Schedule 52
Table 6-3 Pipe Segments on Federal Lands with MOP of 1,600 psig 53
Table 7-1 Climate Data in the Vicinity of Federal Lands Crossed by the Project 58
Table 7-2 Summary of Paleontological Sensitivities of Geologic Units Underlying the Proposed Route on Federal Lands 59
Table 7-3 Landslide Incidence and Susceptibility on Federal Lands 68
Table 7-4 Locations on Federal Lands in Montana with >15% Slopes Underlain by Cretaceous Shale 70
Table 7-5 Summary of Soil Characteristics of Concern for the Project on BLM Land 75
Table 7-6 Waterbodies Crossed on Federal Lands[1] 77
Table 7-7 Miles of Wetlands and Waterbodies Crossed by the Project on Federal Lands 89
Table 7-8 Wetlands Crossed on Federal Lands 90
Table 7-9 Miles of Vegetation Cover Types Crossed by the Project ROW on Federal Lands 91
Table 7-10 Noxious Weeds Found During Surveys on Federal Lands 93
Table 7-11 Big Game Winter Ranges[1] on Federal Lands Potentially Affected by the Project in Montana 94
Table 7-12 Big Game Crucial Winter Ranges on Federal Lands Potentially Affected by the Project in Montana 96
Table 7-13 Sharp-Tailed Grouse Lek Site Restrictions on Federal Lands 97
Table 7-14 Sage-Grouse Lek Site Restrictions on Federal Lands 98
Table 7-15 Sagebrush Habitat on Federal Lands Affected by the Project 99
Table 7-16 Seasonal Timing Restrictions and Buffers for Big Game, Game Birds, and Raptors 103
Table 7-17 Waterbodies that May Support Fisheries Crossed by the Project or Downstream of Crossings on Federal Lands in Montana 106
Table 7-18 Surface Water Classification 107
Table 7-19 Game and Commercial Fish Spawning Periods and Habitat 107
Table 7-20 Potential Species Survey Windows on BLM Land 112
Table 7-21 Land Uses Affected by Construction of the Project on Federal Land (Miles) 117
Table 7-22 Bureau of Land Management Visual Resource Management Class Objectives 119
Table 7-23 VRM Classes Crossed by the Pipeline Centerline on Federal Lands 119

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1.0 Introduction

TransCanada Keystone Pipeline, LP (Keystone) has updated the draft Plan of Development (POD) that was finalized with the Bureau of Land Management (BLM) in 2014. This POD outlines the construction procedures, environmental requirements, site-specific project plans, mitigation and conservation measures that will be implemented by Keystone during construction of the Keystone XL Project (Project) on federal lands. The POD is supplied in support of Keystone's SF299 (application #MTM98191), filed with the BLM on March 17, 2008, and updated in 2009, 2010, September 2012, 2014, and February 8, 2017.

There has been a long regulatory review of the Project, starting in 2008. A Final Environmental Impact Statement (FEIS) was issued by the U.S. Department of State (DOS) in 2011 with a Biological Assessment (BA). A Final Supplemental EIS (FSEIS) was issued in 2014 with an amended BA and a Biological Opinion (BO). After the FSEIS, the DOS and U.S. Fish and Wildlife Service (USFWS) reviewed and issued conference opinions on the rufa red knot and northern long-eared bat as not likely to adversely affect. Also, during this time, the USFWS confirmed that the Project effects on a list of species and conservation measures proposed to mitigate those effects in the BO were still applicable (USFWS 2017b).

On January 24, 2017, President Trump issued a *Presidential Memorandum Regarding Construction of the Keystone XL Pipeline* (Memorandum) directing the BLM and other Federal permitting agencies to process expeditiously Keystone's permit applications for the Project. The memorandum also stated that the January 2014 Final Supplemental Impact Statement (FSEIS) satisfies the National Environmental Policy Act (NEPA) and Section 7 Endangered Species Act (ESA) reviews required for the Project.

On March 29, 2019, the President issued a new Presidential Permit, authorizing the Project to cross the U.S.-Canada border. As the President himself issued the Presidential Permit, the DOS no longer has a federal nexus to the Project and the previous Section 7 consultation and BO have been withdrawn. The BLM and DOS prepared an additional Supplemental EIS (SEIS) to address the Nebraska Mainline Route Alternative Route (MAR) approved by the Nebraska Public Service Commission (PSC) and to address the items identified by the Montana Federal District Court in its November 8, 2018 ruling. A draft SEIS was issued on October 4, 2019 and the final was issued on December 20, 2019. In concert with the new SEIS, a new BA was completed by DOS and BLM in November 2019, leading to a BO issued in December 2019.

Since the FSEIS was issued by the DOS on January 14, 2014, Keystone has undertaken additional minor route refinements to address agency requests, engineering design, constructability considerations, environmental impact minimization, and landowner requests. These minor route refinements are addressed in the Final SEIS and outlined in this updated POD.

The POD is intended to be used as a project resource manual, which:

- Is a compendium of project environmental conditions and requirements; and
- Describes the processes and procedures that will be used to comply with the environmental requirements of the BLM and other federal, state, and local agencies for construction on federal lands.

During the course of preparing for and constructing the Project on federal lands, changes to the POD will occur. This document will be the Project reference for new or amended permits, approvals, clearances, and plans that may be issued during construction. In most cases, construction procedures along the entire Project Right-of-Way (ROW) will follow BLM guidelines.

The Project will affect BLM lands within the jurisdiction of the Malta, Glasgow, and Miles City, Montana field offices. These field offices manage federal lands under their jurisdiction according to the following approved resource management plans (ARMPs): the HiLine ARMP (BLM 2015), which covers the Malta and Glasgow field offices (collectively referred to as the North Central Montana District), and the Miles City ARMP, as amended (BLM 2015a), which covers the Miles City field office. The BLM lands in the Project area are

predominantly composed of grasslands used by permittees for grazing livestock (BLM 2008a), with lease agreements in place according to the ARMPs. Construction and operation of the Project is consistent with the stipulations listed in the BLM ARMPs and with current land uses. Under the ARMPs, types of utilities that could be located within a corridor include power lines, pipelines, significant canals, ditches and conduits, railroads, electric communication and microwave sites, communication lines, and highways (BLM 1995, 1985). The Project will conform with the ARMPs subject to: 1) site-specific ARMP stipulations such as seasonal closures, 2) site-specific stipulations for crossing special management areas, and 3) other general stipulations needed to reduce or eliminate impacts to resources.

The Project will also cross lands owned by the Department of Defense (DOD) and managed by the U.S. Army Corps of Engineers (USACE). These lands are located on the south and southeastern side of the Missouri River near the confluence with the Milk River. The land is primarily rangeland with interspersed trees and shrubs. BLM and Keystone have worked with the USACE to address consistency with their land management objectives and review of the Missouri river crossing since it is downstream of the Fort Peck dam. This has included additional scour studies and modeling of releases from the Fort Peck dam to assess the security and safety of the Keystone XL pipeline to be installed via horizontal directional drilling (HDD) under the Missouri River as a part of the Section 408 review undertaken by the USACE.

BLM has worked with U.S. Bureau of Reclamation (BOR) with respect to the canals crossed on federally managed lands in Montana (Table 1-1). Project BOR water pipeline crossings in South Dakota occur on private lands; there are no federal lands associated with these water lines. The crossing locations and designs are the same as was previously advanced in Keystone's ROW Grant application number MTM98191. Keystone has designed BOR canal crossings to meet BOR's requirements (see Appendix A).

Table 1-1 BOR Canal Crossings on Federal Lands

Affected State	Milepost (MP)	Feature[1]	County	Section-Township-Range
Montana	84.99	Main Drain No. VW22 Canal	Valley	12-27N-41E
	85.10	Lateral V-235	Valley	12-27N-41E
	85.53	Vandalia Canal	Valley	12-27N-41E
	196.12	Glendive Main Canal	Dawson	10-13N-53E
	197.33	Glendive Open Drain	Dawson	14-13N-53E
	197.49	Lateral 4.7 Pipeline	Dawson	14-13N-53E

[1]Canal crossings are not included in the mileage or acreage calculations for the Project because the crossings will be bored, and the BOR has an easement for each of these canals and does not own the land. As a result, there is no impact to federal lands.

See Table 1-2 for the anticipated disturbance on federal lands as of the date of this POD. As a result of the route refinements in 2018 and 2019, there were very minor increases in the total pipeline miles (approximately 0.04 miles) and permanent ROW (approximately 0.33 acres) on federal lands, and minor decreases in the temporary construction ROW (approximately 10.77 acres).

Table 1-2 Disturbance of Federal Lands

Land Management Agency	Permanent Pipeline ROW		Temporary Workspace	ATWS[1]	Access Roads			
					Permanent		Temporary	
	Miles	Acres	Acres	Acres	Miles	Acres	Miles	Acres
BLM	44.45	269.65	312.08	111.97	1.62	5.67	10.11	36.51
USACE	1.88	11.37	12.22	10.82	1.22	4.38	0.95	3.25
Totals	**46.33**	**281.02**	**324.30**	**122.79**	**2.84**	**10.05**	**11.06**	**39.76**

Note: Mileages and acreages are based on December 6, 2019 centerline. Discrepancies in mileage in this table compared to tables later in the POD are due to rounding.
[1] **Additional Temporary Workspace**

1.1 Project Summary

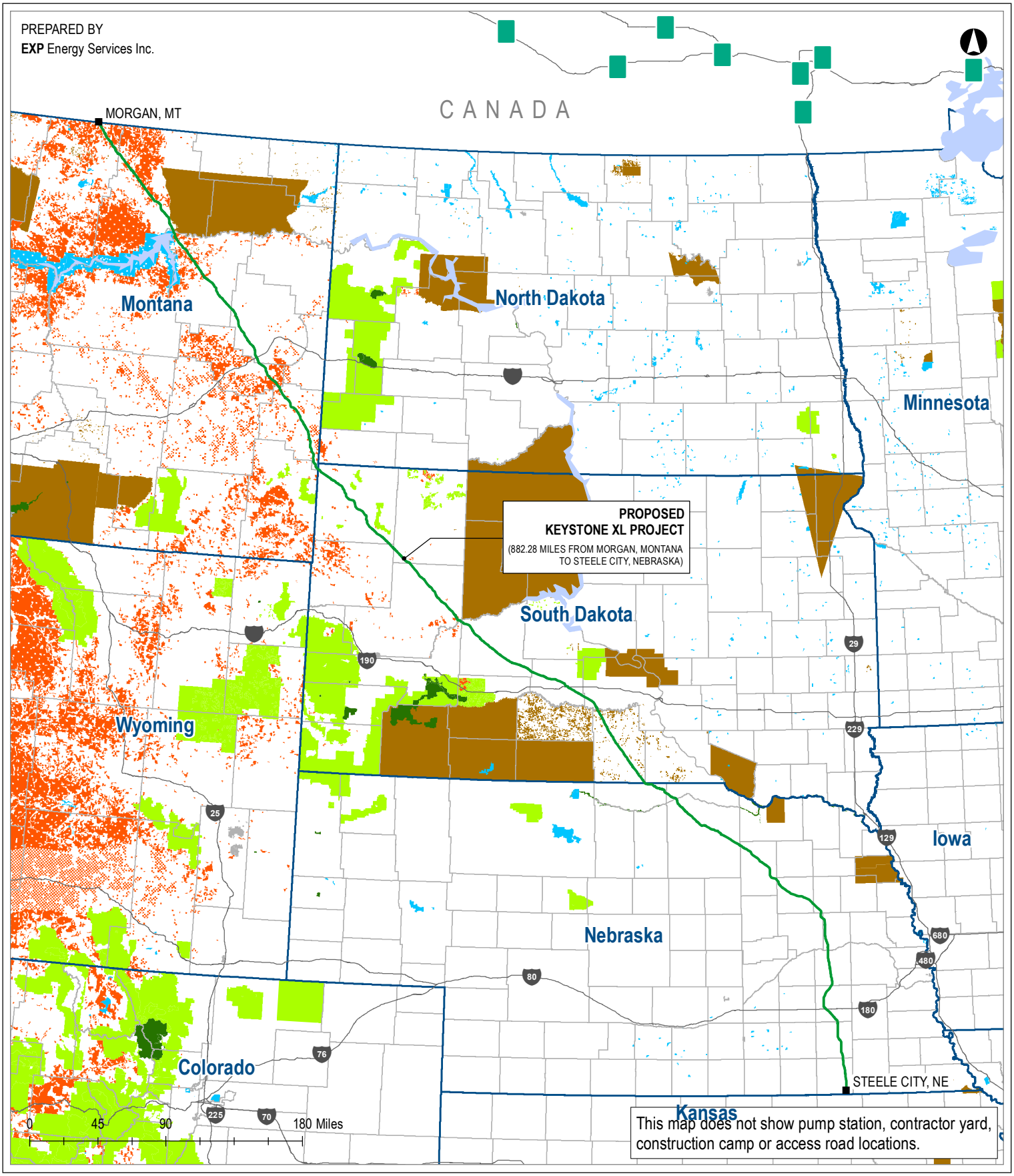
Keystone proposes to construct, connect, operate, and maintain a pipeline system that would transport crude oil from its existing facilities at Hardisty, Alberta, Canada, as well as crude oil from an on-ramp at Baker, Montana, to Steele City, Nebraska, for onward delivery to refineries in the Gulf Coast area, subject to commercial demand. At Steele City, Nebraska, the proposed pipeline would connect to the existing Keystone Cushing Extension pipeline, which extends from Steele City, Nebraska, to Cushing, Oklahoma (refer to Figure 1-1)[1]. The proposed project would have the capacity to deliver up to a nominal 830,000 barrels per day (bpd) of crude oil from the Western Canadian Sedimentary Basin (WCSB) in Canada and the Williston Basin in the U.S. to Steele City, Nebraska.

1.1.1 Background

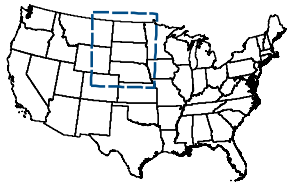
In its review of prior Presidential Permit applications for the Project, DOS conducted an environmental review process consistent with NEPA. As a result of that process, an extensive environmental record was compiled between 2008 and 2019. In its 2011 FEIS, 2014 FSEIS, and 2019 Final SEIS, DOS, and cooperating federal agencies—including the BLM, concluded that the Project could be built with minimal environmental impact, utilizing the conservation measures outlined in all three EISs. Provided below is a brief summary of the Project regulatory background and history dating back to 2008:

- September 19, 2008, Keystone filed an application with DOS for a Presidential Permit authorizing the construction and operation of the proposed Project at the US–Canada border crossing in Montana. At that time, the Project included three segments:
    i. the Steele City Segment, extending from an oil supply hub near Hardisty, Alberta, Canada, to Steele City, Nebraska, where it connected with the existing Keystone Cushing Extension pipeline;
    ii. the Gulf Coast Pipeline, extending from Cushing, Oklahoma, south to Nederland, Texas; and
    iii. the Houston Lateral, extending from Liberty County, Texas, to Moore Junction, Harris County, Texas.
- April 16, 2010, DOS published the Draft Environmental Impact Statement (DEIS) reaching the conclusion that the Project could be built with minimal environmental impacts.
- June 29, 2010, South Dakota Public Utilities Commission issued amended final decision and order granting Keystone a permit to construct the portion of the proposed Project in the State, pursuant to the South Dakota Energy Conversion and Transmission Facilities Act.
- April 22, 2011, DOS published the Supplemental Draft Environmental Impact Statement (SDEIS) with new information that became available after the DEIS was issued. DOS concluded that the Project could be built with minimal environmental impacts.
- August 16, 2011, DOS published the FEIS reaching the conclusion that the Project could be built with minimal environmental impacts.
- November 10, 2011, DOS determined that additional information regarding potential alternative routes in Nebraska was required before it could make a National Interest Determination.

[1] Project also involves the construction of two pump stations in Kansas along the existing Keystone Cushing Extension.



VICINITY MAP



LEGEND

- PROPOSED KEYSTONE XL PROJECT
- STATE BOUNDARY
- COUNTY BOUNDARY
- FOREST SERVICE
- DEPARTMENT OF DEFENSE
- BUREAU OF LAND MANAGEMENT
- FISH AND WILDLIFE SERVICE
- NATIONAL PARK SERVICE
- BUREAU OF INDIAN AFFAIRS

KEYSTONE XL PROJECT

FIGURE 1-1

PROPOSED KEYSTONE XL PROJECT

TC Energy

- November 22, 2011, 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 EIS review process.
- December 23, 2011, Congress adopted a provision of the Temporary Payroll Tax Cut Continuation Act that required the President to make a decision on Keystone's Presidential Permit application within 60 days.
- January 18, 2012, the President determined, based upon DOS's recommendation, that the proposed Project, as presented and analyzed at that time, would not serve the national interest. This determination was based solely on the Administration's inability to complete its review within the time provided by the 2011 legislation; it was not a determination based on the merits of the Project.
- February 27, 2012, Keystone advised DOS that it considered the Gulf Coast Pipeline portion of the proposed Project as having its own independent utility and that it intended to commence construction of that segment as soon as other required permits were obtained.
- March 22, 2012, President Obama announced his intent to expedite permitting of the Gulf Coast Pipeline project.
- April 11, 2012, Nebraska Legislature passed LB 1161, which clarified its direction to Nebraska Department of Environmental Quality (NDEQ) to evaluate pipelines in that state. This legislation was signed by the Nebraska Governor on April 17, 2012.
- May 4, 2012, Keystone filed a new application for a Presidential Permit requesting authorization to construct, connect, operate, and maintain the border crossing facility requested in connection with construction and operation of the proposed Project, including only the Steele City Segment and excluding the Gulf Coast Pipeline and the Houston Lateral.
- May 24, 2012, the NDEQ entered into a Memorandum of Understanding with DOS to provide a framework for a timely and collaborative environmental analysis of alternative pipeline routes within Nebraska.
- September 2012, Keystone submitted an ER in support of its Presidential Permit application that provided additional information about the revised route in Nebraska.
- January 3, 2013, after a year-long public review process, NDEQ submitted its Final Evaluation Report on the proposed pipeline reroute to the Nebraska Governor for his review.
- January 22, 2013, the Nebraska Governor approved the proposed Project route in that State under the Nebraska Major Oil Pipeline Siting Act, certifying the design, location, construction, operation, maintenance, and decommissioning of the Nebraska portion of the proposed Project.
- March 1, 2013, DOS published a Draft Supplemental Environmental Impact Statement (DSEIS) for the proposed Project.
- January 2014, DOS published the FSEIS for the proposed Project. The FSEIS again concluded that the project would have minimal effects on the environment. The FSEIS included a Biological Opinion (BO) from the U.S. Fish and Wildlife Service (USFWS), which still remains in effect for the project.
- August 27, 2015, USFWS concurred with the DOS determination that the Project may affect but is not likely to adversely affect the Rufa red knot.
- October 5, 2015, due to legal challenges to the statute authorizing the Governor's 2013 approval, Keystone filed an application with the Nebraska PSC for approval of the same route, pursuant to the Nebraska Major Oil Pipeline Siting Act.

- November 3, 2015, Secretary Kerry signed a Record of Decision and National Interest Determination recommending denial of Keystone's requested Presidential Permit based on the premise that approval would undermine U.S. climate leadership in the international arena.
- November 6, 2015, President Obama and Secretary of State Kerry announced the denial of Keystone's Presidential Permit for the reason noted above.
- November 18, 2015, Keystone filed a request with the Nebraska PSC that its Major Oil Pipeline Siting Act application filed on October 5, 2015, be dismissed, without prejudice. The Nebraska PSC granted Keystone's request on November 23, 2015.
- January 21, 2016, South Dakota Public Utilities Commission (PUC) issued order accepting Keystone's certification of its 2010 permit.
- February 12, 2016, in consultation with BLM, Keystone withdrew its application for a Grant of Right-of-Way and Temporary Use Permit, without prejudice to a future re-filing. BLM did not act on that request.
- January 26, 2017, Keystone submitted an updated Presidential Permit Application for the Project. The application included minor route revisions due to changes in the right-of-way and easement agreements with property owners, but the Project remained within the area previously analyzed in the 2014 FSEIS.
- February 8, 2017, Keystone rescinded its pending request to withdraw the ROW Grant application.
- February 16, 2017, Keystone filed a new application with the Nebraska PSC for a 275.2-mile-long pipeline that would start at the Nebraska-South Dakota border in Keya Paha County, Nebraska and terminate at Steele City in Jefferson County, Nebraska. Keystone also included the MAR in its application as one of two potential pipeline route alternatives.
- March 16, 2017, USFWS completed consultation on Northern long-eared bat.
- March 23, 2017, DOS determined that the Project would serve the national interest and issued a Presidential Permit, acting pursuant to delegated Presidential authority.
- November 20, 2017, following review of the application and the evidence presented, the Nebraska PSC approved the Mainline Alternative Route, finding that it was in the public interest of Nebraska.
- July 2018, DOS issued the Draft EA for Keystone XL Mainline Alternative Route Project.
- August 15, 2018, US District Court for the District of Montana ordered the 2014 Keystone XL Final SEIS be supplemented to consider the potential impacts of the MAR and related facilities.
- November 8, 2018, US District Court for the District of Montana found that the 2014 Keystone XL Final SEIS largely complied with NEPA but ordered that it be supplemented to account for new information that has become available since its publication, specifically including an updated market analysis, post-2014 cultural resource surveys and studies, revised greenhouse gas emissions modeling, and updates to the accidental release analysis based on post-2014 information.
- March 29, 2019, President Trump issued a new Presidential Permit allowing construction, connections, maintenance, and operation of the Project at the US – Canada border. This Presidential Permit revokes the permit issued on March 23, 2017.
- October 1, 2019, DOS issued the draft SEIS for the Project for public review and comment. The final SEIS was issued December 20, 2019.
- The BA was issued in November 2019 and a BO issued in December 2019.

Previously, Keystone filed a SF299 application (Application No. MTM98191) and POD with the BLM on March 17, 2008, along with updates in 2009, 2010, 2012, 2013, and 2017. Following a Record of Decision

TPC Kick-off Meeting on June 26, 2014, Keystone submitted an updated POD to the BLM, and the BLM had prepared a draft Record of Decision approving the Project. However, the grant decision was held up awaiting Presidential Permit approval from the DOS. Subsequent to the DOS decision to deny the Presidential Permit in November 2015, Keystone requested to withdraw the SF299 application without prejudice to future re-filing. However, due to volume of the administrative record that needed to be reviewed, the BLM case file was not closed. Accordingly, pursuant to the Memorandum dated January 24, 2017, directing the DOS, U.S. Department of Interior, and USACE to expedite review of the Project, on February 8, 2017, Keystone submitted a request to rescind the withdrawal of Application Number MTM98191 and to proceed with the completion of the authorization process of the ROW Grant and Temporary Use Permit (TUP) to the BLM. A revised POD was submitted in February 2018 after review and update with the BLM.

Federally owned and administered land in Montana will be crossed by the Project (see Figure 1-2 Maps A and B). Table 1-3 provides permanent and temporary acreage impacts to BLM-administered lands, as well as miles crossed by the pipeline centerline and access roads. No pipe yards, contractor yards, or borrow pits will be located on federal lands. There are 17 temporary construction access roads located on BLM land and one temporary construction access road on USACE-administered land in Montana. Four permanent access roads (three on federal lands and one on BLM and USACE-administered land) will cross federal lands in Montana (at approximate milepost [MP] 49.35, 90.70, 91.83 and 119.50). Two intermediate mainline valves (IMLV) will be constructed one on BLM-administered land and one on USACE-administered land in Montana; no further aboveground facilities will be constructed on BLM-administered lands.

Table 1-3 Mileage and Acreage Impacts of BLM Lands in Montana

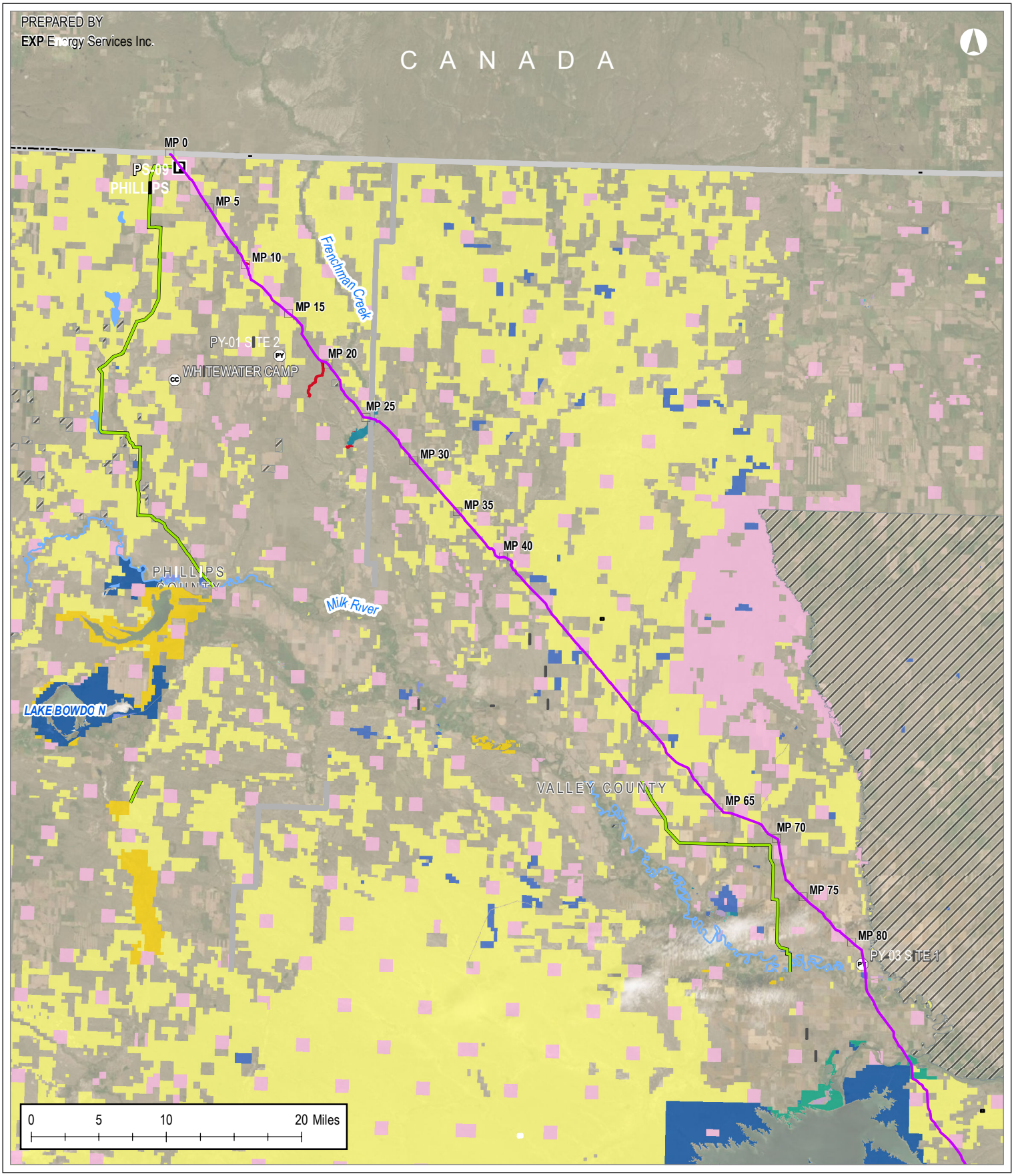
	Miles Crossed[1]	Land Required Under Temporary Use Permit[2] (acres)	Land Required Under ROW Grant[3] (acres)	Land Disturbed During Construction[4] (acres)
Total	**56.18**	**460.56**	**275.32**	**735.88**

[1]Includes miles crossed by the pipeline centerline and miles of access roads on BLM-administered lands. This does not include USACE lands.

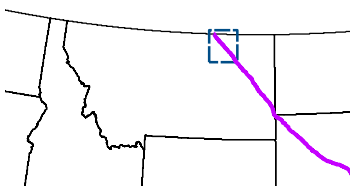
[2]Based on a 60-foot-wide temporary workspace, additional temporary workspaces, and construction of or improvements to 30-foot-wide access roads. This does not include USACE lands.

[3] Based on a 50-foot-wide permanent ROW and four permanent access roads. This does not include USACE lands.

[4]Construction disturbance is the area temporarily disturbed for the Project and is the sum of the areas requested under the TUP as well as those under the ROW Grant. The footprint of the intermediate mainline valves (IMLVs), will be included within the 50-foot permanent ROW. This does not include USACE lands.



VICINITY MAP



Legend

- MILE POST
- PUMP STATION
- KEYSTONE XL PROJECT
- CONSTRUCTION CAMP
- CONTRACTOR YARD
- PIPE YARD
- ACCESS ROADS
- TRANSMISSION LINES
- INDIAN RESERVATION OR TRUST LAND
- CITY GOVERNMENT
- COUNTY GOVERNMENT
- LOCAL GOVERNMENT
- MONTANA DEPT OF TRANSPORTATION
- MONTANA FISH, WILDLIFE, AND PARKS
- MONTANA STATE TRUST LANDS
- STATE OF MONTANA
- US ARMY CORPS OF ENGINEERS
- US BUREAU OF LAND MANAGEMENT
- US BUREAU OF RECLAMATION
- US DEPT OF DEFENSE
- US FISH AND WILDLIFE SERVICE
- US GOVERNMENT
- STATE BOUNDARY
- COUNTY BOUNDARY

KEYSTONE XL PROJECT

FIGURE 1-2

MAP A
PROJECT OVERVIEW MONTANA

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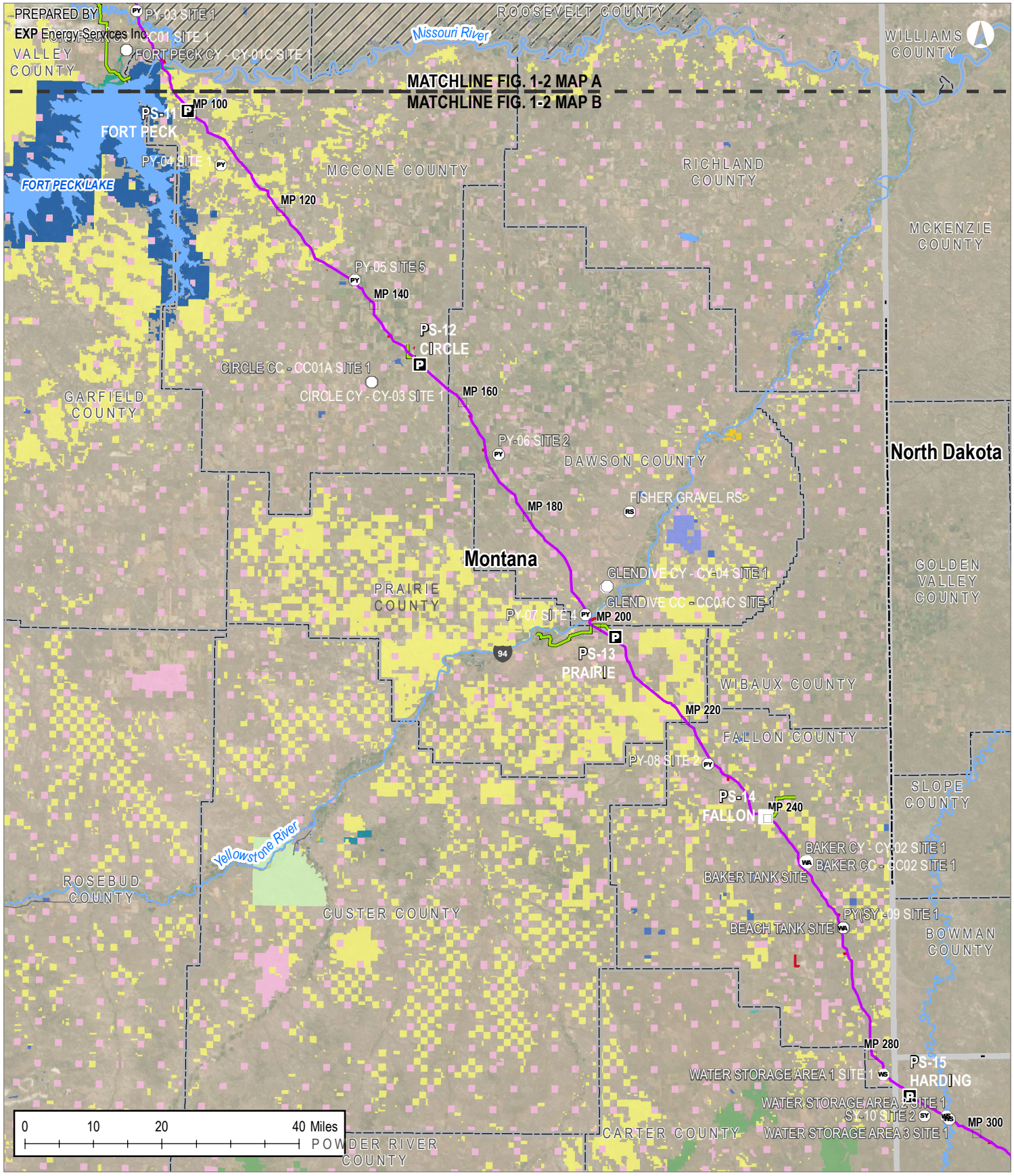
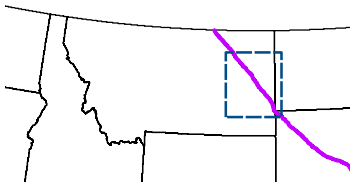


VICINITY MAP



Legend

- MILE POST
- PUMP STATION
- KEYSTONE XL PROJECT
- CONSTRUCTION CAMP
- CONTRACTOR YARD
- PIPE YARD
- RAIL SIDING
- STORAGE YARD
- WATER STORAGE AREA
- WATER STORAGE SITE
- ACCESS ROADS
- TRANSMISSION LINES
- INDIAN RESERVATION OR TRUST LAND
- CITY GOVERNMENT
- COUNTY GOVERNMENT
- LOCAL GOVERNMENT
- MONTANA DEPT OF CORRECTIONS
- MONTANA DEPT OF TRANSPORTATION
- MONTANA FISH, WILDLIFE, AND PARKS
- MONTANA STATE TRUST LANDS
- MONTANA UNIVERSITY SYSTEM
- NATIONAL PARK SERVICE
- STATE OF MONTANA
- US ARMY CORPS OF ENGINEERS
- US BUREAU OF LAND MANAGEMENT
- US BUREAU OF RECLAMATION
- US DEPT OF AGRICULTURE
- US DEPT OF DEFENSE
- US FISH AND WILDLIFE SERVICE
- US FOREST SERVICE
- US GOVERNMENT
- STATE BOUNDARY
- COUNTY BOUNDARY

KEYSTONE XL PROJECT

FIGURE 1-2

MAP B
PROJECT OVERVIEW MONTANA

TC Energy

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2.0 Purpose and Need

The primary purpose of the proposed Project is to provide the infrastructure to transport 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. The proposed Project would also provide transport capacity for domestically produced crude oils, notably Bakken crude oil that could be on-loaded in Montana, subject to commercial demand.

The WCSB and Williston Basin are both projected to have significant increases in production. In the WCSB, most of this increase is projected to come from the oil 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 Williston Basin, the increased production is part of a broader development in the U.S. of crude oil production from *tight oil* areas, 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 in excess of 480,000 bpd of WCSB crude oil on the proposed Project to existing Gulf Coast area delivery points. Long-term contracts in excess of 205,000 bpd currently provide transportation service to Cushing, Oklahoma and the Gulf Coast area, via the existing Keystone Pipeline system. If the proposed Project were approved and implemented, Keystone would transfer shipment of crude oil under those existing contracts to the proposed Project.[2]

Keystone would make available up to 100,000 bpd of capacity on the proposed Project for crude oil from the Bakken, subject to commercial demand. Long-term contracts to transport Bakken Shale crude oil from the Williston Basin in Montana and North Dakota were previously signed.

As explained in detail in Section 1.4 of the FSEIS (2014) and Final SEIS (2019), there is existing demand by Gulf Coast area refiners for secure 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 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 (approximately 50 percent decline in 20 years) and Venezuela (greater than 50 percent decline in 20 years). 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 Williston Basin crude oils would also compete in the market with other domestic and foreign sources of crude oil available to the Gulf Coast area refiners.

[2] Transferring the 205,000 bpd from the existing Keystone Pipeline system to the proposed Project would make that amount of capacity available for additional shipments to the Midwest.

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3.0 Project Description

This project description describes the Project in its entirety. A discussion of the Project components on federal lands is provided in Section 3.1 of this document. Ownership of lands crossed in Montana is summarized in Table 3-1.

Table 3-1 Surface Ownership Crossed by the Project ROW

Ownership Type	Miles Crossed	Percent of Total Length
Montana		
Federal	46.33	16.21
State	30.65	10.73
Private	207.34	72.58
Local government	0.57	0.20
Water	0.57	0.20
Railroad	0.23	0.08
Keystone XL Project Total	**285.69**	**100.00**

NOTE: Mileage shown is for the pipeline construction right-of-way only. Access roads are not included.

The proposed Project (including the 97 route refinements) would consist of approximately 1,210 miles of new, 36-inch-diameter pipeline extending from Hardisty, Alberta, to Steele City, Nebraska. Approximately 882 miles of the pipeline would be located in the U.S. The pipeline would cross the international border between Saskatchewan, Canada, and the U.S. near the town of Morgan, Phillips County, Montana. The proposed project would have the capacity to deliver up to a nominal 830,000 bpd of crude oil. Annual quantities would likely vary based on market conditions and other factors.

Williston Basin crude would enter the pipeline within the U.S. through the proposed Bakken Marketlink Project—a five-mile pipeline with pumps, meters, and storage tanks that would connect to the Keystone XL pipeline near Baker, Montana. The facilities would provide capacity for up to 100,000 bpd of Bakken formation crude oil, subject to commercial demand.

At its southern terminus, the proposed Project would connect to the existing Keystone Cushing Extension, which extends from Steele City, Nebraska, to Cushing, Oklahoma. The Keystone Cushing Extension in turn connects to Keystone's Gulf Coast Pipeline, which extends south to Nederland, Texas. In addition, the Houston Lateral extends from the Gulf Coast Pipeline at Liberty County, Texas, to Moore Junction, Harris County, Texas, in order to serve Houston area refineries.

In addition to the pipeline and Bakken Marketlink facilities, the proposed Project would include various aboveground facilities. Eighteen pump stations with mainline valves would be located along the proposed Project in Montana, South Dakota, and Nebraska. Keystone anticipates new pumping capacity would be necessary on the Keystone Cushing Extension in Kansas and on the Gulf Coast Pipeline in Oklahoma and Texas. Therefore, two pump stations would be added to the Keystone Cushing Extension in Kansas, and four pump stations would be added to the Gulf Coast Pipeline, with one in Oklahoma and three in Texas.

Fifty IMLVs would be installed along the Project route and one mainline valve (MLV) would be installed at each pump station constructed in Montana, South Dakota, and Nebraska. MLVs were constructed at the proposed pump station locations in Kansas, Oklahoma, and Texas during the construction of the Keystone Cushing Extension in Kansas and Gulf Coast Pipeline in Oklahoma and Texas.

Approximately 212 temporary use access roads to the construction ROW, 19 temporary use contractor yards, 26 pipe stockpile sites, and 9 railroad sidings are being considered for the construction of the Project. Construction of the Project in remote areas of the Project will require construction and operation of eight

temporary construction camps for construction worker housing (seven in Montana, four in South Dakota, and one in Nebraska).

Power line and associated facility upgrades will be required in multiple locations along the route to provide electrical power for the new pump stations and to power remotely operated valves and densitometers located along the pipeline route. Keystone will not construct nor be responsible for the permitting of new power lines and related facility construction. Local power providers will be responsible for construction and for obtaining any necessary approvals or authorizations from federal, state, and local governments for such facilities (except as outlined below).

A separate ROW Grant will be required from the BLM for power lines that cross BLM lands. This is required by the BLM in order to ensure those ROW Grant Applications are processed in parallel with the 2019 SEIS process. Power providers have started their permitting processes with the BLM. In addition, those power providers that require a MFSA certificate from the Montana Department of Environmental Quality (MDEQ) have started that process.

Figure 3-1 shows an overview of the Project, entry into the U.S., and interconnection with the Keystone Cushing Extension pipeline.

The Project will require a 50-foot-wide permanent ROW for the operation phase. An additional 60-foot-wide TUP will be required during construction. Additional area will be required for extra temporary workspaces, as well as for construction and operation of aboveground facilities.

The proposed construction work area (the footprint of disturbances during construction) for the Project facilities is estimated at approximately 15,800 acres. This area is required for the construction of approximately 882 miles of 36-inch-diameter crude oil pipeline. In addition to the 50-foot-wide permanent ROW and 60-foot TUP, the proposed construction work area also includes site-specific workspaces (e.g., slash storage [no ground disturbance], staging areas, pipe yards, contractor yards, river crossings, and access roads). On private lands, the ROW will be acquired from landowners of the property where the Project facilities will be located.

The Project received a Presidential Permit to cross the U.S./Canada border on March 29, 2019. In addition, the Project has received the following ROW approvals:

- Montana: The Project requires a certificate from the MDEQ under the Montana Major Facilities Siting Act (MFSA), which included an environmental review under the Montana Environmental Policy Act (MEPA). The MDEQ issued a MFSA Certificate to Keystone in March 2012. The certificate is valid until March 2022.
- South Dakota: The South Dakota PUC issued an amended final decision and order granting Keystone a permit to construct under the Energy Conversion and Transmission Facilities Act in June 2010. In September 2014, Keystone filed a Certification with the PUC confirming that it can comply with the original permit conditions. PUC issued a Final Decision and Order in January 2016 accepting the Certification and finding that Keystone is authorized to proceed with the construction and operation of the Keystone XL Pipeline subject to the conditions attached as Exhibit A to the Amended Final Decision and Order dated June 30, 2010. The amended order was affirmed by the South Dakota Supreme Court.
- Nebraska: Keystone submitted a proposed reroute of the Project through Nebraska to the NDEQ in April 2012. The reroute was subsequently approved by the Nebraska Governor under LB 1161 in January 2013. On October 5, 2015, Keystone filed an application for route approval with the Nebraska PSC in view of litigation challenging the statute authorizing the Governor's approval. On November 18, 2015, Keystone filed a request that its application filed on October 5, 2015, be dismissed without prejudice, in view of the denial of its Presidential Permit application denial. On November 23, 2015, Nebraska PSC approved Keystone's request to withdraw its application, without prejudice. Keystone has filed a new application with the Nebraska PSC on February 16, 2017. Following review of the application and the additional evidence presented, the Nebraska PSC

approved the Mainline Alternative Route finding in its Order dated November 20, 2017, that it was in the public interest of Nebraska. The Mainline Alternative Route would be 280.5 miles long, starting at the Nebraska-South Dakota border in Keya Paha County, Nebraska and terminating at Steele City in Jefferson County, Nebraska. The Nebraska PSC ruling was affirmed by the Nebraska Supreme Court.

3.1 Affected Federal Lands

The Project will require the issuance of ROW Grant(s) and TUP from the BLM to cross approximately 56.18 miles of BLM-Administered lands (including pipeline, temporary and permanent access roads) and approximately 4.05 miles (including pipeline, temporary and permanent access roads) on USACE lands. The federally-managed lands in Montana impacted by the Project are shown on maps in Appendix B. No federally-managed lands are crossed by the pipeline or access roads in South Dakota or Nebraska. Issuance of a ROW Grant is considered a federal action and is subject to environmental review pursuant to NEPA (42 USC Section 4321 et seq.).

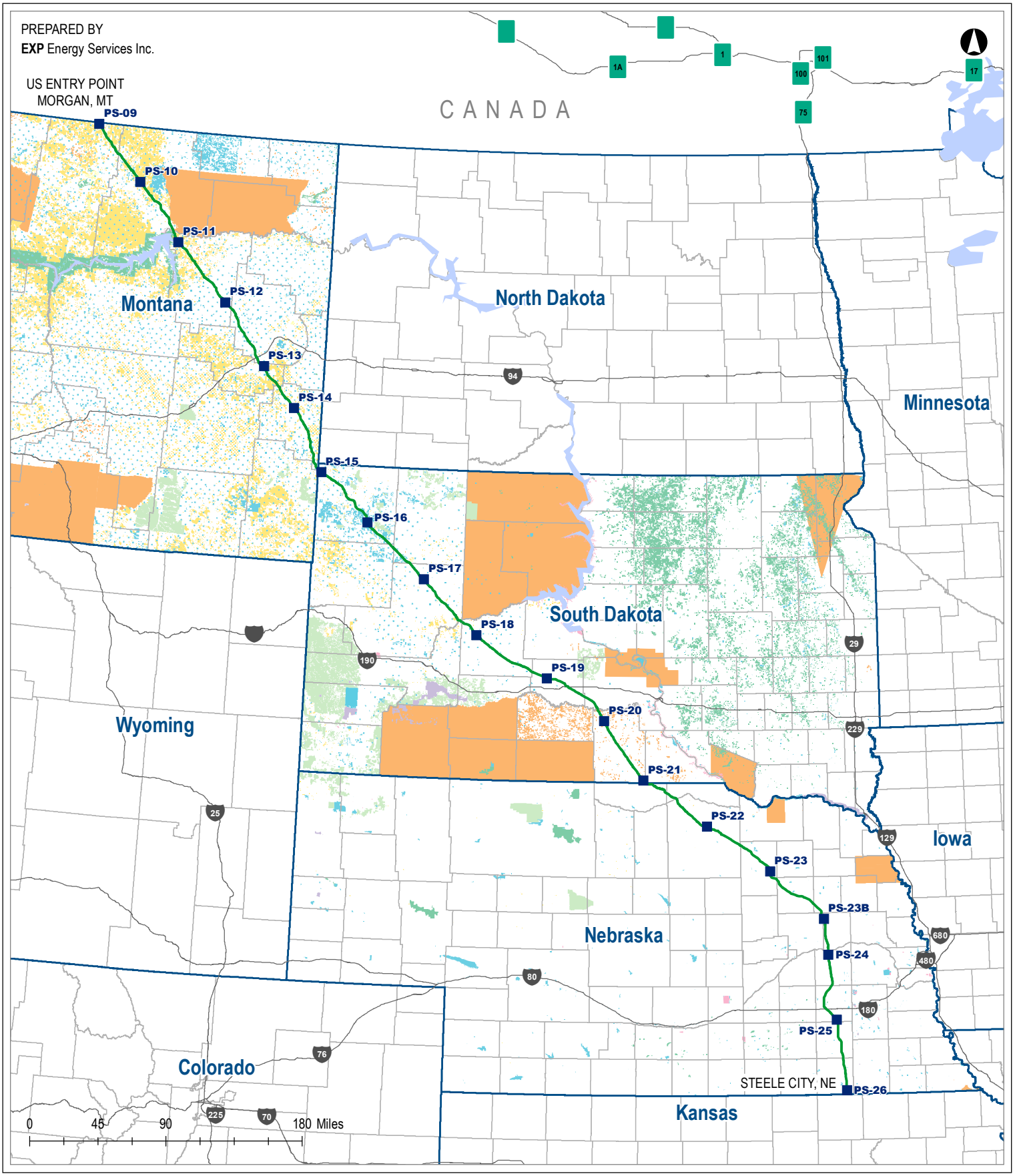
DOS is the lead federal agency, for the purposes of the NEPA analysis, and issued the FSEIS for the Project in January 2014. President Trump's Memorandum dated January 24, 2017, stated that the FSEIS satisfies the NEPA analysis required for the Project. However, the U.S. District Court for the District of Montana found that the 2014 FSEIS largely complied with NEPA but ordered that it be supplemented to account for new information that has become available since its publication. As a result, the DOS issued the draft SEIS for the Project in October 2019 and the final in December 2019. The SEIS analyzed the impacts along the MAR in Nebraska but in accordance with the Court's directive, also included an updated market analysis, results of post-2014 cultural resource surveys and studies, revised greenhouse gas emissions modeling, and updates to the accidental release analysis based on post-2014 information. A new BA was completed, and a BO was finalized by the USFWS on December 23, 2019 that included Project updates and impacts associated with third-part power lines to service the pump stations.

The FSEIS included the Construction, Mitigation, and Reclamation Plan (CMRP) for the Project as Appendix G. A BLM-Specific CMRP has also been prepared for the Project and is included as Appendix C to this POD.

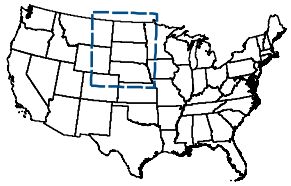
The FSEIS and SEIS encompasses all lands crossed by the Project, regardless of ownership or management, and includes an objective disclosure of environmental impacts, beneficial and adverse, resulting from the Project, as well as a set of reasonable alternatives. Keystone submitted reports for paleontological, biological and cultural resource surveys to the DOS on November 20, 2008; July 6, 2009; May 20, 2010; and September 7, 2012. The paleontological and cultural resource survey reports that have been generated since the issuance of the FSEIS in January 2014 have been provided under separate cover. The reports for the biological surveys conducted in 2013 were provided with the updated POD submitted in April 2017. Reports for biological surveys conducted between 2017 through 2019 are included as Appendix N. The remainder of this POD focuses on construction methods and impacts associated with affected federal lands only and is intended to provide the BLM with adequate information to evaluate construction procedures for the Project for the purpose of issuing the necessary ROW Grant(s) and TUP.

Preliminary mapping information for power lines affecting federal lands is included in Appendix D, based on information provided by the power providers.

Discussions and quantification of impacts in this POD will apply to construction and operation of the Project on federal lands in Montana only (Table 3-2). These lands consist of BLM-managed lands, DOD lands in Montana, and BOR canals/water pipelines in Montana. A description of the affected environment and impacts on lands potentially impacted by the Project is included in the FSEIS and SEIS. Since the FSEIS was issued, Keystone has undertaken additional minor route refinements to address agency requests, engineering design, constructability considerations, environmental impact minimization, and landowner requests. These adjustments were also provided and included in the SEIS. Maps of these route refinements



VICINITY MAP



LEGEND

- PUMP STATION
- KEYSTONE XL PROJECT
- STATE BOUNDARY
- COUNTY BOUNDARY

LAND OWNERSHIP (AFFECTED STATES)

- BUREAU OF INDIAN AFFAIRS/TRIBAL
- DOD, USACE
- NATIONAL PARK SERVICE
- US BUREAU OF LAND MANAGEMENT
- US BUREAU OF RECLAMATION
- US FOREST SERVICE
- US FISH AND WILDLIFE SERVICE
- STATE, COUNTY, LOCAL LANDS

KEYSTONE XL PROJECT

FIGURE 3-1

PROJECT OVERVIEW

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were submitted to the DOS in support of Keystone's request for a Presidential Permit submitted on January 26, 2017 and the SEIS in August 2019. The legal descriptions of all pipeline facilities (e.g., ROW, mainline valves, and access roads) on federal lands has been provided to the BLM under separate cover.

Table 3-2 Summary of Federal Lands Affected by the Project

	Land Required Under Temporary Use Permit[1, 2] (acres)	Land Required Under ROW Grant[2] (acres)	
Montana			
Pipeline ROW	324.30	281.02	605.32
Additional Temporary Workspace (ATWS) Areas	122.79	NA	122.79
Pipe Stockpile Sites, Rail Sidings, and Contractor Yards	NA	NA	NA
Construction Camps	NA	NA	NA
Access Roads	39.76	10.05	49.81
Montana Subtotal[3]	486.85	291.07	777.92

NA – not applicable
[1]Operational acreage was estimated based on a 50-foot permanent ROW. Pigging facilities will be located within either pump stations or delivery facility sites. IMLVs and densitometers will be constructed within the construction easement and operated within the permanently maintained 50-foot ROW. Other MLVs, check valves and block valves, and meters will be located within the area associated with a pump station, delivery site, or permanent ROW. Consequently, the acres of disturbance for these aboveground facilities are captured within the Pipeline ROW and Pump Station/Delivery Facilities categories within the table. No Pump Stations/Delivery Facilities are located on federal lands.
[2]Discrepancies in total acreages between this table and those that follow are due to rounding.
[3]Access road temporary and permanent disturbance is based on 30-foot width; non-public roads are conservatively estimated to require upgrades and maintenance during construction.

3.2 Connection to an Existing Right-of-Way

3.2.1 Location in Regard to Existing Corridors

For approximately 25 miles between approximately MP 0 and MP 25, the Project will be adjacent to the Northern Border Pipeline, an existing natural gas pipeline. A portion of the lands (approximately four total miles) crossed by the Project along this portion of the pipeline ROW are owned by BLM (see Table 4-1). Construction disturbance in this area will include a portion of the landscape previously disturbed and reclaimed by Northern Border. Northern Border was constructed in the early 1980s. No other Project components on federal lands are collocated with the Project ROW.

3.3 Additional Components of the Right-of-Way

The Project generally will require a 50-foot-wide permanent and a 60-foot-wide TUP. The TUP width may exceed 60 feet in some locations depending on site-specific conditions, including rough terrain, and the depth and method of topsoil stripping. Additional work spaces could also be required for areas requiring special construction techniques (e.g., river, wetland, and road crossings; HDD entry and exit points; steep slopes; rocky soils), pipe yards, and construction staging areas.

The location of additional temporary workspaces will be modified as necessary with respect to actual wetland and waterbody crossing locations. Keystone will adjust additional temporary workspace at prescribed set back distances from waterbody and wetland features (to maintain a vegetated buffer between additional temporary workspaces and the feature), unless impractical, as determined on a site-specific basis.

Keystone does not currently anticipate the need for expansion of the Project through addition of components beyond those discussed in this POD.

3.3.1 Aboveground Facilities

Keystone will construct two IMLVs along the new pipeline ROW on federal lands. One valve will be located at approximate MP 90.69 and will be constructed on USACE lands. The other valve will be located at approximate MP 91.79 on BLM-managed lands. Both valves will be located downstream of the Missouri River crossing, which is at approximate MP 89.60. These IMLVs will be fenced with 8-foot high, chain-link wire that is crowned with angled barbed wire to prevent entry. The approximate footprint of each valve will be a 50-foot by 50-foot site within the permanent pipeline ROW. Each valve will be approximately 6 feet high and consist of small-diameter pipe stands and valve wheels.

3.3.2 Delivery Facilities

No Project delivery facilities will be located on federal lands.

3.3.3 Pump Stations and Power Lines

No pump stations will be constructed on federal lands.

Pump stations will operate on locally purchased electric power and will be fully automated for unmanned operation. Permitting and construction of power lines will be the responsibility of each electrical power provider. Overview mapping of potential impact areas for power lines on federal lands is included in Appendix D of this POD; however, each electrical power provider will be responsible for the final analysis of impacts, as well as construction and conservation methods, to be filed as a portion of their ROW Grant application(s). The SEIS provides updates to powerlines on federal land as well as updated impact analyses.

3.3.4 Densitometer Sites

No densitometer sites will be located on federal lands.

3.3.5 Pigging Facilities

No pig launchers and/or receivers will be constructed on federal lands.

3.3.6 Access Roads

The Project will use existing public and private roads to provide access to most of the construction ROW; construction of new temporary or permanent access roads will be limited. Paved roads are not expected to require improvement or maintenance prior to or during construction. Gravel roads and dirt roads may require maintenance during the construction phase due to high use. Road improvements such as blading and filling will be restricted to the existing road footprint. Private roads and any new temporary access roads will be used and maintained only with permission of the landowner or land management agency. New temporary access roads will be reclaimed to original contour and land use after construction.

Keystone will construct short, permanent access roads from public roads to the proposed pump stations, and IMLVs. On federal lands, permanent access roads will be no more than 30-feet in width and maintained by Keystone throughout the life of the Project. A total of four permanent access roads will cross federal lands:

- CAR-068A will be constructed on BLM-managed lands at approximate MP 49.30 to access Pump Station 10.
- CAR-227 will be constructed on BLM and USACE-managed lands at approximate MP 90.67 to access 260-VLLEY-04C.

- VAR-07 will be constructed on BLM-managed lands at approximate MP 91.77 to access 260-VLLEY-05A.
- CAR-086 will be constructed on BLM-managed lands at approximate MP 118.39 to access the pipeline ROW.

Eighteen temporary access roads that cross federal lands will also be used. These will be extended or improved to reach the ROW. The temporary access roads will be accessed from existing public roads. Extended access roads will be reclaimed after the Project is constructed. See the discussion in Section 4.1 that details the number and locations of the proposed access roads that will affect federally owned or managed lands. The legal descriptions of temporary and permanent access roads on federal lands has been provided to the BLM under separate cover.

Construction of Project access roads on federal lands required completion of cultural resources and biological surveys, as well as the appropriate BLM, State Historic Preservation Office(r) (SHPO), and USFWS consultations and approvals.

The design and construction of new access roads and upgrades to existing access roads required for the Project will include implementing proper drainage measures, minimizing soil erosion, preserving topsoil, and utilizing visually-compatible materials as described in Section 7.9.2. On federal lands, approximately 50 acres of disturbance will be associated with the construction of new access roads or the temporary widening of certain existing access roads. Further, Keystone anticipates that dirt or gravel access roads may initially, or at some time during the Project, require upgrading from their present condition to allow for safe, adequate passage of construction traffic. Private roads and new temporary access roads will be used and maintained only with permission of the landowner or land management agency. These roads are shown on the maps in Appendix B. Refer to the BLM-Specific CMRP (Appendix C), for details on controlling traffic and crossing procedures for access roads.

3.3.7 Temporary Extra Workspace and Staging Areas

Keystone is proposing additional temporary work spaces that include deviations from the nominal 110-foot-wide construction ROW, to allow for grading due to rugged terrain, for storage of topsoil and slash, and to provide adequate space for spoil excavated from the trench, allowing a buffer outside the spoil storage for either clods that might roll off or extra space required for very sandy material. As proposed, the Project will also require additional work spaces and staging areas necessary for waterbody, roadway, and difficult terrain crossings, and certain pipeline point of intersection (PI) locations. The specific additional work spaces are shown on the route maps.

In addition to the 50-foot-wide permanent ROW, construction of the Project will require a 60-foot-wide TUP and smaller additional temporary work spaces along the pipeline. Typical dimensions of temporary use areas are summarized in Table 3-3.

Locations of additional work spaces on federal lands based on the December 2019 centerline, including township, range, and section, are shown on maps included in Appendix B. Final locations and sizes of work spaces and TUP will be provided to BLM with the as-built surveys

3.3.8 Pipe Storage and Contractor Yards

No pipe storage or contractor yards will be located on federal lands.

3.3.9 Borrow Pits

No borrow material will be taken from federal lands.

Table 3-3 Dimensions and Acreage of Typical Temporary Use Areas		
Feature	**Dimensions (length by width in feet at each side of crossing)**	**Acreage**
Waterbodies traversed via HDD	250 x 150, as well as the length of the drill plus 150 x 150 on exit side	1.4
Waterbodies >50 feet wide	300 x 100	0.7
Waterbodies <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 x length of wetland	Varies
Construction spread mobilization and demobilization	470 x 470	5.1
Stringing truck turnaround areas	200 x 80	0.4

3.4 Alternatives

The proposed route for the Project was developed through an iterative, multidisciplinary route selection process. This process involved the systematic identification of objectives, control points, collection of data, review of alternatives and continual reassessment of these factors as refinement occurred.

3.4.1 Definition of Control Points

The objectives of the Project required the Keystone XL route to enter the U.S. at an existing border facility near Morgan, Montana, and end at the Cushing Extension Pipeline interconnect near Steele City, Nebraska. Other geographical or land use issues served to further define route alternatives, including:

- The narrow gap between the Fort Peck Reservoir and Fort Peck Indian Reservation, Montana; and
- Crossing the Niobrara River at locations not designated as wild and scenic, in Nebraska.

3.4.2 Constraints and Opportunities

A number of constraints were identified to guide the route selection process. The route was designed to avoid these constraints whenever possible and minimize contact when unavoidable. A primary constraint included public lands, including BLM, USACE, USFWS, and state lands. Where possible, the pipeline was routed to avoid these lands; however, the entry point (Morgan, Montana) and control points listed in Section 3.4.1 required the pipeline to traverse a region with a high concentration of BLM lands in northeastern Montana. In addition, the MFSA requires MDEQ to evaluate the use of public lands in routing, and MDEQ required Keystone to adopt refinements to the proposed route, some of which cross additional federal and state lands. Therefore, no route was able to entirely avoid public lands. Additional constraints include:

Primary

- Large waterbodies and water control structures;
- Lands with permitting processes that could affect schedule;
- Extreme terrain;
- Large wetland complexes;
- Urban areas;

- Properties listed on the National Register of Historic Places (NRHP); and
- National Wildlife refuges and state management areas.

Secondary

- Water crossings;
- Wetland crossings;
- Waterfowl production areas;
- Irrigated croplands;
- Bedrock;
- Rural communities;
- Aquifers;
- Extensive forested areas, including commercial forest lands; and
- Residences and associated features such as driveways, outbuildings, and wind breaks.

Opportunities refer to those features which are favorable for pipeline routing and generally serve to simplify construction and decrease disturbance. These include:

- Existing linear features (i.e., collocation with) such as pipelines (preferred), power lines and roadways;
- Flat or gently rolling terrain;
- Soils, which can be readily excavated; and
- Areas lacking forested vegetation.

3.4.2.1 Route Alternatives Identification

Based on the above information and objectives, a number of route alternatives and alternative route segments were developed and evaluated. These routes and route segments met the basic Project objectives and respected the constraints and opportunities to varying degrees. Discussion of route alternatives for the Project that will affect federal lands follows are included in the DOS FEIS and FSEIS, and in SEIS for Nebraska.

Outside of this alternative analysis effort and over one year after the MFSA application was filed with MDEQ, MDEQ requested that Keystone develop and use a GIS analysis weighting criterion that it identified to develop another alternative for analysis. One of the major criteria that MDEQ weighted heavily for pipeline routing was public lands including both State of Montana and BLM lands. The GIS analysis was completed, and a new alternative was generated that MDEQ subsequently modified or adjusted and required to be included in the DOS FEIS and FSEIS. The modifications are considered refinements to the preferred route and are discussed below.

The following paragraphs provide an overview of the characteristics of each of the major route alternatives and alternative route segments. These alternatives are illustrated on Figure 3-2.

3.4.3 Major Route Alternatives

3.4.3.1 Keystone XL Western Alternative

The Keystone XL western alternative enters the U.S. at Morgan, Montana, and runs southwest through Montana, South Dakota, and Nebraska to reach the southern terminus of the Cushing Extension Pipeline.

The total length of this route would be approximately 1,110 miles in the U.S. Of this, approximately 56 miles would be on federally managed lands and approximately nine miles would be on tribal lands. This route would cross northeast of Fort Peck Reservoir and avoid crossing reaches of the Niobrara River designated wild and scenic.

Most of the northern portion of the western alternative, from the U.S./Canada border to the delivery point at Cushing, would be constructed within new ROW; only the northernmost portion of the alternative would parallel the existing Northern Border Pipeline. South of Cushing to Nederland and Moore Junction, this alternative route would follow multiple ROWs. New pipeline would be constructed for the entire route. This alternative was not analyzed further because it failed to make use of the Cushing Extension, thereby resulting in approximately 300 additional miles of greenfield pipeline construction.

3.4.3.2 Keystone XL Option A

The Keystone XL, Option A, collocates with an existing pipeline for the entire pipeline route. This alternative would be approximately 920 miles long; of this, approximately 17 miles would cross federally managed lands. Option A collocates with the Northern Border Pipeline from the U.S./Canada border through Montana, North Dakota, and into South Dakota, until intersecting with the existing Keystone Mainline Pipeline in eastern South Dakota. The route then collocates with the Keystone Mainline Pipeline, southward through South Dakota and Nebraska, ending in southeastern Nebraska at the Platte Pipeline at Steele City, Nebraska. At this location, the alternative would connect with the Keystone Cushing Extension. This alternative would cross the federal lands listed in the following subsections.

3.4.3.2.1 Wilderness Study Area - Bitter Creek (MP 44 to MP 48)

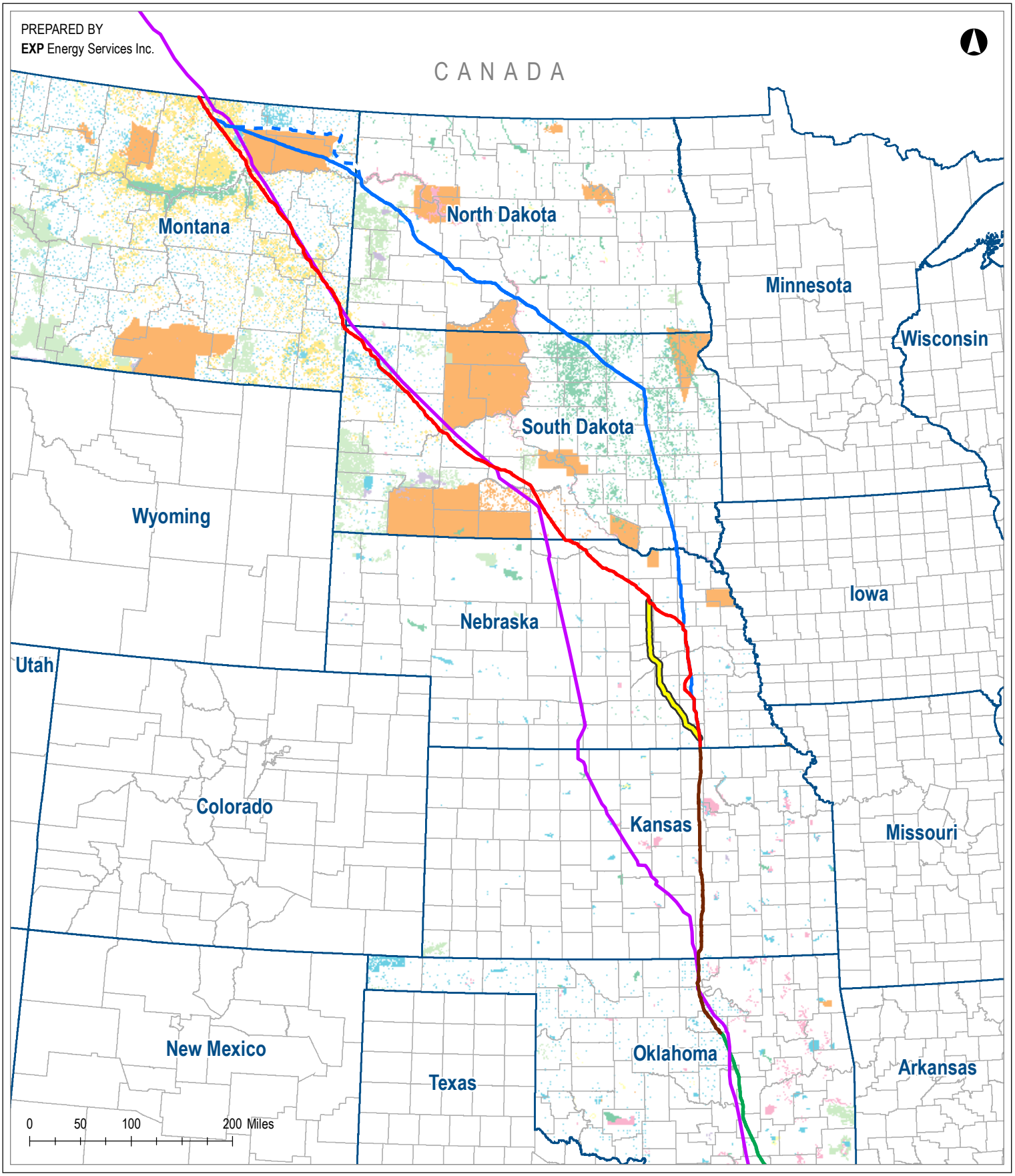
Under the Federal Land Policy and Management Act (FLPMA), the BLM conducted studies on several tracts of land with the intention of designating certain parcels as wilderness study areas (WSAs). One of these properties is the Bitter Creek WSA in the state of Montana, which consists of approximately 59,660 acres. The area is known to contain a variety of vegetation types and wildlife habitats. Currently, the BLM manages the protection of WSAs. The BLM would be the primary agency that would determine the possibility and conservation measures involved with crossing this WSA.

3.4.3.2.2 Tribal lands – Fort Peck Indian Reservation (MP 58 to MP 146)

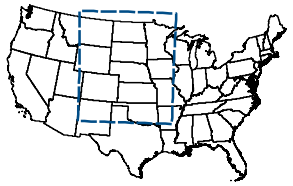
Fort Peck Indian Reservation is under the jurisdiction of the Bureau of Indian Affairs (BIA). Obtaining ROW easements across BIA lands can require significantly more time and processing than private or other federally managed lands.

3.4.3.3 Keystone XL Option A1A

Option A1A is an additional alternative to Option A along the Steele City Segment. This alternative would cross approximately 17 miles of federal lands, with a total pipeline length of approximately 951 miles. As in the Steele City Segment, Option A, this alternative collocates with the Northern Border Pipeline along the east-west portion of the route and with the existing Keystone Mainline Pipeline along the north-south segment, except in northeastern Montana where the route passes to the north of the Fort Peck Indian Reservation. The route deviates from the Keystone XL, Option A, in central Valley County, Montana, by continuing to run east just to the north of the Fort Peck Indian Reservation. The route then turns south at the eastern edge of the reservation in Sheridan County, Montana, and runs to the west of the Medicine Lake area through an area identified post-reconnaissance as a wildlife refuge. This area is discussed in more detail below. The route crosses into Roosevelt County, Montana, turning to the southeast and crosses into Williams County, North Dakota. The route joins back with the Steele City Segment, Option A, just north of the Missouri River crossing at the Williams-McKenzie County line in North Dakota and continues to collocate with the Northern Border Pipeline, until reaching the Keystone Mainline Pipeline in Clark County, South Dakota, then collocating with the Keystone Mainline Pipeline south to Steele City, Nebraska. This route would cross the federal lands listed in the following subsections:



VICINITY MAP



LEGEND

- OPTION A
- OPTION A1A
- OPTION B (PREFERRED)
- NE PSC ALTERNATIVE
- WESTERN ALTERNATIVE
- KEYSTONE CUSHING EXTENSION
- GULF COAST SEGMENT
- STATE BOUNDARY
- COUNTY BOUNDARY

LAND OWNERSHIP (AFFECTED STATES)

- BUREAU OF INDIAN AFFAIRS/TRIBAL
- DOD, USACE
- NATIONAL PARK SERVICE
- US BUREAU OF LAND MANAGEMENT
- US BUREAU OF RECLAMATION
- US FOREST SERVICE
- US FISH AND WILDLIFE SERVICE
- STATE, COUNTY, LOCAL LANDS

KEYSTONE XL PROJECT

FIGURE 3-2

ALTERNATIVE ROUTES EVALUATED

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3.4.3.3.1 Medicine Lake National Wildlife Refuge (Approximate MP 169)

The Medicine Lake National Wildlife Refuge (NWR) was established in 1935 to provide breeding habitats for migratory birds and other wildlife. The Medicine Lake NWR is managed by USFWS. It lies within the highly productive prairie pothole region and has relief typical of the glacial drift prairie. Medicine Lake NWR was recognized by the American Bird Conservancy as one of the "Top 100 Globally Important Bird Areas in the U.S." and was designated as a National Natural Landmark in 1980.

The Medicine Lake NWR is home to a diverse array of native prairie and wetland-associated wildlife species. More than 273 species of birds were spotted in the NWR, 125 of which breed there. The 31,660-acre refuge contains 22 natural and artificial lakes and managed impoundments, along with numerous small wetlands or "potholes" encompassing more than 13,000 wetland acres. NWR uplands consist of gently rolling mixed-grass prairie with a few trees found in riparian areas. The rolling hills and sand dunes around Medicine Lake make up the most extensive sandhill formation in Montana.

NWR grasslands and wetlands are prime breeding areas for waterfowl, with 17 species producing 40,000 offspring annually. It also is an important resting area for migrating birds, including sandhill cranes, Canada geese, white-fronted geese, tundra swans, and many duck species. The American white pelican nesting colony in the refuge is one of the largest in North America, with about 10,000 birds breeding there each summer. Large populations of rare grassland birds such as Baird's sparrows, Sprague's pipits, and chestnut-collared longspurs nest on refuge prairies, attracting birdwatchers from around the U.S.

Additionally, some year-round residents include white-tailed and mule deer, coyote, badger, beaver, muskrat, sharp-tailed grouse, and pheasant. Less frequent visitors include moose, elk, and pronghorn. A wolverine was seen in 1998.

Option A1A traverses Diversion Ditch No. 1, a canal that connects the refuge to Big Muddy Creek in Sheridan County, Montana. The field reconnaissance indicates that the ditch is an extension of the refuge, but the surrounding lands are not. The potential impact of this crossing may be minimized or avoided by adjusting the currently proposed alignment, or by using the HDD installation technique to cross Diversion Ditch No. 1 and/or Lake Creek. Discussions would need to be conducted with the agency to determine the approval process for the crossing and the potential presence of other utility crossings.

3.4.3.4 Keystone XL Option B

Keystone XL, Option B, is designed to minimize the miles of newly constructed pipe relative to the Western Alternative by taking advantage of interconnection with existing pipe, as well as providing a shorter route than Alternatives A and A1A and avoiding many of the environmental and regulatory restraints associated with Alternatives A and A1A. This route primarily includes the route included in the 2014 Final SEIS along with the MAR in Nebraska. The MAR route was included as part of this alternative following the Nebraska PSC approval of the route on November 20, 2017.

This route option would be approximately 882 miles long and cross approximately 61 miles of federally managed lands. Option B enters the U.S. parallel to the Northern Border Pipeline in Phillips County, Montana, and is collocated with that existing ROW within the first 25 miles of the Project.

After Option B diverges from the Northern Border Pipeline, it continues in a more southerly direction and runs west of the Fort Peck Indian Reservation, crossing the Missouri River through the narrow gap between the Fort Peck Reservoir and the Fort Peck Indian Reservation. The route then proceeds southeast, crossing into Harding County, South Dakota, and continues in a southeasterly direction to enter Nebraska in Keya Paha County. There it crosses the Niobrara River east of the segment that is designated as wild and scenic. The route continues southeast where it meets up with the Keystone Mainline Pipeline ROW in Stanton County. The route then turns south and parallels the existing Keystone Mainline pipeline for a total of 97.6 miles. The route shifts away from the existing Keystone pipeline for 29.8 miles, routing west around the

Seward County Wellhead Protection Area (WPA)[3]. The route then rejoins and parallels the existing Keystone Mainline pipeline and continues to the termination point in Steele City, Nebraska. The Project would then interconnect with the proposed Cushing Extension segment of the Keystone Pipeline Project. This route would cross the federal lands listed in the following subsections.

3.4.3.4.1 Department of Defense Property (Approximate MP 89.80)

The DOD is the underlying owner of a parcel of land on the south and southeastern side of the Missouri River near the confluence with the Milk River. It is a parcel of land that cannot be avoided because the Charles M. Russell NWR lies to the west-southwest and the Fort Peck Indian Reservation lies to the northeast of the proposed crossing. Land in this area generally is open rangeland with trees and shrubs interspersed on the property.

Because this pipeline would be greater than 24 inches in diameter, Congressional notification would be required. The USACE has indicated that granting an easement for the pipeline would be possible.

Table 3-4 summarizes the lengths of the alternatives considered for the northern portion of the Project.

Based on these considerations, and on the comprehensive route analysis provided in the FEIS and FSEIS, DOS determined Route B would be the preferred route for the Steele City Segment of the Project.

Table 3-4 Lengths of the Project Route Options (Canadian Border to Cushing, Oklahoma)

Route Option	Route and the Corresponding Alternative	Mileage (new pipe construction)	Mileage (connection to Keystone Cushing Extension)
Western Route	Western Alternative – direct line to Cushing, Oklahoma.	1,110	0
Route A	Eastern route through Montana, North Dakota, South Dakota, and Nebraska, to connect to the Keystone Cushing Extension at Steele City.	920	298
Route A1A	Eastern route through Montana, North Dakota, South Dakota, and Nebraska, to connect to the Keystone Cushing Extension at Steele City, avoiding BIA lands.	951	298
Route B	Eastern route through Montana, South Dakota, and Nebraska, to connect to the Keystone Cushing Extension at Steele City.	882	298

3.4.4 Route Changes Since FSEIS Publication

Since the FSEIS was issued in January 2014, a total of 798 route refinements have been implemented for the entire Project. The majority of the route refinements were minor and located within surveyed corridor. Of the 798 route refinements, 73 impacted federal lands. The majority of the route refinements were minor and were implemented to reduce constructability issues and, in some cases, avoid environmental resources and cultural sites.

For the route refinements implemented in Montana, including those on federal lands; Keystone followed MDEQ guidelines and kept the pipeline route within the MFSA-designated corridor (500 feet) and within all existing cultural and biological surveyed areas. None of the Montana route changes are outside of the MFSA corridor and are compliant with the requirements of MDEQs environmental specifications (Attachment 1 of Appendix I of the FEIS).

[3] See NDEQ Final Evaluation Report dated January 2013.

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4.0 ROW Grant Application and Temporary Use Permit

4.1 Affected Federal Lands

As indicated in Table 3-1, most of the Project will be constructed on private lands. The primary disturbance on public lands includes approximately 46.33 miles of buried pipeline ROW on federal lands in Montana, of which approximately 44.45 miles are lands under BLM jurisdiction, and are located within the Malta, Glasgow, and Miles City field office jurisdictions (Table 4-1). In addition, approximately 13.90 miles of access roads in Montana will be located on lands under BLM jurisdiction (Table 4-2). These field offices manage public lands under their jurisdiction according to the following ARMPs: the HiLine ARMP which covers most of northern Montana including Phillips and Valley Counties which are crossed by the Project and the Miles City ARMP, as amended, which covers eastern Montana including McCone, Dawson, Prairie and Fallon Counties that are crossed by the Project (Figure 4-1). The legal descriptions of the pipeline facilities (e.g., ROW, mainline valves, and access roads) on federal lands has been provided to the BLM under separate cover.

The remaining 1.88 miles of federally owned lands crossed by the pipeline are owned by the DOD and are managed by USACE. The DOD lands are on the south and southeastern side of the Missouri River near the confluence with the Milk River. USACE manages the land for flood control downstream of the Fort Peck Dam. The land is primarily rangelands with interspersed trees and shrubs. None of the Project components will interfere with USACE use of these lands.

The crossings of canals, managed by the BOR in Montana, are approximately 50 feet wide. These canal crossings are not included in the mileage or acreage calculations for the Project because the BOR has an easement for these canals and does not own the land. Based upon discussions with the local BOR representatives, there are no restrictions to granting a pipeline easement across these conveyances.

Locations of federal lands crossed by the pipeline based on centerline MPs are included in Table 4-1; locations of federal lands crossed by proposed access roads are included in Table 4-2. These locations are mapped, with township, range, and section identified, in Appendix B. A summary of estimated disturbance on federal lands associated with the Project and associated facilities are included in Table 4-3.

Additional information on federal lands affected by the Project is included within resource discussions in Section 7.0 of this document.

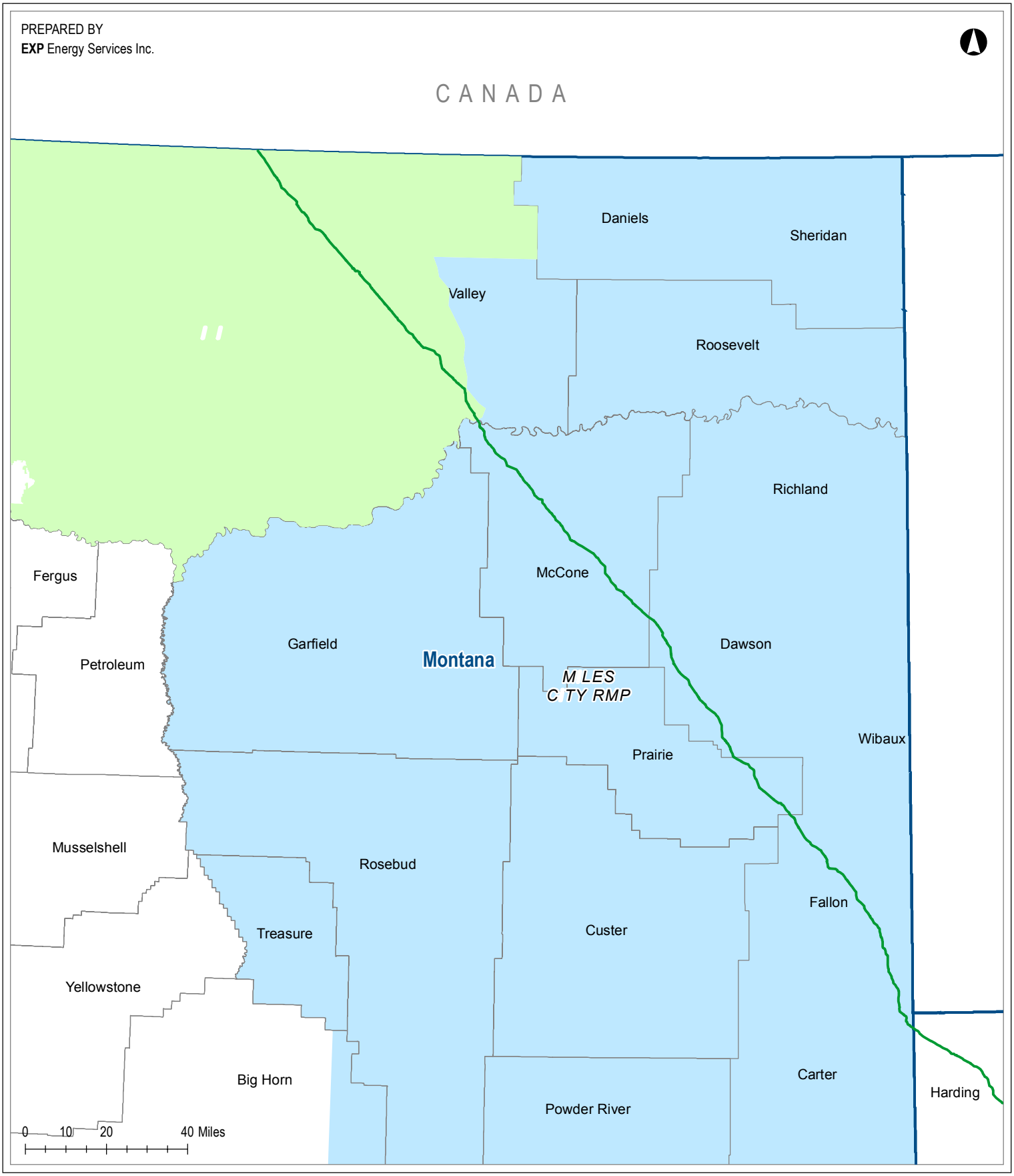
Table 4-1 Pipeline to be Located on Federal Lands

Start MP	End MP	Miles Crossed	Federal Owner	ARMP
0.00	0.93[1]	0.93	Bureau of Land Management	HiLine (Malta Field Office)
2.47	2.64[1]	0.17		
6.03	6.26[1]	0.23		
9.20	9.74	0.54		
11.40	12.33[1]	0.93		
13.06	13.78[1]	0.72		
15.38	15.42[1]	0.04		
21.31	21.66	0.36		
24.99	25.11[1]	0.13		
28.84	28.87	0.03		HiLine (Glasgow Field Office)
32.62	33.60	0.98		
33.60	34.10	0.51		
34.10	34.84	0.74		

Table 4-1 Pipeline to be Located on Federal Lands				
Start MP	**End MP**	**Miles Crossed**	**Federal Owner**	**ARMP**
35.21	35.58	0.37		
35.58	36.32	0.74		
36.32	36.67	0.34		
37.07	37.34	0.27		
37.68	38.58	0.90		
38.58	38.85	0.28		
42.57	43.16	0.59		
45.84	46.20	0.36		
46.20	46.30	0.10		
46.30	46.61	0.32		
46.61	46.96	0.35		
47.73	47.97	0.24		
47.97	48.49	0.52		
49.95	50.67	0.71		
50.67	50.72	0.05		
50.72	51.45	0.73		
51.45	52.04	0.59		
52.04	52.20	0.16		
52.20	52.38	0.18		
52.38	52.74	0.35		
52.74	52.97	0.23		
53.39	54.48	1.09		
54.71	55.23	0.51		
55.56	56.03	0.47		
56.03	56.19	0.17		
56.82	56.85	0.04		
57.19	57.53	0.34		
58.31	58.83	0.52		
58.83	59.35	0.52		
59.35	60.18	0.83		
60.18	60.62	0.44		
60.62	61.64	1.02		
62.49	62.87	0.38		
63.67	64.38	0.71		
65.26	65.75	0.49		
66.98	67.32	0.35		
67.32	68.37	1.05		
89.79	90.19	0.39	U.S. Army Corps of Engineers	Miles City
90.19	90.23	0.04		
90.23	90.51	0.28		
90.51	91.67[2]	1.16		
91.67	92.46[3]	0.79	Bureau of Land Management	
92.46	93.13	0.66		
93.88	94.13	0.25		
94.13	95.19	1.07		

Table 4-1 Pipeline to be Located on Federal Lands				
Start MP	**End MP**	**Miles Crossed**	**Federal Owner**	**ARMP**
95.19	95.54	0.34		
95.84	96.48	0.64		
96.48	97.11	0.63		
99.76	100.08	0.32		
104.22	104.49	0.27		
107.35	107.61	0.25		
107.93	108.15	0.22		
109.85	110.50	0.65		
111.20	111.29	0.09		
112.47	113.08	0.61		
113.08	113.10	0.02		
115.95	116.37	0.42		
116.37	116.63	0.25		
117.17	117.49	0.32		
117.49	117.87	0.38		
118.74	118.83	0.10		
120.14	120.68	0.53		
120.82	121.03	0.21		
127.58	127.61	0.03		
129.90	130.39	0.49		
211.30	211.95	0.65		
212.55	212.60	0.05		
212.60	213.25	0.65		
213.33	214.11	0.78		
214.11	214.56	0.45		
214.56	215.78	1.22		
215.78	215.79	0.01		
215.79	216.98	1.19		
216.98	217.77	0.79		
217.77	218.64	0.87		
218.64	218.99	0.35		
218.99	220.27	1.29		
231.74	232.37	0.63		
233.24	233.29	0.04		
233.29	233.85	0.56		
239.68	239.86	0.19		
249.29	250.00	0.71		
256.43	256.55	0.12		
256.74	256.97	0.24		
275.10	275.60	0.50		
Total Miles		**46.32**		

Note: Discrepancies in mileage totals are due to rounding
[1]Collocated with Northern Border Pipeline.
[2]One IMLV will be located at approximately 90.67 on USACE lands and one IMLV will be located at approximately MP 91.77 on BLM lands.
NOTE: Permanent ROW requested would be 50 feet wide. Discrepancies in total miles are due to rounding.


PREPARED BY
EXP Energy Services Inc.
CANADA
Daniels
Sheridan
Valley
Roosevelt
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Petroleum
MILES CITY RMP
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Musselshell
Rosebud
Fallon
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Big Horn
Harding
Powder River
0 10 20 40 Miles
VICINITY MAP
LEGEND
STATE BOUNDARY
COUNTY BOUNDARY
RMP DISTRICTS
HILINE RMP
MILES CITY RMP
KEYSTONE XL PROJECT
FIGURE 4-1
RMP DISTRICTS
TC Energy

4.2 Right-of-Way Grant

Keystone requests a grant of a ROW that will include a permanent 50-foot ROW for the pipeline, portions of four 30-foot wide permanent access roads, and two IMLVs on federal lands. With the exception of the fenced area for the IMLV locations, the entire permanent pipeline ROW will be reclaimed and after reclamation, grazing will be the primary land use. The IMLVs will be located within a 50-foot by 50-foot area that will be located within the permanent ROW.

In addition to the pipeline ROW, Keystone will require approximately 10.05 acres of federal lands for the four permanent access roads (Table 4-3). These locations of the access roads are provided in Table 4-2 and included on maps in Appendix B.

Table 4-2 Access Roads to be Located on Federal Lands

Access Road Designation	Corresponding Pipeline MP	Miles of Federal Lands Crossed	County	Existing or New Access Road	Federal Owner
CAR-228	0.20	0.79	Phillips	Both	Bureau of Land Management
CAR-003	17.16	0.52	Phillips	Both	
CAR-005	23.09	0.26	Phillips	Existing	
CAR-006B	25.10	0.24	Phillips	Existing	
CAR-008	33.05	0.94	Valley	Existing	
CAR-010A	38.20	1.42	Valley	Existing	
CAR-012B	43.53	0.06	Valley	Both	
CAR-068A[1]	49.35	0.36	Valley	Both	
CAR-15B	51.37	0.14	Valley	New	
CAR-015A	51.47	0.83	Valley	Existing	
CAR-016	54.41	1.80	Valley	Both	
CAR-072	56.34	0.24	Valley	Existing	
CAR-084	57.02	0.42	Valley	Existing	
CAR-154	64.49	0.41	Valley	Existing	
CAR-125	90.06	0.98	McCone	Existing	U.S. Army Corps of Engineers
CAR-227[1,3]	90.70	0.67	McCone	Existing	Bureau of Land Management
		1.47	McCone	Existing	U.S. Army Corps of Engineers
VAR-07[1,2]	91.83	0.04	McCone	Existing	Bureau of Land Management
CAR-089	117.17	0.52	McCone	Both	
CAR-088	117.66	0.15	McCone	New	
CAR-086[1]	119.50	0.29	McCone	Existing	
CAR-024A	128.78	0.62	McCone	Existing	
CAR-040C	283.35	0.08	Fallon	Existing	

[1]Permanent Access Roads
[2]Valve Access Road Completely within Permanent Easement
[3]This access road is an existing gravel road

4.3 Temporary Use Permit

Keystone requests a TUP on federal lands for areas required for construction of the Project, including a minimum of a 60-foot-wide TUP, temporary work spaces, and temporary roads to access the construction areas. The duration of the TUP, starting on the first day of construction through revegetation on federal land, is estimated to be a minimum of 24 months and a maximum of four years, dependent on revegetation success.

Approximately 324.30 acres, located within the temporary construction ROW will be required for the Project. The land requirements for the temporary and permanent ROW are provided in Table 4-3 and on maps in Appendix B. In addition, based on current analysis, Keystone will require approximately 122.79 acres for temporary work spaces associated with activities such as crossing waterbodies, roadways, or rough terrain, or for truck turnarounds. Preliminary location of these areas is shown on maps in Appendix B.

Temporary roads to construction areas, as listed in Table 4-2, also will cross federal lands. Roads will be maintained, improved, or newly constructed to be approximately 30 feet wide to accommodate construction traffic. For the purposes of this POD, existing roads are conservatively considered to require at least moderate improvement. Conservatively, construction of or improvements to approximately 11.06 miles of 30-foot-wide temporary access roads to cross federal lands is estimated to require approximately 39.76 acres.

Areas of temporary disturbance will be reclaimed to pre-existing conditions after construction.

Table 4-3 Summary of Land Requirements Associated with Federal Lands[1] on the Project in

Facility	Land Required Under Temporary Use Permit[2] (acres)	Land Required Under ROW Grant[3] (acres)	Land Disturbed During Construction[4] (acres)
Pipeline ROW	324.30	281.02	605.32
Mainline Valve	NA	NA	NA
Additional Work Spaces[5]	122.79		122.79
Access Roads[6]	39.76	10.05	49.81
Keystone XL Project Total[5,6]	**486.85**	**291.07**	**777.92**

Note: Discrepancies in totals are due to rounding
NA – Not applicable
[1]Includes USACE land.
[2]Pipeline disturbance is based on a total of 110-foot-wide construction ROW, except in areas requiring extra workspace necessitated by site conditions. Construction of two IMLVs on federal lands will occur within the construction ROW.
[3]Operation acreage for the pipeline was estimated based on a 50-foot-wide permanently maintained ROW. Two IMLVs will be located on federal lands. Each IMLV will be located within a 50-foot by 50-foot area (approximately 0.06 acre) within the permanently maintained ROW. No other aboveground facilities will be located on federal lands.
[4]Construction disturbance is the area temporarily disturbed for the Project and is the sum of the areas requested under the TUP as well as those under the ROW Grant, with the exception of the IMLV, which will be constructed and operated within the 50-foot permanent ROW.
[5]Does not include the potential for extended additional work spaces necessary for construction in rough terrain or in unstable soils. These locations are currently undergoing identification and analysis. Potential disturbance associated with these areas will be included in supplemental filings to BLM.
[6]Access road disturbance is based on a nominal 30-foot-wide disturbance for the length of the identified routes. Permanent impacts would be limited to the four permanent access roads on federal lands (see Section 3.3.6).

5.0 Plan of Development

5.1 Relationship to Other Environmental Documents

This POD has been finalized based on the 2011 EIS, 2014 FSEIS and 2019 SEIS completed by the DOS. The POD appendices incorporate regulatory approvals, plans, permits, maps, and other authorizations that involve environmental requirements, and serve as the mechanism to implement BLM and DOD requirements identified during agency review of lands under federal jurisdiction. If amendments and/or additions to the appendices are recommended by regulatory agencies prior to or during construction of the project, the POD will be consistently and accurately maintained and updated as a reference document.

5.2 Federal and State Agencies Involved

A list of federal, state, and local permits and approvals is provided in Table 5-1. Individual road crossing and road use permits have been aggregated in this table under general county permits, since such permits will be a standard requirement in the counties crossed.

5.3 Permits and Relationship to Federal Policies, Plans, and Programs

A number of federal agencies have permitting, environmental review, and regulatory roles with respect to the Project. The roles of the applicable federal agencies with respect to the Project are summarized below.

DOS is responsible for the issuance of a Presidential Permit authorizing the international border crossing. As the lead federal agency under NEPA, DOS completed its environmental review consistent with NEPA for the entire Project, as well as including cooperating agencies for the NEPA analysis (including BLM). In the FEIS and FSEIS, DOS determined that the Project could be built with minimal environmental impacts.

The BLM was a cooperating agency for the 2011 EIS, 2014 FSEIS and 2019 SEIS. The ROW Grant application for the Project is subject to standard approval procedures as outlined in 43 Code of Federal Regulations (CFR) § 2800 and 2880. The BLM is responsible for conservation measure compliance on federally managed land, including BLM and DOD lands. BLM approval of Keystone's application for a ROW Grant requires that the project POD include site-specific stipulations, plans, permit conditions, and agreements developed during the course of the NEPA review.

USACE, USFWS, Department of Transportation – Pipeline and Hazardous Materials Safety Administration (PHMSA), appropriate SHPO, and other state and local agencies also have regulatory authority and have completed permit reviews and consultations for the Project. Table 5-1 provides a complete list of the permits, licenses, and approval and consultation requirements for the Project.

Table 5-1 Permits, Licenses, Approvals, and Consultation Requirements for the Project

Agency[1]	Permit or Consultation/Authority	Agency Action
Federal		
DOS	Presidential Permit, Executive Order 13337 of April 30, 2004 (69 Federal Register [FR]. 25299, et seq.)	Considers approval of cross-border facilities. Request for Presidential Permit submitted on January 26, 2017 and approved on March 23, 2017. New Presidential Permit authorizing border crossing approved March 29, 2019. The 2019 Presidential Permit voided the 2017 permit.
	NEPA	Lead federal agency for the environmental review in connection with consideration of the Presidential Permit application

Table 5-1 Permits, Licenses, Approvals, and Consultation Requirements for the Project		
Agency[1]	**Permit or Consultation/Authority**	**Agency Action**
	Section 106 of the National Historic Preservation Act (NHPA)	Supervised and coordinated compliance with Section 106 of NHPA and consultation with interested Tribal agencies
	Section 7 of the ESA	The BLM in coordination with Western Area Power Administration, Rural Utilities Service and USACE facilitated Section 7 with the USFWS.
BLM	The ROW and TUP for the pipeline would be under Section 28 of the Mineral Leasing Act (MLA). The ROW and short-term ROWs for ancillary facilities such as powerlines would be under FLPMA.	Considers approval of ROW grant and TUPs for the portions of the Project that would encroach on public lands
	Archeological Resources Protection Act (ARPA) Permit	Considers issuance of cultural resource use permit to survey, excavate or remove cultural resources on federal lands
	Notice to Proceed (NTP)	Following issuance of a ROW grant and approval of the Project's POD, considers the issuance of a Notice to Proceed with Project development and conservation measures for federal lands
	Section 106 (NHPA)	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies
USACE – Omaha District	Section 404, Clean Water Act (CWA)	Considers issuance of Section 404 permits for the placement of dredge or fill material in Waters of the U.S., 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 (NHPA)	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies
	Section 408	Grants permission for the alteration of a public work so long as that alteration is not injurious to the public interest and will not impair the usefulness of the work.
USFWS	ESA Section 7 Consultation, Biological Opinion	Reviewed findings (BA) of an impact of federally-listed or proposed species; Concurrences were received for 6 species in MT and the NLEB May Affect determination relied upon the 2016 programmatic BO on the 4(d) rule.
	Migratory Bird Treaty Act (MBTA)	Reviews projects for compliance with the MBTA
BOR	ROW Grant and Temporary Use Permit under Section 28 of the MLA	Determines if ROW grant issued under MLA by BLM is in compliance with BOR standards
	Section 106 (NHPA)	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies
Federal Highway Administration (FHA)	Crossing Permit	Considers issuance of permits for the crossing of federally funded highways

Table 5-1 Permits, Licenses, Approvals, and Consultation Requirements for the Project		
Agency[1]	**Permit or Consultation/Authority**	**Agency Action**
U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, 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 [ERP]), 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 [PSRP]) prior to initiation of operation and within 2 years of startup approves the PSRP.
U.S. Environmental Protection Agency, Regions 6, 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)
U.S. Department of Agriculture – Natural Resources Conservation Service	Section 106 (NHPA)	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies
U.S. Department of Agriculture – Farm Service Agency	Section 106 (NHPA)	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies
U.S. Department of Agriculture – Rural Utilities Services (RUS)	Section 106 (NHPA)	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies
Western Area Power Administration (Western)	Section 106 (NHPA)	Responsible for compliance with Section 106 of NHPA and consultation with interested Tribal agencies
Advisory Council on Historic Preservation	Consultation	Advised federal agencies during the Section 106 consultation process; signatory to the Programmatic Agreement
U.S. Department of Treasury – Bureau of Alcohol, Tobacco, and Firearms	Treasury Department Order No. 120-1 (former No. 221), effective 1 July 1972	Reviews permit to purchase, store, and use explosives should blasting be required
Montana		
Montana SHPO – Montana Historical Society[3]	Section 106 consultation regarding NRHP eligibility of cultural resources and potential Project effects on historic properties, Compliance with Montana State Antiquities Act	Reviewed and commented on activities potentially affecting cultural resources
MDEQ	Certificate of Compliance under the state MFSA	A MFSA Certificate was issued in March 2012

Table 5-1 Permits, Licenses, Approvals, and Consultation Requirements for the Project		
Agency[1]	**Permit or Consultation/Authority**	**Agency Action**
MDEQ – Permitting and Compliance Division – Water Protection Bureau	Montana Ground Water Pollution Control System and Non-Degradation 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)	Issued permits for stream and wetland crossings; provides Section 401 water quality certification review for Section 404/10 process. Updated permit applications are being prepared for resubmission.
	Montana Pollutant Discharge Elimination System (MPDES)	Reviewed permit for hydrostatic test water discharge into surface water, trench dewatering, and stormwater discharge. Updated permit applications are being prepared for resubmission.
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 activities on lands classified as "Other" and 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 permits 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)	Provided technical oversight to DNRC Conservation Districts in review of applications for 310 permits

Table 5-1 Permits, Licenses, Approvals, and Consultation Requirements for the Project		
Agency[1]	**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 (MCS) 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	Considered whether or not an applicant qualifies as a common carrier under Montana Annotated Code (MAC) 69-13-101; as Keystone has been determined to be a common carrier, the commission would supervise and regulate operations under MCA 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	Review under county approval process.
	Special or Conditional Use Permits, where required	Review 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 required after Certificate of Compliance under MFSA is issued).
South Dakota [2]		
South Dakota Historical Society[3]	Consultation under Section 106, NHPA	Reviewed and commented on activities potentially affecting cultural resources.
South Dakota Public Utilities Commission	Energy Conversion and Transmission Facilities Act	A PUC Certificate was issued in March 2010 and amended in June 2010. The PUC certified that Keystone continued to comply with the permit in January 2016.
Department of Environment and Natural Resources, Surface Water Quality Program	Section 401, CWA, Water Quality Certification	Issues permits for stream and wetland crossings pursuant to Section 401 in coordination with the Section 404 process.
	Hydrostatic Testing/Dewatering & 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,
	SDCL 34A-18 (oil spill response plans).	Reviews crude oil pipeline spill response plans.
Department of Game, Fish, and Parks	Consultation	Consulted 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.

Table 5-1 Permits, Licenses, Approvals, and Consultation Requirements for the Project		
Agency[1]	**Permit or Consultation/Authority**	**Agency Action**
County and Local Authorities	Pump Station Zoning Approvals, where required	Reviewed under county approval process.
	Special or Conditional Use Permits, where required	Reviewed under county approval process.
Nebraska		
Nebraska SHPO[3]	Consultation under Section 106, NHPA	Reviewed and commented on activities potentially affecting cultural resources.
Public Service Commission	Public Service Commission Major Oil Pipeline Siting Act	Considers whether proposed route is in the public interest of Nebraska (pursuant to Neb. Rev. Stat. § 57-1408) and authorizing Keystone to act under Neb. Rev. Stat. § 57-1101. Application submitted in February 2017 and route approved on November 20, 2017.
DEQ, Division of Water Resources	Section 401, CWA, Water Quality Certification	Considers issuance of permit for stream and wetland crossings; consult for Section 404 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.
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).
Game and Parks Commission	Consultation	Consulted 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	Reviewed under county approval process.
	Special or Conditional Use Permits, where required	Reviewed under county approval process.

[1] All permits are considered attainable and consistent with existing land use plans based on consultation with the relevant agencies listed in the table.
[2] Permits associated with construction camps are described in the FEIS Section 2.2.7.4.
[3] The SHPO has the opportunity to review federal agency decisions under Section 106 of the National Historic Preservation Act, but this is not a legal obligation.

5.3.1 USACE Section 408 Permitting

The pipeline will cross approximately 1.88 miles of land managed by the USACE on the south and southeastern side of the Missouri River crossing (near MP 89.60) in McCone County, Montana. USACE manages the land for flood control downstream of the Fort Peck Dam, which is associated with the Fort Peck civil works project. As a result of this crossing, it was determined that USACE requires a review of the crossing in accordance with 33 USC Section 408. Under Section 408, USACE determines whether the Project crossing could potentially impair the usefulness of the USACE civil works project, which includes retaining the civil works project's authorized purpose, and is not injurious to the public interest. This permit application would be reviewed by the USACE Operations Division as well as the Regulatory Division. It should be noted that construction of the proposed pipeline would not alter the upstream dam or spillway south of Fort Peck dam, nor will the Project impair the usefulness of the dam or spillway with the use of HDD installation under the river.

Keystone submitted a Request for Review under Section 408 on April 5, 2017. Since that time, the USACE made additional requests for information and clarification. In response to the information requests, several reports and studies were completed and provided to USACE for their review. The submitted reports and studies have been included herein as Appendix E.

The reports and studies provided in Appendix E include:

- Missouri River Water Crossing Plan
- Site Specific Risk Assessment for the Missouri River Crossing
- Missouri River – Fort Peck Geographic Response Plan
- Tree Count and Habitat Assessment
- Memorandum for CENWO-OD-E, Executive Order 11988 and NWDR 1110-2-5 Compliance Memo for the Keystone XL Pipeline Project in McCone County, Montana, across Flowage and Saturation Easements

Following the completion of USACE's review, a Record of Decision approving the pipeline crossing and any stipulations will be provided by the USACE and a letter of permission issued to the BLM for inclusion in the ROW Grant ROD

The additional studies were used to demonstrate that the pipeline design installation depth mitigates for the potential impacts from both a worst-case full release scenario and a 40,000-year flood event dam release and the resulting vertical and lateral migration scour. The valves on either side of the river are located above the 500-year flood level. The Keystone design includes a mainline valve (260-VLLEY-04C) on USACE-managed land near MP 90.69 (south side of the river).

5.4 Permits and Relationship to Non-Federal Policies, Plans, and Programs

In Montana, the Project requires a certificate under the Montana MFSA, under 75-20-101 et seq., Montana Code Annotated, which includes environmental review under MEPA. The MDEQ issued a MFSA Certificate (March 30, 2012) for the Project requiring Keystone to utilize the Montana route variations identified in the FEIS. Since the issuance of the MFSA Certificate, Keystone has adopted those route refinements along with 182 additional route refinements which were implemented to further minimize landowner and environmental impact. None of the Montana route changes are outside of the MFSA designated corridor.

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6.0 Construction

Keystone will implement an environmental compliance program for the Project. Construction of the Project on federal lands will begin after applicable state and federal ROW grants and permits have been acquired for the Project. Conditions and requirements will be reviewed with the installation contractor and procedures established to ensure personnel are familiar with the conditions and that they will be adhered to during construction. Keystone personnel, construction contractor, and environmental inspectors will receive copies of the following prior to commencement of construction activities:

- All conditions placed on construction that have been agreed to by Keystone and the landowners;
- Conditions contained in the required permits, as well as Keystone's POD and BLM-Specific CMRP;
- Any approved alterations to the POD and BLM-Specific CMRP; and,
- Procedures detailed in the Construction/Reclamation Unit Specifications in Appendix F.

6.1 Construction Impact Mitigation Procedures

The facilities will be designed, constructed, tested, and operated in accordance with applicable requirements, including in the U.S. Department of Transportation (USDOT) regulations at 49 CFR Part 195; Transportation of Hazardous Liquids by Pipeline, American Society of Mechanical Engineers Standard B31.4; and other applicable federal and state regulations. These regulations and standards specify pipeline material and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion, thereby ensuring adequate protection for the public and environment by preventing pipeline incidents.

To manage construction impacts, Keystone will implement the procedures in its BLM-Specific CMRP (Appendix C) and the Construction/Reclamation Unit Specifications in Appendix F. Where procedures are not detailed in the Construction/Reclamation Unit Specifications, Keystone will implement the procedures detailed in its BLM-Specific CMRP (Appendix C). This plan contains construction and mitigation procedures. Subsections address specific environmental conditions.

A Project Spill Prevention, Control, and Countermeasures (SPCC) Plan (Appendix G) will be implemented to avoid or minimize the potential for harmful spills and leaks during construction. The plan describes spill prevention practices, emergency response procedures, emergency and personal protection equipment, release notification procedures, and cleanup procedures.

Conservation measures contained in this POD will apply to the basic design and construction specifications applicable to federal lands disturbed by the Project.

6.2 Pipeline Construction Process

Before starting construction at a specific site, Keystone will finalize engineering surveys of the ROW centerline and additional temporary work spaces and complete the acquisition of ROW easements.

Pipeline construction generally proceeds as a moving assembly line as shown in Figure 6-1 and summarized below. Keystone currently plans to construct the pipeline through Montana in four spreads; three of which cross Federal lands. 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, Keystone will use special construction techniques where warranted by site-specific conditions. These special techniques will be used when constructing across rugged terrain, waterbodies, wetlands, paved roads, highways, and railroads.

6.2.1 Survey and Staking

The first step of construction involves marking the limits of the approved work area (i.e., the construction ROW boundaries and any temporary work spaces) and flagging the location of approved access roads and existing utility lines. Before clearing and grading activities commence, landowner fences will be braced and cut and temporary gates and fences will be installed by the fence crew to contain livestock, if present. Wetland boundaries and other environmentally sensitive areas will be marked or fenced for protection at this time. Before the pipeline trench is excavated, a survey crew will stake the centerline of the proposed trench.

6.2.2 Clearing, Topsoil Salvage, and Grading

A clearing crew will follow the fence crew and will clear the work area of vegetation (including crops) and obstacles (e.g., trees, logs, brush, rocks). Temporary erosion control measures, such as silt fence, will be installed prior to or immediately following vegetation removal down slopes into wetlands and riparian areas. Certified weed free straw bales may be used where they are the only option.

Following the clearing crew, the grading crew will perform earthmoving to create a safe and level workspace. Topsoil will typically be salvaged over the entire ROW. Salvage depths will typically be a minimum of four inches to a maximum of 12 inches depending on the depth of topsoil present in the area. On BLM lands, topsoil shall be salvaged over the entire ROW (see Section 6.2.4) except in designated sagebrush habitat areas (See Section 7.8.1.3.2). Topsoil salvaging shall be done as detailed in the Construction/Reclamation Unit Specifications and the Keystone XL Pipeline Special Soil Handling Report – Montana.

Grading will be kept to a minimum but will be conducted where necessary to provide a reasonably level work surface. Where the ground is relatively flat and does not require grading, rootstock will be left in the ground. More extensive grading will be required on steep side slopes or vertical areas and, where necessary, to avoid excessive bending of the pipe.

The minimum clearing and grading equipment per spread is as follows: six D8 dozers, one 330 backhoe (thumb and hoe pack), two 345 backhoes, two D8 ripper dozers, and one 140 motor grader. Two environmental crews will be required per spread for installing silt fence and hay bale structures, as required.

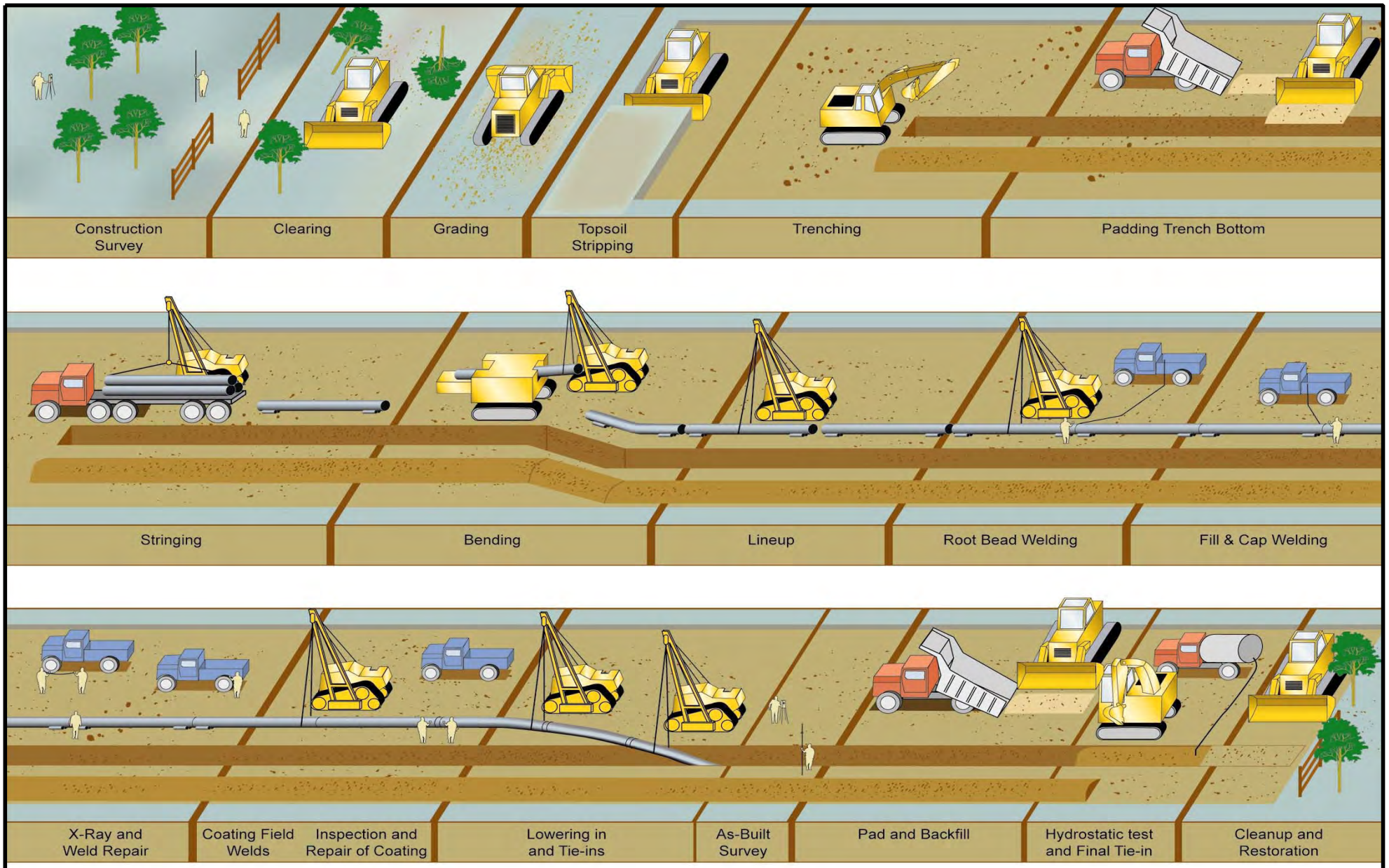
6.2.3 Disposal of Vegetation Removed During Construction

The primary need for disposal of vegetation will arise from construction in forested areas. The Project crosses approximately 0.30 miles of forested areas on federal lands, and none of the forested areas contain merchantable timber. Section 4.13 of the BLM-Specific CMRP addresses timber removal and treatment for the forested areas.

6.2.4 Trenching

The trench will be excavated to a depth that provides sufficient cover over the pipeline after backfilling. Typically, the trench will be approximately seven to eight feet deep and four to five feet wide in stable soils. In most locations, the depth of cover over the pipeline will be a minimum of 48 inches, as discussed in more detail in Section 6.6. Trenching may precede bending and welding or may follow, depending upon several factors, including soil characteristics, water table, presence of drain tiles, and weather conditions at the time of construction.

When rock or rocky formations are encountered, tractor-mounted mechanical rippers, or rock trenchers, will be used to fracture the rock prior to excavation. In areas where mechanical equipment cannot break up or loosen the bedrock, blasting (use of explosives) will be required. Excavated rock will be used to backfill the trench to the top of the existing bedrock profile.



Typical Pipeline Construction Sequence
Figure 6-1

Topsoil will be separated from subsoil over the full width of the ROW on BLM lands. This will assist with proper reclamation of the soil during the backfilling process. Topsoil will be stored above the ordinary high-water mark during construction and will not be stored in riparian or mapped floodplain areas.

The minimum trenching equipment per spread is as follows: six 345 backhoes, one 345 backhoe with pecker hammer, and two ditching machines.

6.2.5 Pipe Stringing, Bending, and Welding

Prior to or following trenching, sections of externally-coated pipe nominally 80 feet long (also referred to as "joints") will be transported by truck to the ROW and placed or "strung" along the trench in a continuous line. After the pipe sections are strung along the trench and before joints are welded together, individual sections of the pipe will be bent to conform to the contours of the trench by a track-mounted, hydraulic pipe-bending machine.

The pipeline joints will be lined up and held in position until securely joined by welding. Keystone will non-destructively inspect 100 percent of the welds using non-destructive testing (NDT) methods, such as radiographic, ultrasonic, or other USDOT-approved inspection method. Welds that do not meet established specifications will be repaired or removed. Once the welds have passed inspection, an anti-corrosion coating will be applied to the welded joints. The pipeline will be visually and electronically inspected or "jeeped" for disbondment in the coating. Damage to the coating will be repaired before the pipeline is lowered into the trench.

To minimize the impact on agricultural areas, livestock, and wildlife movements during construction, Keystone will 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 machinery, livestock, and wildlife to cross the trench safely. Soft plugs will be constructed with a ramp on each side to provide an avenue of escape for animals that may fall into the trench.

Prior to lowering the pipe into the trench, multiple sections of pipe may be welded together above the trench. These welded pipe strings may be greater than one mile in length. Keystone will lower these sections of pipeline into the trench using side boom tractors.

The minimum stringing, bending, and welding equipment per spread is as follows: two 345 backhoes – one at the pipe yard and one at the ROW; one D7 dozer; eight string trucks; two bending machines; thirteen 572 side booms; one mechanized welding machine with end-facing machine; one welding shack; eight ultrasonic testing units; one hand scanner; one sled; two heat rings; two coating rings; and one sled with generators.

6.2.6 Lowering in and Backfilling

Before the pipeline is lowered in, the trench will be inspected to be sure it is free of rock and other debris that could damage the pipe or protective coating. In areas where water has accumulated, dewatering may be necessary to permit inspection of the bottom of the trench. The pipeline then will be lowered into the trench.

On sloped terrain, trench breakers (stacked sand bags or foam) will be installed in the trench at specified intervals to prevent subsurface water movement along the pipeline. The trench will then be backfilled using the excavated material.

In rocky areas, the pipeline will be protected with an abrasion-resistant coating or rock shield (fabric or screen that is wrapped around the pipe to protect the pipe and its coating from damage by rocks, stones, and roots). Alternatively, the trench bottom will be filled with padding material (e.g., finer grain sand, soil, or gravel) to protect the pipeline. Topsoil will never be used as padding material.

The minimum equipment per spread for lowering in and backfilling is as follows: three 345 backhoes (one equipped with long neck), five 583 side booms, two padding machines, and three D8 dozers.

Three tie-in crews per spread will be utilized to complete the tie-ins to the mainline. The minimum equipment per spread per tie-in crew is as follows: two welding machines; welding shacks, seven 572 side booms, eight ultrasonic testing units, hand scanner, sled, two heat rings, two coating rings, sled with generators, two 345 backhoes (one equipped with shaker bucket), one 583 side boom, and one D8 dozer.

6.2.7 Hydrostatic Testing

The pipeline will be hydrostatically pressure tested in sections determined by the pipe elevation to ensure the system is capable of withstanding the operating pressure for which it is designed. This process involves isolating the pipe segment with test manifolds, filling the line with water, pressurizing the section to a pressure at least 1.25 times the maximum operation pressure (MOP), and maintaining that pressure for a period of eight hours. The hydrostatic test will be conducted in accordance with 49 CFR Part 195.

Keystone proposes to obtain water for hydrostatic testing from rivers and streams crossed by the pipeline and in accordance with federal, state, and local regulations. Hydrostatic testing will occur in sections approximately 30 to 50 miles in length. The volume of water required for testing 50 miles of pipe is approximately 14 million gallons, or 43 acre-feet. Keystone is considering using two sources that are located on federal lands for the pipeline hydrostatic test water. One source is the Missouri River and the second source is a tributary to Cabin Creek.

The pipeline will be hydrostatically tested after backfilling and the construction work that will directly affect the pipe is complete. If leaks are found, the defective pipe section(s) will be replaced, and the section of pipe retested until specifications are met. Water used for the testing may then be transferred to another pipe section for subsequent hydrostatic testing. The water will be returned to the original source as required. The water will be tested to ensure compliance with the general discharge permit in compliance with National Pollutant Discharge Elimination System (NPDES) requirements, treated if necessary, and discharged.

Hydrostatic test water will be discharged on non-federal land surface at an approved location near the source or directly to the waterbody source. Discharges will be directed into Keystone-approved energy dissipation devices, depending on NPDES discharge permit requirements. Discharged water on the ground may evaporate or infiltrate into the soil or drainage where the water is released. The discharge of hydrostatic test water will follow state permit requirements, which would reduce potential effects on water quality or aquatic organisms. Energy dissipaters will be used to prevent erosion at discharge locations.

6.2.8 Final Tie-ins

Following successful hydrostatic testing, test manifolds will be removed, and the final pipeline tie-in welds will be made and inspected.

6.2.9 Commissioning

After the final tie-ins are complete and inspected, the pipeline will be cleaned and dewatered. Commissioning involves verifying that equipment has been installed properly and is working, that controls and communications systems are functional, and that the pipeline is ready for service. In the final step, the pipeline is prepared for service by filling the line with crude oil.

6.2.10 Cleanup and Reclamation

After backfilling, final cleanup will begin as soon as weather and site conditions permit. Every reasonable effort will be made to complete final cleanup (defined as final grading and installation of permanent erosion control devices) as soon as possible within approximately 20 days after backfilling the trench. During cleanup, construction debris on the ROW will be removed and disposed of and work areas will be final graded and preconstruction contours will be restored as closely as possible. Segregated topsoil will be returned and spread over the surface of the ROW and permanent erosion controls will be installed.

After permanent erosion control devices are installed and final grading is complete, disturbed work areas, except annually cultivated fields, will be seeded as soon as possible. Seeding is intended to stabilize the soil, revegetate areas disturbed by construction, and restore native vegetation. Timing and methodology of the reseeding efforts shall be completed as detailed in the Construction/Reclamation Unit Specifications.

The minimum cleanup and reclamation equipment per spread is as follows: six D8 dozers, three 345 backhoes, and two tractors with mulcher spreaders (seed and reclamation).

6.2.11 Additional Construction Spread Requirements

In addition to the equipment described above, the following resources typically will be deployed on each spread, though the number of personnel and equipment would be limited at any given time, as depicted in Figure 6-1:

- 500 to 600 construction personnel;
- 50 inspection personnel;
- 85 pickups, water trucks, tractor trailers;
- Seven equipment low-boys;
- Seven flat beds; and
- Five 2-ton bob tails.

6.3 Special Construction Procedures

In addition to standard pipeline construction methods, Keystone will use special construction techniques where warranted by site-specific conditions. These special techniques will be used when crossing paved roads, highways, railroads, steep terrain, waterbodies, wetlands, and when blasting through rock. These special techniques anticipated on federal lands are described in the following sections.

Crossing of BOR canals will be completed according to procedures contained in Appendix A – BOR Canal and Waterline Crossings.

6.3.1 Road, Highway, and Railroad Crossings

Construction across roads will be in accordance with the requirements in crossing permits and approvals obtained by Keystone. On federal lands, roadways crossed generally will be smaller, unpaved roads and driveways. These roads will be crossed using the open-cut method where permitted by local authorities or private owners. The open-cut method will require temporary closure of the road to traffic and establishment of detours. If no reasonable detour is feasible, at least one lane of traffic will be kept open, except during brief periods when it is essential to close the road to install the pipeline. Most open-cut road crossings can be finished, and the road restored within 1 or 2 days. Keystone will take measures, such as posting signs at open-cut road crossings to ensure safety and minimize traffic disruptions and prepare traffic control plans in accordance with the applicable regulations as necessary.

Roads that cannot be crossed using the open-cut method may be crossed by boring beneath the road. Figure 6-2 illustrates a typical bored road crossing. Generally, boring requires the excavation of a pit on each side of the feature to be crossed, the placement of boring equipment in the pit, and boring a hole under the road at least equal to the diameter of the pipe. Once the hole is bored, a pipe section will be installed through the borehole. Boring will result in minimal or no disruption to traffic at road crossings and will typically take 1 to 2 days.

6.3.2 Steep Terrain

Additional grading may be required in areas where the pipeline route will cross steep slopes. Steep slopes often need to be graded down to a gentler slope for safe operation of construction equipment and to accommodate pipe-bending operations. In such areas, the slopes will be excavated prior to pipeline installation and restored following backfill to a stable condition.

In areas where the pipeline route crosses laterally along the side of a slope, cut and fill grading may be required to obtain a safe, flat work terrace and to accommodate pipeline bending limitations. Topsoil will be stripped from the entire ROW and stockpiled prior to cut and fill grading on the side slope. During construction, topsoil piles will be protected from erosion through matting, mulching, or watering, as necessary, based on site-specific conditions. After the pipeline is installed, the slope's contour will be restored as near as practicable to pre-construction condition. Topsoil from the stockpile will be spread over the surface, erosion control measures installed, and seeding implemented as specified detailed in its BLM-Specific CMRP (Appendix C).

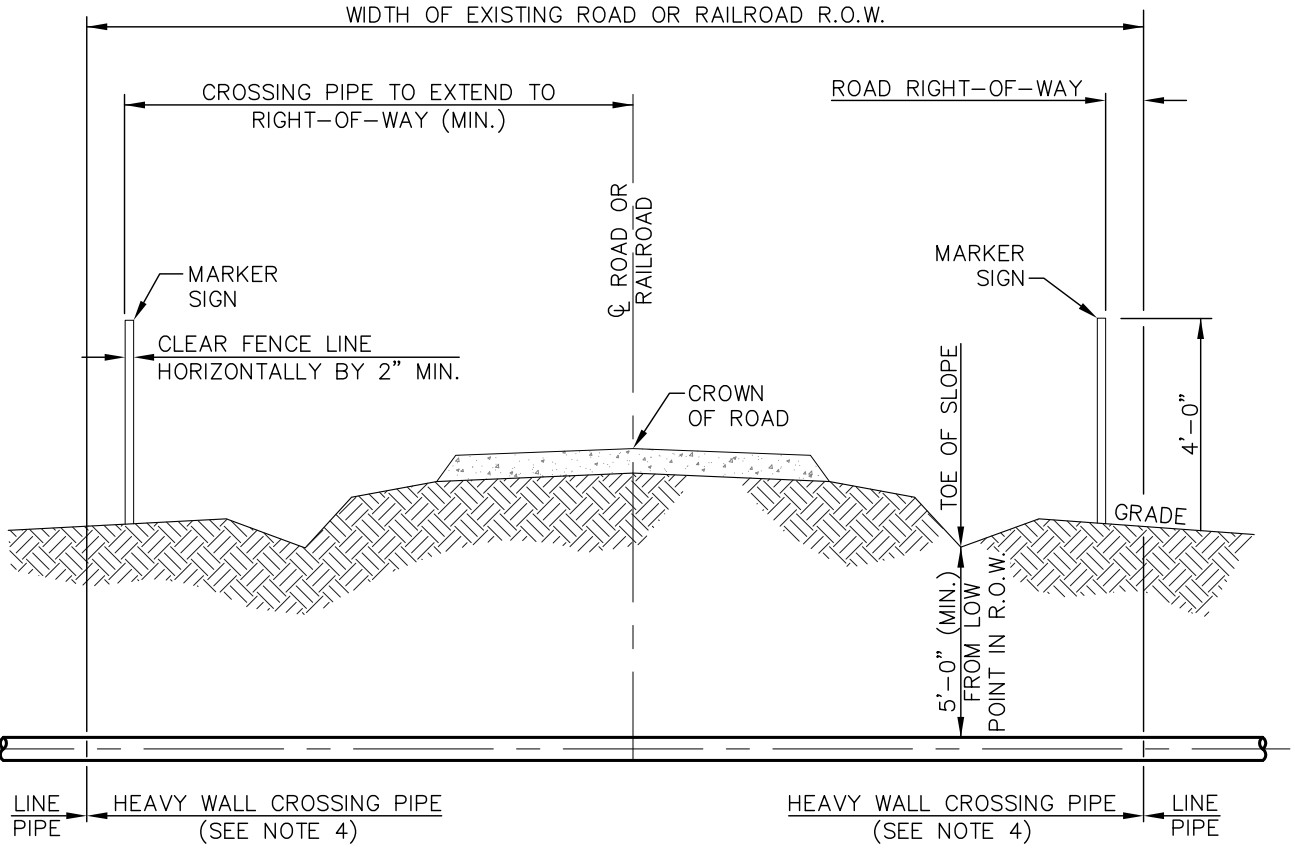
In areas with greater than 5 percent slopes or with highly erodible soils, temporary sediment barriers, such as silt fence, will be installed during clearing to prevent the movement of disturbed soil into wetland, waterbody, or other environmentally sensitive areas. Certified weed free straw bales may be used where they are the only option. Temporary slope breakers consisting of mounded and compacted soil berms will be installed across the ROW during grading and permanent slope breakers will be installed during cleanup. Mulch or tackifier shall be applied in areas of high erosion potential or with greater than 8 percent slopes. Following construction, land imprinting or other techniques will be used to scarify the slope, if needed; approved seed mixes will be applied to steep slopes and the ROW will be mulched with hay, non-brittle straw, wood straw, or covered with biodegradable erosion control fabric. Sediment barriers will be maintained across the ROW until permanent vegetation is established. Fencing or other livestock management measures may be implemented during re-establishment of vegetation. Additional temporary work spaces may be required for storage of graded material and/or topsoil during construction.

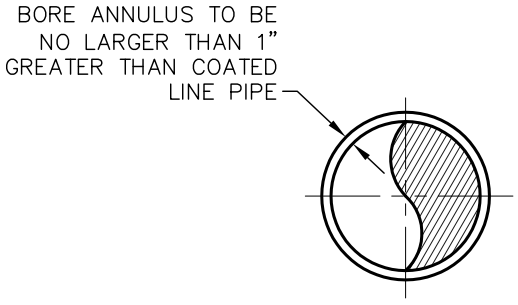
Keystone has identified an area with steep slopes that required an alternative route on BLM lands to avoid a butte (MP 116, McCone County, Montana). Construction and reclamation measures for this area will be performed in accordance with the Breaks conservation/reclamation (Con/Rec) unit (See Appendix F).

6.3.3 Waterbody Crossings – Perennial

See Table 7-6 for a list of the waterbody crossings on federal lands. The Missouri River will be crossed using the HDD method. The only perennial waterbody crossing is the unnamed tributary to Struple coulee at approximate MP 94.55, which will be crossed using dry flume or dry dam-and-pump methods (BLM-Specific CMRP Details 13 and 14). A bridge would be installed across the creek to allow mainline construction equipment to pass over the creek, and the stream crossing would be constructed in a short period of time (24 to 48 hours). The flume crossing method involves diverting the flow of water across the trenching area through one or more flume pipes placed in the waterbody. The dam-and-pump method is similar to the flume method, except that pumps and hoses will be used instead of flumes to move water around the construction work area. In both methods, trenching, pipe installation, and backfilling are done while water flow is isolated from construction. Once backfilling is completed and the stream channel is restored to original grade, the stream banks are restored and stabilized, and the flume or pump hoses are removed.

The HDD method involves drilling a pilot hole under the waterbody and banks, then enlarging the hole through successive reaming passes until the hole is large enough to accommodate a prefabricated segment of pipe. Throughout the process of drilling and enlarging the hole, slurry consisting mainly of water and bentonite clay will be circulated in a closed loop system to lubricate the drill bit, remove drill cuttings, and provide stability to the drilled holes. Pipe sections long enough to span the entire crossing will be staged and welded along the construction work area on the opposite side of the waterbody and then pulled through





NOTES:

1. CROSSINGS SHALL BE IN ACCORDANCE WITH APPLICABLE PERMIT.
2. ROAD CROSSING PIPE SHALL EXTEND AT MINIMUM TO RIGHT-OF-WAY LINE UNLESS OTHERWISE SPECIFIED.
3. THE TYPE AND MINIMUM REQUIRED LENGTH OF PIPE FOR CROSSINGS OF ROADS SHALL BE AS SPECIFIED ON ALIGNMENT SHEETS.
4. PIPE FOR BORED CROSSINGS TO INCLUDE ABRASION-RESISTANT (ARB) COATING.
5. PIPELINE MARKER AND TEST STATIONS TO BE INSTALLED ON RIGHT-OF-WAY LINE NEXT TO FENCE IF POSSIBLE.
6. THE CROSSING PIPE SHALL BE STRAIGHT WITH NO VERTICAL OR HORIZONTAL BENDS WITHIN ROAD RIGHT-OF-WAY.

REVISIONS | 1 | Updated drawing notes | 2 | REVISED DWG. NUMBER

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TransCanada
In business to deliver
KEYSTONE XL PROJECT

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ORIGINATOR: JOE A. NELSON 11/04/08 (NAME / DATE)

CHECKED BY: TW | APPROVED BY: SS

FIGURE 6-2

FIA #	CHAINAGE:	DISCIPLINE #
1399		03

TITLE: TYPICAL UNCASED ROAD/RAILROAD CROSSING BORE DETAIL

SCALE	DWG No	REV
N.T.S.	1399-03-ML-03-463	2

LAST PLOT DATE: Tue, 21 Jul 2009 - 2:16pm

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the drilled hole. Ideally, use of the HDD method results in no impact on the banks, bed, or water quality of the waterbody being crossed (BLM-Specific CMRP Detail 15).

If a waterbody is flowing at the time of construction, the Project will utilize dry flume or dry dam-and-pump methods (BLM-Specific CMRP Details 13 and 14). The flume crossing method involves diverting the flow of water across the trenching area through one or more flume pipes placed in the waterbody. The dam-and-pump method is similar to the flume method except that pumps and hoses will be used instead of flumes to move water around the construction work area. In both methods, trenching, pipe installation, and backfilling are done while water flow is isolated from construction. Once backfilling is completed, the stream banks are restored and stabilized, and the flume or pump hoses are removed.

Approximately nine intermittent waterbody crossings are required by the Project on federal lands. In the event these intermittent waterbodies are dry at the time of crossing, Keystone proposes to use modified conventional upland cross-country construction techniques that would prevent ponding on the ROW if water were to flow through the waterbody during construction and reduce sediment from reaching the waterbody (BLM-Specific CMRP Detail 11). If an intermittent waterbody is flowing when crossed, Keystone will install the pipeline using one of the dry-ditch crossing methods discussed previously. When crossing waterbodies, Keystone will adhere to the guidelines outlined in its BLM-Specific CMRP located in Appendix C and the requirements of its waterbody crossing permits. There are no perennial streams on federal lands in Montana that are crossed by the open cut wet method. The crossing method and guidelines for the Missouri River crossing are detailed in the Missouri River Waterbody Crossing Plan included in Appendix E. Canal crossings on BOR lands are detailed in Appendix A.

6.3.4 Wetland Crossings

Data from wetland delineation field surveys, aerial photography, and National Wetland Inventory (NWI) mapping were used to identify wetlands crossed by the pipeline. Pipeline construction across wetlands will be similar to typical conventional upland cross-country construction procedures, with several modifications where necessary to reduce the potential for pipeline construction to affect wetland hydrology and soil structure, including reducing the construction ROW to 85-feet.

The wetland crossing method used will depend largely on the stability of the soils at the time of construction. If wetland soils are not excessively saturated at the time of construction and can support construction equipment without equipment mats, construction will occur in a manner similar to conventional upland cross-country construction techniques (BLM-Specific CMR Plan Detail 8). Topsoil will be segregated over the trench line; however, in most saturated soils, topsoil segregation will not be possible, however, the best possible effort will be made to segregate it. Temporary work spaces will be required on both sides of particularly wide saturated wetlands to stage construction, fabricate the pipeline, and store materials. These work spaces will be located in upland areas a minimum of 50 feet from the wetland edge, particularly in areas where buffalo berry shrubs are present

Construction equipment working in saturated wetlands will 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 will be allowed to travel through wetlands only if the ground is firm enough (which will be affirmed by the onsite inspector) or has been stabilized to avoid rutting.

Clearing of vegetation in wetlands will be limited to trees and shrubs, which will be cut flush with the surface of the ground along the working side of the ROW and removed from the wetland. To avoid excessive disruption of wetland soils and the native seed and rootstock within the wetland soils, stump removal, grading, topsoil segregation, and excavation will be limited to the area immediately over the trench line. During clearing, sediment barriers, such as silt fence, will be installed and maintained on down slopes adjacent to saturated wetlands and within work spaces as necessary to minimize the potential for sediment runoff. Certified weed free straw bales may be used where they are the only option.

Where wetlands are located at the base of slopes, permanent slope breakers will be constructed across the ROW in upland areas adjacent to the wetland boundary. Temporary sediment barriers will be installed where necessary until revegetation of adjacent upland areas is successful. Once revegetation is successful, sediment barriers will be removed from the ROW and disposed of properly.

Wetlands typically reestablish volunteer hydrophytic vegetation that is appropriate to the site quickly following pipeline disturbance. Wetlands should only be reseeded as directed by BLM and USACE.

6.3.5 Blasting

Blasting may be required in areas where consolidated shallow bedrock or boulders cannot be removed by conventional excavation methods. If blasting is required to clear the ROW and to fracture rock within the ditch, strict safety precautions will be followed. Keystone will exercise care to avoid damage to underground structures, cables, conduits, pipelines, and underground watercourses or springs. To protect property and livestock, Keystone will provide adequate notice to adjacent landowners or tenants in advance of blasting. Blasting activity will be performed during daylight hours and in compliance with federal, state, and local codes and ordinances and manufacturers' prescribed safety procedures and industry practices.

6.3.6 Residential and Commercial Construction

No residential or commercial construction on federal lands was identified in the vicinity of the Project.

6.3.7 Fences and Grazing

Fences will be crossed or paralleled by the construction ROW. Before cutting any fence for pipeline construction, fences generally will be braced and secured to prevent the slacking of the fence and a temporary gate will be installed. To prevent the passage of livestock the gates will be closed when construction crews leave the area. If gaps in natural barriers used for livestock control are created by pipeline construction, the gaps will be fenced according to land management agency or lessee's requirements. Existing improvements, such as fences, stockwater pipelines, gates, irrigation ditches, cattle guards, and reservoirs will be maintained during construction and repaired to pre-construction conditions or better upon completion of construction activities.

6.3.8 Fueling

On lands administered by the BLM, distances from specific sensitive features for equipment parking, refueling, and materials storage will be specified in the BLM-Specific CMRP (Appendix C). Contaminants from construction equipment, welding, and refueling could enter flows, pools, and sediments at waterbody crossings. To minimize the occurrence of such impacts, Keystone has developed a SPCC Plan in accordance with state permit requirements as Appendix G of this POD.

6.3.9 Access Roads

A total of twenty-two access roads that cross federal lands, as discussed in Section 3.3.7 and listed in Table 4-2, are required for construction and operation of the Project. These roads are shown on the maps in Appendix B. For a complete list of access roads, regardless of ownership, see the January 2014 FSEIS. Four access roads leading to the pipeline ROW IMLVs and a pump station will be maintained for the life of the Project. Existing two-track roads will require modification to accommodate Project traffic. Direct access to the pipeline ROW also will require construction of new roads that connect existing roads to the ROW. Gravel roads and dirt roads may require maintenance during the construction period due to high use. Refer to the BLM-Specific CMRP (Appendix C) for details on controlling traffic and crossing procedures for access roads. Modification and construction of access roads on federal lands will be in accordance with BLM Surface Operating Standards (Gold Book, BLM 2007a). Keystone will take the necessary precautions for protection and safety of the public during construction and will develop a site-specific crossing and sign plan

for the federal lands to address the primary concerns of limited access and potential conflicts with hunters during construction.

Once the final access route has been approved and permitted by the BLM and pre-construction surveys for biological resources are completed, construction will begin. Typical equipment utilized for access road construction will include one dozer, one motor grader, and one hoe. The dozer will clear the path by making the necessary cuts and fills. If necessary, the motor grader also will be used to clear the path on level terrain. The hoe will be used to clear rock and debris and to install the necessary flume pipe in the washes and cuts. After clearing is complete, the motor grader will crown, ditch, and shape the road. If gravel is needed for road pack in wetlands, geotechnical fabric or other suitable material will be installed first. This will enhance the ability to remove the gravel during reclamation and keep the project in compliance with USACE Nationwide permitting requirements.

Roads will be modified or constructed to no more than 30 feet width on federal lands. Ideally, roads will be a double-lane, graded, drained, and surfaced travel-way with a design speed of 15 miles per hour. However, where practicable and appropriate to minimize the impact on the environment, primitive, two-track roads with turn outs may be utilized with minor or moderate grading. Turnouts generally will take advantage of naturally occurring landscape, such as additional widths on ridges or other available areas on flat terrain.

6.4 Aboveground Facilities Construction

IMLV construction will be carried out concurrently with the construction of the pipeline. Two IMLVs will be constructed on federal land, south of the Missouri River crossing. Construction activities will include clearing, grading, trenching, installing piping, fencing the area, and cleaning up the area. Permanent access roads CAR-227 and VAR-07 will be used to access the two IMLV sites. VAR-07 will be constructed within the permanent ROW.

6.5 Construction Work Force and Schedule

6.5.1 Work Force

Construction of the proposed Project would begin when Keystone obtains necessary permits, approvals and authorizations. Keystone anticipates a total peak work force on the three spreads that cross federal lands of approximately 1,000 construction personnel per spread. Construction personnel will consist of Keystone employees, contractor employees, construction inspection staff, and environmental and safety inspection staff.

Keystone is planning to build the entire Project in 10 construction spreads. Four of the construction spreads will have components on federal lands. The construction spreads that will impact federal lands are summarized on Table 6-1.

Keystone anticipates 500 to 600 construction and inspection personnel associated with each spread. Each spread will require 6 to 8 months to complete.

Keystone, through its construction contractors and subcontractors, will attempt to hire temporary construction staff from the local population.

Table 6-1 Construction Spreads Associated with Federal Lands on the Keystone XL Project

Spread Number	Approximate Number of Workers	Location (MPs)	Approximate Distance within Construction Spread (miles)
Spread 1	500 - 600	0 - 90.07	90.07
Spread 2	500 - 600	90.07 – 163.10	73.03
Spread 3	500 – 600	163.10 – 239.58	76.48
Spread 4	500 - 600	239.58 – 283.53	43.95

6.5.2 Work Schedules

An industry rule-of-thumb for construction progress is a rate of approximately 20 completed miles per calendar month, which could be used for scheduling purposes. Based on experience, the construction schedule is estimated as follows:

- 2-3 weeks (14-21 calendar days) of work on the ROW prior to the start of production welding. These activities will include clearing, grading, stringing, and ditching.
- Production welding, based on an average of 1.25 miles per working day and a 6-day work week (7 calendar days), will be completed at 7.5 miles per week, on average.
- 7 weeks (49 calendar days) of work after completion of production welding. These activities will include NDT, field joint coating, lowering-in, tie-ins, backfill, ROW clean-up, hydrostatic testing, reseeding, and other ROW reclamation work.

Using this as a basis for determining the duration of construction activities on the ROW will yield the time requirements shown below for various spread lengths (Table 6-2).

Table 6-2 Resulting Construction Times Based on Estimates of Schedule

Spread Length	Pre-welding	Welding Time	Post-welding and Clean-up	Duration
40 miles	21 days	38 days	49 days	108 days (16 weeks)
60 miles	21 days	57 days	49 days	127 days (19 weeks)
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)

In addition, about one month for contractor mobilization before the work is started and one month after the work is finished for contractor demobilization should be added to the overall construction schedule.

Staging areas are designated at the start of each construction spread (located on private lands at public road crossings) where access may be gained without necessitating use of private roads, wherever possible.

6.6 Facility Design Factors

All proposed facilities will be designed, constructed, tested, and operated in accordance with applicable requirements included in the USDOT regulations 49 CFR Part 195, Transportation of Hazardous Liquids by Pipeline, and other applicable federal and state regulations, and the 59 Special Conditions developed by PHMSA and included in Appendix Z of the January 2014 FSEIS. These requirements are intended to ensure adequate protection for the public and to prevent liquid pipeline accidents and failures. Among other design standards, Part 195 specifies pipeline material and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion.

The pipeline will be constructed of high-strength steel pipe (American Petroleum Institute [API] 5L) with MOP ratings of 1,440 to 1,600 pounds per square inch gauge (psig). New steel pipe will be mill inspected by an authorized owner's inspector and mill tested to API/American Society for Testing and Materials specification requirements, as a minimum. Pipe wall thickness will be a minimum of 0.465 inch. An external coating (fusion-bonded epoxy) will be applied to the pipeline to protect against corrosion. Cathodic protection will be provided by impressed current. The pipe will be manufactured, constructed, and operated in accordance with applicable local, state, and federal regulations. Toxicity and potential spill information relating to the crude oil to be transported by the pipeline was included in the Risk Assessment, filed with the DOS in July 2009.

The design of the Project's pipeline is based on a maximum 1,440 psig discharge pressure at each pump station. The result is that the MOP of the pipeline between pump stations generally is 1,440 psig. For

location-specific, low elevation segments, the MOP will be 1,600 psig. This allows a consistent maximum discharge pressure at the pump stations, optimized for efficiency at nominal flow capacity. Table 6-3 identifies pipeline segments on federal lands with a MOP of 1,600 psig.

Table 6-3 Pipe Segments on Federal Lands with MOP of 1,600 psig

Pipe Segment	MP Start	MP End	Length (Miles) of Heavy Wall Pipe Required on Federal Lands
From PS 9 to PS 10	2.47	2.64	0.17
From PS 10 to PS 11	49.95	52.97	3.01
From PS 10 to PS 11	53.39	54.48	1.09
From PS 10 to PS 11	54.71	55.23	0.51
From PS 10 to PS 11	55.56	56.19	0.63
From PS 11 to PS 12	99.76	100.08	0.32
From PS-14 to PS-15	239.68	239.86	0.19

The location of the pipeline on federal lands is depicted on maps in Appendix B. Township, range, and section, as well as preliminary centerline location, work spaces, and aboveground facilities are included.

Typically, the trench will be about seven to eight feet deep and about four to five feet wide in stable soils. In most areas, the USDOT requires a minimum of 36 inches of cover. In rocky areas, the USDOT requires a minimum depth of cover of 18 inches. However, for the Project, the depth of cover for the pipeline will be a minimum of 48 inches in most locations (Table 6-4). Trenching may precede bending and welding or may follow based on several factors including soil characteristics, water table, existence of drain tiles, and weather conditions at the time of construction.

Table 6-4 Minimum Pipeline Cover

Location	Cover, Normal Excavation (inches)	For Rock Excavation (inches)
All waterbodies[1]	60	36
Dry creeks, ditches, drains, washes, gullies, etc.	60	36
Drainage ditches at public roads and railroads	60	48
All other land	48	36

[1] For waterbody crossings that are crossed by the HDD method, the depth of cover will be a minimum of 25 feet.

The components of a cathodic protection system include:

- Rectifiers;
- Anode ground beds;
- Conductive material; and
- Test leads.

Cathodic protection uses a rectifier to convert alternating current power to direct current power. The rectifier output is electrically connected to the pipe on one side and, on the other side, to anodes (metal rods). The rectifier is usually sited adjacent to existing power lines in the area. Anodes are buried in groups (referred to as ground beds) along the pipeline and are backfilled with a carbon-based conductive material to improve their effectiveness. As the electric current flows from the pipeline through the rectifier to the anode bed the pipe is protected from corrosion.

The distance between rectifier units depends on the current requirements of the system. Current requirements are based on different soil types. Typically, a rectifier and anode ground bed can protect 40 or more miles of pipeline from a single location. Rectifier and anode ground bed equipment are located at facility sites, such as pump stations or valve sites.

The effectiveness of the cathodic protection system is measured using test leads. Test leads attached to the pipe allow the cathodic protection system to be checked on a regular basis. These test leads are located at approximately two-mile intervals, brought to the surface via wires, and attached to a supporting post.

6.7 Spill Prevention and Contingency Plan

Spill prevention and containment applies to the use and management of hazardous materials on the construction ROW and ancillary areas during construction. This includes the refueling or servicing of equipment with diesel fuel, gasoline, lubricating oils, grease, hydraulic, and other fluids during normal upland applications and special applications within 500 feet of perennial streams or wetlands. However, pumps used for hydrostatic testing and water use from the Missouri River will be required to be closer than 500 feet to the waters edge. They will be fully contained in secondary containment.Keystone has committed to measures outlined in Chapter 3.0 of the BLM-Specific CMRP, which will be implemented in the various states in compliance with 40 CFR Part 112 (for oil spills) and corresponding state regulations (including NPDES requirements for spills of other substances that may occur during construction activities).

On federal lands, refueling and lubricating of most construction equipment will be restricted to upland areas at least 500 feet away from the edge of waterbodies and wetlands. In a few unavoidable cases, such as for pumps or directional drill equipment located within or near a waterbody or wetland, refueling will be completed within or near a waterbody or wetland. In these situations, the specific measures identified in the SPCC Plan portion of the BLM-Specific CMRP will be followed.

Fuels and lubricants will be stored in designated areas and in appropriate service vehicles. Whenever possible, storage sites for fuels, other petroleum products, chemicals, and hazardous materials, including wastes, will be located in uplands or at least 500 feet from waterbodies and wetlands.

6.8 Snow Removal

Winter construction is not currently planned. Should winter construction, and consequently, snow removal, become necessary, Keystone will amend the BLM-Specific CMRP and POD with information pertaining to methods and ROW requirements for snow removal.

6.9 Fire Prevention Plan

Measures that will be implemented for fire prevention and suppression are described in detail in Section 2.16 of the BLM-Specific CMRP (Appendix C) and Keystone's Fire Prevention and Suppression Plan (Appendix H). At a minimum, Keystone will ensure that the construction contractors comply with those measures identified in Appendix H, as well as federal, state, county, and local fire regulations pertaining to burning permits and the prevention of uncontrolled fires. In addition to mitigation measures listed in Appendix H, Keystone also will ensure:

- All combustible material will be cleared for a minimum of a 10-foot radius around locations where welding activities will occur.
- Personnel will be on-site during manual above-ground welding activities, and for a minimum of two hours after manual above-ground welding activities have ceased to suppress any potential fires. Keystone will ensure these personnel have adequate ability to communicate with off-site emergency personnel.
- The project-specific Fire Prevention Plan prepared by Keystone will be approved by BLM prior to commencing construction.

7.0 Resource Concerns During Construction

The discussion in this section is specific to construction impacts on federal lands; however, these issues will occur throughout the Project area. For a discussion of Project-wide impacts, see the FEIS issued in August 2011, the FSEIS released in January 2014 and SEIS issued in December 2019.

Assumptions

For the purposes of this analysis, the following assumptions were made:

1. The Project's construction, operation, reclamation methods, and environmental protection measures contained in the BLM-Specific CMRP will be implemented on federal land along with BLM ROW Grant stipulations.
2. Keystone will acquire necessary federal, state, and local permits and approvals to construct and operate the Project (not including power lines, which will be constructed and operated by power providers), regardless of whether these permits and approvals are listed.

Guidelines

Activities in the Construction Phase include surface-disturbing activities necessary to construct the pipeline, valves, and permanent access roads so that the pipeline system can be placed into service. It also includes reclamation activities for areas where the surface is disturbed.

For impacted resources, unless specific exceptions are stated, short-term impacts are those that will occur over a five-year period or less, while long-term impacts are those that exceed five years.

Keystone's committed environmental protection measures included in the BLM-Specific CMRP (Appendix C) were used to evaluate environmental impacts.

7.1 Air Resources

7.1.1 Air Quality Regulation Applicability to Project Facilities on Federal Lands

Construction of the Project will result in intermittent and short-term emissions. These emissions will include fugitive dust from soil disruption, as well as combustion emissions from construction equipment and construction worker commuter vehicles. Mobile sources of emissions are the construction equipment and vehicles to be used during construction of the pipeline, pump stations, and other ancillary facilities. Fugitive sources of emissions during construction will include particulate emissions from paved and unpaved roadways, particulate emissions from soil disturbance during construction activities, and fugitive tailpipe emissions from the operation of earthmoving and other heavy equipment and commuter vehicles.

The quantity of fugitive dust emissions will depend on the moisture content and texture of the soils that will be disturbed, along with the frequency and duration of precipitation events. The majority of pipeline construction activities will pass by a specific location within a 30-day period; therefore, fugitive dust emissions during construction will be restricted to the brief construction period along each segment of the Project route, with construction impacts diminishing once construction activities end and after disturbed areas are reclaimed. Fugitive particulate emissions from roadways consist of heavier particles and tend to settle out of the atmosphere within a few hundred yards. Fugitive particulate emissions will be limited to the immediate vicinity of the Project and the surrounding region will not be significantly impacted. If dust control plans are required by the BLM, they will be filed prior to land disturbance activities.

Construction equipment exhaust will result in temporary increases in combustion emissions and local airborne particulate matter concentrations. The combustion emissions from construction equipment will be minimized because the engines are manufactured to meet federal standards for mobile sources established by the U.S. Environmental Protection Agency (USEPA) mobile source emissions regulations (40 CFR 85).

Beginning in 2010, the USEPA required the sulfur content of non-road diesel to be reduced to 15 parts per million by weight (ppmw) to reduce sulfur dioxide and particulate emissions from diesel combustion. USEPA's diesel program standards require that highway diesel fuel supplied to the market must be ultra-low sulfur diesel (ULSD) and highway diesel vehicles must be able to operate using ULSD.

Dust suppression techniques may be used in construction zones near residential and commercial areas to mitigate the impacts of fugitive dust emissions in sensitive areas. Local ordinances on open burning will be followed. Both of these impacts will be temporary and so impacts to local or regional air quality is expected to be minor. Measures which will be implemented are described in detail in Appendix C of this POD.

Mitigating measures for dust control available for the construction activities include:

- Proper maintenance of construction equipment;
- Watering of the construction sites (or use of other tackifier such as magnesium chloride) for fugitive dust control, if necessary; and
- Minimizing soil disturbance to areas necessary for construction.

Local ordinances on open burning will be followed, with appropriate burn permits being acquired prior to conducting such activities.

7.1.2 Climate

This section discusses the regional climate and meteorological conditions that influence transport and dispersion of air pollutants and discusses the existing levels of criteria air pollutants in the Project region as they pertain to federal lands crossed by the Project.

The project area is located within the humid continental climate that is found over great expanses in the temperate regions of the mid-latitudes. The humid continental climate is noted for its variable weather patterns and its large temperature range due to its interior location in mid-latitude continents. This climate lies in the boundary zone between many different air masses, principally polar and tropical. Polar-type air masses collide with tropical type air masses causing uplift of the less dense and moister tropical air resulting in precipitation. These huge systems generally work their way across the surface from west to east, embedded in the dominant wind flow of the westerly wind belt.

During the winter, the polar high expands in area to influence the northern portion of the continental humid climate. Cold temperatures occur during winter when continental arctic air masses sweep into the region. Otherwise, continental polar air masses dominate for much of the winter. Precipitation in the humid continental climate occurs only with invasions of maritime tropical air. A noticeable decrease and seasonality to the precipitation occurs as distance from the Gulf of Mexico increases.

The cool summer subtype of the humid continental climate in North America is found throughout much of the Great Lakes region and upper Midwest extending into south central Canada. This is the region in which the Project crosses federal lands. Most of its precipitation falls in the summer. However, this region receives less precipitation than warmer summer subtypes due to colder temperatures and the associated lower humidity.

The climate data presented in Table 7-1 are representative of the region where pipeline construction emissions could impact air quality on federally managed lands. Historical climate data from meteorological stations along the pipeline route for Circle, Montana, and Midland, South Dakota, are included.

7.2 Noise

The existing noise environment is characterized by determining ambient noise levels, identifying existing noise sources, identifying noise sensitive receptors in the vicinity of project noise sources, and evaluating local terrain features that may affect noise transmission.

During construction, Keystone will be required to comply with any applicable local construction noise requirements. Construction activities will normally be limited to daylight hours. Nighttime noise levels will normally be unaffected by construction activities.

The Project will be constructed primarily in rural agricultural areas. It is estimated that day-night average levels (L_{dn})[4] on the A-weighted scale (dBA)[5] range between 40 dBA (rural residential) and 45 dBA (agricultural cropland) (USEPA 1978). Ambient (background) noise levels occur from roadway traffic, farm machinery on a seasonal basis, pets, and various other household noises. Project areas along major highways and interstates may experience higher ambient noise levels of approximately 68 to 80 dBA (USEPA 1978).

7.3 Geology Resources

The Project is located in the Great Plains physiographic province (Fenneman 1928). Federal lands affected by the Project are within two major sections of the Great Plains: The Glaciated Missouri Plateau and the Unglaciated Missouri Plateau (Figures 7-1 and 7-2). The Missouri Plateau is essentially a dissected plateau characterized by badlands, buttes, mesas, and exhumed mountain ranges such as the Black Hills. The proposed route is in the Glaciated Missouri Plateau from the U.S.-Canada border to near Circle, Montana, where it crosses the Unglaciated Missouri Plateau through South Dakota. The glaciated area generally is of low relief compared with the unglaciated area, which has a greater variety of landforms (Trimble 1980).

The Glaciated Missouri Plateau is covered by glacial deposits, but the boundary between the glaciated and unglaciated sections is not distinct because the glacial deposits thin gradually. Elevations along the proposed route where it intersects federal lands vary from 3,000 feet above mean sea level (amsl) in the northern and southeastern parts of the Project area to approximately 2,000 feet amsl at the Missouri River.

The surficial deposits in Montana primarily are composed of Quaternary alluvium, colluvium and glacial till. In South Dakota, surficial deposits include alluvial terraces and eolian deposits (sand dunes). The alluvium primarily occurs in modern channels and floodplains but is also present in older river terraces or in glacial deposits.

The bedrock geology consists of Upper Cretaceous and Tertiary rocks. Table 7-2 provides a description of the bedrock units crossed by the proposed route. The Claggett Shale and the Bearpaw Shale were deposited under marine conditions and the Judith River Formation was deposited under marine to marginal marine conditions (Condon 2000). The Fox Hills Formation is a marginal marine sandstone that has widespread distribution throughout the Northern Rocky Mountain basins from northeast Colorado to Montana. Overlying the Fox Hills Formation is the Hell Creek Formation, which was deposited under non-marine conditions in depositional environments of river channels, floodplains, and lakes.

The Tertiary section is primarily represented by various members of the Fort Union Formation, which was deposited under non-marine conditions similar to the Hell Creek Formation in river channels, floodplains, and lakes. Both the Hell Creek and Fort Union Formations appear to have been sourced by uplift and erosion of the emerging Rocky Mountains to the west and south of the Project area (McDonald 1971). The Flaxville Formation is thought to be Miocene in age and was deposited by braided streams sourced to the west and southwest (Leckie 2006)

[4] L_{dn} is the A-weighted equivalent sound level for a 24-hour period with 10 decibels added to nighttime sounds to adjust for increased sensitivity to noise at night.

[5] The A-weighted scale adjusts for the sensitivity of the human ear to different sound frequencies.

Table 7-1 Climate Data in the Vicinity of Federal Lands Crossed by the Project													
Location/Precipitation Type	**Monthly Average**												
Circle, Montana Location[1]	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Average Max. Temperature (°F)	26.2	32.7	43.6	57.8	68.5	78.0	86.9	85.8	73.8	59.7	42.3	29.7	57.1
Average Min. Temperature (°F)	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
Average Total Precipitation (in.)	0.5	0.3	0.6	1.3	2.2	2.6	1.9	1.3	1.3	0.8	0.4	0.4	13.55
Average Total Snow Fall (in.)	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
Average Snow Depth (in.)	4	4	1	0	0	0	0	0	0	0	0	2	1
Midland, South Dakota Location[2]	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Average Max. Temperature (°F)	34.3	38.3	47.9	61.0	71.3	80.4	88.7	88.0	77.6	62.5	46.5	34.7	60.9
Average Min. Temperature (°F)	10.0	14.1	23.0	33.8	45.4	54.9	61.2	58.8	47.8	34.5	21.0	10.6	34.6
Average Total Precipitation (in.)	0.01	0.02	0.04	0.08	0.09	0.11	0.08	0.06	0.04	0.05	0.02	0.02	0.05
Average Total Snow Fall (in.)	0.2	0.2	0.3	0.2	0.0	0	0	0	0	0.0	0.2	0.2	0.1
Average Snow Depth (in.)	2.2	2.7	1.7	0.4	0	0	0	0	0	0	0.4	1.8	0.4

[1] Source: Western Regional Climate Center (WRCC), Circle, Montana, Station 241758, http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?mt1758

[2] Source:–High Plains Regional Climate Center (HPRCC), Midland, South Dakota, Station 395891, http://hprcc.unl.edu/index.php

Major structural features crossed by the proposed route include the Williston Basin, the Sioux Arch or Ridge, and the Salina Basin (Figure 7-2). The entire route crosses the western fringe of the Williston Basin, a major structural basin that covers northeast Montana, most of North Dakota, and northwest South Dakota (Peterson and McCary 1987). The majority of the federal lands affected by the Project are within the Williston Basin. The Williston Basin also extends north into Saskatchewan and Manitoba in southern Canada. The basin contains approximately 15,000 feet of Paleozoic through Tertiary sedimentary rock. The center of the basin is located in western North Dakota and, in the Project area, the rocks dip gently towards the east and northeast. Other major structural features crossed by the proposed route in areas intersected by federal lands include the Hinsdale, Weldon-Brockton, and Poplar Fault Zones or Lineaments and the Cedar Creek Anticline. The fault zones or lineaments extend into the Precambrian basement (ancient rocks that lie beneath the sedimentary rock section). These fault zones are thought to have influenced sedimentation patterns in the basin but are not thought to be active at present (Fischer 2005). The Cedar Creek Anticline is a northwest to southeast trending anticlinal structure in southeastern Montana that extends into the southwestern corner of North Dakota and the northwestern corner of South Dakota (Clement 1987). The structure is approximately 145 miles long and approximately 6 to 20 miles wide. The Project is located on the southwest flank of the structure and generally parallels the strike of the anticline.

7.3.1 Mineral Resources

The major energy mineral resources that potentially occur on federal lands in the Project area in Montana are oil, natural gas, and coal (Montana Bureau of Mines and Geology 1963). Uranium deposits are present, but do not represent a significant resource. The major non-fuel mineral resources are sand, gravel, and bentonite (Montana Bureau of Mines and Geology/U.S. Geological Survey [USGS] 2004; Kennedy 1990,). The Williston Basin (Figure 7-2) is a major oil and gas producing basin. In the U.S. portion of the basin, total production averaged 1.2 million barrels of oil per day and averaged 17.8 million cubic feet of gas per day (Montana Board of Oil and Gas 2015; North Dakota Industrial Commission 2016). Recent technological advances in oil production and recovery reversed oil production declines experienced in the 1990s. The recently tapped Bakken Formation has an estimated mean technically recoverable resource of 3.7 billion barrels of oil and 1.9 trillion cubic feet of gas (USGS 2008a). The pipeline route crosses a relatively low number of oil and gas producing areas since the route lies on the western edge of the basin. However, the proposed route passes through the Buffalo Field in Harding County on private lands. One well, a plugged and abandoned well on private lands in Valley County, was identified within 1,320 feet of the proposed ROW on federal lands. This well was located within 1,000 feet of the ROW on federal lands, at approximately MP 36.

Table 7-2 Summary of Paleontological Sensitivities of Geologic Units Underlying the Proposed Route on Federal Lands

Geologic Formation (Fm)/Deposit (Map Symbol)	Period	Description	BLM Potential Fossil Yield Classification System (PFYC) Class/Types of Fossils	Start Milepost	Miles Crossed
Alluvium/colluvium (Qal, Qac), landslides (Qls), sand and gravel (Tsg), and other unconsolidated deposits (e.g., sand dunes)	Tertiary – Quaternary	Sand, gravel and clay	Class 2/Holocene-age deposits contain the unfossilized remains of modern taxa and are too young to contain fossils. Pleistocene-age deposits may contain mineralized or partially mineralized bones, invertebrates, and plants. Fossil mammals are known from sediments thought to be of equivalent	25.07	0.04
				34.11	0.70
				35.21	0.44
				37.81	0.08
				38.78	0.08
				47.88	0.15
				51.24	0.20
				52.30	0.22
				53.39	0.16

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Geologic Formation (Fm)/Deposit (Map Symbol)	**Period**	**Description**	**BLM Potential Fossil Yield Classification System (PFYC) Class/Types of Fossils**	**Start Milepost**	**Miles Crossed**
			age and source to the Tertiary deposits; however, no fossils have been found in these deposits.	55.56	0.23
				59.42	0.12
				59.86	0.11
				67.88	0.11
				89.79	0.88
				90.88	0.52
Ludlow Member of Fort Union Fm. (Tfld)	Tertiary - Paleocene	Primarily sandstone, siltstone, mudstone, carbonaceous shale and lignite/uraniferous lignite, up to 460 feet thick.	Class 5/Plants, invertebrates, vertebrates (fish, amphibians, reptiles, birds, mammals).	249.29	0.71
				256.43	0.12
				256.79	0.08
				275.58	0.02
Tongue River Member of Fort Union Fm. (Tftr)	Tertiary - Paleocene	Poorly cemented sandstone interbedded with siltstone and mudstone and coal. Some coals have burned to form “clinker beds”. Commonly eroded to badland topography. Thickness 400 to 650 feet.	Class 5/Plants, invertebrates, vertebrates (fish, amphibians, reptiles, birds, mammals)	130.20	0.19
				211.30	0.65
				212.55	0.70
				213.33	6.94
				231.74	0.63
				233.24	0.60
				239.68	0.19
Lebo Member of Fort Union Fm. (Tfle)	Tertiary - Paleocene	Sandstone, siltstone, and mudstone interbedded with carbonaceous shale. Forms rolling hills. Thickness 180 to 300 feet.	Class 5/Invertebrates (mollusks), vertebrates (mammals).	120.82	0.21
				129.90	0.30
Tullock Member of Fort Union Fm. (Tft)	Tertiary-Paleocene	Sandstone, claystone, and carbonaceous shale and thin isolated coal beds. Thickness 200 to 300 feet.	Class 5/Plants, Invertebrates, and vertebrates (fish, amphibians, reptiles, birds, mammals).	107.35	0.25
				107.93	0.10
				117.60	0.27
				118.74	0.10
				120.14	0.53
				127.58	0.03
Hell Creek Fm (Khc)	Upper Cretaceous	Shale, sandy shale, mudstone, lenticular sandstone and coal beds. Forms badland topography. Contact with underlying Fox Hills Fm. is gradational and sometimes not	Class 5/Large numbers of plants and terrestrial vertebrates (fish, reptiles, mammals, dinosaurs), invertebrates (mollusks), and plants. Fossil fauna and flora are well preserved and diverse.	92.42	0.07
				92.52	0.60
				93.88	0.60
				94.60	0.05
				94.91	0.45
				95.43	0.04

Table 7-2 Summary of Paleontological Sensitivities of Geologic Units Underlying the Proposed Route on Federal Lands					
Geologic Formation (Fm)/Deposit (Map Symbol)	**Period**	**Description**	**BLM Potential Fossil Yield Classification System (PFYC) Class/Types of Fossils**	**Start Milepost**	**Miles Crossed**
		distinguishable. Thickness 300to 400 feet.		96.40	0.71
				99.76	0.32
				104.22	0.27
				108.03	0.12
				109.85	0.65
				111.20	0.09
				112.47	0.63
				115.95	0.67
				117.17	0.43
				256.74	0.05
				256.87	0.11
				275.10	0.48
Fox Hills Fm (Kfh)	Upper Cretaceous	Typically, siltstone that grades to a fine-grained sandstone. The Fox Hills Formation overlies the Pierre or Bearpaw, depending on the geographic location of the exposure. Generally, thickness ranges from 150 to 300 feet.	Class 3/ Fox Hills Formation, which although not particularly fossiliferous does contain some exceptional leaf impressions. Trace fossils, invertebrates, and fish remains have also been reported.	91.39	0.37
				91.83	0.07
				91.96	0.09
				92.10	0.02
				92.14	0.28
				94.48	0.12
				94.65	0.26
				95.36	0.07
				95.47	0.06
				95.84	0.57
earpaw Fm./Pierre Shale (Kb/Kp)	Upper Cretaceous	Bentonitic mudstone and shale with fossiliferous concretions containing. Thickness 1,100 feet or more. The Pierre shale is the eastern equivalent to the Claggett, Judith River, and Bearpaw Fms.	Class 3/ Invertebrates (mollusks, ammonites) are very common, marine vertebrates (plesiosaurs, mosasaurs, turtles) are less common and terrestrial vertebrates (dinosaurs) are uncommon.	0.00	0.93
				6.03	0.23
				9.20	0.54
				11.40	0.93
				13.06	0.72
				15.38	0.04
				21.31	0.36
				32.62	0.98
				33.60	0.50
				34.80	0.04
				35.65	0.19
				36.17	0.49
				45.84	1.13

Table 7-2 Summary of Paleontological Sensitivities of Geologic Units Underlying the Proposed Route on Federal Lands

Geologic Formation (Fm)/Deposit (Map Symbol)	Period	Description	BLM Potential Fossil Yield Classification System (PFYC) Class/Types of Fossils	Start Milepost	Miles Crossed
				47.73	0.15
				48.03	0.46
				49.95	1.29
				51.44	0.86
				52.52	0.44
				53.39	0.00
				53.55	0.94
				54.71	0.51
				55.79	0.40
				56.82	0.04
				57.19	0.34
				58.31	1.11
				59.54	0.33
				59.97	1.67
				62.49	0.38
				63.67	0.71
				65.26	0.49
				66.98	0.91
				67.99	0.38
				90.67	0.21
				91.76	0.07
				91.90	0.06
				92.05	0.05
				92.12	0.02
Judith River Fm. (Kjr)	Upper Cretaceous	Sandstone, siltstone, mudstone, shale, and coal or lignite. Thickness up to 600 feet.	Class 5/ Contains a variety of vertebrate fossils including fish, turtles, crocodiles, dinosaurs, and mammals. Also invertebrates and plants.	2.47	0.17
				24.99	0.09
				28.84	0.03
				35.83	0.34
				37.07	0.27
				37.68	0.13
				37.89	0.89
				42.57	0.59

[1]Classification based on description in BLM (2006).

Sources: Bergantino (1999, 2001, 2003); BLM (1992; 2006); Condon (2000); Gill and Cobban (1966); SWCA (2008); Vuke and Colton (2003); Vuke et al. (2003, 2001); Wilde and Bergantino (2004); and Wilde and Smith (2003a,b).

Table 7-2 Summary of Paleontological Sensitivities of Geologic Units Underlying the Proposed Route on Federal Lands					
Geologic Formation (Fm)/Deposit (Map Symbol)	**Period**	**Description**	**BLM Potential Fossil Yield Classification System (PFYC) Class/Types of Fossils**	**Start Milepost**	**Miles Crossed**

The pipeline route crosses the Fort Union Coal region from just south of the Missouri River to the northwest corner of South Dakota (Averitt 1963). The coal in the Fort Union Formation generally is lignite in the Project area. The proposed route crosses approximately two miles of the coal-bearing Ludlow Member of the Fort Union Formation, and limited coals in the Hell Creek Formation. Based on today's economics, potential for the development of mines in the state is low (Erickson 1956). To the southwest of the proposed route in the

Powder River Basin, the coal becomes progressively higher rank to sub-bituminous and is mined extensively in that area of Montana as well as northeast Wyoming.

No lignite mines are present along the proposed route. In southeastern Montana, uranium-bearing lignites have been found in the Fort Union Formation (Weissenborn and Weiss 1963). While some fairly high-grade deposits have been identified in northeast Fallon County and northern Carter County, the proposed route does not intersect identified deposits in these counties. In northwest South Dakota, uranium-bearing lignites are present in the Fort Union Formation in an area called the Cave Hills (Pipiringos et al. 1965). Lignites were mined in the 1950s and 1960s at South Cave Hills, North Cave Hills, and Slim Buttes, but no mining has taken place since 1964 (Stone et al. 2006). The proposed route does not cross mined out areas. The mining method used was to strip off the overburden to obtain access to the lignite. The mined areas were not reclaimed and as a result, sediment-bearing runoff deposited spoil material in drainages immediately adjacent to the buttes where mining took place. Bentonite, a clay derived from layers of volcanic ash, is present in mineable quantities in the Bearpaw Shale, and in other upper Cretaceous and Tertiary formations. Bentonite has a variety of uses and is commonly used as a major constituent of drilling fluids and as a moisture absorbent. In the Project area, bentonite was mined in an area known as the Chinook-Malta-Glasgow bentonite district (Kennedy 1990). There are a number of abandoned pits in the Glasgow-Malta area. Bentonite was mined and processed southeast of Glasgow beginning in 1976 (BLM 1992). The processing plant was shut down in 1979, but mining continued until 1985. According to the BLM, the bentonite claims have been abandoned. As of 2004, there was no bentonite mining in the area (Montana Bureau of Mines and Geology/USGS 2004).

Aggregate production occurs from local deposits in floodplains and glacial deposits. Sand and gravel deposits have been identified to the east of the proposed route in glacial sediments in the Fort Peck Indian Reservation and areas to the north (Weis 1963). Gravel deposits are present on private lands along the Yellowstone River where the route crosses the river. The proposed route does not cross aggregate mining operations. It is anticipated that the pipeline trench will be backfilled with materials derived from the trench excavation. It might be necessary to obtain construction sand and gravel from local commercial sources for use as pipe padding, road base, or surface facility pads. These uses for sand and gravel will not substantially affect the long-term availability of construction materials in the area.Construction will have very minor and short-term impact on current mineral extraction activities due to the temporary and localized nature of pipeline construction activities. One plugged and abandoned oil and gas well was identified on private lands close to the Project construction ROW on federal lands. Construction activities could impact abandoned wells since construction could remove existing abandoned well markers and damage near-surface cement plugs. Because both oil and gas are typically produced from depths of more than 1,000 feet, construction of the pipeline is not expected to affect the oil and natural gas producing formations. Because of required notification and surveys to locate underground facilities, construction-related impacts will be limited to surface or near-surface components of area wells and gathering systems, which will temporarily disrupt production until repairs are made. Prior to construction, Keystone will verify the exact locations of active, shut-in, and abandoned wells

and any associated underground pipelines in the construction ROW and take appropriate precautions to protect the integrity of such facilities. Keystone also will abide by utility locate rules in each state and conduct due diligence to identify and contact oil and gas well operators and pipeline gathering system owners prior to construction activities.

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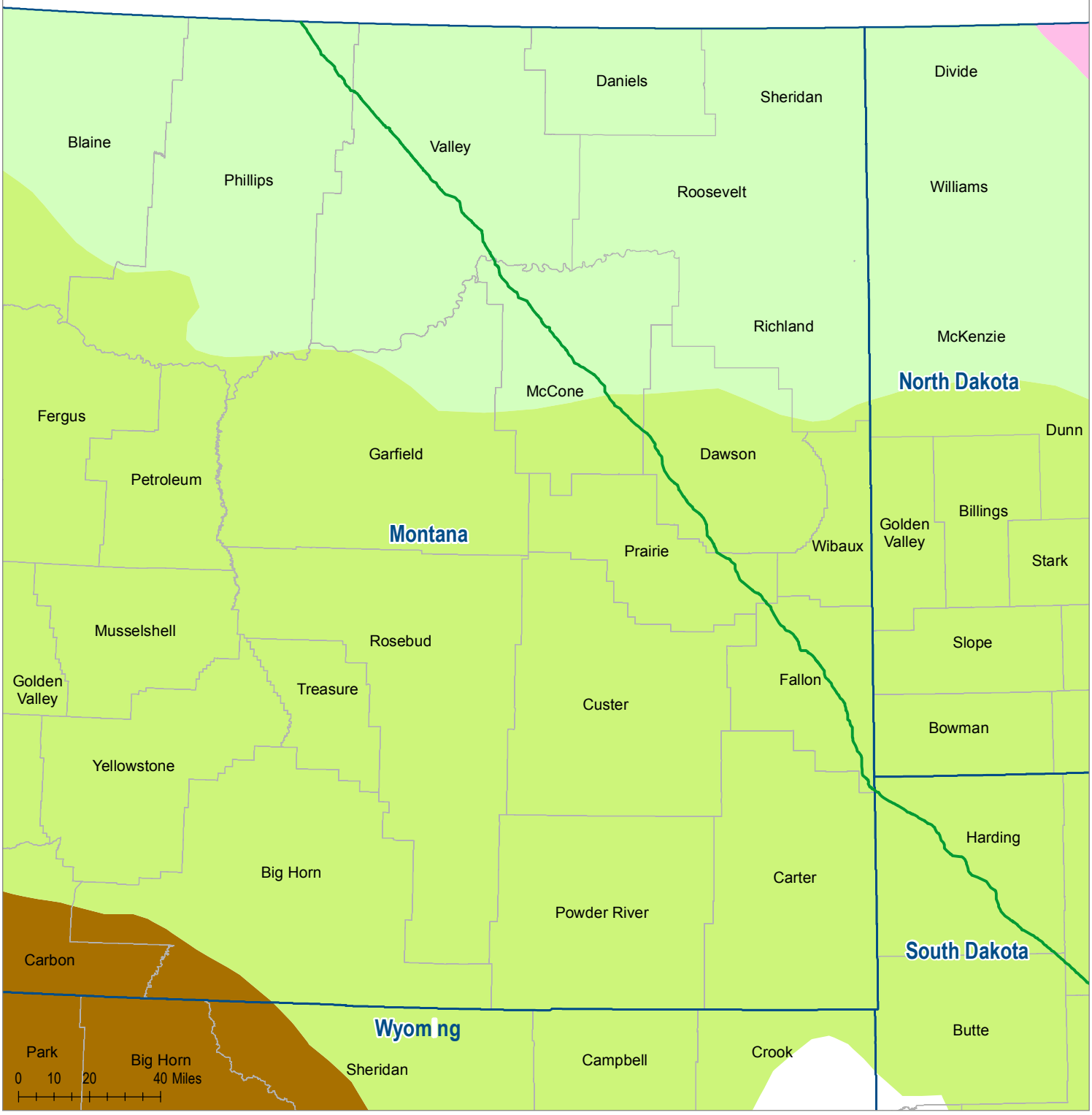
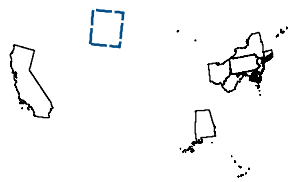


VICINITY MAP



LEGEND

- KEYSTONE XL PROJECT
- STATE BOUNDARY
- COUNTY BOUNDARY

PHYSIOGRAPHIC SECTIONS

GREAT PLAINS PROVINCE

- MISSOURI PLATEAU, GLACIATED
- MISSOURI PLATEAU, UNGLACIATED

ROCKY MOUNTAIN PROVINCE

- MIDDLE ROCKY MOUNTAINS

CENTRAL LOWLANDS PROVINCE

- WESTERN LAKE

KEYSTONE XL PROJECT

FIGURE 7-1

PHYSIOGRAPHIC REGIONS OF EASTERN MONTANA

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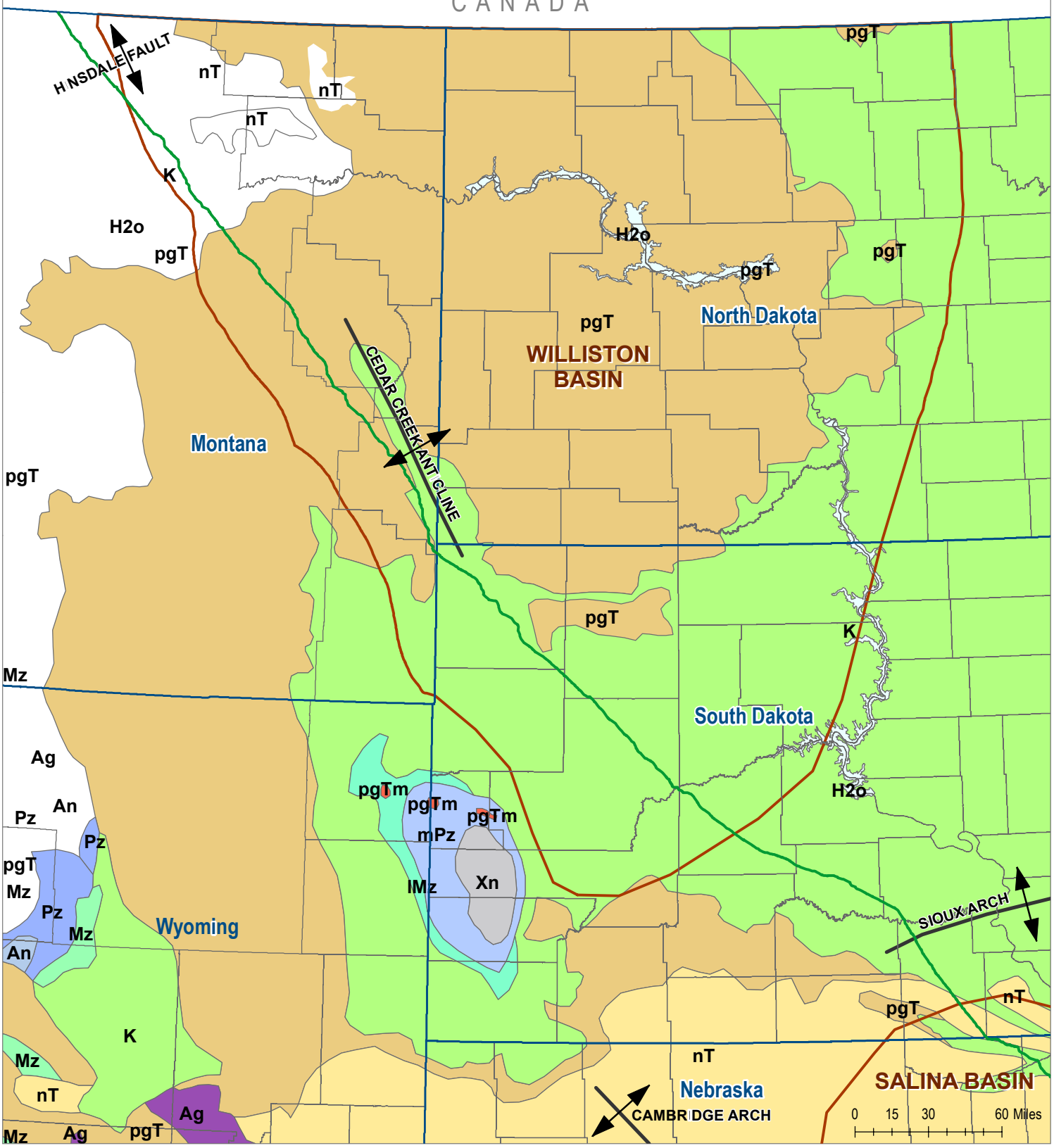
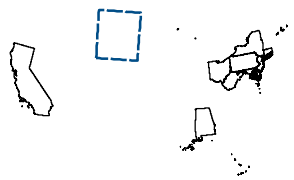


VICINITY MAP



LEGEND

- KEYSTONE XL PROJECT
- ANTICLINE
- BASIN
- NT - NEOGENE SEDIMENTARY ROCKS
- PGT - PALEOGENE SEDIMENTARY ROCKS
- PGTM - PALEOGENE MAFIC ROCKS
- K - CRETACEOUS SEDIMENTARY ROCKS
- LMZ - LOWER MESOZOIC (TRIASSIC AND JURASSIC) SEDIMENTARY ROCKS
- MZ - MESOZOIC SEDIMENTARY ROCKS
- MPZ - MIDDLE PALEOZOIC (SILURIAN, DEVONIAN, AND MISSISSIPPIAN) SEDIMENTARY ROCKS
- PZ - PALEOZOIC SEDIMENTARY ROCKS
- XN - EARLY PROTEROZOIC GNEISS
- AN - ARCHEAN GNEISS
- AG - ARCHEAN GRANITIC ROCKS
- H2O - WATER BODY

KEYSTONE XL PROJECT

FIGURE 7-2

GENERAL GEOLOGY

TC Energy

7.3.2 Seismic Hazards

The intensity and frequency of seismic events (seismicity) determines the relative chance of seismic hazard occurrences. The physical manifestations of seismic hazards are faults and ground motion. The following describes the potential for seismic hazard occurrences in the Project area.

Faults are dislocations where blocks of earth material on opposite sides of the faults have moved in relation to one another. Rapid slippage of blocks of earth past each other can cause energy to be released, resulting in an earthquake. The Weldon-Brockton fault zone or lineament has surface expression in the Brockton-Froid Fault that has been defined as Late Quaternary in age (Figure 7-2) (USGS and Montana Bureau of Mines and Geology 2006). Late Quaternary means that movement occurred in the last 300,000 years. The fault was mapped on-trend with the Weldon-Brockton lineament approximately 50 miles east of the proposed route in Roosevelt County, just north of Culbertson, Montana. The fault was mapped on the basis of surface features, shallow auger holes, and evidence obtained from oil and gas exploration data (Wheeler 1999). There is an indication of offset in older strata, but no evidence that would lead to a conclusion of movement on the fault in the last 10,000 years. An active fault is one in which movement can be demonstrated to have taken place within the last 10,000 years (USGS 2008b). Some researchers think the feature is not a fault, but an erosion feature in the glacial deposits that cover the area.

Seismicity concerns the intensity, frequency, and location of earthquakes in a given area. Eastern Montana and northwestern South Dakota historically have little earthquake activity (USGS 2008b, c, d). From 1973 to 2007, east of longitude 110 degrees west to the Montana state line, there were 14 earthquakes; seven were not assigned magnitudes. The other seven had magnitudes of 4.1 or less. During the same period, 30 earthquakes were recorded in South Dakota, the strongest being 4.2 in magnitude. There are no recorded epicenters from 1973 to present along the proposed route.

Ground motion hazards result when the energy from an earthquake is propagated through the ground. The USGS ground motion hazard mapping indicates that potential ground motion hazard in the Project area is low. The hazard map estimates peak ground acceleration expressed as a percentage of the acceleration of gravity with a two percent probability of exceedance in 50 years (Frankel et al. 1997; Peterson et al. 2008).

7.3.3 Landslides

Landslide is a term used for various processes involving the movement of earth material down slopes (USGS 2004). Landslides can occur in a number of different ways in different geological settings. Large masses of earth become unstable and gravity pulls them downhill. The instability can be caused by a combination of steep slopes, periods of high precipitation, undermining of support by natural processes (stream erosion), or unintentional undercutting or undermining the strength of unstable materials in the construction of roads and structures.

Cretaceous and Tertiary rocks in the Missouri River Plateau have high clay content and upon weathering can be susceptible to instability in the form of slumps and earth flows. Landslide potential is enhanced on steeper slopes. Formations that are especially susceptible are the Cretaceous-aged Hell Creek, Claggett, Bearpaw Shales, and shales in the Tertiary Fort Union Formation (Radbruch-Hall et al. 1982). These shale units can contain appreciable amounts of bentonite, a rock made up of montmorillonite clay that has deleterious properties when exposed to moisture.

The Project is located in areas of varying landslide susceptibility and recorded incidence (Table 7-3). Landslide susceptibility “refers to the likelihood of a landslide occurring in an area on the basis of terrain conditions,” but does not take into account the probability of occurrence (National Research Council 2004). Incidence is based on the percentage of area involved in movement (low: less than 1.5 percent; moderate: 1.5 to 15 percent, and high: more than 15 percent) (Radbruch-Hall et al. 1982).

Of particular concern for slope stability in Montana are Cretaceous shales present on slopes greater than 15 percent (MDEQ 2004). In the Project area, steeper slopes occur along the Missouri River Valley walls and larger tributaries (Radbruch-Hall et al. 1982). Landslides are documented at approximate MP 39 and between approximately MP 90 and MP 91.5. At both of these locations, slumps occurred at major drainages, Rock Creek and the south side of the Missouri River Valley, respectively (Bergantino 1999, 2002). Table 7-4 presents places on the proposed routes where slopes exceed 15 percent and are underlain by Cretaceous shale. These areas with steep slopes and underlain by Cretaceous shales may have more susceptibility to landslides than other areas. These areas with steep slopes that are underlain by Cretaceous shales may be more susceptible to landslides than other areas.

The main hazard of concern during construction of the pipeline will be from unintentional undercutting of slopes or construction on steep slopes resulting in instability that could lead to landslides. Other hazards may result from construction on Cretaceous shales that contain bentonite beds. The high swelling hazard may cause slope instability during periods of precipitation. When selecting the pipeline route, Keystone has attempted to minimize the number of steep slopes crossed by the pipeline. Special pipeline construction practices described in the BLM-Specific CMRP will minimize slope stability concerns during construction and reclamation.

Table 7-3 Landslide Incidence and Susceptibility on Federal Lands

Pipeline Segment (Approximate MPs)		Landslide Incidence	Landslide Susceptibility
Start MP	End MP		
0.00	0.93	Low	High
2.47	2.64		
6.03	6.26		
9.20	9.74		
11.40	12.33		
13.06	13.78		
15.38	15.42		
21.31	21.66		
24.99	25.11		
28.84	28.87		
32.62	34.84		
35.21	36.67		
37.07	37.34		
37.68	38.85		
42.57	43.16		
45.84	46.96		
47.73	48.49		
49.95	52.97		
53.39	54.48		
54.71	55.23		
55.56	56.19		
56.82	56.85		

Table 7-3 Landslide Incidence and Susceptibility on Federal Lands			
Pipeline Segment (Approximate MPs)		**Landslide Incidence**	**Landslide Susceptibility**
Start MP	**End MP**		
57.19	57.53		
58.31	61.64		
62.49	62.87		
63.67	64.38		
65.26	65.75		
66.98	68.37		
89.79	91.35	High	High
91.35	93.13	Moderate	High
93.88	95.54		
95.84	97.11		
99.76	100.08		
104.22	104.49		
107.35	107.61	Low	Low
107.93	108.15		
109.85	110.50		
111.20	111.29		
112.47	113.10		
115.95	116.63		
117.17	117.87		
118.74	118.83		
120.14	120.67		
120.82	121.03		
127.58	127.61		
129.90	130.39		
211.30	211.95		
212.55	213.25		
213.33	220.27		
231.74	232.37		
233.24	233.85		
239.68	239.86		
249.29	250.00		
256.43	256.55		
256.74	256.97		
275.10	275.60		

Table 7-4 Locations on Federal Lands in Montana with >15% Slopes Underlain by Cretaceous Shale			
County	**Start MP**	**End MP**	**Miles**
Phillips County	11.54	11.58	0.05
	11.59	11.60	0.01
	12.21	12.22	0.01
	13.65	13.69	0.04
	13.74	13.78	0.04
	24.99	25.05	0.06
Valley County	32.68	32.70	0.01
	33.73	33.78	0.04
	34.51	34.53	0.02
	34.83	34.84	0.01
	35.74	35.78	0.04
	35.94	35.96	0.02
	36.01	36.03	0.02
	37.68	37.72	0.04
	37.74	37.77	0.03
	37.85	37.89	0.04
	37.94	37.98	0.05
	38.00	38.00	0.00
	38.10	38.13	0.03
	38.62	38.75	0.13
	43.07	43.08	0.01
	43.12	43.13	0.01
	43.14	43.16	0.01
	46.27	46.30	0.03
	46.31	46.31	0.01
	46.32	46.35	0.03
	46.65	46.69	0.03
	46.69	46.74	0.05
	46.79	46.80	0.01
	46.83	46.84	0.02
	46.88	46.90	0.02
	48.28	48.34	0.07
	48.38	48.39	0.02
	48.43	48.49	0.05
	51.14	51.18	0.05
	51.39	51.40	0.02
	51.48	51.53	0.05

Table 7-4 Locations on Federal Lands in Montana with >15% Slopes Underlain by Cretaceous Shale			
County	**Start MP**	**End MP**	**Miles**
	51.63	51.66	0.03
	51.67	51.68	0.01
	52.49	52.52	0.03
	53.78	53.82	0.04
	53.84	53.88	0.04
	53.94	53.95	0.01
	53.98	54.03	0.05
	54.07	54.09	0.02
	55.09	55.12	0.03
	55.14	55.16	0.03
	55.19	55.22	0.03
	55.81	55.84	0.04
	56.00	56.00	0.00
	56.03	56.04	0.01
	56.10	56.14	0.04
	56.15	56.18	0.03
	57.41	57.43	0.02
McCone County	90.69	90.84	0.15
	90.87	90.88	0.00
	91.39	91.40	0.01
	91.43	91.50	0.06
	91.53	91.59	0.06
	91.62	91.72	0.10
	91.76	92.13	0.37
	92.21	92.23	0.02
	92.23	92.31	0.08
	92.41	92.45	0.04
	92.58	92.58	0.00
	92.66	92.67	0.02
	92.69	92.72	0.03
	92.74	92.75	0.01
	92.84	92.85	0.01
	92.88	92.89	0.01
	92.91	92.93	0.03
	93.07	93.13	0.05
	94.02	94.04	0.03
	94.18	94.22	0.04

Table 7-4 Locations on Federal Lands in Montana with >15% Slopes Underlain by Cretaceous Shale			
County	**Start MP**	**End MP**	**Miles**
	94.29	94.30	0.00
	94.37	94.39	0.01
	94.40	94.49	0.09
	94.56	94.60	0.04
	94.61	94.70	0.09
	94.72	94.86	0.15
	94.89	94.94	0.05
	94.99	95.00	0.01
	95.08	95.12	0.05
	95.17	95.18	0.01
	95.26	95.28	0.02
	95.30	95.32	0.02
	95.32	95.36	0.03
	95.39	95.44	0.05
	95.46	95.54	0.08
	95.84	95.92	0.09
	95.95	96.00	0.05
	96.02	96.03	0.01
	96.03	96.04	0.01
	96.06	96.12	0.06
	96.14	96.19	0.05
	96.26	96.35	0.09
	96.35	96.37	0.02
	96.38	96.43	0.05
	96.44	96.60	0.16
	96.62	96.67	0.06
	96.74	96.75	0.01
	96.92	96.98	0.05
	97.00	97.11	0.11
	99.76	99.81	0.05
	100.01	100.07	0.06
	104.44	104.49	0.05
	116.07	116.13	0.06
	116.29	116.33	0.05
Fallon County	275.10	275.11	0.01
	275.17	275.21	0.04

7.3.4 Subsidence

No ground subsidence or karst hazards are present in the vicinity of the proposed route on federal lands (National Atlas 2008).

7.3.5 Flooding

In general, seasonal flooding hazards exist where the pipeline route will cross rivers and streams, and flash flooding hazards exist where the pipeline will cross localized drainages. On federal lands, the pipeline route will cross one perennial stream, eight intermittent streams, six canals, 74 ephemeral drainages and two seasonal drainages, all of which are locations where seasonal or flash flooding could occur. No aboveground facilities are currently located in identified flood zones on federal lands. The stream and drainage crossings are listed in Table 7-6.

The effects of construction will include disturbances to the topography along the proposed ROW and at aboveground facilities due to grading and trenching activities. Upon completion of construction, Keystone will restore topographic contours and drainage patterns as closely as possible to the pre-construction condition. Keystone has committed to extending the burial depth under perennial streams a minimum of 15 feet on either side where lateral migration is a potential concern. Lateral migration studies will be completed prior to construction and extended burial depths will be depicted on the construction drawings.

7.3.6 Swelling Clays

The bentonite layers in the Claggett and Bearpaw Shales may present hazards associated with swelling clays (Olive et al. 1989). These formations are considered to have “high swelling potential.” Bentonite significantly expands in volume when wet. When bentonite layers are exposed to successive cycles of wetting and drying, they swell and shrink, and the soil fluctuates in volume and strength.

7.3.7 Blasting

Blasting potentially could adversely impact the geologic and physiographic environment. Limited blasting may be required in areas where shallow bedrock or boulders were encountered that cannot be removed by conventional excavation with a track hoe trencher, ripping with a bulldozer followed by track hoe excavation, or hammering with a track hoe-mounted hydraulic hammer followed by excavation. Blasting is not anticipated because the largely sandstone-composed formations can be disaggregated by using hydraulic hammers. In the event blasting is necessary, Keystone will prepare a blasting plan for the Project.

7.4 Paleontological Resources

The fossil potential of the various formations crossed by the Project on federal lands is provided in Table 7-2. In 2007, BLM adopted the Potential Fossil Yield Classification (PFYC) system – a predictive modeling tool for evaluating paleontological potential based on geologic mapping (BLM 2007). Keystone has applied the PFYC system to units within the Project area based on an analysis of existing data (BLM 1998, 2008). The Judith River, Hell Creek, and Fort Union formations are the most sensitive units within the project area (PFYC Class 5). The Judith River and Hell Creek formations have yielded scientifically significant remains of numerous dinosaurian taxa, as well as many other fossil vertebrates, invertebrates, and plants. In addition, fossil invertebrates and plants have been documented in the Fox Hills Formation (PFYC Class 3) within the project area (Lange 1967). However, because vertebrate fossils are comparatively uncommon, the Fox Hills Formation has moderate paleontological potential (PFYC Class 3). Concretions containing fossil invertebrates are locally common and well preserved, but rare. Vertebrate fossils are known from the Pierre and Bearpaw shales (PFYC Class 3) in the project area.

Paleontological surveys were conducted (see Appendix I) of areas underlain by units designated as PFYC classes 3, 4, and 5 (moderate to very high paleontological potential). During the 2008 through 2019 field surveys, 41 non-significant fossil occurrences were documented, and 19 significant fossil localities were discovered on federal lands. Significant fossil localities have been collected or avoided; no known significant localities will be impacted by the Project.

There is the potential for discovery of additional surface fossils and subsurface fossils during pipeline construction regardless of pre-construction surveys, especially in areas in Montana historically known to produce abundant fossils. Should any subsurface fossils be encountered during construction of the Project, Keystone will adhere a Paleontological Resources Mitigation Plan developed for the Project. An outline of the plan that will be implemented on federal lands is included in Appendix J. Adherence to the Paleontological Mitigation Plan will minimize adverse impacts to scientifically significant paleontological resources on federal lands, and the recovered fossils will be transferred to a BLM-approved paleontological curation facility for curation and permanent storage.

7.5 Soil Resources

Soils including prime farmland, hydric, highly erodible, low reclamation potential, droughty, and other important soil characteristics are described in further detail below.

Prime farmland soils are defined by the U.S. Department of Agriculture (USDA) as those that are best suited for food, feed, forage, fiber, and oilseed crops. These soils have properties that favor the economic production of sustained high yields of crops (USDA NRCS 2007). Prime farmland is represented by many soil associations and series and does not need to be actively cultivated to be classified as prime farmland. Any undeveloped land with high crop production potential can be included in this classification.

A hydric soil is defined by the USDA as soil that formed under conditions of saturation, flooding, or ponding for a long enough period during the growing season to develop anaerobic conditions in the upper part. These soils, under natural conditions, are either saturated or inundated for a sufficient period during the growing season to support the growth and reproduction of hydrophytic vegetation (USDA NRCS 2007).

Erosion is defined as the wearing away of the land surface by water, wind, ice, or other geologic events (USDA NRCS 2007).

Soil limitations for the potential of depth to bedrock within 60 inches of ground surface were obtained from the Soil Survey Geographic (SSURGO) database. The presence of bedrock in the top seven feet of soil (anticipated depth of pipeline trench) could result in a need for blasting during construction.

Successful reclamation and revegetation are important for maintaining productivity and to protect the underlying soil from potential damage, such as erosion.

Soil association drainage characteristics were obtained from the SSURGO database. These drainage characteristics refer to the frequency and duration of saturation or partial saturation under natural soil conditions. Seven natural soil drainage classes are recognized by the USDA: excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained (USDA NRCS 2007).

Grading and excavating for the pipeline and ancillary facilities will primarily disturb rangeland soils, as well as a small amount of agricultural, wetland, and forestland soils. Certain inherent soil characteristics influence the agricultural productivity and revegetation potential after disturbance. The major soil characteristics of concern on federal lands and the miles encountered of each type in each state are indicated in Table 7-5. The quantification of mileage for each of the characteristics is based on data in the SSURGO database. Appendix K includes a table of soil characteristics crossed by the Project centerline on federal lands. The description and types of soils crossed by the Project in Montana has not materially changed since issuance of the FEIS.

On land with soils that are compaction prone, soil compaction and rutting will likely result from the movement of heavy construction vehicles along the construction ROW and additional work spaces, and on temporary access roads. The degree of compaction will depend on the moisture content and texture of the soil at the time of construction. Compaction will be most severe where heavy equipment operates on moist to wet soils with high clay contents. Detrimental compaction also can occur on soils of various textures and moisture contents if multiple passes are made by high ground weight equipment. If soils are moist or wet where trenchline only topsoil trenching can occur, topsoil will likely adhere to tires and/or tracked vehicles and be carried away.

Typically, soils that are compaction prone also are prone to rutting or displacement when saturated. Rutting occurs when the soil strength is not sufficient to support the applied load from vehicle traffic. Rutting affects the surface hydrology of a site as well as the rooting environment. The process of rutting physically severs roots and reduces the aeration and infiltration of the soil, thereby degrading the rooting environment. Rutting also disrupts natural surface water hydrology by damming surface water flows, creating increased soil saturation upgradient from ruts, or by diverting and concentrating water flows creating accelerated erosion. In locations where grading and stockpiling of topsoil does not occur, rutting may mix thin topsoil with the subsoil, thereby reducing soil productivity. Rutting is most likely to occur on moist or wet fine-textured soils, but also may occur on dry sandy soils due to low soil strength.

Revegetation recovery rates may be slow in areas with stony or rocky soils associated with glacial till. Similarly, in areas of shallow bedrock (relative to the trench excavation depth), excavation may result in rock fragments remaining on the surface or within the trench backfill at levels that will limit the success of reclamation efforts. Shallow lithic (hard) bedrock occurs along less than four percent of the pipeline ROW. Where the pipeline route crosses soils with lithic bedrock blasting or rock saws may be required for trenching.

Table 7-5 Summary of Soil Characteristics of Concern for the Project on BLM Land

	Total Miles[1]	Highly Erodible		Low Revegetation Potential (LRP)	Prime Farmland[2]	Hydric	Compaction Prone[3]	Stony – Rocky[4]	Shall-low Bedrock[5]	Droughty[6]
		Wind	Water							
Project Total[7]	44.44	0.00	24.23	34.85	1.99	0.19	39.02	6.26	0.16	1.92

Note: Discrepancies in mileage totals are due to rounding
[1]Table includes construction of pipeline only. Individual soils may occur in more than one characteristic class.
[2]Includes land listed by the NRCS (2007) as potential prime farmland if adequate protection from flooding and adequate drainage are provided.
[3]As designated by the NRCS (2007).
[4]Includes soils that have clay loam or finer textures.
[5]Includes soils that have either: 1) a cobbly, stony, bouldery, gravelly, or shaly modifier to the textural class; or 2) have > 5 percent (weight basis) of stones larger than 3 inches in the surface layer.
[6]Includes soils that have lithic rock within 60 inches of the soil surface.
[7]Includes coarse-textured soils (sandy loams and coarser) that are moderately well to excessively drained.
NOTE: Discrepancies in acreage totals are due to rounding.

Some soils along the route in Montana weathered from glacial till or cretaceous shales that are high in smectitic clay minerals. These soils typically have high shrink swell potentials and also are prone to erosion by water when disturbed. Soils such as the Sunburst series occur in Valley, Phillips, and McCone counties. The Sunburst series has a very high shrink-swell potential due to a high percentage of smectite clay minerals. The route will cross numerous other smectitic soils such as Neldore, Scobey, Gerdrum, Creed, and the Bascovy series. Badlands also may be associated with cretaceous shales and may be highly erodible and difficult to reclaim when disturbed. Please refer to Section 7.3 for further discussion on slope instability associated with cretaceous shales and swelling clays.

A small portion of the Project on federal lands will encounter droughty soils. Droughty soils will be prone to wind erosion during construction and will be more difficult to successfully stabilize and revegetate following construction. Similarly, scattered areas of saline and/or sodic soils are known to occur in the Project region. Saline and/or sodic soils often have drainage limitations and may undergo compaction impacts similar to the hydric or compaction-prone soils. In addition, the success of stabilization and reclamation efforts in these areas may be limited unless additional treatments and practices are employed to offset the adverse physical and chemical characteristics of the soils.

Keystone plans to minimize or mitigate potential impacts to soils during construction by implementing the soil protection measures identified in the BLM-Specific CMRP (Appendix C) and the Construction/Reclamation Unit Specifications (Appendix F). The measures include procedures for conserving, segregating, and replacing topsoil, trench backfilling, relieving areas compacted by heavy equipment, removing surface rock fragments, and implementing water and wind erosion control practices. In addition, Keystone will work closely with the BLM and soil conservation agencies to identify and implement recommended soil conservation practices in specific areas where they are needed. Damaged irrigation and tile drainage systems will be repaired in accordance with the BLM-Specific CMRP.

To accommodate potential discoveries of contaminated soils, Keystone will develop contaminated soil discovery procedures in consultation with relevant agencies. If hydrocarbon contaminated soils are encountered during trench excavation, the state agency responsible for emergency response and site remediation will be contacted immediately. A site-specific remediation plan of action will be developed in consultation with that agency. Depending on contaminant and the level of contamination found, affected soil may be replaced in the trench, land farmed, or removed to an approved landfill for disposal.

7.5.1 Soils on the Project Route

The soils in the northern portion of Montana generally formed in glacial till. Some glacial lacustrine deposits occur, and shale may be exposed on some uplands. Small areas of alluvial deposits occur along rivers and drainageways. The soils generally are very deep, well drained, and loamy or clayey. Soils such as Natrustalfs (Elloam and Thoeny series) and Haplustalfs (Phillips series) formed in till on till plains. Ustorthents (Hillon and Sunburst series) formed in till on till plains and hills. Argiustolls formed in till on till plains and hills (Bearpaw, Joplin, Scobey, Telstad, and Vida series) and in alluvium on alluvial fans, stream terraces, and hills (Ethridge and Evanston series).

From McCone County south to Fallon County the soils formed on old plateaus and terraces that eroded. Slopes generally are gently rolling to steep. Steeply sloping badlands border a few of the larger river valleys. In some areas flat-topped, steep-sided buttes rise sharply above the general level of the plains. The soils generally are shallow to very deep, well drained, and clayey or loamy. In areas of cretaceous shales, soils with high bentonite clay contents may occur, such as the Neldore series. These soils frequently have saline or sodic soil chemical properties.

Other soils occur in the area, such as Ustorthents formed in residuum on hills and ridges (Cabba, Cabbart, and Yawdim series). Ustifluvents (Havre series) formed in alluvium on fans, terraces, and flood plains. Haplustepts (Busby, Cherry, Delpoint, Lonna, and Yamacall series) formed in alluvium, eolian deposits, and residuum on terraces, fans, and hills. Calciustepts (Cambeth series) formed in alluvium, colluvium, and residuum on fans, hills, and plains. Natrustalfs (Gerdrum series) and Haplustolls (Shambo series) formed in alluvium and glaciofluvial deposits on fans and terraces and in drainageways. The typical freeze-free period ranges from 135 to 165 days (USDA Soil Conservation Service 1981).

Figure 7-3 depicts soils that may be susceptible to erosion due to water and Figure 7-4 depicts soils susceptible to wind erosion.

7.6 Water Resources

7.6.1 Surface Water

Surface water resources on federal lands along the Project route are located within the Missouri River Water Resource Region (which includes Montana, South Dakota, Nebraska, and Northern Kansas). Hydrologic units crossed by the Project are shown in Figure 7-5. Table 7-6 is a detailed tabulation of the stream crossings associated with the proposed route on federal lands. For a complete discussion of potential surface water impacts associated with the Project, refer to the January 2014 FSEIS.

Potential impacts to surface water on public lands resulting from the Project could arise during either construction or operation. Potential construction impacts include water quality degradation from temporary increases in suspended solids concentrations during in-stream construction activities, increased sedimentation in streams resulting from in-stream construction runoff, nearby channel and bank modifications that affect channel morphology and stability, and reduced flows in streams where water is withdrawn for hydrostatic testing. Other potential construction impacts include water quality degradation from the spilling of hazardous materials including diesel fuel, gasoline, lubricating oils, grease, and hydraulic and other fluids. A discussion of the extent of these issues on public lands and planned mitigation measures follows.

7.6.1.1 Surface Water Resources

Table 7-6 indicates one perennial stream (unnamed tributary to Struple coulee), eight intermittent streams, 74 ephemeral drainages, and two seasonal drainages (as designated in the NHD database) that will be crossed by the Project on federal lands.

Although not on Federal lands, the Missouri River will be crossed at the Valley-McCone County Line, approximately nine river miles below the Fort Peck Dam, where the river is approximately 1,100 feet wide. A HDD crossing plan for this crossing is provided in Appendix A of the Missouri River Waterbody Crossing Plan included in Appendix E. The land on the south side of the river is owned by the DOD and managed by the USACE.

7.6.1.2 Water Quality

CWA Section 303(c), requires each state to review, establish, and revise water quality standards for surface waters within a state. Each state developed a beneficial-use classification system to describe state-designated uses. Regulatory programs for water quality standards include default narrative standards, non-degradation provisions, a Total Maximum Daily Load regulatory process for impaired waters and associated minimum water quality requirements for the designated uses of listed surface waterbodies within the state.

There is no existing agency information to determine if any of the streams crossed on federal land meet their designated use. Three intermittent streams and 17 ephemeral drainage segments are listed as impaired by the USEPA (303d reports).

Table 7-6 Waterbodies Crossed on Federal Lands[1]

County	Crossing Name	Waterbody Type	MP Start	Width at crossing (ft.)
Phillips	UNNAMED TRIBUTARY TO EAST FORK WHITEWATER RIVER	Ephemeral	2.48	3.92
Phillips	UNNAMED TRIBUTARY TO DUNHAM COULEE	Ephemeral	9.59	3.74
Phillips	UNNAMED TRIBUTARY TO COTTONWOOD CREEK	Ephemeral	11.68	31.09

Table 7-6 Waterbodies Crossed on Federal Lands[1]				
County	**Crossing Name**	**Waterbody Type**	**MP Start**	**Width at crossing (ft.)**
Phillips	UNNAMED TRIBUTARY TO COTTONWOOD CREEK	Ephemeral	11.88	16.25
Phillips	UNNAMED TRIBUTARY TO COTTONWOOD CREEK	Ephemeral	12.00	17.30
Phillips	UNNAMED TRIBUTARY TO COTTONWOOD CREEK	Intermittent	13.75	48.69
Valley	PAPOOSE CREEK	Ephemeral	33.01	15.79
Valley	PAPOOSE CREEK	Ephemeral	33.07	6.49
Valley	UNNAMED TRIBUTARY TO PAPOOSE CREEK	Ephemeral	33.68	6.20
Valley	UNNAMED TRIBUTARY TO PASTURE COULEE	Ephemeral	34.56	41.20
Valley	UNNAMED TRIBUTARY TO PASTURE COULEE	Ephemeral	35.37	52.28
Valley	UNNAMED TRIBUTARY TO PASTURE COULEE	Ephemeral	35.40	60.94
Valley	UNNAMED TRIBUTARY TO JONES COULEE	Ephemeral	35.99	18.40
Valley	HAY COULEE	Intermittent	37.83	44.86
Valley	BLACK COULEE	Ephemeral	47.82	26.29
Valley	UNNAMED TRIBUTARY TO BEAR CREEK	Ephemeral	48.04	19.36
Valley	UNNAMED TRIBUTARY TO BEAR CREEK	Ephemeral	48.08	20.62
Valley	UNNAMED TRIBUTARY TO BLACK COULEE	Ephemeral	48.16	18.71
Valley	UNNAMED TRIBUTARY TO BLACK COULEE	Ephemeral	48.22	14.26
Valley	BRUSH FORK	Intermittent	51.20	18.09
Valley	UNNAMED TRIBUTARY TO BRUSH FORK	Ephemeral	51.43	12.33
Valley	UNNAMED TRIBUTARY TO BRUSH FORK	Ephemeral	51.51	44.25
Valley	BEAR CREEK	Seasonal	52.38	9.00
Valley	UNNAMED TRIBUTARY TO BEAR CREEK	Intermittent	52.49	22.03
Valley	UNGER COULEE	Intermittent	53.41	3.30
Valley	UNNAMED TRIBUTARY TO UNGER COULEE	Ephemeral	53.70	34.08
Valley	UNNAMED TRIBUTARY TO UNGER COULEE	Ephemeral	54.05	3.58
Valley	UNNAMED TRIBUTARY TO BUGGY CREEK	Ephemeral	55.13	31.08
Valley	UNNAMED TRIBUTARY TO BUGGY CREEK	Ephemeral	55.58	5.56
Valley	UNNAMED TRIBUTARY TO BUGGY CREEK	Ephemeral	56.03	18.29
Valley	UNNAMED TRIBUTARY TO BUGGY CREEK	Ephemeral	56.18	64.63
Valley	UNNAMED TRIBUTARY TO ALKALI COULEE	Ephemeral	58.44	5.28
Valley	UNNAMED TRIBUTARY TO WIRE GRASS COULEE	Ephemeral	58.86	3.79
Valley	WIRE GRASS COULEE	Ephemeral	59.42	9.00
Valley	UNNAMED TRIBUTARY TO WIRE GRASS COULEE	Ephemeral	59.46	30.14
Valley	SPRING CREEK	Intermittent	59.93	15.60
Valley	UNNAMED TRIBUTARY TO MOONEY COULEE	Ephemeral	62.82	22.11
Valley	UNNAMED TRIBUTARY TO CHERRY CREEK	Ephemeral	65.55	36.58
Valley	UNNAMED TRIBUTARY TO FOSS CREEK	Ephemeral	67.13	4.78

Table 7-6 Waterbodies Crossed on Federal Lands[1]				
County	**Crossing Name**	**Waterbody Type**	**MP Start**	**Width at crossing (ft.)**
Valley	FOSS COULEE	Ephemeral	67.94	6.48
McCone	UNNAMED TRIBUTARY TO STRUPLE COULEE	Ephemeral	94.06	12.64
McCone	UNNAMED TRIBUTARY TO STRUPLE COULEE	Perennial	94.55	16.04
McCone	STRUPLE COULEE	Seasonal	94.70	10.91
McCone	UNNAMED TRIBUTARY TO JORGENSEN COULEE	Ephemeral	96.13	3.03
McCone	UNNAMED TRIBUTARY TO JORGENSEN COULEE	Ephemeral	96.24	2.33
McCone	UNNAMED TRIBUTARY TO JORGENSEN COULEE	Ephemeral	96.37	33.64
McCone	UNNAMED TRIBUTARY TO NORTH PRONG SHADE CREEK	Ephemeral	109.93	5.76
McCone	UNNAMED TRIBUTARY TO SHADE CREEK	Ephemeral	112.47	5.41
McCone	UNNAMED TRIBUTARY TO SHADE CREEK	Ephemeral	112.48	6.79
McCone	UNNAMED TRIBUTARY TO SHADE CREEK	Ephemeral	112.68	29.55
McCone	UNNAMED TRIBUTARY TO SHADE CREEK	Ephemeral	112.90	21.56
McCone	UNNAMED TRIBUTARY TO SOUTH FORK SHADE CREEK	Ephemeral	116.56	3.16
McCone	UNNAMED TRIBUTARY TO SOUTH FORK SHADE CREEK	Ephemeral	117.27	31.19
McCone	UNNAMED TRIBUTARY TO FLYING V CREEK	Ephemeral	120.48	24.04
McCone	UNNAMED TRIBUTARY TO FLYING V CREEK	Ephemeral	120.61	16.60
Prairie	UNNAMED TRIBUTARY TO HAY CREEK	Ephemeral	213.65	23.28
Prairie	McNaney Creek	Ephemeral	214.32	24.36
Prairie	UNNAMED TRIBUTARY TO CABIN CREEK	Ephemeral	214.41	11.65
Prairie	UNNAMED TRIBUTARY TO CABIN CREEK	Ephemeral	215.10	42.77
Prairie	UNNAMED TRIBUTARY TO CABIN CREEK	Ephemeral	215.86	16.24
Prairie	UNNAMED TRIBUTARY TO CABIN CREEK	Ephemeral	216.54	51.88
Prairie	UNNAMED TRIBUTARY TO CABIN CREEK	Ephemeral	217.08	5.90
Prairie	UNNAMED TRIBUTARY TO CABIN CREEK	Ephemeral	217.41	13.92
Prairie	UNNAMED TRIBUTARY TO CABIN CREEK	Ephemeral	218.13	13.85
Prairie	UNNAMED TRIBUTARY TO CABIN CREEK	Ephemeral	218.47	12.62
Prairie	UNNAMED TRIBUTARY TO CABIN CREEK	Intermittent	219.01	37.27
Prairie	UNNAMED TRIBUTARY TO CABIN CREEK	Ephemeral	219.56	15.54
Fallon	UNNAMED TRIBUTARY TO LITTLE BEAVER CREEK	Ephemeral	256.77	18.74
Fallon	UNNAMED TRIBUTARY TO LITTLE BEAVER CREEK	Ephemeral	256.87	39.24
Fallon	UNNAMED TRIBUTARY TO LITTLE BEAVER CREEK	Ephemeral	256.93	9.51
Fallon	UNNAMED TRIBUTARY TO LITTLE BEAVER CREEK	Ephemeral	256.95	14.78
Fallon	SODA CREEK	Intermittent	275.14	6.13

[1] Does not include BOR canal crossings. See Table 1-1 for the list of canal crossings.

7.6.1.3 Waterbody Crossings

To limit potential impacts at waterbody crossings, Keystone will use the following crossing techniques where water is present: dry-ditch flumed crossings, dry-ditch dam and pump crossings, or HDD (see construction details in the BLM-Specific CMRP [Appendix C]). The only waterbody adjacent to federal lands planned for HDD is the Missouri River. At present, Keystone is proposing open-cut dry crossings at dry and intermittent waterbody crossings and directional bore at the canal crossings in Montana.

Runoff and the resulting erosion of lands adjacent to waterbodies can lead to the introduction of solids into suspension and the deposition of sediment in-stream. The BLM-Specific CMRP includes extensive procedures to limit the extent of disturbed land adjacent to waterbodies, to control erosion, and methods to prevent sediments from entering waterbodies or wetlands. These measures include Best Management Practices (BMPs), such as clearing limits, buffer strips, drainage diversion structures, and sediment barrier installations. In accordance with the CWA, Keystone will comply with NPDES general construction permit(s). Keystone will develop and file a Storm Water Pollution Prevention Plan to satisfy Notice of Intent(s) under NPDES. This plan will include BMPs to minimize soil erosion and sedimentation.

The BLM-Specific CMRP includes procedures for limiting the extent of this disturbance and the reclamation of disturbed areas. Reclamation includes grading, stabilization, and revetment BMPs. These BMPs embrace bioengineering concepts, which encourage the reclamation of natural stream banks.

The pipeline would be constructed under river channels with potential for lateral scour. The pipeline will be buried at an adequate depth to avoid pipe exposure caused by channel degradation and lateral scour. Determination of the pipeline burial depth will be based on site-specific channel and hydrologic investigations, where deemed necessary.

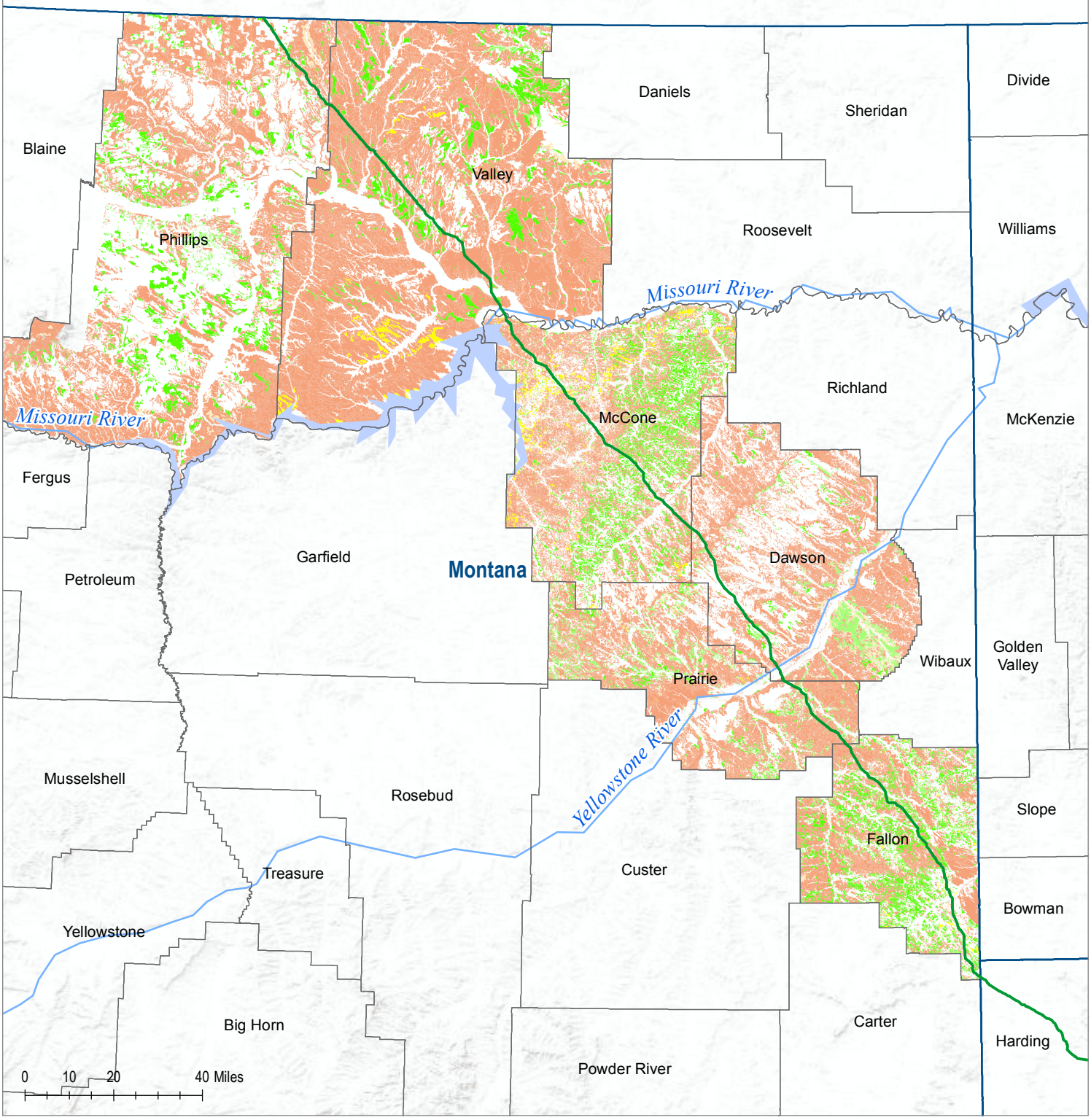
7.6.1.4 Hydrostatic Test Water Withdrawal and Discharge

Hydrostatic test water will be discharged to the land surface at an approved location near the source or directly to the waterbody source with a Keystone-approved energy dissipation device, depending on NPDES discharge permit requirements. Discharged water on the ground may evaporate or infiltrate into the soil or drainage where the water is released. The discharge of hydrostatic test water will follow state permit requirements, which would reduce potential effects on water quality or aquatic organisms. Energy dissipaters will be used to prevent erosion at discharge locations.

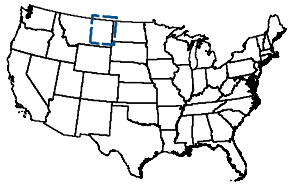
7.6.1.5 Spill Prevention

See Section 6.7.

PREPARED BY
EXP Energy Services Inc.



VICINITY MAP



LEGEND

- KEYSTONE XL PROJECT
- STATE BOUNDARY
- COUNTY BOUNDARY
- MAJOR LAKES
- MAJOR RIVERS

SOIL EROSION SUSCEPTABILITY TO WATER
Percent_WaterErode

- < 5
- 5 - 10
- 10 - 25
- 25 - 50
- > 50

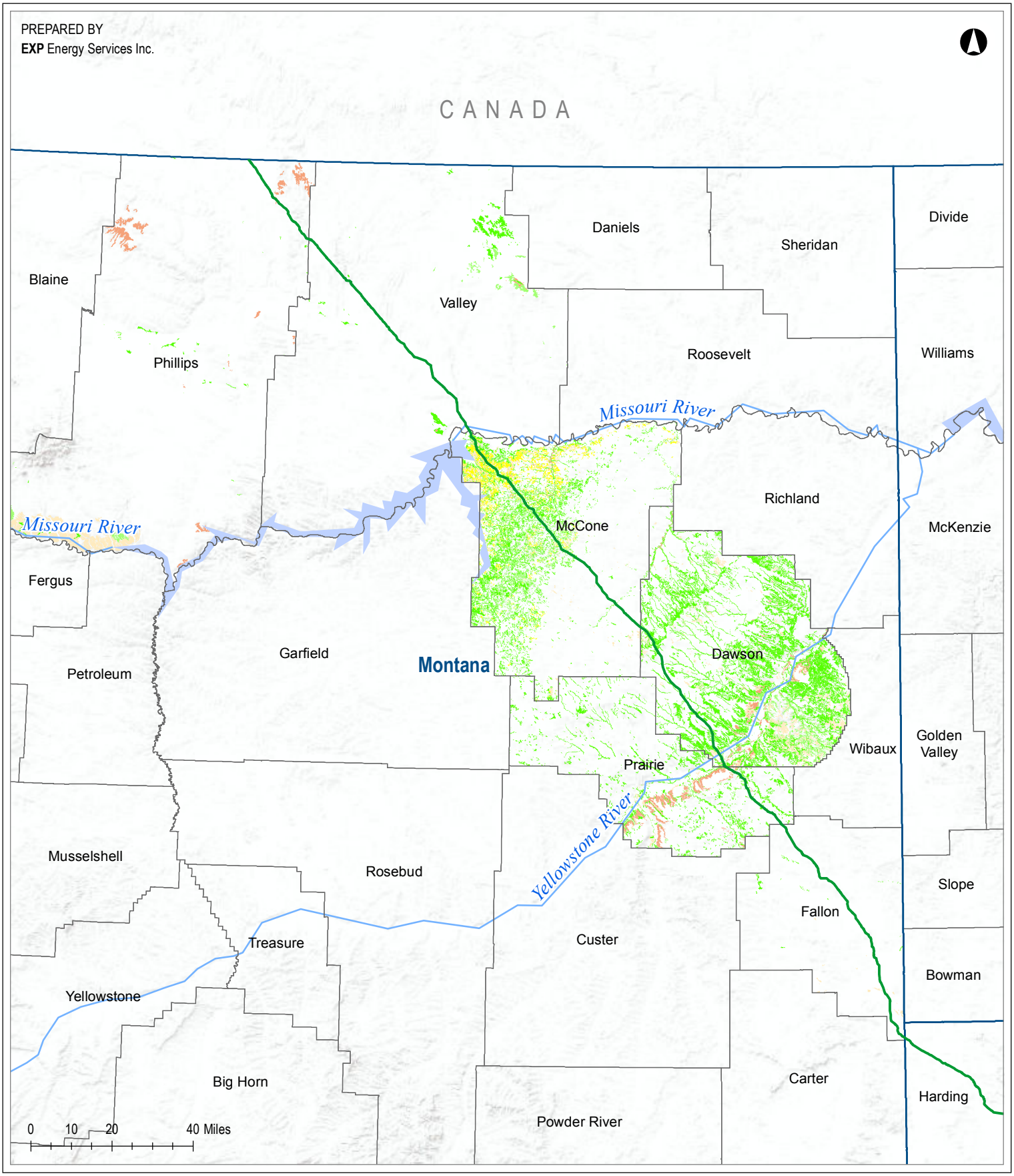
*SOILS ONLY ANALYZED IN COUNTIES AFFECTED BY PROJECT

KEYSTONE XL PROJECT

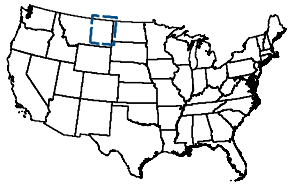
FIGURE 7-3

EROSION SUSCEPTIBILITY - WATER

TC Energy



VICINITY MAP



LEGEND

- KEYSTONE XL PROJECT
- STATE BOUNDARY
- COUNTY BOUNDARY
- MAJOR LAKES
- MAJOR RIVERS

SOIL EROSION SUSCEPTABILITY TO WIND

PERCENTAGE OF SOIL UNIT

- < 5
- 5 - 10
- 10 - 25
- 25 - 50
- > 50

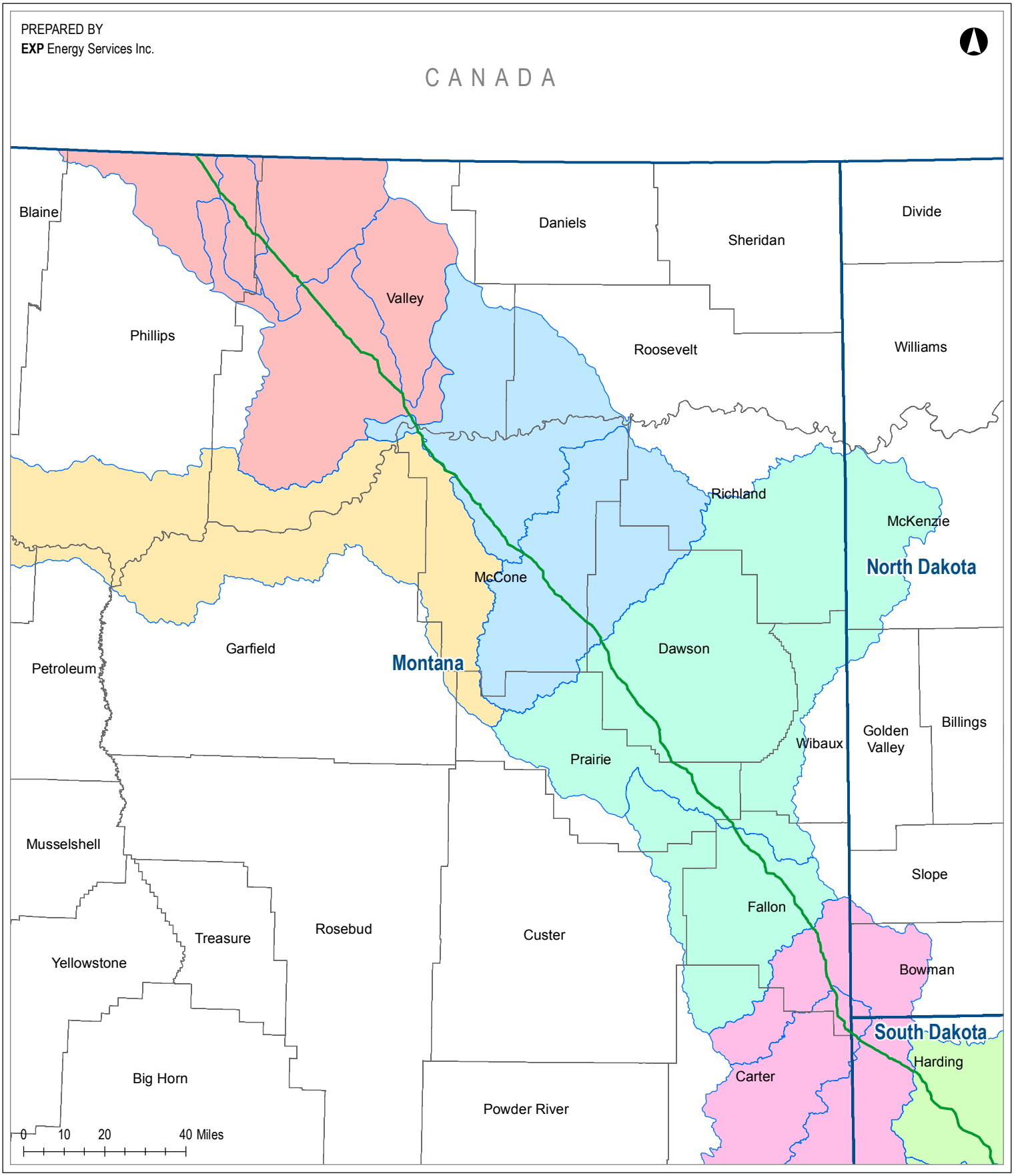
*SOILS ONLY ANALYZED IN COUNTIES AFFECTED BY PROJECT

KEYSTONE XL PROJECT

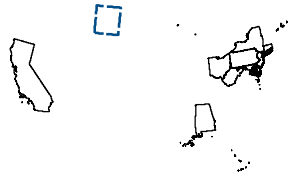
FIGURE 7-4

EROSION SUSCEPTIBILITY - WIND

TC Energy



VICINITY MAP



LEGEND

- KEYSTONE XL PROJECT
- STATE BOUNDARY
- COUNTY BOUNDARY

HYDROLOGY UNITS

- SUBBASIN

HYDROLOGY UNITS

SUBREGION

- LOWER YELLOWSTONE
- MILK
- MISSOURI-LITTLE MISSOURI
- MISSOURI-MUSSELSHELL
- MISSOURI-OAHE
- MISSOURI-POPLAR

KEYSTONE XL PROJECT

FIGURE 7-5

HYDROLOGY UNITS

TC Energy

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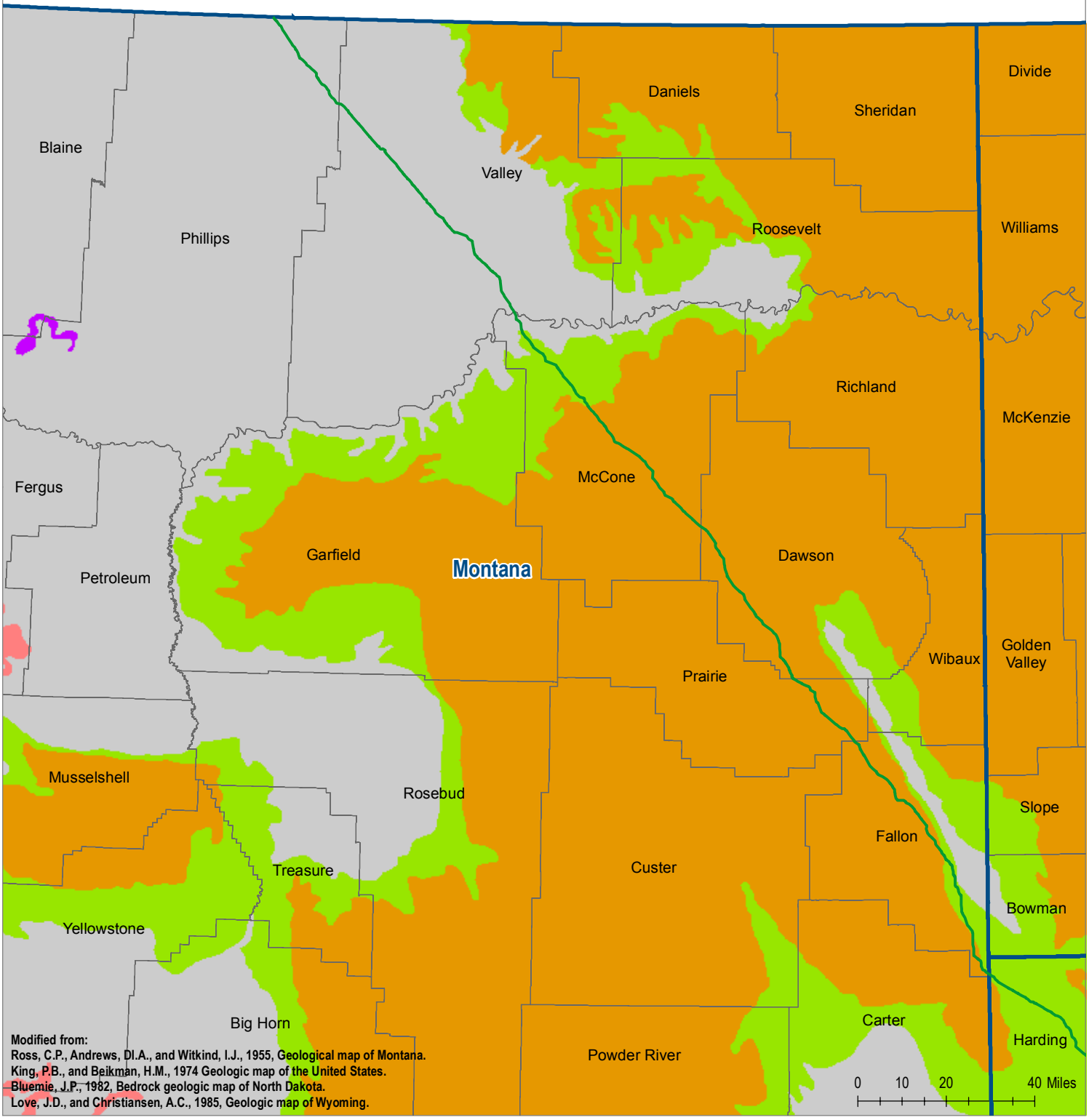

VICINITY MAP

LEGEND

- KEYSTONE XL PROJECT
- STATE BOUNDARY
- COUNTY BOUNDARY
- NOT A PRINCIPAL AQUIFER

AQUIFER MATERIALS

- LOWER TERTIARY AQUIFERS
- LOWER CRETACEOUS AQUIFERS
- PALEOZOIC AQUIFERS
- UPPER CRETACEOUS AQUIFERS

Source: USGS Hydrologic Atlas HA-730-1, Figure 7

KEYSTONE XL PROJECT

FIGURE 7-6

AQUIFER SYSTEM

TC Energy

7.6.2 Groundwater

The potential impact to groundwater associated with the Project on federal lands includes potential groundwater quality degradation during or after construction from disposal of materials, pipeline spills, or leaks that could seep into shallow aquifers used for domestic, agricultural, or public water supplies. Aquifer locations in areas where the Project crosses federal lands are shown in Figure 7-6.

Reductions in groundwater quality from spills, leaks, or disposal practices are not anticipated during construction. Most of the aquifers along the route will be at least temporarily isolated from any spills on the land surface and attending personnel will be able to respond to any incident before contaminants migrate into groundwater. In areas with near-surface groundwater or in areas adjacent to surface waterbodies, additional procedures and measures will be implemented as presented in the BLM-Specific CMRP. Adverse impacts are not anticipated due to pipeline construction.

7.6.2.1 Groundwater Resources

No groundwater impacts are anticipated due to construction or traffic on temporary or permanent access roads. The following discussion is focused on locations crossed by the pipeline. For discussion of groundwater resources potentially impacted by the Project, regardless of land ownership, refer to the January 2014 FSEIS. Existing literature on the geology and groundwater hydrogeology of the states and counties affected by the Project was reviewed, with particular emphasis on the location of shallow aquifers (i.e., those with a depth of less than 200 feet), depth to the shallow groundwater table, and expected use of the shallow aquifers within approximately 10 miles of the route. These locations include areas where estimates of the depth to the water table are based on regional groundwater elevation contours, and where water quality estimates are a general estimate of water quality based on regional or sometimes county-wide evaluations. Generally, areas where aquifers are heavily used or are potentially sensitive to contamination, including shallow alluvial aquifers along major river drainages where the river alluvium is a major source of domestic and irrigation water supply, have more complete and available information that was used in this assessment.

Federal lands affected by the Project lie within the Great Plains physiographic provinces (Thornbury 1965; Whitehead 1996). Continental glaciation during the Pleistocene covered parts of the Great Plains and most of the Central Lowlands provinces with a complex array of glacial drift and glacial outwash. This glacial material covers the bedrock aquifers in many areas and provides shallow alluvial groundwater for domestic and agricultural use in both current stream valleys and also from buried glacial paleochannels. In many cases, the buried paleochannels are not continuous and serve as major sources of groundwater for local use. In many areas of the Great Plains, the glacial drift is fine-grained and relatively impermeable, thus it acts as a confining layer above the bedrock aquifers. Within this fine-grained drift, local paleochannels can be found, which can provide groundwater for ranches and small communities.

Federal lands on the Project route are within five counties in eastern Montana within the Great Plains physiographic province (Thornbury 1965) and are underlain by the Northern Great Plains aquifer system (Whitehead 1996). The two northernmost counties, Phillips and Valley, were glaciated during the Pleistocene, and thus have a thick veneer of glacial till. Three main aquifer types are found along the Project in eastern Montana: 1) unconsolidated alluvial and/or glacial aquifers, 2) lower Tertiary aquifers, mainly in the Fort Union Formation, and 3) upper Cretaceous aquifers, mainly in the Fox Hills and Hell Creek Formations. Shallow alluvial aquifers are found in unconsolidated alluvial and glacial sediments along major drainages, such as the Missouri River, crossed by the pipeline.

7.6.2.1.1 Phillips County

Phillips County is covered by a veneer of glacial till and drift, which generally is 20 to 40 feet thick, but can reach 100 feet (Whitehead 1996). This glacial till overlies the upper Cretaceous Judith River and Clagett Formations. The glacial till is relatively impermeable and acts as a confining layer above the upper Cretaceous

bedrock aquifer found mainly in the Judith River Formation. The glacial till can contain locally permeable buried zones of coarse glacial outwash that may provide water for ranches.

The upper Cretaceous Judith River Formation is the main aquifer and consists of sandstone and siltstone. The aquifer is confined, and the water table elevation ranges from 2,600 to 2,800 feet amsl (Libmeyer 1985). Groundwater quality ranges from Montana Class II with total dissolved solids (TDS) content between 500 and 1,800 milligrams per liter (mg/L), to Montana Class III with a TDS between 1,800 and 10,000 mg/L. While the TDS limits applicable to agricultural uses can vary and be very high (up to 10,000 mg/L in South Dakota), the federal limit for potable water is 500 mg/L (USEPA 2003). The water table is from 150 to 500 feet deep based on drilling depths for recorded water wells (Smith et al. 2000). According to the Montana Bureau of Mines and Geology GWIC database (downloaded 9/17/2012), there are an average of 0.68 wells per square mile in Phillips County. Well yields are in the range of 5 to 20 gallons per minute (gpm) (Whitehead 1996).

7.6.2.1.2 Valley County

Valley County, like Phillips County, once was glaciated and is covered by a veneer of glacial till up to 100 feet in thickness. This glacial till overlies the upper Cretaceous Judith River Formation in the northwest part of the county near the boundary with Phillips County, but over most of the county, the till lies above the impermeable upper Cretaceous Bearpaw Shale. According to the Montana Bureau of Mines and Geology GWIC database (downloaded September 17, 2012), there are an average of 0.68 wells per square mile in Valley County and well yields are low. Water elevations in the Judith River Formation are in the range of 2,600 to 2,800 feet amsl (Libmeyer 1985). Water quality in the upper Cretaceous rocks has a TDS around 2,000 mg/L (Downey and Dinwiddie 1988) and is mostly dominated by sodium chloride (LaRique 1966), making it Montana Class III water.

Most groundwater used in Valley County comes from shallow alluvial aquifers along major drainages. The two main rivers in Valley County encountered by the proposed route are the Milk River and the Missouri River. The many wells in the alluvium along the Missouri River yield 100 to 500 gpm. The shallow alluvial water table is less than 50 feet below ground surface (bgs) (LaRique 1966), and the alluvium along the river in the area of the Project crossing is 30 to 150 feet thick. The TDS ranges from 800 to 2,700 mg/L (Swenson and Drum 1955), consistent with Montana Class II or Class III water.

Shallow groundwater exists along a number of drainages on federal lands in Valley County, including Rock Creek and the Missouri River. Keystone has identified no wells or springs on federal lands within 0.5 mile of the centerline in Valley County.

7.6.2.1.3 McCone County

The Project crosses two aquifers in McCone County, the upper Cretaceous Hells Creek/Fox Hills aquifer and the lower Tertiary Fort Union aquifer. Approximately one-third of the proposed route in McCone County is in the Hells Creek/Fox Hills outcrop area beginning south of the Missouri River in the dissected uplands. The remainder of the proposed route within McCone County is within the rolling upland plains underlain by the lower Tertiary aquifer.

The upper Cretaceous Hells Creek/Fox Hills aquifer has groundwater elevations in the range of 2,200 to 2,400 feet amsl (Whitehead 1996), with a TDS ranging from 500 to 1,800 mg/L dominated by sodium bicarbonate. The permeable sandstones of the lower one-third of the Hells Creek/Fox Hills aquifer contain a confined aquifer overlain by less permeable mudstones. Yields in the permeable sandstones of the Hells Creek/Fox Hills are in the range of 5 to 20 gpm and most wells are drilled to depths of 150 to 500 feet. Groundwater flows northeast and is part of regional flow in the northwestern flank of the Williston Basin.

The lower Tertiary Fort Union aquifer consists of interbedded sandstones, mudstones, shale, and coal seams. Groundwater elevations in the Fort Union aquifer in McCone County are in the range of 2,400 feet amsl in the northern part of the county to 2,800 feet amsl in the southeastern part of the county. Groundwater flow is to the northwest toward the Missouri River. The Fort Union aquifer is mostly a confined aquifer that is found in sandstones interbedded with shales and mudstones. Drilling depths for most wells are in the range of 50 to

300 feet (Libmeyer 1985), and well yields are 15 to 25 gpm. Water quality is highly variable with TDS ranging from 500 to as much as 5,000 mg/L, and sodium bicarbonate is the primary constituent (Busbey et al. 1995). Water depths in the Fort Union aquifer range from 100 to 150 feet bgs (Swenson and Drum 1955). Groundwater flow in the lower Tertiary Fort Union aquifer is mostly to local drainages from highland recharge areas.

Between approximate MP 91 and MP 110, the pipeline route crosses dissected uplands underlain by the upper Cretaceous Hells Creek/Fox Hills aquifer system. Within this aquifer system (approximately between MP 96 to MP 99), the route passes within approximately two miles of the Bear Creek recreational area, which is fed by ephemeral drainages crossed by the proposed route. Groundwater in the alluvium of Bear Creek also could flow into the Bear Creek recreational area. From approximate MP 100 to the Dawson County line (approximately MP 157), the proposed route passes through rolling plains underlain by the lower Tertiary Fort Union aquifer and will be within approximately five miles of mapped ranch wells or mapped springs. The proposed route in McCone County does not cross any streams or areas considered to have highly sensitive groundwater.

7.6.2.1.4 Prairie and Fallon Counties

Prairie and Fallon counties are part of the Lower Yellowstone aquifer system with groundwater resources in the lower Tertiary Fort Union Formation, linked to the lower Yellowstone River system. In parts of Fallon County, the upper Cretaceous Fox Hills and Hells Creek formations are exposed in the Cedar Creek anticline, however, the pipeline route will not go through the Cedar Creek anticline area.

The Fort Union Formation is a shallow bedrock aquifer and provides most of the groundwater used in the three counties. Major streams in the area, such as the Yellowstone, have considerable alluvial material along their banks and in terraces which contain important shallow aquifers which are used for water supply. The upper Cretaceous Fox Hills and Hells Creek formations underlie the lower Tertiary Fort Union at depths from 600 to 1,600 feet bgs. Groundwater flow in the Fox Hills and Hells Creek formations is confined and part of a regional flow system that directs groundwater flow to the lower Yellowstone River. Groundwater flow in the Fort Union Formation includes both local flow from higher topographic areas to local drainages and a general regional flow to the Yellowstone River.

Groundwater elevations in the lower Tertiary Fort Union aquifer range from 2,600 to 3,000 feet amsl. The Yellowstone River acts as a regional drain for groundwater in the Fort Union aquifer because a groundwater low area exists along the course of the river. Groundwater elevations in the underlying upper Cretaceous Fox Hills/Hells Creek aquifer range from 2,200 to 2,800 feet amsl. Groundwater levels in the alluvial aquifers adjacent to the lower Yellowstone River are in the range of 2,000 to 2,200 feet amsl (Smith 1998).

Well yields and groundwater quality vary depending on the aquifer and the depth of the well. Well yields in the shallow alluvial aquifers adjacent to the Yellowstone River range from 50 to 500 gpm (LaRique 1966). Water quality is similar to river water quality, consisting of calcium bicarbonate water with TDS ranges from 1,000 to 1,500 mg/L. Wells in the Fort Union aquifer yield an average of 10 gpm, and water is dominated by sodium bicarbonate, with a TDS range of 500 to 5,000 mg/L. Average TDS is about 1,670 mg/L (Smith et al. 2000). Wells in the Fox Hills aquifer usually yield below 15 gpm (Smith et al. 2000). Like water in the Fort Union aquifer, water in the Fox Hills aquifer also is sodium bicarbonate dominated, but the TDS ranges from 1,000 to 2,500 mg/L, averaging about 1,460 mg/L (Smith et al. 2000). About 60 percent of the wells in these three counties are less than 200 feet deep (Smith 1998), and the maximum well depth is around 400 feet (Smith et al. 2000).

Aquifer properties have been measured in the lower Yellowstone River system (Smith et al. 2000). Shallow alluvial aquifers have a hydraulic conductivity around 75 feet per day with a transmissivity that ranges from 3,600 to 5,800 gallons per day per foot. Slug tests in the Fort Union aquifer gave estimates of hydraulic conductivity in the range of 0.01 to 0.6 feet per day. For the Hells Creek aquifer, transmissivities range from 300 to 3,000 gallons per day per foot. Groundwater in wells less than 100 feet in depth has high tritium values, suggesting recent recharge from precipitation (Smith et al. 2000). Groundwater in deeper wells and especially

in the Fox Hills/Hells Creek aquifer has low tritium values and probably has not been recharged in the past 40 to 50 years.

The proposed route through these counties crosses a few streams with shallow alluvial aquifers, which could be considered sensitive groundwater areas, although only one is on federal lands. At approximate MP 215, the route passes a flowing well within approximately two miles of the pipeline. Crossing the alluvial plains of ephemeral creeks also may involve shallow alluvial aquifers that have water during the spring but may be mostly dry during the late summer and fall.

7.6.3 Water Supplies and Wells

No potential public water supply sources have been identified within one mile of federal lands affected by the Project.

7.6.4 Floodplains

From a geomorphic perspective, floodplains are relatively low, flat areas of land that surround waterbodies and hold overflows during flood events. Floodplains are often associated with rivers and streams, where they consist of stream deposited sediments forming levels (or “terraces”) deposited at different times along the watercourse.

From a policy perspective, the Federal Emergency Management Agency (FEMA) defines a floodplain as being any land area susceptible to being inundated by waters from any source (FEMA 2005). Much of the basic inventory, regulation, and mitigation effort for floodplains and flood mitigation (including the National Flood Insurance Program) are led by FEMA. Executive Order 11988, Floodplain Management, states that actions by federal agencies shall 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 shall 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: 1) acquiring, managing, and disposing of federal lands, and facilities; 2) providing federally undertaken, financed, or assisted construction and improvements; and 3) conducting federal activities and programs affecting land use, including, but not limited to, water and related land resources planning, regulating, and licensing activities.

Within the Project area, low terraces occur at nearly every stream crossing. For smaller intermittent and ephemeral drainages, these are typically narrow and infrequently flooded. At crossings of rivers and larger perennial streams, floodplains are wider and may be more frequently flooded to a particular elevation depending on the magnitude of a given flood. One aboveground facility, an IMLV, will be located on USACE-managed lands outside the southern boundary of the floodplain.

7.6.5 Wetlands and Riparian Areas

In wetland areas on federal lands, the Project may have temporary impacts, limited to construction and reclamation that could include soil disturbance and short-term increases in turbidity and fluctuations in wetland hydrology. There is potential for both short- and long-term modifications in wetland vegetation community composition and structure from clearing and maintenance activities, as well as potential modifications in wetland productivity due to the potential changes to surface and subsurface flow patterns from pipeline construction.

Based on aerial photo interpretation and the results of field surveys conducted in 2008, 2009, 2010, 2011, and 2013, less than one percent of construction disturbance associated with the Project on federal lands will occur in wetlands. Of this total, approximately four percent is palustrine emergent wetlands (marshlands and

meadows), and the remainder (approximately 96 percent) is stream channels and open water. No palustrine forested or palustrine scrub-shrub lands are intersected by the Project on federal lands.

Effects on wetland vegetation will be greatest during and immediately following construction. To mitigate the potential for these impacts, Keystone will implement the procedures outlined in the BLM-Specific CMRP.

Keystone will restore or mitigate impacts to wetlands affected by construction. Pipeline construction through wetlands must comply, at a minimum, with USACE Section 404 nationwide permit conditions.

For the Missouri River, which will be crossed by the HDD method, streamside wetlands or floodplain forests will not be affected. Smaller streams and ephemeral or intermittent drainages will likely be open cut and wetlands located in these areas will be crossed by trenching. No permanent loss of wetlands will occur as a result of the Project. Herbaceous vegetation in palustrine emergent wetlands is expected to reestablish to pre-construction levels within three to five years following the completion of reclamation, resulting in a short-term loss of vegetation and available habitat for some wildlife species.

As described in the BLM-Specific CMRP, specific construction techniques will be used to retain the hydrological and vegetation characteristics of wetlands that will be disturbed by construction. These techniques will include segregation and replacement of wetland soils (except in areas of standing water, saturated wetlands, or where no topsoil is evident) so that soil profiles and native vegetation seed and rootstock will be reestablished to help ensure successful reclamation and reestablishment of local drainage patterns to restore existing surface and subsurface water flow patterns.

7.6.5.1 Identified Wetlands

Wetlands were identified along the Project through field surveys and review of aerial photographs. Wetlands and Waters of the U.S. on federal lands along the proposed route were delineated in accordance with the direction provided by the USACE – Omaha District. The federal lands crossed by the Project are within the USACE Omaha District.

In addition to collecting sufficient data for "routine on-site delineations" as per the USACE Wetlands Delineation Manual (USACE 1987) and channel characteristics data for drainage crossings, wetland survey teams collected sufficient data (e.g., defined bed and bank and connectivity to navigable waters) for the USACE to make jurisdictional determinations for the wetlands and drainage crossings surveyed in the field.

Wetland and riverine communities crossed by the pipeline on federal lands are summarized in Table 7-7.

Table 7-7 Miles of Wetlands and Waterbodies Crossed by the Project on Federal Lands

Affected State	Wetland Types Crossed (miles)				Waterbody Types Crossed (miles)				Total
	Palustrine Emergent	Palustrine Forested	Riverine/ Open Water	Palustrine Scrub-Shrub	Ephemeral	Intermittent	Perennial	Seasonal	
Montana	0.034	0.000	0.000	0.000	0.238	0.037	0.003	0.004	**0.316**

Note: Delineations were based on field surveys wherever possible. Where surveys were not conducted, a combination of national data coverage (e.g., NWI) and aerial photo interpretation was used.

Wetlands and riverine habitats occupy less than one percent of the pipeline route on federal lands. Of this, the majority of the waterbodies crossed are either ephemeral or intermittent. A number of wetland areas are located in actively grazed rangeland.

Only one perennial stream crossing is located on federal lands. The wetlands crossed on federal lands (approximately 117.5 feet) are classified as palustrine emergent wetlands, dominated by perennial rooted herbaceous vegetation. The wetland crossings on federal lands are summarized in Table 7-8.

Table 7-8 Wetlands Crossed on Federal Lands

Affected State	County	MP Start	Pipeline Centerline Crossing Length (feet)	Wetland Type	Field ID	Acreage Impacted During Construction
Montana	Valley	35.98	31.96	Palustrine Emergent	exp-WL-13001	0.049
Montana	Valley	36.00	51.47	Palustrine Emergent	exp-WL-13001	0.109
Montana	McCone	89.79	0.0[1]	Palustrine Emergent	W7AMC001	0.001
Montana	Prairie	216.55	19.29	Palustrine Emergent	W106PR001	0.028
Montana	Fallon	275.15	14.78	Palustrine Emergent	W901FA001	0.040

[1] Wetland would be avoided by Missouri River HDD

[2] There are two pipeline centerline crossings of the wetland at this location. The pipeline crossing and acreages provided are for the total crossing.

7.7 Vegetation Resources

7.7.1 General Vegetation Types

Vegetation types that occur along the Project route were identified and delineated based on review of literature, internet database resources, interpretation of aerial photography, vegetation mapping made during biological surveys, and information collected during wetland and waterbody delineations.

Grassland/rangeland, upland forest, palustrine emergent, shrub-scrub, forested wetlands, streams, and open water habitats typically support naturally occurring terrestrial and aquatic vegetation. The most common native grassland community type on federal lands is needle-and-thread/blue grama-western wheatgrass. Upland forests are primarily woody draws dominated by green ash, with understories of silver buffaloberry and chokecherry. Wetlands of any type are uncommon on federal lands. In general, residential and commercial/industrial areas are characterized as artificially created landscapes with minimal naturally occurring vegetation. Cropland and pivot-irrigated cropland areas primarily include introduced crop species, providing forage and grain for livestock and human consumption. Areas of existing ROW consist of previously disturbed areas associated with pipelines and other utilities which have been reclaimed. Table 7-9 provides the approximate mileage of each vegetation cover types crossed by the Project ROW and access roads on federal lands.

Table 7-9 Miles of Vegetation Cover Types Crossed by the Project ROW on Federal Lands

State	Vegetation Communities Crossed (miles)								
	Agriculture	Previously Disturbed	Grassland/ Rangeland	Upland Forest	Riverine/Open Water	Palustrine Forested Wetlands	Palustrine Emergent Wetlands	Palustrine Scrub-Shrub Wetlands	Total
Pipeline									
Montana	0.026	0.413	45.335	0.298	0.248	0.000	0.004	0.000	46.324
Pipeline Subtotal	0.026	0.413	45.335	0.298	0.248	0.000	0.004	0.000	46.324
Access Roads*									
Montana	0.000	12.269	0.960	0.000	0.020	0.000	0.000	0.000	13.249
Access Road Subtotal	0.000	12.269	0.960	0.000	0.020	0.000	0.000	0.000	13.249
Project Total[1]	**0.026**	**12.682**	**46.296**	**0.298**	**0.267**	**0.000**	**0.004**	**0.000**	**59.572**

[1]Discrepancies in totals are due to rounding.
*Roads include permanent and temporary access roads.

Pipeline construction will involve the temporary alteration of vegetation through ROW clearing and excavation and high traffic activity. Vegetation community recovery rates are estimated to range between three to five years for herbaceous-dominated cover types.

Reclamation, revegetation, and revegetation success monitoring, as outlined in the BLM-Specific CMRP (see Appendix C), will be completed for disturbed areas within the construction ROW following the completion of Project construction activities. Under normal to above-normal precipitation conditions, vegetation cover within the reclaimed areas will consist primarily of herbaceous plant species within three to five growing seasons. Reclamation success is dependent upon several variables, including soil preparation, season of seed application (see Appendix F), and precipitation levels following seed application and post-construction land management.

Keystone will monitor revegetation success along the pipeline ROW according to permits and approvals, including from the BLM and USACE. Revegetation will be considered successful on BLM lands when the density and cover of native vegetation is similar in density and cover to those adjacent, undisturbed lands as outline in Appendix S. In agricultural areas, revegetation will be considered successful if crop yields are similar to those adjacent undisturbed portions of the same field. On USACE managed lands, revegetation will be considered successful when disturbed areas achieve 80 percent in density and cover compared to adjacent undisturbed areas after five growing seasons.

Keystone will use seed mixtures approved by the BLM and/or USACE on federal lands. Consequently, the various vegetation types altered by the pipeline, other than forested communities, are expected to return to near pre-construction conditions. If desirable plant species are not established in the ROW within a short period of time, adverse impact might include, but are not limited to, higher soil erosion rates, introduction and/or spread of noxious or invasive plant species, and reduced forage production.

Following the completion of construction activities, disturbed areas (with the exception of the two IMLV sites and permanent access roads on federal lands) will be rehabilitated and revegetated to its pre-construction land use, as described in the BLM-Specific CMRP and as required by BLM ROW Grant conditions for federal lands. BLM and USACE will approve successful reclamation on their respective federal lands (Appendix C).

7.7.2 Sensitive, Rare, Threatened, and Endangered Plant Species

There are species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed species that are protected under the ESA, species of concern as identified by USFWS, and species designated as state sensitive by BLM. The following information reflects federal sensitive plant species data from responses from USFWS, BLM, various state Natural Heritage Programs, state wildlife agencies, and field surveys. BLM Montana/Dakotas Instruction Memorandum (no. MT-2014-067), which was extended by Instruction Memorandum MT-20170014, provides a list of BLM special status plant species by field office. As provided in IM-2014-067, the Glasgow, Malta, and Miles City Field Offices do not contain any BLM designated special status plant species.

7.7.3 Noxious and Invasive Weeds

Surface disturbance associated with construction activities could contribute to the introduction or spread of noxious and invasive weed species and other undesirable plant species. Noxious and invasive weed species are typically fast growing and could displace native species and inhibit the establishment of native grass, forb, and shrub species. Increases in noxious and invasive weed species are particularly serious within areas where they were introduced by construction. Common locations for noxious weed infestations include riparian zones, livestock concentration areas, roads, and disturbed soils. Invasive and noxious plant species are most prevalent in areas of prior surface disturbance, such as agricultural areas, roadsides, and existing utility ROWs. The prevention of the introduction or spread of noxious and invasive weeds is a high priority for nearby communities. Under Executive Order 13751 of 2016 – Invasive Species, federal agencies shall not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species in the U.S. or elsewhere unless it has been determined that the benefits of such actions outweigh the potential harm caused by invasive species and that feasible and prudent measures to minimize the risk of harm will be taken in conjunction with the actions.

The term “noxious weed” is defined under federal and state laws. Under the Federal Plant Protection Act of 2000 (formerly the Noxious Weed Act of 1974 [7 USC SS 2801-2814]), a noxious weed is defined as “any plant or plant product that can directly or indirectly injure or cause damage to crops, livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment” (USDA Animal and Plant Health Inspection Service [APHIS] 2000; Institute of Public Law 1994). Under Executive Order 13112 of February 3, 1999, an “invasive species” is defined as “an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health” (APHIS 1999). The Federal Plant Protection Act contains a list of 137 federally restricted and regulated federal noxious weeds, including 19 aquatic and wetland weeds, 62 parasitic weeds, and 56 terrestrial weeds (7 CFR Chapter III, Part 360). Each state is required to comply with the rules and regulations set forth by this Act and to manage its lands accordingly.

In addition to federally listed noxious weeds species, the Montana Department of Agriculture and various county weed boards each maintain a list of regulated and prohibited noxious and invasive weed species.

Table 7-10 summarizes noxious weed species found during surveys conducted on federal lands in 2019. In addition, BLM identified potential weed issues for access roads between approximate MP 38 and 44 and some weed management areas that need to be verified prior to construction. Additional surveys will be conducted prior to construction to document weed infestation areas in the project footprint. Keystone will prevent the spread of established weed populations as a result of the Project and will mitigate to prevent the establishment of those species that are not currently present within the Project footprint including: permanent pipeline ROW, temporary workspace, ATWS, and temporary and permanent access roads.

Table 7-10 Noxious Weeds Found During Surveys on Federal Lands			
Common Name	**Scientific Name**	**MP Enter**	**MP Exit**
Valley County			
Leafy spurge	*Euphorbia esula*	35.36	35.38
		35.40	35.40
		35.74	35.87
		35.93	36.05
		36.57	36.67
		37.07	37.34
		37.68	38.85
		43.12	43.16
		46.31	46.33
		46.34	46.34
McCone County			
Canada thistle	*Cirsium arvense*	90.57	90.58
Field bindweed	*Convolvulus arvensis*	109.85	110.00
		112.48	112.58
		117.66	117.67
Prairie County			
Leafy spurge	*Euphorbia esula*	215.81	215.91
		216.53	216.56
		217.06	217.09
		217.38	217.40
		218.94	219.05
		219.50	219.56
Canada thistle	*Cirsium arvense*	219.56	219.56
Leafy spurge	*Euphorbia esula*	219.62	219.63
		219.66	219.78

Where an individual or population is identified within the Project footprint, suitable techniques will be implemented pursuant to the BLM-Specific Noxious Weed Management Plan (Appendix L) to control the spread and establishment of noxious and invasive weed species. Noxious weed treatments may include mechanical, biological or chemical methods, as appropriate, and will be implemented as needed. Keystone will confer with BLM and applicable county weed boards to ensure that noxious weed management practices enacted for the ROW are in compliance with BLM and county standards, and in accordance with the BLM's Programmatic EIS for Vegetation Treatments (BLM 2016) Montana County Weed Control Act (Title 7, Chapter 22 Part 21 and Title 80, Chapter 7 Part 7), the Miles City Field Office Weed Environmental Assessment (BLM 2012), and the Miles City Field Office Approved Resource Management Plan (2015).

7.8 Wildlife Resources

7.8.1 Terrestrial Wildlife Species

7.8.1.1 General Wildlife Habitat

Wildlife habitats along the Project on federal lands consist of grassland/rangeland, agriculture, palustrine emergent wetlands, riverine/open water, and upland forest/woody draws. Descriptions of vegetation communities crossed by the Project are discussed in Section 7.7. Table 7-9 indicates that approximately 46 miles of grassland/rangeland, 0.3 miles of upland forest, and 0.27 miles of riverine/open water. No palustrine emergent, palustrine scrub-shrub, or palustrine forested wetland habitat is crossed by the Project on federal lands.

7.8.1.2 Big Game Species

Mule deer, white-tailed deer, and pronghorn are the primary big game species occurring along the Project within Montana. Elk could occur occasionally; moose are rare. Montana Fish, Wildlife and Parks (MFWP) has identified **five** areas for conservation for big-game winter range and migration corridors. The State of Montana has developed the *"Montana Action Plan for Implementation of Department of the Interior Secretarial Order 3362: Improving Habitat Quality in Western Big-Game Winter Range and Migration Corridors".* This plan identifies five areas as priority big-game winter range and migration corridors, referred to as Priority Areas A through **E, Habitat** types found within Priority Area D for the elk, deer and pronghorn species in this region range from sagebrush grasslands to deciduous wetland/riparian areas. Those locations between MP 0 and MP 89 would be within the Priority D area (see Table 7-21).

Locations for big game winter ranges and crucial winter ranges were determined using data received from Montana Fish Wildlife and Parks (MFWP) and BLM (Table 7-11). Certain habitat ranges for these species are considered crucial for maintenance of game populations and are defined as that portion of the winter range on which a wildlife species is dependent for survival during periods of heaviest snow cover. Big game crucial winter ranges are included in Table 7-12.

Construction impacts to primary big game species may include the temporary loss of forage area, resulting in an increase in temporary habitat fragmentation within the proposed surface disturbance areas. These temporary forage losses would represent only a small percentage of the overall available habitat within the broader Project region. The loss of shrubland vegetation may be long-term (greater than 5 years and, in some cases, more than 20 years). In the interim, grassland species may become established within 3 to 5 years, depending on weather conditions and grazing management practices. In most instances, suitable habitat adjacent to the disturbed areas may be available for wildlife species until grasses and woody vegetation are reestablished within the disturbance areas.

Impacts could result from increased noise levels and human presence during surface disturbance activities. Big game animals (especially pronghorn and mule deer) could decrease their use within 0.5 mile of surface disturbance activities due to increased noise levels (Ward et al. 1980; Ward 1976). This displacement could be short-term and animals would return to the disturbance area following the completion of construction and reclamation activities. This could be applicable during operations for the four permanent access roads on Federal land for travel to and from IMLVs and one pump station.

To reduce impacts to big game species on federal lands, construction activity and surface disturbance will be prohibited during the period from December 1 to May 15 on BLM administered land within designated big game winter range and crucial winter range (Table 7-11) within the North Central Montana District. Within the Miles City Field Office construction activity and surface disturbance would be prohibited during the period from December 1 to March 31 within designated Big Game Crucial Winter Range.

Table 7-11 Big Game Winter Ranges[1] on Federal Lands Potentially Affected by the Project in Montana

Species	Beginning MP	Ending MP	Total Length Crossed (miles)	Acreage Affected During Construction[2]
Pronghorn	15.38	15.42	0.04	0.57
	21.31	21.66	0.36	4.77
	24.99	25.11	0.13	1.69
	42.57	43.16	0.59	7.83
	45.84	46.96	1.13	15.00
	47.73	48.49	0.76	10.07
	49.95	52.97	3.01	40.18

Table 7-11 Big Game Winter Ranges[1] on Federal Lands Potentially Affected by the Project in Montana				
Species	**Beginning MP**	**Ending MP**	**Total Length Crossed (miles)**	**Acreage Affected During Construction[2]**
	53.39	54.48	1.09	14.59
	54.71	55.23	0.51	6.85
	55.56	56.19	0.63	8.42
	56.82	56.85	0.04	0.50
	57.19	57.53	0.34	4.52
	58.31	61.04	2.72	36.32
	61.06	61.64	0.58	7.80
	62.49	62.87	0.38	5.05
	63.67	64.38	0.71	9.51
	65.26	65.33	0.07	0.95
Mule Deer	11.40	12.33	0.93	12.45
	13.06	13.78	0.72	9.55
	15.38	15.42	0.04	0.57
	21.31	21.66	0.36	4.77
	24.99	25.11	0.13	1.69
	37.21	37.34	0.13	1.77
	37.68	38.85	1.18	15.70
	42.57	43.16	0.59	7.83
	45.84	46.96	1.13	15.00
	47.73	48.49	0.76	10.07
	49.95	52.97	3.01	40.18
	53.39	54.48	1.09	14.59
	54.71	55.23	0.51	6.85
	55.56	56.19	0.63	8.42
	56.82	56.85	0.04	0.50
	57.19	57.53	0.34	4.52
	58.31	61.64	3.33	44.38
	66.98	68.29	1.32	17.54

[1] The big game winter ranges provided are located within the HiLine resource management district. No big game winter range is located within the Miles City Field Office BLM-administered lands.

[2] Acres Affected by Construction calculated from ROW of 110 ft.

Table 7-12 Big Game Crucial Winter Ranges on Federal Lands Potentially Affected by the Project in Montana				
Species	**Beginning MP**	**Ending MP**	**Total Length Crossed (miles)**	**Acreage Affected During Construction[2]**
Big Game[1]	***North Central Montana District***			
	13.06	13.78	0.72	9.55
	15.38	15.42	0.04	0.57
	21.31	21.66	0.36	4.77
	24.99	25.11	0.13	1.69
	Miles City Field Office			
	90.67	93.13	2.45	32.71
	93.88	95.54	1.66	22.13
	95.84	97.11	1.27	16.95
	99.76	100.08	0.32	4.23
	104.22	104.49	0.27	3.63
	107.35	107.61	0.25	3.40
	107.93	108.15	0.22	2.97
	216.86	217.05	0.19	2.49
	249.29	250.00	0.71	9.50

[1] The BLM does not distinguish between the different big game species in the crucial winter range. [2] Acres Affected by Construction calculated from ROW of 110 ft.

7.8.1.3 Small Game Species

Small game species that could occur along the Project on federal lands include: upland gamebirds, waterfowl, furbearers, and small mammals. Specific species could include mourning dove, ring-necked pheasant, greater sage-grouse, sharp-tailed grouse, gray partridge, wild turkey, sandhill crane, and a wide variety of migratory waterfowl species. Furbearers include beaver, bobcat, red fox, swift fox, raccoon, badger, least weasel, long-tailed weasel, mink, and eastern cottontail

Potential impacts to small game from the Project could result in the temporary loss of and fragmentation of habitat until vegetation is re-established. Impacts could include the temporary displacement of small game from the disturbance areas as a result of increased noise and human presence. Although habitats adjacent to the Project may support some displaced animals, species that are at or near carrying capacity could suffer some increased mortalities due to displacement. Displacement or loss of small game animals from disturbance areas would be short-term because of their generally high reproductive rates and ability to return to the disturbance areas following completion of construction and reclamation activities.

Potential Impacts to small game species could include nest or burrow abandonment and loss of eggs or young where construction occurs during the breeding season. Of greatest concern is the potential for disturbance or loss of lekking mating grounds and nesting habitat for greater sage-grouse and sharp-tailed grouse. Based on the most recent BLM and MFWP survey data and 2019 lek data, sharp-tailed grouse leks (active status) within two miles of the Project are shown in Table 7-13.

Table 7-13 Sharp-Tailed Grouse Lek Site Restrictions on Federal Lands			
MP Locations		Buffer Zone Length Crossed (miles)	Buffer Zone Acreage Affected During Construction[1]
Beginning MP	Ending MP		
15.38	15.42	0.04	0.57
45.84	46.96	1.13	15.00
47.73	48.49	0.76	10.07
51.55	52.97	1.42	18.92
57.19	57.53	0.34	4.52
58.31	61.41	3.10	41.28
62.49	62.87	0.38	5.05
63.67	64.38	0.71	9.51
65.26	65.75	0.49	6.55
90.42	93.13	2.70	36.04
93.88	95.54	1.66	22.13
95.84	97.11	1.27	16.95
99.76	100.08	0.32	4.23
104.22	104.49	0.27	3.63
107.35	107.61	0.25	3.40
107.93	108.15	0.22	2.97
109.85	110.22	0.37	4.87
211.30	211.95	0.65	8.71
212.55	213.25	0.70	9.36
213.33	220.27	6.94	92.57
231.74	232.37	0.63	8.38
233.24	233.85	0.60	8.05
239.68	239.86	0.19	2.48
249.29	250.00	0.71	9.50
275.10	275.60	0.50	6.67
Totals		**26.36**	**351.41[2]**

[1]Based on a nominal ROW width of 110 feet.

[2] Discrepancies in mileage totals are due to rounding

Note: Surface-disturbing and disruptive activities are allowed on and within 2 miles of sharp-tailed grouse lek sites with design features to protect breeding, nesting, and brood-rearing habitats at a level capable of supporting the long-term populations associated with the lek. Activities are restricted within .5 miles of a lek between March 1 and June 30.

Prior to the start of construction and two years post-construction, surveys will be conducted, in accordance with BLM and MDEQ requirements, to determine the presence of sharp-tailed grouse leks within two-miles of the construction ROW Surface-disturbing and disruptive activities are allowed on and within 2 miles of sharp-tailed grouse active lek sites with design features which include habitat reclamation as addressed in Appendices P and Q to protect breeding, nesting, and brood-rearing habitats at a level capable of supporting the long-term populations associated with the lek. This includes reclamation activities which maintain optimal vegetative conditions for sharp-tailed grouse habitats. As addressed in Appendices P and Q, the revegetation reclamation activities are based on soil types and pre-construction vegetative conditions must be met. Activities are not allowed within .5 miles of an active lek between March 1 and June 30 in areas under the

HiLine ARMP.

7.8.1.3.1 Greater Sage-Grouse

The greater sage-grouse is considered the most sensitive small game species along the Project and is discussed further as a special status species in Appendices M and Q. Greater sage-grouse leks within 3.1 miles of the Project are shown in Table 7-14; note that some of these leks may not be active.

To avoid, minimize, and mitigate impacts to greater sage-grouse from the Project, Keystone has developed a greater sage-grouse conservation plan (Appendix M) which was approved by the State of Montana and BLM in April 2017 which addresses:

- Avoidance of sage-grouse leks during initial Project routing;
- Minimization of impacts near Project leks through seasonal and time-of-day construction restrictions in areas near leks;
- Restoration and monitoring measures to restore sage-grouse habitat and document restoration; and
- Compensatory mitigation to achieve net conservation gain.

Table 7-14 Sage-Grouse Lek Site Restrictions on Federal Lands

MP Locations		Buffer Zone Length Crossed (miles)	Buffer Zone Acreage Affected During Construction[1]
Beginning MP	Ending MP		
45.84	46.96	1.13	15.00
47.73	48.49	0.76	10.07
51.21	52.97	1.75	23.37
53.39	54.48	1.09	14.59
54.71	55.23	0.51	6.85
55.56	56.19	0.63	8.42
56.82	56.85	0.04	0.50
57.19	57.49	0.30	3.98
67.36	68.37	1.01	13.49
90.56	92.34	1.78	23.79
95.53	95.54	0.01	0.09
95.84	97.11	1.27	16.95
99.76	100.08	0.32	4.22
104.22	104.49	0.27	3.63
107.35	107.61	0.25	3.40
107.93	108.15	0.22	2.97
109.85	110.50	0.65	8.67
111.20	111.29	0.09	1.20
112.56	113.10	0.54	7.04
115.95	116.63	0.67	8.94
117.17	117.87	0.70	9.38
118.74	118.83	0.10	1.30
120.14	120.67	0.54	7.21

Table 7-14 Sage-Grouse Lek Site Restrictions on Federal Lands			
MP Locations		**Buffer Zone Length Crossed (miles)**	**Buffer Zone Acreage Affected During Construction[1]**
Beginning MP	**Ending MP**		
120.82	121.03	0.21	2.81
211.30	211.95	0.65	8.71
212.55	213.25	0.70	9.36
213.33	220.27	6.94	92.57
239.68	239.86	0.19	2.48
256.43	256.55	0.12	1.61
256.74	256.97	0.24	3.14
Totals		**23.68**	**315.74[2]**

[1]Based on a nominal ROW of 110 feet.

[2] Note: Discrepancies in mileage totals are due to rounding

Note: Construction activity and surface disturbance will be prohibited on BLM-administered land during the period from March 1 to June 30 for the protection of greater sage-grouse strutting grounds and a 3.1-mile buffer around them unless justifiable departures are designed as described in Appendix M.

Note: Table indicates locations on federal lands only. For complete list of sage grouse leks crossed by the Project, refer to the January 2014 FSEIS.

7.8.1.3.2 Sagebrush Habitats

Sagebrush community types were mapped on lands crossed by the Project. Sagebrush habitat on federal lands crossed by the Project is presented in Table 7-15. Approximately 60.3 acres of sagebrush habitat are crossed within various Project components (e.g., ROW and aboveground facilities) on land administered by the BLM. Silver sagebrush was the most common sagebrush species encountered on federal land. Wyoming big sagebrush was recorded in more limited areas, primarily south of the Missouri River crossing. Canopy cover and height of sagebrush were qualitatively assessed for the entire stand. Average canopy cover of sagebrush was typically less than 30 percent while average height was typically two feet or less. Sagebrush usually occurred as a relatively limited community type within a dominant grassland matrix. Scattered plants of sagebrush frequently occurred outside sagebrush stands but represented a relatively minor component of the surrounding grassland community.

On designated portions of the ROW, Keystone will utilize trench and working side topsoil salvage to maintain sagebrush root structure on the spoil side of the ROW. Prior to topsoil salvage over the trench and working side, Keystone will mow sagebrush to near ground level on the spoil side of the ROW. Topsoil salvaged from the trench and working side shall be windrowed and stored on the spoil side of the ROW. Spoil material from the trench may also be stored on the spoil side of the ROW provided that none is left on the native, undisturbed soil when backfilling the trench. The entire ROW (i.e., working side and spoil side) will be seeded with the designated BLM-specific sagebrush seed mix. Keystone will utilize this technique to promote sagebrush regrowth at the following locations on BLM-administered lands:

Table 7-15 Sagebrush Habitat on Federal Lands Affected by the Project						
MP Start	**MP End**	**Length (mi)**	**Sagebrush Species[1]**	**Average Canopy Cover (%)[2]**	**Average Height (in)[2]**	**Associated Species[3]**
BLM- Glasgow Field Office						
53.39	53.59	0.2	Silver sagebrush	5-10	12-36	Sandberg bluegrass, western wheatgrass, rubber rabbitbrush

Table 7-15 Sagebrush Habitat on Federal Lands Affected by the Project						
MP Start	**MP End**	**Length (mi)**	**Sagebrush Species[1]**	**Average Canopy Cover (%)[2]**	**Average Height (in)[2]**	**Associated Species[3]**
55.22	55.23	0.01	Silver sagebrush	5-10	12-36	Sandberg bluegrass, western wheatgrass, rubber rabbitbrush
55.56	55.73	0.17	Silver sagebrush	20-30	18-30	Western wheatgrass, Sandberg bluegrass
Subtotal		**0.38**				
BLM-Miles City Field Office						
94.03	94.54	0.51	Silver sagebrush	10-20	18-24	Bluebunch wheatgrass, blue grama, threadleaf sedge
104.22	104.49	0.27	Silver sagebrush/big sagebrush	10-15	24-30	Needle-and-thread, western wheatgrass, green needlegrass
107.37	107.61	0.23	Silver sagebrush/big sagebrush	10-40	18-30	Needle-and-thread, western wheatgrass, blue grama, prairie sandreed
109.85	110.50	0.65	Big sagebrush/Silver sagebrush	20-35	18-36	Western wheatgrass, blue grama, needle-and-thread
112.47	113.08	0.61	Silver sagebrush	10-15	18-24	Western wheatgrass, blue grama
116.47	116.62	0.15	Silver sagebrush/big sagebrush	10-20	24-36	Crested wheatgrass, blue grama, needle-and-thread
120.14	120.64	0.5	Silver sagebrush/big sagebrush	5-20	12-30	Bluebunch wheatgrass, saltgrass, western wheatgrass, blue grama, needle-and-thread
127.58	127.61	0.03	Silver sagebrush	10-15	18-30	Kentucky bluegrass, saltgrass, western wheatgrass, crested wheatgrass, creeping juniper
213.60	213.68	0.08	Silver sagebrush	15-25	24-36	Western wheatgrass, blue grama, needle-and-thread
214.17	214.22	0.05	Silver sagebrush	10-20	30-40	Needle-and-thread, western wheatgrass, blue grama
214.28	214.81	0.53	Silver sagebrush	5-20	12-48	Western wheatgrass, blue grama, needle-and-thread

Table 7-15 Sagebrush Habitat on Federal Lands Affected by the Project

MP Start	MP End	Length (mi)	Sagebrush Species[1]	Average Canopy Cover (%)[2]	Average Height (in)[2]	Associated Species[3]
218.82	218.97	0.15	Silver sagebrush	20-30	12-30	Western wheatgrass, blue grama, needle-and-thread
233.79	233.84	0.05	Silver sagebrush	30-35	24-36	Western wheatgrass, needle-and-thread, little bluestem
249.29	249.33	0.04	Big sagebrush/silver sagebrush	15-20	12-36	Needle-and-thread, western wheatgrass, blue grama
256.44	256.55	0.11	Big sagebrush	10-15	6-18	Needle-and-thread, western wheatgrass, blue grama
256.75	256.92	0.17	Big sagebrush	10-15	6-18	Needle-and-thread, western wheatgrass, blue grama
Subtotal		**4.13**				
Total		**4.51**				

[1]Silver sagebrush (*Artemisia cana*), big sagebrush (*Artemisia tridentata* spp. *wyomingensis*).

[2]Estimated range of canopy cover and height within sagebrush stand.

[3]Common grass indicator species within sagebrush stand.

Although the Project will not result in a permanent loss of sagebrush habitat along the pipeline ROW, the regeneration of sagebrush may be slow, depending on site-specific conditions such as slope, aspect, temperature and rainfall, and particularly the definition of "recovery" at the site in question. Keystone is required to reclaim sagebrush habitat as part of the Project's sage-grouse conservation plan and as described in Appendix S. These documents identify several success metrics, including stem density, basal cover, and canopy cover. There are different recovery periods for these types of metrics, as well as different recovery periods for different species or subspecies of sagebrush. For example, the Wyoming big sagebrush may recover to an ecologically meaningful density within 6-10 years (Hild et al. 2006; Schuman et al. 2005) but it may require 30 years for the canopy cover to be similar to pre-disturbance conditions (Connelly et al. 2000). Species and subspecies also recover at different rates, for example mountain big sagebrush may recover within 5 (Wyoming Interagency Vegetation Committee 2002) to 20 years (Connelly et al. 2000), while silver sagebrush may recover very quickly, sprouting in one to two years (Wyoming Interagency Vegetation Committee 2002). Plants also respond dramatically to moisture conditions and may reach 35-50 cm (14-20 inches) in one year (McArthur and Taylor 2004). The Project will implement several measures that have been reviewed by the BLM to re-establish sagebrush on the ROW (Appendix F) and measure recovery success according to measures found in the Project's Sage-Grouse Conservation Plan (Appendix M Attachment 3) and Reclamation Monitoring Plan for Federal Lands (Appendix S).

7.8.1.4 Nongame Species

The Project traverses various regions which are inhabited by a diversity of nongame species (e.g., small mammals, raptors, songbirds, amphibian, and reptiles). Nongame mammals include shrews, bats, squirrels, prairie dogs, pocket gophers, pocket mice, voles, and mice. These small mammals provide an important prey base for the region's predators including, coyote, badger, skunk, raptors (eagles, buteos, accipiters, owls), and snakes.

Nongame birds include a variety of songbirds and raptor species, most associated with open, grassland habitat, although woodland species also are represented along woodland riparian corridors and upland forests/woody draws along the route. Raptors that could be present on federal lands include: prairie falcon, golden eagle, red-tailed hawk, Swainson's hawk, northern harrier, ferruginous hawk, American kestrel, short-eared owl, long-eared owl, burrowing owl, and great horned owl. The northern harrier, short-eared owl, and ferruginous hawk are the only ground nesters. The burrowing owl is a below-ground nesting species.

Aerial raptor surveys were conducted for the Project between April 7 and 10, 2008, spring 2009, spring 2010, and spring 2011 along the ROW in Montana to identify nest sites along the Project ROW (ENSR 2008, 2009, 2010; Westech 2011, 2012, 2013). The results of these surveys were previously provided to the BLM with the POD updated in April 2017. Since 2017 additional raptor surveys have been conducted. Reports of these surveys are found in Appendix N. On federal lands, a total of 75 nests were documented within 0.62 miles of the Project ROW in 2017, 81 nests in 2018, and 77 nests in 2019. Bald eagle surveys were conducted by helicopter in April 2017 and winter bald eagle roost pedestrian surveys were performed in January 2018 and 2019. No bald eagle winter roost sites were found on federal lands during those surveys.

In 2017, 29 nests were active at the time of the surveys, 17 were active in 2018, and 31 in 2019. A majority of the nests were occupied by red-tailed hawks. This species is known to be relatively tolerant of human activity and development (Beeler 2004; Call 1978; Johnsgard 1990, 1988; Kingery 1998). The others were occupied by the great horned owl Ferruginous hawk, and golden eagle. None of the nests are within the Project ROW and TUP. Impacts resulting from increased noise and human presence are expected to be minor and short-term.

The majority of the songbirds inhabiting the region are neotropical migrants. These are birds that breed in North America but winter in neotropical regions of Central and South America. Examples of neotropical migrants in the area of the proposed route on federal lands include: eastern and western kingbird, spotted towhee, lark bunting, Sprague's pipit, Baird's sparrow and Chestnut-collard longspur.

Impacts to nongame species from surface disturbance activities would result from temporary loss of habitat and increased fragmentation until vegetation is reestablished. Potential impacts also would result in mortalities of less mobile or burrowing nongame species (e.g., small mammals, birds, reptiles, amphibians, invertebrates) due to exposure to vehicle and construction equipment traffic. Potential direct impacts would also include nest or burrow abandonment or loss of eggs or young when construction occurs during the breeding season. Other impacts would include the short-term displacement of some of the more mobile species (e.g., medium-sized mammals, adult birds) as a result of surface disturbance. Although the habitats adjacent to the proposed disturbance area may support some displaced animals, species that are at or near carrying capacity could suffer some increased mortalities. Displacement or loss of nongame species from disturbance areas will be short-term due to repopulation of adjacent lands and high reproduction rates of the species involved.

Numerous migratory birds occur within the Project area. Conservation measures would be implemented for the Project to avoid impacts to migratory bird species. These measures were developed from guidance in the USFWS' Nationwide Standard Conservation Measures (USFWS 2016); the BLM's MBTA Guidelines (BLM 2015a); and FSEIS or state-requirements as clarified by the DOI Opinion M-37050. These measures will be implemented at different phases of the Project to ensure maximum effectiveness. In addition, Keystone will implement specific nest avoidance measures for listed species such as interior least tern, and for species specifically identified with conservation measures in the FSEIS or state permits such as Sprague's pipit, bald and golden eagle, and other raptor species. The conservation measures that would be implemented during the different phases of the Project are provided in the Migratory Bird Conservation Plan included in Appendix O.

7.8.1.5 Habitat Disturbance

Habitat fragmentation is frequently a concern when clearing ROWs. In general, fragmentation results in an altered wildlife community as species more adaptable to edge habitats establish themselves, while species requiring undisturbed habitats are subject to more negative effects. These effects would result in overall changes in habitat quality, habitat loss, increased animal displacement, reductions in local wildlife and migratory bird numbers, and changes in species composition. The severity of these effects on migratory birds depends on factors such as sensitivity of the species, seasonal use, type and timing of construction activities, and physical parameters (e.g., topography, cover, forage, and climate). The effects of fragmentation on native wildlife populations will be relatively small since the majority of the Project will cross relatively open habitat types (e.g., shrubland, grassland, and cultivated land).

The effects of long-term habitat loss on native wildlife populations would be relatively small since the majority of habitat disturbance would be restored to the pre-disturbance condition. Agricultural lands would continue to be used for pre-construction uses while native habitats would be reclaimed to primarily herbaceous communities using appropriate seed mixes prescribed by local, state, and federal agencies. Loss of woodland vegetation would be permanent since trees would not be allowed to reestablish within 15 feet of either side of the pipeline centerline. Habitat losses also would be long-term at permanent aboveground pipeline facility locations such as pump stations and access roads. Noise impacts from nearby pump stations (10 and 14) to sage-grouse and other nesting birds would be evaluated through post-construction noise studies conducted by Keystone to determine anticipated operational noise levels and consultation with BLM and other agencies.

To reduce impacts associated with construction to wildlife resources including greater sage-grouse, sharp-tailed grouse, migratory birds, and raptors, agency-recommended seasonal buffers and timing restrictions are provided in Table 7-16.

Location information, timing restrictions, and buffer distances for these species were obtained from BLM, MFWP, SDGFP, and aerial surveys (see Appendix N).

Table 7-16 Seasonal Timing Restrictions and Buffers for Big Game, Game Birds, and Raptors

Species	Milepost Locations		Buffer Zone Length Crossed (miles)	Seasonal Timing Restrictions
	Beginning Milepost	Ending Milepost		
North Central Montana District				
Raptor Nest Sites[1]	8			Surface-disturbing and disruptive activities are allowed in raptor nest buffers with BLM-approved design features which maintain the functionality for the raptor nest and nesting habitat. This includes prohibiting construction activities and surface disturbance from March 1 to August 1 for the protection of raptor nests and a 0.5-mile buffer around them.
	25			
	39			
	40			
	55			
	55.20	55.23	0.03	

Table 7-16 Seasonal Timing Restrictions and Buffers for Big Game, Game Birds, and Raptors				
Species	**Milepost Locations**		**Buffer Zone Length Crossed (miles)**	**Seasonal Timing Restrictions**
	Beginning Milepost	**Ending Milepost**		
Sage Grouse Winter Range	55.56	55.85	0.29	Surface-disturbing and disruptive activities are allowed in Sage Grouse Winter Range with BLM-approved design features which maintain functionality of winter range habitat. This includes prohibiting construction activities and surface disturbance on BLM-administered land during the period from December 1 to March15 for the protection of greater sage-grouse winter range
Pronghorn Winter Range	15.38	15.42	0.04	Construction activity and surface disturbance will be prohibited on BLM-administered land during the period from December 1 to May 15 for the protection of designated big game winter range,
	21.31	21.66	0.36	
	24.99	25.11	0.13	
	42.57	43.16	0.59	
	45.84	46.96	1.13	
	47.73	48.49	0.76	
	49.95	52.97	3.01	
	53.39	54.48	1.09	
	54.71	55.23	0.51	
	55.56	56.19	0.63	
	56.82	56.85	0.04	
	57.18	57.53	0.34	
	58.31	61.04	2.72	
	61.06	61.64	0.58	
	62.49	62.87	0.38	
	63.67	64.38	0.71	
	65.26	65.33	0.07	
Mule Deer Winter Range	11.40	12.33	0.93	
	13.06	13.78	0.72	
	15.38	15.42	0.04	
	21.31	21.66	0.36	
	24.99	25.11	0.13	
	27.21	37.34	0.13	
	37.68	38.85	1.18	
	42.57	43.16	0.59	
	45.84	46.96	1.13	
	47.73	48.49	0.76	
	49.95	52.97	3.01	
	53.39	54.48	1.09	
	54.71	55.23	0.51	
	55.56	56.19	0.63	
	56.82	56.85	0.04	
	57.19	57.53	0.34	
	58.31	61.64	3.33	
	66.98	68.29	1.32	
	13.06	13.78	0.72	

Table 7-16 Seasonal Timing Restrictions and Buffers for Big Game, Game Birds, and Raptors				
Species	**Milepost Locations**		**Buffer Zone Length Crossed (miles)**	**Seasonal Timing Restrictions**
	Beginning Milepost	**Ending Milepost**		
Big Game Crucial Winter Range	15.38	15.42	0.04	Surface-disturbing and disruptive activities are allowed in Big Game Winter Range with BLM-approved design features which maintain functionality of winter range habitat Construction activity and surface disturbance will be prohibited on BLM-administered land during the period from December 1 to May 15 for the protection of designated big game crucial winter range.
	21.31	21.66	0.36	
	24.99	25.11	0.13	
Miles City Field Office				
Raptor Nest Sites[2]	218.89	220.11	1.23	Surface-disturbing and disruptive activities are allowed in raptor nest buffers with BLM-approved design features which maintain the functionality for the raptor nest and nesting habitat. This includes prohibiting construction activities and surface disturbance from March 1 to August 1 for the protection of raptor nests and a 0.5-mile buffer around them and active within the last seven years.
	233.24	233.37	0.03	
	233.27	233.85	0.57	
	233.27	233.85	0.57	
	256.43	256.55	0.12	
	256.74	256.75	0.01	
Big Game Crucial Winter Range	90.67	93.13	2.45	Surface-disturbing and disruptive activities are allowed in Big Game Crucial Winter Range with BLM-approved design features which maintain functionality of crucial winter range habitat. This includes prohibiting construction activities and surface disturbance BLM-administered land From December 1 to March 31.
	93.88	95.54	1.66	
	95.84	97.11	1.27	
	99.76	100.08	0.32	
	104.22	104.49	0.27	
	107.35	107.61	0.25	
	107.93	108.15	0.22	
	216.86	217.05	0.19	
	249.29	250.00	0.71	

[1] Raptor mileposts from March 22, 2012, Draft Exhibit B Stipulations. Since these locations were established, the proposed pipeline centerline has been adjusted slightly with the minor route refinements. Thus, the mile posts listed in this report have shifted slightly as a result.
[2] Raptor mileposts are from the 2019 raptor surveys performed by WESTECH Environmental Services, Inc. in April 2019.

7.8.2 Aquatic Resources

Aquatic biology resources are defined in this study as fish and invertebrate communities that inhabit perennial streams and pond/lake environments. The description of aquatic communities focuses on important fisheries, which are defined as species with recreational or commercial value or threatened, endangered, or special status (i.e., special status). This section describes recreationally or commercially important fisheries that occur at or immediately downstream of the proposed crossings on federal lands. Special status aquatic species are discussed in Section 7.8.3. The study area for aquatic resources includes the perennial streams, rivers, and ponds/lakes that would be crossed by the Project on federal lands. Other waterbodies are included if they are located within approximately 0.5 mile of the proposed crossing and support recreationally or commercially important game fish or special status aquatic species.

Invertebrate communities in waterbodies along the Project include worms, immature and adult insect groups, shellfish, and other forms of aquatic life. The composition can vary depending on flowing or standing water and other physical characteristics of the waterbody. They represent important food sources for fish and also are used as indicators of water quality conditions. For the purpose of describing aquatic resources, it is assumed that invertebrates are present in Project area waterbodies.

The Project will cross 10 waterbodies on federal lands that are known to support or are capable of supporting warm water fisheries (Table 7-17). Although the Missouri River is not located on federal lands and will be avoided using HDD, it has been included in the table since it is a Class II fishery. The Missouri River crossing is approximately 1,100 feet; the widths of the other streams are less than 65 feet.

Table 7-17 Waterbodies that May Support Fisheries Crossed by the Project or Downstream of Crossings on Federal Lands in Montana

Waterbody	County	Fishery Class[1]	Number of Crossings
Unnamed tributary to Pasture Coulee	Valley	Non-Salmonid	3
Hay Coulee	Valley	Non-Salmonid Fishery	1
Black Coulee	Valley	Non-Salmonid Fishery	1
Brush Fork	Valley	Non-Salmonid Fishery	1
Bear Creek	Valley	Non-Salmonid Fishery	1
Unger Coulee	Valley	Non-Salmonid Fishery	1
Wire Grass Coulee	Valley	Non-Salmonid Fishery	1
Missouri River	McCone	Marginal Salmonid Fishery	1
		Red Ribbon, Class II	
Unnamed tributary to Struple Coulee	McCone	Non-Salmonid Fishery	2
Unnamed tributary to Shade Creek	McCone	Non-Salmonid Fishery	4
Soda Creek	Fallon	Non-Salmonid Fishery	2

[1]Fishery classifications, as part of surface water classifications, are defined in Table 7-18.

Sources: Berry et al. 2004; MRIS 1999; MTDEQ 2006; NDEQ 2006; SDDENR 2008.

Representative game fish that occur within these waterbodies include a variety of warm water species such as catfish, sauger, walleye, bass, and bullhead. These recreationally important fish species or groups that occur within these waterbodies are listed in Table 7-19. Table 7-19 also includes the associated spawning periods and habitats.

Potential construction impacts to aquatic resources could include: short-term physical disturbance to stream channels, short-term increases in suspended solids concentrations from in-stream activities and erosion from adjacent disturbed lands, one-time increases in downstream sedimentation from in-stream activities and erosion from adjacent disturbed lands, potential fuel spills from equipment and toxicity to aquatic biota if fuel reached a waterbody, local short-term reductions in habitat if surface water is used for hydrostatic testing and loss of individuals during pumping, and potential loss of individuals as a result of acute and chronic toxicity from exposure to accidental fuel releases.

Table 7-18 Surface Water Classification		
State	**Classification**	**Definition**
Montana	Non-Salmonid	Waters that do not provide habitat for trout and salmon species. Non-salmonid species include sturgeons, suckers, minnows, etc.
	Marginal Salmonid	Waters that provide marginal habitat for trout and salmon species. Non-salmonid species include sturgeons, suckers, minnows, etc.
	Blue Ribbon – Class I	Recreational fishery of outstanding value.
	Red Ribbon – Class II	Recreational fishery of high value.

Keystone plans to use the HDD technique to cross the Missouri River; therefore, construction-related impacts on aquatic biota and their habitat will be minor. HDD would minimize impacts to important game and commercial fish species and special status species. Additionally, directional drilling would not alter or remove stream bank or aquatic habitat because construction within the channel would not be required. It is possible that mud from directional drilling inadvertently could enter the active stream along the drilling path. However, if mud seepage (frac-out) is detected, Keystone would implement the HDD frac-out contingency plan, and corrective measures would be implemented to eliminate or minimize seepage. If any seepage enters the stream, increased turbidity or physical impact to the covering substrate would be localized and short-term (less than one day). Preventive and response measures to frac-outs will be enumerated in a frac-out contingency plan.

Keystone will employ multiple safeguards to prevent a pipeline release. The chance of a spill occurring is very low and if a spill occurred, the volume is likely to be relatively small. In the unlikely event of a pipeline release, Keystone will initiate its Emergency Response Plan and emergency response teams will contain and clean-up the spill. To minimize impacts to aquatic resources, appropriate remedial measures will be implemented to meet federal and state standards designed to ensure protection of human health and environmental quality.

Table 7-19 Game and Commercial Fish Spawning Periods and Habitat													
Species or Group [1]	**Months [2]**												**Habitat**
	J	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	
Burbot	X	X	X									X	Eggs are scattered over sand or gravel substrates.
Bass					X	X							Shallow areas over clean gravel and sand bottoms.
Bullhead (yellow and black)					X	X							Usually spawn in weedy or muddy shallow areas by building nests.
Buffalo				X	X	X							Spawn at depths of four to 10 feet over gravel or sand substrates.
Carp				X	X	X							Adhesive eggs scattered in shallow water over vegetation, debris, logs, or rocks.

Table 7-19 Game and Commercial Fish Spawning Periods and Habitat													
Species or Group [1]	**Months [2]**												**Habitat**
	J	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	
Channel catfish					X	X	X						Prefers areas with structure such as rock ledges, undercut banks, logs, or other structure where it builds nests.
Crappie					X	X							Eggs deposited in depressions on bottom in cove or embayments.
Freshwater drum					X	X							Buoyant eggs drift in river currents during development.
Northern pike					X	X							Small streams or margins of lakes over submerged vegetation.
Paddlefish				X	X								Moves into rivers and spawns over flooded gravel bars.
Sauger				X	X								Moves into tributary streams or backwaters where they spawn over rock substrates.
Shovelnose sturgeon					X	X							Spawning occurs in open water channels of large rivers over rocky or gravelly bottoms.
Walleye				X	X								Spawn in lakes and streams in shallow water over rock substrates.
White bass				X	X	X							Egg masses deposited over sand bars, submerged vegetation, or other instream debris.
Yellow perch				X	X	X							Shallow open water over weedy areas.

[1]Rainbow trout is not included because the species does not spawn in streams crossed by the pipeline route.
[2]Spawning periods are approximate and could occur in only a portion of a particular month.
Sources: Eddy and Underhill 1974; Harlan et al. 1987; Skaar 2001; MFWP 2008c.

A discussion of potential effects from open-cut crossings follows.

7.8.2.1 In-Stream Habitat

In the vicinity of the trench-line, trenching and backfilling can result in alteration of in-stream habitat and the mortality of benthic invertebrates inhabiting that reach of the watercourse. Studies done to monitor the effects on benthic invertebrates have indicated that the impacts are short term. The disturbed area typically is re-colonized by benthic invertebrates to near pre-construction levels by the spring or summer following construction (Tsui and McCart 1981; Schubert and Vinikour 1987).

Backfilling the in-stream trench can either improve or lessen the quality of habitat available. This habitat quality change would depend largely on the nature of the soil materials from the lower depths of the trench with respect to those near the surface. If backfilling results in a different material on the stream bed surface than the adjacent areas, a local habitat modification may have occurred. However, the limited extent of the disturbed area and the active bottom substrate sorting by a river suggest any such habitat modification would be small and of short duration in most stream environments.

7.8.2.2 Bank Cover

Vegetation cover along the stream banks of a waterbody provides cover for fish, shading, bank stability, erosion control, and an increased food and nutrient supply due to the deposition of insects and vegetation matter into the watercourse. Loss of bank cover may result in increased water temperatures, reduced food supply, impaired aesthetics, and reduced productivity. The potential for channel migration also can be increased since the removal of vegetation destabilizes the banks at discrete locations. Given the relatively small width of disturbance associated with a pipeline crossing, the above impacts tend to be negligible relative to an entire stream system. The BLM-Specific CMRP describes typical stream bank reclamation measures that would ensure short-term bank stability (temporary erosion control structures) and rapid vegetation recovery (replanting woody species where appropriate).

7.8.2.3 Interruption of Fish Movement

Most water crossing methods allow movement of fish across the ROW; however, some techniques, such as dry crossing procedures, may temporarily block or delay normal movements. Long-term interruption of fish movement in a watercourse or a relatively short-term delay in spawning migration can have adverse impacts. Interruptions during sensitive periods typically are not a concern since in-stream construction generally can be performed outside of sensitive periods. Blockage of non-spawning-related fish movement for limited periods (less than seven days) should not affect fish growth and behavior. Delays of less than three days would not adversely affect spawning migrations (Dryden and Stein 1975).

7.8.2.4 Direct Disturbance of Spawning

In-stream construction activities can displace spawning fish from preferred habitat and result in the utilization of lower quality spawning habitat. Generally, this is of limited concern for water crossing construction since in-stream activities generally are not scheduled during spawning period. Keystone will work with agencies as necessary to further define spawning periods and to refine construction schedules to avoid, where possible, in-stream activities during sensitive periods. As shown in Table 7-19, spawning periods for most fish species extend from April through June

7.8.2.5 Water Quality Effects

It is widely recognized that in-stream excavation activities result in short-term increases in Total Suspended Solids (TSS) levels and turbidity. These levels decrease with distance from the source as particles settle. The levels also decrease with time following cessation of in-stream activities.

The impact to aquatic organisms by increases in suspended solids levels is a function of the duration of exposure and the concentration of suspended solids. While relatively high levels of TSS can occur immediately downstream of a crossing, the effects are very short-term with construction across most streams being completed in one day. Additionally, the waterbodies in the Project area experience wide ranges in seasonal flow rates, large peak flows due to precipitation events, and drain through areas with relatively fine-grained soils. These factors cause sudden natural peaks in suspended solids concentrations. The aquatic systems supported by these waterbodies are adapted to such increases.

The extent of the increase in TSS levels will be mitigated through the use of BMPs that include: measures to reduce the period of in-stream activity spoil handling techniques, as well as equipment access installation procedures. Standard industry BMPs also address upland erosion and sediment control procedures to limit the potential for runoff from disturbed areas to contribute to increase in-stream TSS levels.

7.8.2.6 Sedimentation Effects

Solids introduced into suspension in a waterbody ultimately would settle on the streambed downstream of the crossing. The distance from the crossing depends on the depth of flow, flow velocity, particle diameter and flow characteristics. Coarser materials (sands and gravels) settle relatively close to the crossing location and tend to be distributed uniformly across the stream section. Fine silts and clays can stay in suspension for considerable periods of time and tend to settle in natural depositional areas downstream of the crossing.

The channel substrates of the streams and rivers that would be crossed by the project consist primarily of fine-grained materials (clay, silt, and sand). Fine-grained excavated materials that become deposited downstream are expected to be similar to the existing substrate. Stream flows would re-suspend, and re-deposit excavated materials during higher flow periods.

Young and Mackie (1991) found that benthic invertebrates inhabiting the upper surface of the substrate may be more adaptable to sedimentation than are taxa occupying the interstitial spaces of the substrate. Post-construction studies have shown that benthic invertebrate populations generally have recovered to normal within one to two months of construction. Tsui and McCart (1981) reported benthic invertebrate populations downstream of a water crossing had recovered to near pre-construction levels shortly after construction.

The BMPs adopted for the Project as described in the BLM-Specific CMRP would mitigate the short-term effects of downstream sedimentation, as discussed under Section 7.0, Waterbodies and Riparian Areas.

7.8.2.7 Hydrostatic Testing

Section 8.2 of the BLM-Specific CMRP (Appendix C) shows streams or rivers as that may be used as potential water sources for hydrostatic testing for the Project. Of these, one location, the Missouri River, is located on or associated with federal lands, while tributaries to another, Cabin Creek, are on federal lands. The water is likely to be withdrawn during summer and fall months. Compared with stream base flow, relatively small one-time withdrawals would occur from the streams or rivers designated for hydrostatic test water in accordance with withdrawal permits.

Withdrawal rates and volumes would be designed to avoid impacts to aquatic life and downstream water users. Hydrostatic test water would be discharged to the land surface at an approved location or be returned to the source with an approved energy dissipation device. Discharged water may evaporate or infiltrate into the soil or drainage where the water is released. Hydrostatic test water would be returned to the same water source.

Water withdrawal could entrain small fish and drifting macro-invertebrates. The expected numbers of organisms removed during entrainment is considered to be relatively small in relation to the overall numbers in the stream or river. Hydrostatic testing would result in minor impacts to aquatic biota. The discharge of hydrostatic test water would follow state permit requirements, which will reduce potential effects on water

quality or aquatic organisms. Energy dissipation devices also would be used to prevent erosion at discharge locations.

7.8.3 Wildlife and Aquatic Species

Using the initial route, existing agency data bases, land use/land cover data, literature, and agency website information, a list of potential threatened, endangered, species of concern, and special status species, designated by state or federal agencies, was created for the Project area. Keystone then reviewed aerial photography, USGS maps, and previous field studies from the Project area and eliminated species not likely to occur based upon habitat traversed or a species historical range. This list was then used as a basis for discussion with the agencies to further refine and eliminate species not likely to occur and/or will not likely be impacted. This resulted in the development of survey protocols (see Appendix P) for the final list of species that could potentially occur in the project area on federal lands. Surveys in 2008 and 2009 were then undertaken to survey for species presence/absence (if in the suitable survey window) and/or to survey for potential habitat to refine the locations where presence/absence surveys will occur prior to construction. Appendix P contains contact reports, meeting minutes, and correspondence to/from agencies concerning this effort. Appendix P also contains copies of the survey protocols and the master list of species requiring survey.

Coordination with state wildlife agencies, USFWS, and BLM was initiated in March 2008, in a series of overview and information request meetings conducted state by state. Follow-up meetings were then arranged by state to discuss wildlife impacts specifically. Agencies were given species packages ahead of the meetings to review prior to approval. For migratory birds protected by the MBTA, Keystone has developed the Migratory Bird Conservation Plan (see Appendix O) which describes conservation measures that would be implemented during the different phases of the Project. Conservation measures identified in the November BA, December 2019 BO, and the December 23, 2019 letter from the USFWS that will be implemented for the Project are included in Appendix U.

7.8.3.1 Terrestrial Species

Six species that are federally listed as threatened and endangered under the ESA (whooping crane, black-footed ferret, interior least tern, piping plover, northern long-eared bat, and rufa red knot) and 36 listed as BLM special status species have been identified to potentially occur on federal lands crossed by the Project (Appendix Q). These species, their associated habitats, and their potential for occurrence along the Project route on federal lands was evaluated for each species based on its habitat requirements and/or known distribution. Based on these evaluations, three species (interior least tern, piping plover, and peregrine falcon) were eliminated from detailed analysis as not occurring on federal lands crossed by the Project (see Appendix Q for rationale).

Based on correspondence and consultation with USFWS, BLM, and MFWP, species-specific surveys were required for these species within suitable habitat (USFWS 2008a, b; BLM 2008d,e; MFWP 2008d,e). Biological surveys were conducted between 2008 and 2013 to identify suitable habitat. Additional agency consultations will be conducted prior to construction. In addition, species-specific surveys were conducted for nesting and roosting bald eagles and nesting raptors within appropriate habitat along the entire Project route. Additional species-specific surveys were conducted in 2018 and 2019. The results for the raptor surveys conducted in 2017 through 2019 and Bald Eagle Winter Roost surveys performed in 2018 and 2019 are presented in Appendix N. The results for the surveys completed between 2008 and 2013 were previously provided to the BLM and are not included in this POD. Table 7-20 outlines the timing of surveys that will occur prior to construction.

Potential impacts to wildlife resources will parallel those discussed in Section 7.8.1. Impacts to species from surface disturbance activities include the short-term loss or alteration of potential breeding and foraging habitats and temporary habitat fragmentation until native vegetation is reestablished. Potential impacts also could include the loss of less mobile species as the result of exposure to vehicle and construction equipment

traffic and the potential abandonment of a nest site or territory, including the loss of eggs or young. Other impacts would include short-term displacement of some of the more mobile species from the disturbance areas as a result of increased noise and human presence.

A number of occurrences of state-listed threatened or endangered species or species of special concern were identified by the state National Heritage Programs (NHPs) as occurring near or within the Project. BLM indicated that for reptile and amphibian species on BLM land, Keystone should assume their presence and not conduct surveys. Keystone would be required to establish off-site mitigation for impacts to these species. Recommendations also include setting up conservation measures for protecting snake hibernacula and preventing snakes from entering or being trapped in the open ditch. For terrestrial wildlife, most species may be rare within a given state, but their populations are relatively secure elsewhere. In addition, most are relatively mobile species that could avoid short-term construction disturbance with no resulting long-term adverse effects on local populations. Increased mortality rates could occur in species that are less mobile as the result of exposure to vehicles and construction traffic. This will result in the loss of some individuals, but the relatively narrow and linear disturbance area associated with pipeline construction is unlikely to have measurable adverse effects on local populations of special status species. For a few species, however, such as the greater sage-grouse, construction through an important habitat feature, such as a lek, may result in the loss of a local breeding population. This could result in extirpation of a population and contribute to a trend leading to federal listing without the implementation of appropriate conservation measures. Greater sage-grouse is listed as BLM special status species and a species of concern in Montana.

Table 7-20 Potential Species Survey Windows on BLM Land

Species	Locations	Time of Survey
Raptors (including bald and golden eagle)		March 1 – August 1
Swift fox	MT	April – August
Burrowing owl	MT	March 15 – October 31
Mountain plover	MT	May 1 – June 15
Sprague's pipit	MT	April 15 – July 15
Northern long-eared bat	MT	June 1 – July 31
Townsend's big-eared bat / Long-legged myotis*	MT	To be determined
BLM sensitive fish species*	MT	To be determined

Surface disturbance activities along the pipeline ROW would result in the temporary disturbance of portions of native prairie, wetland, and long-term disturbance in shrub or wooded habitats which may contain potentially suitable habitat for a number of species. Habitat surveys were completed in 2008, 2009, 2011, and 2013 to locate areas where suitable habitat may exist for follow-up species presence/absence surveys. The results for these surveys were previously provided to the BLM and are not included in this POD. Additional surveys were conducted in 2017, 2018 and 2019. The reports of these surveys are provided in Appendix N.

Avoidance, minimization, mitigation and conservation measures to reduce impacts to threatened and endangered species have been developed in consultation with federal and state agencies and are described in the FSEIS (2014), Final SEIS (2019) and BO. Outlined below is a summary of some of this analysis based upon what was found in in the surveys that have been conducted between 2008 and 2019. Detailed further in this section are current conservation measures for specific terrestrial and aquatic species potentially occurring along the Project. The analysis and avoidance, minimization, and conservation measures have been developed based on the results of the surveys.

7.8.3.1.1 Mammals

7.8.3.1.1.1 Townsend's Big-eared Bat, Long-legged Myotis, Northern long-eared Bat

No historic communal bat roost sites (e.g., hibernacula, nursery colonies, bachelor roosts) have been recorded along the Project route, thus impacts to communal roosts are not anticipated. During acoustic and mist net surveys conducted south of the Missouri River crossing on USACE lands in June and July 2019, six species were definitively confirmed. The northern long-eared myotis and little brown myotis were captured and identified with a combination of morphology and genetics, and silver-haired bat, hoary bat, western small-footed bat, long-eared myotis, and little brown myotis were confirmed in the acoustic data. Big brown bat and long-legged myotis bat passes were identified as "probable" during acoustic surveys. The results of the 2019 surveys are included in Appendix N.

No impacts are anticipated to Townsend's big-eared bat or long-legged bat. Impacts to northern long-eared bat could result from the removal of maternity roost trees should they be present and occupied. However, Keystone will implement conservation measures identified in the BO to avoid incidental impacts to this species, such as not removing trees between June 1 and July 31 without survey for occupied maternity roost trees within 150-feet of project disturbances.

7.8.3.1.1.2 Black-footed Ferret

Black-footed ferrets are extremely unlikely along the route. All known black-footed ferrets in the wild are the result of reintroduction efforts and "it is unlikely that any undiscovered wild populations remain" (USFWS 2015). There are no prairie dog colonies crossed by the Project in Montana, including any on federal land. In South Dakota, the project would cross occupied prairie dog colonies; however, South Dakota is block cleared for black-footed ferret meaning the prairie dog towns no longer contain any wild free-ranging black-footed ferrets and activities within these areas that result in the removal of the black-tailed prairie dogs and/or their habitat would no longer be required to meet the USFWS survey guidelines for black-footed ferrets or undergo consultations under Section 7 of the ESA (AECOM 2008a).

There are four black-footed ferret re-introduction sites in Montana: the U.L. Bend of the Charles Russell National Wildlife Refuge, the Fort Belknap Reservation, the Crow Reservation, and the Cheyenne Reservation (USFWS 2018). None of these sites are within 50 miles of any project component, including components on BLM-Administered land. The Service considers Montana unoccupied by wild ferrets outside of the re-introduced populations.

No impacts are anticipated to black-footed ferrets by the Project.

7.8.3.1.1.3 Black-tailed Prairie Dog

Keystone has completed numerous aerials and/or pedestrian surveys between 2008 and 2019 for black-tailed prairie dog colonies along the entire route. There are no black-tailed prairie dog colonies on or near BLM-Administered land that will be crossed by the Project. The only black-tailed prairie dog colonies within the Project survey corridor occur in South Dakota. No impacts to black-tailed prairie dog on federal lands are anticipated.

7.8.3.1.1.4 Swift Fox

The Project traverses current swift fox distribution on federal lands in Phillips, Valley, and Prairie counties in Montana (Kahn et al. 1997). Additionally, the Project crosses suitable habitat on federal lands in Fallon and McCone counties in Montana (Kahn et al. 1997). Data from the Montana Natural Heritage Program indicates that the proposed route is within five miles of swift fox occurrence records. Pedestrian surveys of most areas with suitable habitat, including those areas of suitable habitat on BLM-managed lands, were surveyed for swift fox natal dens in 2008, 2009, 2010, 2013, and 2019. Two potential, and one probable, swift fox natal dens were identified in 2013 on private land in Phillips and Valley counties. The probable den was distinguished from the potential dens by a landowner account which stated that the den had previously been used by swift fox. These three dens were revisited in 2019, and new dens were searched for. No evidence of swift fox use at any den was documented in 2019.

Potential impacts to swift fox potentially occurring along the pipeline route include a temporary incremental loss of foraging and/or denning habitat. These animals would be disturbed by increased human presence and associated construction activities (noise, dust); however, since they are mobile species their displacement would be temporary, and they would most likely return to the Project area when the Project is completed. If swift fox dens occur within the Project construction ROW, Project construction could result in a loss of individual animals if occupied. It is assumed that both adults and young would not avoid construction activities and would remain in natal den sites that could be directly removed by trenching activities or lost to vehicle operation. Construction activities prior to March would avoid direct effects to pups, if present. Loss of individual animals would result in an incremental reduction in the local population; however, no significant population effects are anticipated. If construction activity occurs during the breeding season (spring/summer) in the counties mentioned above, surveys for active dens would be required. If no active dens are found, construction would proceed. If an active den is found, construction activities would adhere to the recommended timing restrictions.

7.8.3.1.2 Birds

7.8.3.1.2.1 Raptors and Other Migratory Birds

Raptor species identified as potentially occurring along the route include ferruginous hawk, prairie falcon, Swainson's hawk, golden eagle, bald eagle, and burrowing owl. No active Swainson's hawk, ferruginous hawk, or golden eagle nests were observed on federal lands during surveys, although inactive ferruginous hawk nests were recorded, and suitable nesting, perching, and hunting habitat is present for all of these species.

Aerial raptor surveys did not include the identification of burrowing owl nests. Burrowing owls typically use burrows made by prairie dogs and other small mammals. Surveys for prairie dog colonies have been completed on the Project during pedestrian survey, and during aerial survey concurrent with raptor and grouse surveys. No colonies would be crossed by the route in Montana.

Surveys for active burrowing owl nests are recommended by MFWP, USFWS, and BLM, if construction is to occur during the nesting season (April 15 – October 1) in suitable habitat (BLM 2008e). One natal burrow was inadvertently found during biological surveys on private land in Montana. This natal burrow occurred in an abandoned badger burrow. Based on the lack of suitable nesting habitat for burrowing owls on BLM-Administered land, impacts to the species are not anticipated.

There are a number of non-raptor migratory bird species listed as BLM special status species that may be impacted by the Project. They include:

- Long-billed Curlew;
- White-faced Ibis;
- Loggerhead Shrike;
- Chestnut-collared Longspur;
- Red-headed Woodpecker;
- McCown's Longspur;
- Brewer's Sparrow;
- Baird's Sparrow;
- Sprague's Pipit; and
- Franklin's Gull.

Most of these species have been observed concurrent with other biological surveys on the Project, although many observations were on private land. In 2019, Keystone completed a survey for Sprague's pipit nests; two active nests were documented within the survey area and 75 calling males were recorded. Both Sprague's pipits' nests occurred on BLM-Administered land, the first near MP 33.3 and the second near MP 65.6. Potential impacts to these migratory species would be the same as discussed in Section 7.8.1 for nongame species.

Keystone has prepared Migratory Bird Conservation Plan dated July 6, 2018 (see Appendix O) that provides the conservation measures to be implemented during the different phases of the Project.

7.8.3.1.2.2 Mountain Plover

Mountain plover surveys are recommended in Montana within prairie dog towns colonies and in clay-pan habitat with low-growing vegetation that are within the species' range. There are no prairie dog colonies on BLM-Administered land. There are three areas of clay-pan habitat on BLM-Administered land along the Project route that could provide suitable nesting habitat for the species. Surveys for nesting mountain plover would be required for these areas if construction occurred between April 1 and July 15 and would not be allowed within 0.25-mile of an active nest. Surveys would be conducted according to USFWS mountain plover survey guidelines (USFWS 2002) unless otherwise directed by BLM. Due to the paucity of suitable habitat on BLM-Administered land, it is unlikely mountain plover would be impacted by the Project. Should an active nest be identified within the Project area, adherence to seasonal and spatial buffers for mountain plovers would be required as determined consistent with the HiLine ARMP. Potential impacts to these migratory species would be the same as discussed in Section 7.8.1 for nongame species.

7.8.3.1.2.3 Piping Plover and Interior Least Tern

No suitable habitat has been identified on federal lands. For discussion of potential habitat and results of 2008 and 2011 surveys, refer to the January 2014 FSEIS. Additionally, surveys were conducted at the Missouri River crossing in July 2019. No nesting habitat was observed within 0.25 miles of the pipeline crossing during the surveys due to high, consistent water levels and the lack of unvegetated sand bars. Due to the lack of suitable nesting habitat, such as consistent water levels and dense, emergent vegetation substrate, it is unlikely that piping plover and interior least tern would be present.

7.8.3.1.2.4 Greater Sage-Grouse

The greater sage-grouse is designated as a special status species by BLM and the state of Montana. In April 2004, USFWS determined that listing the sage-grouse under the ESA may be warranted and initiated a status review. However, based on a 12-month finding for petitions to list the greater sage-grouse as threatened or endangered, USFWS has subsequently determined that the listing is not warranted (70 FR 2244).

Locations of active, unconfirmed, and inactive lek sites were identified by MFWP and BLM and have been surveyed by agency and Project biologists. The results of the most recent surveys conducted in 2019 are provided in Appendix N. Sixteen leks were observed on federal lands within an 8-mile corridor (4 miles on each side of pipeline). The leks activity status were determined using MFWP definitions and available data. Ten leks were confirmed active (CA), one lek was identified as confirmed inactive (CI), three leks were never confirmed active (NCA), and 2 leks were unconfirmed (UC).

The BLM has identified avoidance, minimization, mitigation and conservation measures for sage-grouse in both the HiLine ARMP (BLM 2015) and Miles City ARMP, as amended (BLM 2015a). Sage-grouse conservation buffers are identified in Appendix C to both plans. The ARMP, and associated BAs, specify a nominal 3.1-mile buffer between March 1 and June 30. However, justifiable increases or decreases from these distances may be made on a lek-by-lek basis depending on "local data, best available science, landscape features, and other existing protections (e.g., land use allocations, state regulations)" (BLM 2015, 2015a). Keystone has developed lek-specific conservation buffers using local data, best available science, landscape features, and regulatory protections (i.e., environmental specifications from the Project's DEQ permit and requirements provided by the BLM). In addition, the Project's compensatory mitigation is

presented in the Project's sage-grouse conservation plan (Appendix M). Based on Keystone's conservation measures, the Project will not have an adverse impact on sage-grouse.

7.8.3.1.3 Reptiles/Amphibians

Six species of reptiles and amphibians (western hog-nosed snake, milk snake, spiny softshell, great plains toad, plains spadefoot, and northern leopard frog) were initially identified as occurring within the Project area; all but the milk snake could occur on federal lands (Appendix Q). Further consultation with MTNHP indicated historic occurrence records for four species (northern leopard frog, plains spadefoot, spiny softshell, and western hog-nosed snake).

Potential impacts to amphibian and reptile species include direct mortalities of individuals from construction activities, ground compaction, and vehicle traffic within suitable habitat. Impacts also would result from the incremental long-term reduction of potential habitat until reclamation is complete and vegetation reestablished.

The BLM recommended that surveys not take place, but that Keystone assume species presence and develop mitigative measures with BLM on off-site mitigation as well as species handling procedures if they come onto the construction ROW.

7.8.3.1.4 Aquatic Species

Aquatic species identified as potentially occurring in waterbodies crossed by the Project on federal lands include nine fish species (Appendix Q). Based on evaluations of associated habitats and known distribution, two species (the northern redbelly X fine scale dace and pearl dace) were eliminated from detailed analysis as not occurring on federal lands crossed by the Project (see Appendix Q for rationale). The Project would cross one stream or river (Missouri River) that contains known or potential habitat for special status fish species: the Missouri River borders federal lands on the south bank. The Missouri River contains historic occurrence data for the sicklefin chub, shortnose gar, sauger, blue sucker, paddlefish, sturgeon chub, and the pallid sturgeon, a USFWS endangered species (MFWP 2008a). However, impacts to special status species at the Missouri River would be avoided using HDD crossing methods.

Permanent access road CAR-227 will be constructed on federal lands at approximate MP 90.67 to access 260-VLLEY-04C. A portion of the access road will parallel the Missouri River (See Appendix B, Sheet 11). To protect pallid sturgeon habitat, the access road improvements will maintain a minimum distance of 30-feet from the edge of the riparian areas associated with the Missouri River and will be bladed and filled to ensure that runoff from the access road will generally be toward the south away from the Missouri River and riparian areas. In accordance with the BLM-Specific CMRP (Appendix C), BMPs will be installed along the access road to prevent runoff toward the river. The access road will be approximately 30-feet wide. Determination as to whether gravel will be needed will be determined during final design.

7.9 Land Use

Approximately six percent of overall Project disturbance will occur on federal lands. The principal land use affected by the Project on federal lands is rangeland, comprising over 96 percent of land use on the federal lands. Other land use categories that would be affected by construction of the Project on federal lands include developed, agriculture, forest, water, and wetlands. Miles of surface disturbance to various land uses on federal lands caused by construction of the Project are summarized in Table 7-21.

A relatively small, temporary loss of forage land will occur in many rangelands during construction. Keystone will repair or restore fences and habitat that are temporarily disturbed during pipeline construction, as described in the BLM-Specific CMRP. The BLM-Specific CMRP also describes topsoil handling and reclamation practices designed to restore land productivity to its prior use.

Table 7-21 Land Uses Affected by Construction of the Project on Federal Land (Miles)							
	Developed	**Agriculture/ Cropland**	**Rangeland**	**Forest**	**Water**	**Wetland/ Riparian**	**Total**
Pipeline							
Montana	0.41	0.03	45.34	0.30	0.25	0.004	46.32
Pipeline Subtotal	0.41	0.03	45.34	0.30	0.25	0.004	46.32
Access Roads							
Montana	12.27	-	0.96	-	0.02	-	13.25
Access Road Subtotal	12.27	-	0.96	-	0.02	-	13.25
Federal Lands Total[1]	**12.68**	**0.03**	**46.30**	**0.30**	**0.27**	**0.004**	**59.57**
[1]Discrepancies in totals are due to rounding.							

The following overview of land use types within the proposed ROW on federal lands represents information gathered from field surveys conducted between 2008 and 2019 input from federal, state, and local agencies, and review of current aerial photography. Land use was defined in the following groups:

- Developed: lands on federal lands that have previously been developed ROW for roads or other power lines.
- Agriculture/cropland: land suitable for or used for the cultivation of crops.
- Grassland/Rangeland: land that is occupied by native herbaceous or shrubby vegetation, which is grazed by domestic or wild herbivores. Grasslands can be native or improved land.
- Forest Land: land consisting of wooded upland forests. This land is dominated by trees and shrubs and includes areas planted with trees for the pulp and/or paper industry.
- Water: rivers, streams, creeks, bayous, ponds, lakes, etc.
- Wetlands: low-lying areas of land that are saturated with moisture, especially when regarded as the natural habitat of wildlife. These lands include emergent wetlands, scrub/shrub wetlands, and forested wetlands.

Based on the assessments, no habitable structures are located within 500 feet of the Project ROW and access roads on federal lands.

There is the potential, if construction occurs during the hunting season, for short-term recreational disruptions as construction passes through. Hunting opportunities will still exist nearby on state and federal lands, which construction will not affect. Any disrupted hunting opportunities on these lands will resume in the long-term as the land is reclaimed.

Construction of the Project will have temporary impacts on recreational traffic and use patterns during construction activities in special management areas and recreational areas. Access to the immediate area will be restricted during construction. Keystone will continue to coordinate with agency managers to minimize conflicts between construction activities and recreational uses for which these special areas were established. These impacts will be of short duration with no long-term impacts.

7.9.1 Traffic Control Plan

When construction occurs on or adjacent to roadways, Keystone will ensure the Contractor will furnish, install, sign, and maintain temporary traffic controls to provide adequate warning for potentially affected motorists. Additionally, the contractor will be required to maintain access to roads during construction activities, particularly for emergency vehicles. A project-specific traffic control and sign plan will be prepared by Keystone and approved by BLM prior to commencing construction. Flagmen and devices shall be as specified in the "Manual on Uniform Traffic Control Devices for Streets and Highways" (MUTCD).

7.9.2 Visual Resources

Landscape characteristics over the Project include rolling terrain north of the Missouri River, and rolling to broken terrain south of the Missouri River interspersed with breaks and badlands. Vegetation is dominated by native grasslands and sagebrush rangeland. Project impacts could include the physical disturbance during construction of the visual environment's landform, vegetation and/or structures. Construction activities have visual components that may contrast with the existing visual environment. A generally positive consideration regarding pipeline construction is that the activity moves relatively rapidly along the approved route. Topographic modifications will be minor; for the most part, the pipeline will follow native terrain and the backfill will restore the surface to natural levels. Upon completion of construction, the disturbed ROW will be revegetated with approved seed mixes to provide native grasses in grassland areas. The pipeline will not cross heavily forested areas on federal lands, so permanent clearing will not occur. After reclamation, visual effects of the pipeline will be essentially eliminated with the first crop grown on those portions of the ROW.

Aboveground facilities will be limited to two IMLVs, to be located on federal land south of the Missouri River crossing. Both valves will be located downstream of the Missouri River crossing, which is at approximate MP 89.60. These IMLVs will be fenced with 8-foot high, chain-link wire that is crowned with angled barbed wire to prevent entry. The approximate footprint of each valve will be a 50-foot by 50-foot site within the permanent pipeline ROW. Each valve will be approximately 6 feet high and consist of small-diameter pipe stands and valve wheels. Each IMLV will be painted covert green per the BLM Standard Environmental Color Chart (BLM 2008). All temporary and permanent roads on BLM-Administered lands will be covered in a visually compatible material that is similar to the color of native soil and rock where the road is established.

Descriptions of visual resources include the aesthetic value of the natural and developed landscape, the public value of viewing the natural landscape, and the visibility of the landscape from sensitive viewpoints (e.g., residences, recreation areas, rivers, and highways). Documentation of potential visual effects of the pipeline includes evaluation of physical features of the landscape, with particular attention to the ability of the particular landscape to absorb the visual modifications that will be introduced, together with the level of concern, or sensitivity, people have for scenic quality. Together these factors define the degree of landscape modification that will acceptable. BLM is responsible for identifying and protecting scenic values on public lands under several provisions of FLPMA and NEPA. The BLM Visual Resource Management (VRM) system was developed to facilitate the effective discharge of that responsibility in a systematic, interdisciplinary manner.

The VRM system, documented by BLM in the 8400 series VRM Manual (BLM 1986), was used as the basis for both the visual resources inventory and the assessment of visual impacts of Project route alternatives. The VRM system includes an inventory process, based on a matrix of scenic quality, viewer sensitivity to visual change, and viewing distances, which leads to classification of public lands and assignment of visual management objectives. Four VRM classes have been established, which serve two purposes: 1) as an inventory tool portraying relative value of existing visual resources and 2) as a management tool portraying visual management objectives for the respective classified lands to establish the guidelines for the level of acceptable visual change allowed in the landscape. The management objectives for each of the VRM classes are displayed in Table 7-22.

The VRM system also includes a contrast rating procedure for evaluating the potential visual effects of a proposed project or management activity. The VRM system was used to evaluate the visual impact of the Project on BLM lands as well as the potential cumulative visual effects of the project in the context of other activities that have taken place or may take place in the area in the reasonably foreseeable future (Table 7-23).

Table 7-22 Bureau of Land Management Visual Resource Management Class Objectives

Classification Objectives	Requirement
Class I Objective	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
Class II Objective	The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen but should not attract the attention of the casual observer. Any changes must repeat the basic (design) elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
Class III Objective	The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
Class IV Objective	The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic (design) elements.
Rehabilitation Areas	Areas in need of rehabilitation from a visual standpoint should be flagged during the inventory process. The level of rehabilitation will be determined through the ARMP process by assigning the VRM class approved for that particular area.

Source: BLM 2015, 2015a.

Table 7-23 VRM Classes Crossed by the Pipeline Centerline on Federal Lands

Federal Lands Crossed	From MP	To MP	Miles by VRM Class			
			Class II	Class III	Class IV	Total
Bureau of Land Management	0.00	0.93	-	-	0.93	0.93
	2.47	2.64	-	-	0.17	0.17
	6.03	6.26	-	-	0.23	0.23
	9.20	9.74	-	-	0.54	0.54
	11.40	12.03	-	-	0.63	0.63
	12.03	12.33	0.3	-	-	0.3
	13.06	13.78	0.72	-	-	0.72
	15.38	15.42	0.04	-	-	0.04
	21.31	21.66	0.36	-	-	0.36
	24.99	25.11	0.13	-	-	0.13
	28.84	28.87	-	-	0.03	0.03
	32.62	34.84	-	-	2.22	2.22
	35.21	36.67	1.46	-	-	1.46
	37.07	37.34	0.27	-	-	0.27
	37.68	38.85	1.18	-	-	1.18

Table 7-23 VRM Classes Crossed by the Pipeline Centerline on Federal Lands						
Federal Lands Crossed	**From MP**	**To MP**	**Miles by VRM Class**			
			Class II	**Class III**	**Class IV**	**Total**
	42.57	43.16	0.59	-	-	0.59
	45.84	46.96		-	1.13	1.13
	47.73	48.49		-	0.76	0.76
	49.95	52.97		-	3.01	3.01
	53.39	54.48		-	1.09	1.09
	54.71	55.23		-	0.51	0.51
	55.56	56.19	-	-	0.63	0.63
	56.82	56.85	-	-	0.04	0.04
	57.19	57.53	-	-	0.34	0.34
	58.31	61.64	-	-	3.33	3.33
	62.49	62.87	-	-	0.38	0.38
	63.67	64.38	-	-	0.71	0.71
	65.26	65.75	-	-	0.49	0.49
	66.98	67.29	-	-	0.31	0.31
	67.29	68.37	-	1.08	-	1.08
U.S. Army Corps of Engineers	89.79	91.67	1.88	-	-	1.88
Bureau of Land Management	91.67	92.13	0.46	-	-	0.46
	92.13	93.13	-	-	1.00	1.00
	93.88	93.97	-	-	0.09	0.09
	93.97	95.54	-	1.57	-	1.57
	95.84	97.11		1.27	-	1.27
	99.76	100.08		0.32	-	0.32
	104.22	104.36		0.14	-	0.14
	104.36	104.49	-	-	0.13	0.13
	107.35	107.61	-	-	0.25	0.25
	107.93	108.15	-	-	0.22	0.22
	109.85	110.50	-	0.65	-	0.65
	111.20	111.29	-	-	0.09	0.09
	112.47	113.10	-	-	0.63	0.63
	115.95	116.63	-	-	0.67	0.67
	117.17	117.87	-		0.70	0.70
	118.74	118.83	-	-	0.10	0.10
	120.14	120.67	-	-	0.53	0.53
	120.82	121.03	-	-	0.21	0.21
	127.58	127.61	0.03	-	-	0.03
	129.90	130.39	0.49	-	-	0.49
	211.30	211.95	-	-	0.65	0.65
	212.55	213.25	-	-	0.70	0.70
	213.33	220.27	-	-	6.94	6.94
	231.74	232.37	-	-	0.63	0.63
	233.24	233.85	-	-	0.60	0.60
	239.68	239.86	-	-	0.19	0.19
	249.29	250.00	-	-	0.71	0.71
	256.43	256.55	-	-	0.12	0.12
	256.74	256.97	-	-	0.24	0.24
	275.10	275.60	-	-	0.50	0.50
TOTAL			**7.90**	**5.03**	**33.40**	**46.32**
Percent of Total			**17.0%**	**10.9%**	**72.12%**	**100%**
Note: Discrepancies in mileage totals are due to rounding						

7.9.2.1 Recreation Use

Most of the BLM land crossed is currently leased for grazing rights by area ranchers. During construction, when equipment is on-site, hunting on some of this land will not be available. The hunting season following completion of the pipeline ROW, the area will be open for continued hunting.

Depending on access, BLM lands crossed by the Project may be used for dispersed recreation such as hunting, camping, hiking, and bird watching. Recreational users may temporarily relocate to surrounding areas if access roads are congested due to construction. Hunting would be expected to be the predominant recreational use of most affected BLM lands. Construction and reclamation work during hunting seasons would temporarily exclude hunters from comparatively small areas. After ROW reclamation is complete, hunter use of BLM lands would return to pre-construction levels. Therefore, hunter opportunities, harvest rates, or the number of hunter days would not be affected over the long-term.

7.9.3 Wilderness Areas

No wilderness areas, wilderness study areas, or lands managed for lands with wilderness characteristics will be crossed by the Project.

7.9.4 Transportation

No impacts to airports, railways, or future construction projects will occur on federal lands.

7.9.4.1 Roadways and Railways

No paved roads or highways, and no railroads are crossed on federal lands.

Minor roads are those transportation corridors having less volume and use than major roads. They are mainly established for local travel within the state. Eleven minor road crossings (local neighborhood or rural roads) will be crossed on federal lands.

7.10 Cultural Resources

Protection of cultural resources is defined by a series of federal laws designed to manage and protect these national assets from damage or loss due to federally funded or permitted activities. These laws include, but are not limited to, the Antiquities Act of 1906, Historic Sites Act of 1935, Executive Order 13007, Executive Order 11593, Archaeological and Historic Preservation Act of 1974, Archaeological Resources Protection Act of 1979, and Section 106 of the NHPA of 1966, as amended. Together, these federal guidelines provide necessary guidance on the protection of cultural resources.

In compliance with the mandates listed above, cultural resource investigations commenced for the Project in June 2008 and are currently ongoing. The reports for the cultural surveys completed for the Project since the issuance of the January 2014 FSEIS, including tables and maps that outline the sites on BLM managed lands that are currently within the Project area, are provided in Appendix R. Areas not surveyed prior to the start of construction will be summarized in a Coordination Plan, which is a requirement of the Programmatic Agreement. The Coordination Plan will outline how these areas will be inventoried prior to ground disturbance.

7.10.1 Results of Records Search

To date, Keystone has conducted several Class I files/records searches for the project area at the Montana SHPO office and at the BLM Miles City Field Office. These Class I searches yielded numerous previously recorded sites on federal lands on the pipeline centerline, access roads, transmission lines, and within ancillary facility survey areas in Montana. Results of the file searches are included in the January 2014 FSEIS

(Berg et al. 2008; Cooper et al., 2009; Zietz et al., 2009; Baer et al. 2010; Crossland et al. 2010, Johnson et al. 2012; Boyer et al. 2013; Kromarek et al. 2013). Class I and III inventories were completed in 2018 and 2019 and are summarized in the Class III Cultural Resources Survey Report – MT, Addendum 9: Additional Fieldwork Results dated January 14, 2019 (Ethnoscience 2019a) and Class III Cultural Resources Survey Report – MT, Addendum 10: Additional Fieldwork Results dated December 30, 2019 (Ethnoscience 2019b).
Results of Field Investigations

Those areas in which construction activity is planned or where impacts are likely to occur are referred to as the area of potential effect or APE. Specifically, the APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of NRHP-eligible sites.

For the Project, the APE is a 300-foot corridor. In greenfield areas, the corridor is centered on the proposed centerline; where the Project parallels the existing Northern Border pipeline, the corridor is set at 50 feet on the spoil side and 250 feet on the working side. The footprint of proposed pump stations, pipe yards, contractor yards, and any other temporary use or staging areas, were entirely surveyed, plus a 100-foot buffer. A 100-foot survey corridor centered on access roads to be used or upgraded during construction were inventoried. Through the course of Project planning, the route has shifted in some locations resulting in the elimination of some cultural resources from the APE. All cultural resources identified during survey were recorded; however, impacts are only considered for resources determined eligible or potentially eligible for listing on the National Register of Historic Places (NRHP). Table 7-24 lists all cultural resources that have been identified on BLM lands along the centerline corridor and access roads. Transmission lines are no longer part of the Project and are being managed and permitted separately by the individual electrical power providers and are not included here. Maps for the sites currently within the Project area are included in Appendix R.

Field Number	Smithsonian Number	NRHP Eligibility Recommendation	Cultural Affiliation	Site Type	APE (In/ Out)	Infrastructure
C054VA006	N/A	Not Eligible	Historic	Isolated Find	In	Centerline
C055VA013	N/A	Not Eligible	Prehistoric	Isolated Find	In	Centerline
C058PR006	N/A	Not Eligible	Prehistoric	Isolated Find	Out	Centerline
C069VA001	N/A	Not Eligible	Prehistoric	Isolated Find	Out	Access Road
C711VA008	N/A	Not Eligible	Prehistoric	Isolated Find	In	Access Road
C720VA006	N/A	Not Eligible	Historic	Isolated Find	Out	Access Road
CC1-PH-IF001	N/A	Not Eligible	Prehistoric	Isolated Find	In	Centerline
CC1-PH-IF002	N/A	Not Eligible	Prehistoric	Isolated Find	In	Centerline
CC1-VL-IF003	N/A	Not Eligible	Prehistoric	Isolated Find	In	Access Road
CC1-VL-IF004	N/A	Not Eligible	Historic	Isolated Find	Out	Centerline
BC-IF1	N/A	Not Eligible	Prehistoric	Isolated Find	Out	Centerline
BC-IF2	N/A	Not Eligible	Prehistoric	Isolated Find	Out	Centerline
BC-IF3	N/A	Not Eligible	Prehistoric	Isolated Find	In	Centerline
BC-IF4	N/A	Not Eligible	Prehistoric	Isolated Find	Out	Centerline
IF1-20190510	N/A	Not Eligible	Prehistoric	Isolated Find	In	Centerline
C001FA002	24FA0761	Not Eligible	Historic	Well / Windmill	In	Centerline
C056MC004	24MC0464	Unevaluated	Historic	Homestead	In	Centerline
C056MC005	24MC0465	Unevaluated	Prehistoric	Stone Feature, Lithic Scatter	In	Centerline

Field Number	Smithsonian Number	NRHP Eligibility Recommendation	Cultural Affiliation	Site Type	APE (In/ Out)	Infrastructure
C069PR001	24PE0721	Unevaluated	Historic	Homestead	Out	Access Road
C054PH001	24PH1759	Unevaluated	Prehistoric	Stone Circle	Out	Centerline
24PH2150	24PH2150	Unevaluated	Prehistoric	Stone Feature	Out	Access Road
C105PH001	24PH4337	Unevaluated	Prehistoric, Historic	Stone Circle, Historic Artifact Scatter	Out	Centerline
C105PH002	24PH4338	Unevaluated	Prehistoric	Stone Feature	Out	Centerline
C105PH011	24PH4347	Unevaluated	Prehistoric	Stone Feature, Lithic Scatter	Out	Centerline
C105PH012	24PH4348	Unevaluated	Prehistoric	Stone Circle	Out	Centerline
C105PH013	24PH4349	Unevaluated	Prehistoric	Stone Feature	Out	Centerline
C105PH004	24PH4340	Unevaluated	Prehistoric	Stone Circle	Out	Centerline
C105PH005	24PH4341	Not Eligible	Historic	Stone Alignment	Out	Centerline
C105PH006	24PH4342	Unevaluated	Prehistoric	Stone Circle	Out	Centerline
C105PH008	24PH4344	Unevaluated	Prehistoric	Stone Feature	Out	Centerline
C105PH009	24PH4345	Unevaluated	Prehistoric	Stone Circle, Artifact Scatter	Out	Centerline
C105PH010	24PH4346	Unevaluated	Prehistoric	Stone Circle	Out	Centerline
C105PH011	24PH4347	Unevaluated	Prehistoric	Stone Circle	Out	Centerline
C105PH012	24PH4348	Unevaluated	Prehistoric	Stone Circle	Out	Centerline
C105PH013	24PH4349	Unevaluated	Prehistoric	Stone Circle	Out	Centerline
C105PH014	24PH4350	Eligible	Historic	Homestead	Out	Centerline
C105PH015	24PH4351	Unevaluated	Prehistoric	Stone Feature	Out	Centerline
C106PH002	24PH4354	Not Eligible	Historic	Homestead	Out	Centerline
C106PH003	24PH4355	Not Eligible	Historic	Depression, Artifact Scatter	Out	Centerline
C054VA010	24VL0805	Unevaluated	Unknown	Stone Cairn	In	Centerline
C054VA012	24VL0962	Eligible, Non-Contributing Portion	Prehistoric, Historic	Stone Feature, Lithic Scatter, Historic Artifact Scatter	In	Centerline
C055VA017	24VL0972	Eligible, Non-Contributing Portion	Prehistoric, Historic	Stone Feature, Historic Fence Line	In	Centerline
C055VA018	24VL0979	Eligible	Historic	Homestead	In	Centerline

Field Number	Smithsonian Number	NRHP Eligibility Recommendation	Cultural Affiliation	Site Type	APE (In/ Out)	Infrastructure
C055VA020/ C63VA001	24VL1269 / 24VL1274	Eligible	Prehistoric	Stone Circle	In	Centerline
C081VA004	24VL1273	Unevaluated	Prehistoric	Stone Feature	Out	Centerline
C073VA005	24VL1298	Unevaluated	Prehistoric , Historic	Stone Circle, Homestead	Out	Centerline
C054VA007	24VL1892	Not Eligible	Historic	Artifact Scatter	In	Centerline
C054VA009	24VL1893	Unevaluated	Prehistoric	Stone Circle	In	Centerline
C055VA015	24VL1901	Not Eligible	Historic	Fence Line, Debris Scatter	In	Centerline
C055VA016	24VL1902	Unevaluated	Prehistoric	Stone Circle	Out	Centerline
C056VA001	24VL1905	Unevaluated	Unknown	Stone Cairn	Out	Centerline
C056VL002	24VL1906	Unevaluated	Unknown	Stone Feature	In	Centerline
C054VA012	24VL1908	Unevaluated	Prehistoric	Stone Circle	Out	Centerline
C212VA002	24VL1912	Eligible	Historic	Homestead	Out	Centerline
C065VA002	24VL1918	Eligible	Historic	Homestead	Out	Access Road
C063VA007	24VL1919	Eligible	Prehistoric	Stone Circle	In	Centerline
C81VA001	24VL1922	Unevaluated	Unknown	Stone Cairn	Out	Centerline
C081VA002	24VL1923	Unevaluated	Prehistoric	Stone Circle	Out	Centerline
C81VA006	24VL1925	Unevaluated	Prehistoric	Stone Circle	Out	Centerline
C81VA007	24VL1926	Unevaluated	Historic	Homestead	Out	Centerline
C212VA005	24VL1930	Unevaluated	Unknown	Stone Cairn	Out	Centerline
C212VA006/ C212VA007	24VL1931	Unevaluated	Unknown	Stone Feature	Out	Centerline
C212VA008	24VL1932	Not Eligible	Historic	Fence Line	Out	Centerline
C212VA011	24VL1935	Unevaluated	Prehistoric , Historic	Stone Cairn, Historic Debris Scatter	Out	Centerline
C213VA002	24VL1936	Unevaluated	Prehistoric	Stone Feature	In	Access Road
C105VA006	24VL1964	Unevaluated	Prehistoric	Stone Feature	Out	Centerline
C105VA009	24VL1967	Unevaluated	Prehistoric	Stone Circle	Out	Centerline
C512VA003	24VL1985	Not Eligible	Historic	Road Grade	Out	Access Road
C700VA004	24VL2055	Unevaluated	Prehistoric	Stone Circle	Out	Access Road
C700VA005	24VL2056	Unevaluated	Prehistoric	Stone Circle	Out	Access Road
CA180524_T318_VA001	24VL2153	Unevaluated	Prehistoric	Rock Alignment	Out	Access Road
CI180524_T318_VA002	24VL2154	Unevaluated	Prehistoric	Cairn	Out	Access Road
BC-8	24VL2166	Not Eligible	Prehistoric	Lithic Scatter	In	Centerline
BC-6	24VL2167	Unevaluated	Prehistoric	Rock Cairns	Out	Centerline

Field Number	Smithsonian Number	NRHP Eligibility Recommendation	Cultural Affiliation	Site Type	APE (In/ Out)	Infrastructure
BC-7	24VL2168	Not Eligible	Prehistoric	Lithic Scatter	In	Centerline
BC-3	24VL2169	Unevaluated	Prehistoric	Stone Rings	In	Centerline
BC-2	24VL2170	Unevaluated	Prehistoric	Stone Features	In	Centerline
BC-1	24VL2171	Unevaluated	Prehistoric	Stone Features	In	Centerline
J-3	24VL2172	Unevaluated	Prehistoric	Stone Ring	Out	Centerline
J-2	24VL2173	Unevaluated	Prehistoric	Rock Cairn	In	Centerline
24VL2174	24VL2174	Unevaluated	Prehistoric	Stone Rings	In	Centerline
TT-4	24VL2175	Unevaluated	Prehistoric	Stone Ring	In	Centerline
BC-5	24VL2176	Not Eligible	Prehistoric	Lithic Scatter	Out	Centerline
RA-1	24VL2177	Unevaluated	Prehistoric	Stone Rings	Out	Centerline
RA-2	24VL2178	Unevaluated	Prehistoric	Stone Ring	Out	Centerline
ML-1	24VL2179	Unevaluated	Prehistoric	Stone Ring	In	Access Road
ML-2	24VL2180	Unevaluated	Prehistoric	Stone Rings	In	Centerline
CC1-VL-002	24VL2183	Unevaluated	Prehistoric	Stone Arc	In	Centerline
CC1-VL-008	24VL2189	Unevaluated	Prehistoric	Stone Ring	In	Centerline
CC1-VL-009	24VL2190	Unevaluated	Prehistoric	Stone Features	In	Centerline
CC1-VL-010	24VL2191	Unevaluated	Prehistoric	Stone Rings	In	Centerline
CC1-VL-011	24VL2192	Unevaluated	Prehistoric	Stone Feature	Out	Access Road
CC1-VL-012	24VL2193	Unevaluated	Prehistoric	Stone Features	In	Centerline
CC1-VL-016	24VL2197	Unevaluated	Prehistoric	Stone Ring	In	Centerline
CC1-VL-017	24VL2198	Unevaluated	Prehistoric	Rock Alignment	In	Centerline
CC1-VL-018	24VL2199	Unevaluated	Prehistoric	Rock Cairn	In	Centerline
CC1-VL-021	24VL2200	Unevaluated	Prehistoric	Rock Cairn	In	Centerline
CC1-VL-022	24VL2201	Not Eligible	Historic	Irrigation System	In	Centerline
CC1-VL-023	24VL2202	Unevaluated	Prehistoric	Stone Ring	In	Centerline
CC1-VL-026	24VL2204	Unevaluated	Prehistoric	Stone Arc	In	Centerline
S120190912	24VL2207	Unevaluated	Prehistoric	Stone Feature	Out	Access Road
S1_20190910	24VL2209	Unevaluated	Prehistoric	Stone Feature	In	Access Road
S2_20190910	24VL2210	Unevaluated	Prehistoric	Stone Feature	In	Access Road
S3_20190910	24VL2211	Unevaluated	Prehistoric	Stone Ring	In	Access Road
CC1-VL-030	24VL2213	Unevaluated	Prehistoric	Stone Feature	Out	Access Road

Keystone archaeologists have identified 105 resources on federal lands during Project surveys. An additional Fifty-eight of these resources on federal lands have been avoided through infrastructure changes and are no

longer within the Project APE. Of the 7 resources (39 sites and 8 isolated finds) located on federal lands within the Project APE, 14 are not eligible (including 8 isolates), 28 are unevaluated, and 5 are eligible.

If adverse effects to any NRHP-eligible, potentially eligible, or unevaluated sites cannot be avoided, Keystone will develop treatment plans for mitigating those effects in accordance with the 2013 Programmatic Agreement. Keystone will file avoidance or treatment plans, as appropriate, with the appropriate SHPOs, BLM, and DOS.

Construction activities and associated operations could adversely affect undiscovered archaeological sites. If previously undocumented sites are discovered within the construction corridor during construction activities, work that might adversely affect the discovery will cease until Keystone, in consultation with the appropriate parties, can evaluate the site's eligibility and the probable effects. If the previously unidentified site (human remains or other cultural materials) is recommended as being eligible for NRHP listing, impacts will be mitigated through the steps outlined in the Unanticipated Discovery Plan (Programmatic Agreement Attachment C).

The primary impact of the operation phase of the Project is the potential introduction of visual or audible elements (e.g., MLV), which could alter the setting associated with historic properties.

7.11 Native American Consultation

Federal statutes and implementing regulations require consultation with Native American tribes concerning the identification of cultural values, religious beliefs, and traditional practices of Native American people that may be affected by federally approved actions. These federal statutes include, but are not limited to:

- Section 106 of the NHPA, as amended, including Advisory Council on Historic Preservation's implementing regulations, specifically 36 CFR Part 800.2(c)(2)(ii);
- Executive Order 13007, which requires federal agencies to accommodate access to and ceremonial use of Native American sacred sites by Native American religious practitioners and to avoid adversely affecting the physical integrity of such sacred sites;
- American Indian Religious Freedom Act (1978); and
- The Native American Graves Protection and Repatriation Act (1990).

Consultation with federally recognized Native American tribes must occur on a government-to-government basis [36 CFR Part 800.2(c)(2)(ii)]; therefore, tribal consultation is the responsibility of the lead federal agency. Under 36 CFR Part 800.3(f)(2), it is the lead federal agency's duty to make a reasonable and good faith effort to identify any Native American tribes that might attach religious and cultural significance to historic properties in the APE and invite them to be consulting parties. Some tribes have a Tribal Historic Preservation Officer (THPO), others have a tribally designated individual or group of individuals responsible for consultation, such as elected tribal officials (e.g., the chief or council) or other respected community leaders, such as elders.

The DOS conducted extensive government-to-government consultation with Native American tribes. This consultation is summarized in the August 2011 DOS FEIS, January 2014 FSEIS, and December 2019 Final SEIS (see Section 7.11.2).

7.11.1 Keystone Tribal Engagement

In May 2008, prior to there being a lead federal agency, Keystone initiated Native American engagement by sending letters to the Native American tribes listed below:

- Blackfeet Nation;
- Fort Peck Tribes;

- Northern Cheyenne Tribe;
- Salish & Kootenai Tribes;
- Little Shell;
- Crow;
- Chippewa Cree;
- Standing Rock Sioux;
- Fort Berthould Tribe;
- Turtle Mountain Band of Chippewa;
- Spirit Lake Nation;
- Mandan, Hidatsa, and Arikara Nations;
- Sisseton-Wahpeton;
- Yankton Sioux;
- Rosebud Sioux;
- Oglala Sioux;
- Flandreau Santee Sioux;
- Crow Creek Sioux;
- Cheyenne River Tribe;
- Lower Brule Tribe;
- Ponca Tribe;
- Santee Sioux Tribe;
- Omaha Tribe;
- Winnebago; and
- Sac & Fox Tribe of the Missouri.

These tribes were identified as potentially falling within the consultation requirements as discussed above. The letters were sent to inform the various tribes of the proposed undertaking and to develop an ongoing and interactive relationship with the tribes. Keystone made clear that this engagement did not represent government-to-government consultation, which is the jurisdiction of the lead federal agency. Continued cooperation between the various SHPOs, state and federal agencies, Keystone archaeologists, various THPOs, and Native American tribal elders is essential to continued protection of historical properties and respect of tribal issues. Tribes have been invited to participate in archaeological surveys and have been provided the opportunity to conduct traditional cultural property studies. To date, 21 tribes have participated in these studies across the three states.

Tribal representation from Chippewa Cree Indians of the Rocky Boy's Reservation, Montana, Blackfeet Nation, and Otoe-Missouria Tribe participated in the reinvestigation of the Keystone XL Project centerline ROW from milepost 0 to 77 and identified 36 locations of interest within the Project ROW on BLM lands (Appendix R, Table R4). Government to government consultation with the tribes regarding these locations is ongoing.

7.11.2 DOS Tribal Consultation

In conjunction with the Section 106 process, DOS has conducted government-to-government consultation with Indian tribes. DOS initiated tribal consultation on January 30, 2009, and engaged consulting tribes by mail, phone, email, teleconferences, and in-person meetings at several locations near the proposed Project route. In consultation with Indian tribes and other stakeholders, DOS developed a Programmatic Agreement (PA) which would guide continuing Section 106 compliance with the NHPA if Keystone receives the necessary permits and implements the proposed Project. The PA can be found in Appendix E of the FSEIS. Following Keystone's 2012 Presidential permit application, DOS began additional government-to-government consultation for the proposed Project. A complete list of consultation efforts can be found in Section 3.11.4.3 and Appendix E of the FSEIS and in Table 3.9-1 of the 2019 SEIS. In the course of the eight years since DOS began reviewing the proposed Project, 125 face-to-face meetings with tribal members were held, 446 phone conversations, 3,757 emails, and 2,010 letters were exchanged between DOS and the tribes. Tribes consulted by DOS for the Project include:

- Absentee-Shawnee Tribe of Indians of Oklahoma;
- Alabama-Coushatta Tribes of Texas;
- Alabama-Quassarte Tribal Town, Oklahoma;
- Apache Tribe of Oklahoma;
- Arapahoe Tribe of the Wind River Reservation, Wyoming;
- Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation, Montana (also known as Fort Peck Tribes);
- Blackfeet Tribes of the Blackfeet Indian Reservation of Montana;
- Cherokee Nation, Oklahoma;
- Cheyenne and Arapaho Tribes, Oklahoma;
- Cheyenne River Sioux Tribe of the Cheyenne River Reservation, South Dakota;
- Chickasaw Nation, Oklahoma;
- Chippewa-Cree Indians of the Rocky Boy's Reservation, Montana;
- Choctaw Nation of Oklahoma;
- Comanche Nation, Oklahoma;
- Confederated Salish and Kootenai Tribes of the Flathead Indian Nation, Montana;
- Confederated Tribes of the Goshute Reservation, Nevada and Utah;
- Crow Creek Sioux Tribe of the Crow Creek Reservation, South Dakota;
- Crow Tribe of Montana;
- Delaware Tribe of Indians, Oklahoma;
- Duckwater Shoshone Tribe of the Duckwater Reservation, Nevada;
- Eastern Band of Cherokee Indians of North Carolina;
- Eastern Shawnee Tribe of Oklahoma;
- Ely Shoshone Tribe of Nevada;

- Flandreau Santee Sioux Tribe of South Dakota;
- Forest County Potawatomi Community, Wisconsin;
- Fort Belknap Indian Community of the Fort Belknap Reservation of Montana (also known as Gros Ventre and Assiniboine Tribe of Ft. Belknap);
- Hannahville Indian Community, Michigan;
- Ho-Chunk Nation of Wisconsin;
- Iowa Tribe of Kansas and Nebraska;
- Iowa Tribe of Oklahoma;
- Jena Band of Choctaw Indians, Louisiana;
- Kaw Nation, Oklahoma;
- Kialegee Tribal Town, Oklahoma;
- Kickapoo Traditional Tribe of Texas;
- Kickapoo Tribe of Indians of the Kickapoo Reservation in Kansas;
- Kiowa Indian Tribe of Oklahoma;
- Little Shell Tribe of Chippewa Indians of Montana
- Lower Brule Sioux Tribe of the Lower Brule Reservation, South Dakota;
- Lower Sioux Indian Community in the State of Minnesota;
- Match-e-be-nash-she-wish Band of Pottawatomi Indians of Michigan (also known as Gun Lake Potawatomi);
- Mille Lacs Band of Minnesota Chippewa Tribes, Minnesota;
- Modoc Tribe of Oklahoma;
- Nez Perce Tribe, Idaho;
- Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana;
- Nottawaseppi Huron Band of the Potawatomi, Michigan (also known as Huron Potawatomi Nation);
- Oglala Sioux Tribe of the Pine Ridge Reservation, South Dakota;
- Omaha Tribe of Nebraska;
- Osage Nation, Oklahoma;
- Otoe-Missouria Tribe of Indians, Oklahoma;
- Pawnee Nation of Oklahoma;
- Poarch Band of Creek Indians of Alabama;
- Pokagon Band of Potawatomi Indians, Michigan and Indiana;
- Ponca Tribe of Indians of Oklahoma;
- Ponca Tribe of Nebraska;
- Prairie Band of Potawatomi Nation, Kansas;

- Prairie Island Indian Community in the State of Minnesota;
- Red Lake Band of Chippewa Indians, Minnesota;
- Rosebud Sioux Tribe of the Rosebud Indian Reservation, South Dakota;
- Sac and Fox Nation of Missouri in Kansas and Nebraska;
- Sac and Fox Nation, Oklahoma;
- Sac and Fox Tribe of the Mississippi in Iowa;
- Santee Sioux Nation, Nebraska;
- Seneca-Cayuga Tribe of Oklahoma;
- Shakopee Mdewakanton Sioux Community of Minnesota;
- Shoshone Tribe of the Wind River Reservation, Wyoming (also known as Eastern Shoshone Tribe);
- Shoshone-Bannock Tribes of the Fort Hall Reservation of Idaho;
- Sisseton-Wahpeton Oyate of the Lake Traverse Reservation, South Dakota;
- Skull Valley Band of Goshute Indians of Utah;
- Southern Ute Indian Tribe of the Southern Ute Reservation, Colorado;
- Spirit Lake Tribe, North Dakota;
- Standing Rock Sioux Tribe of North and South Dakota;
- Stockbridge Munsee Community, Wisconsin;
- Thlopthlocco Tribal Town, Oklahoma;
- Three Affiliated Tribes of the Fort Berthold Reservation, North Dakota;
- Tonkawa Tribe of Indians of Oklahoma;
- Turtle Mountain Band of Chippewa Indians of North Dakota;
- United Keetoowah Band of Cherokee Indians in Oklahoma;
- Upper Sioux Community, Minnesota;
- Ute Indian Tribe of the Uintah and Ouray Reservation, Utah (also known as Ute Indian Tribe, also Northern Ute Tribe);
- Ute Mountain Tribe of the Ute Mountain Reservation, Colorado, New Mexico and Utah;
- White Earth Band of Minnesota Chippewa Tribes, Minnesota;
- Wichita and Affiliated Tribes (Wichita, Keechi, Waco, and Tawakonie), Oklahoma;
- Winnebago Tribe of Nebraska;
- Yankton Sioux Tribe of South Dakota; and
- Ysleta Del Sur Pueblo of Texas.

Of the tribes listed above, three tribes submitted Traditional Cultural Property studies that are applicable to BLM lands for the Project area in Montana:

- Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation, Montana (Fort Peck)

- Blackfeet Tribe of the Blackfeet Indian Reservation of Montana (Blackfeet)
- Little Shell Tribe of Chippewa Indians of Montana

The Chippewa Cree Indians of the Rocky Boy's Reservation (Chippewa Cree) did not submit a TCP study; however, through consultation with DOS, they provided areas for monitoring. All monitoring areas identified by Tribes to date within the current Project area on BLM lands in Montana are included in Appendix R, Table R3.

7.12 Health and Safety

Keystone will develop and submit a comprehensive safety plan (Plan) prior to start of construction. The Plan applies to activities prior to and during pipeline construction and will be implemented to protect employees, contractors, and the general public.

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 Project-specific Special Condition 40 (see Appendix Z of the January 2014 FSEIS), including the following:

- Pipeline markers would be installed on both sides of 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 fence crossings.
- 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 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 five-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 operating life of the proposed Project.

7.12.1 Industrial Waste and Toxic Substances

Hazardous waste materials will be disposed of at licensed waste disposal facilities. Hazardous wastes will not be disposed of in any other fashion, such as unpermitted burying. If toxic or hazardous wastes are encountered during construction, the contractor will be required to stop work immediately and notify Keystone. Keystone will then determine, with input from appropriate state and federal personnel, how to safely and effectively mitigate the contamination.

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8.0 Stabilization and Reclamation

The objectives of reclamation and revegetation are to return the disturbed areas to their approximate pre-construction use and capability. This involves the treatment of soil as necessary to preserve approximate pre-construction capability and the stabilization of the work surface in a manner consistent with the pre-construction land use. Stabilization and reclamation are described in the Construction/Reclamation Unit Specifications and BLM-Specific CMRP (see Appendix C and F).

8.1 Soil Stripping, Replacement, and Stabilization

The objective of topsoil handling is to maintain topsoil capability by conserving topsoil for future replacement and reclamation and to minimize the degradation of topsoil from compaction, rutting, loss of organic matter, or soil mixing so that successful reclamation of the ROW can occur. Keystone plans to implement the topsoil removal and storage measures identified in the BLM-Specific CMRP (Appendix C). Stabilization and reclamation will be completed as detailed in the Construction/Reclamation Unit Specifications and BLM-Specific CMRP. Work shall be conducted in accordance with applicable permits and the BLM Grant of ROW conditions. Salvage depths will typically be a minimum of four inches to a maximum of 12 inches depending on the depth of topsoil present in the area (except in designated sage brush habitat). On BLM lands, topsoil shall be salvaged over the entire ROW (see Section 6.2.2) except in sage brush habitat (see Section 7.8.1.3.2). Topsoil salvaging shall be done as detailed in the Construction/Reclamation Unit Specifications and the Keystone XL Pipeline Special Soil Handling Report – Montana. Based on site-specific circumstances, topsoil will be separated from subsoil over the trench, over the trench and spoil side, or full width of the ROW.

Temporary erosion and sediment control measures shall be installed immediately after initial disturbance of the soil, maintained throughout construction (on a daily basis), and reinstalled as necessary until replaced by permanent erosion control structures or reclamation of the construction ROW is complete. Specifications and configurations for erosion and sediment control measures may be modified by Keystone as necessary to suit actual site conditions. However, work shall be conducted in accordance with applicable permits. Erosion and sediment control measures could include, but are not limited to, the following: sediment barriers, trench plugs, temporary slope breakers (water bars), drainage channels or ditches, temporary mulching, or approved tackifier. If topsoil will be stored more than 30 days, Keystone will consult with BLM on any additional temporary erosion control methods that may be appropriate.

Once the pipe has been placed in the trench, the trench will be backfilled using the stockpiled subsoil whenever possible. Topsoil will not be used for backfill, and concentration and size of rocks will not be greater than what existed prior to construction. Work shall be conducted in accordance with applicable permits.

Soil that is backfilled in the trench will be compacted using the tracked construction equipment utilized during backfilling and rough clean-up. After backfilling, areas of the construction ROW that were stripped for topsoil salvage will be de-compacted prior to topsoil replacement, using methods outlined in Section 4.11 of the BLM-Specific CMRP. The subsoil surface will be graded smooth and any subsoil clumps broken up (disc and harrow) in an effort to avoid topsoil mixing. Topsoil will then be replaced. Plowing under of organic matter including wood chips and manure, or planting of a green crop such as alfalfa to decrease soil bulk density and improve soil structure or any other measures in consultation with the BLM will be considered if mechanical relief of compaction is unsatisfactory.

In the first year after construction, Keystone will physically inspect the ROW to identify areas of erosion or settling. Subsequently, Keystone will monitor erosion and settling through aerial patrols, which are part of Keystone's Integrity Management Plan, and through notification from federal land managers.

8.2 Seeding Specifications

8.2.1 Mixture, Rate, Mulch, Fertilizer, Pesticide/Herbicide Use

Seed mixtures and application are discussed in Section 4.11.4 of the BLM-Specific CMRP. Seeding shall be completed as detailed in the Construction/Reclamation Unit Specifications (Appendix F). Approval will be obtained from the USACE for the Construction/Reclamation Unit Specifications that are applicable to USACE managed lands. The final seed mix will be based on input from the BLM and USACE for their respective lands, and the local NRCS and the availability of seed at the time of reclamation.

Keystone will ensure seeds will be certified and will be used within an appropriate time after certification. BLM may request specific seeding requirements in the ROW grant. Identified seeding areas shall be seeded at a rate appropriate for the region and stability of the reclaimed surface. Seeding rates shall be based on pure live seed.

If site-specific conditions warrant and if agreed to by the land management agency, amendments (fertilizer and soil pH modifier materials and formulations) commonly used for agricultural soils in the area may be applied in accordance with written recommendations from the local soil conservation authority and land management agencies. Amendments shall be incorporated into the normal plow layer as soon as possible after application.

If mulch is applied prior to seeding for temporary erosion control, Keystone will ensure the excess mulch is removed and disposed of prior to seedbed preparation to ensure that seedbed preparation equipment and seed drills do not become plugged with excess mulch, to support an adequate seedbed, and to ensure that seed incorporation or soil packing equipment also can operate without becoming plugged with mulch. If appropriate, the removed temporary mulch may be evenly re-applied to the construction ROW following seeding.

Weather conditions, construction ROW constraints, site access, and soil type shall influence the seeding method to be used (i.e., drill seeding versus broadcast seeding). Areas seeded, except for temporary cover crops, shall be drill seeded unless the ROW is too steep to allow drill seeding. Temporary BLM-approved cover crop seed shall be broadcast. Broadcast or hydro seeding, used in lieu of drilling, shall utilize double the recommended seeding rates. Where seed is broadcast, a harrow, cultipacker, or other equipment immediately following broadcasting to incorporate the seed to the specified depth and to firm the seedbed.

Keystone shall work with BLM to discourage intense livestock grazing of the construction ROW during the first growing season by utilization of temporary fencing, deferred grazing, or increased grazing rotation frequency.

Keystone will implement BMPs for conducting vegetation control where necessary before and after construction. Information from BLM's Programmatic EIS for Vegetation Treatments (BLM 2016) also will be considered for implementation. Typical agricultural herbicides, developed in consultation with county or state regulatory agencies, will be used. Prior to use of pesticides or herbicides on federal lands, Keystone will provide a Pesticide Use Proposal to BLM and USACE for concurrence or approval. Herbicide types will be determined based on the weed species requiring control. Herbicides or pesticides will be applied by applicators appropriately licensed or certified by the state in which the work is conducted, and as deemed necessary for optimum mortality success. Herbicide species will be target species specific and used in accordance to USEPA label requirements. Keystone will implement BMPs in the use of pesticides and herbicides along the pipeline corridor to reduce potential impacts to avian and wildlife species.

On any construction ROW over which Keystone will retain control over the surface use of the land after construction (i.e., valve sites, metering stations, pump stations, etc.), Keystone shall provide for weed control to limit the potential for the spread of weeds onto adjacent lands used for agricultural purposes. Any weed control spraying performed by Keystone shall be done by a state-licensed pesticide applicator.

8.2.2 Criteria to Determine Revegetation Success

Keystone will monitor revegetation success along the pipeline ROW until revegetation is deemed successful as determined by the BLM and USACE. On BLM managed lands, revegetation will be considered successful when the reclamation success criteria, detailed in Appendix S, is achieved. On USACE managed lands, revegetation will be considered successful if the disturbed areas achieve at least 80 percent density coverage as compared to adjacent undisturbed lands over five growing seasons. If conditions warrant, additional plantings will occur to achieve 80 percent success. Monitoring shall be completed in accordance with the "Proposed Revegetation Success Monitoring Plan for the Montana Portion of the Keystone XL Pipeline Project" (Appendix S) that was developed for the Keystone Sage Grouse Mitigation Plan. In addition, Core Method (Herrick et al. 2016) transects shall be monitored in addition to shrub density transects (Appendix S) within all sagebrush stands, as shown on the Con/Rec mapping in the North Valley and McCone Garfield core areas. Core Methods transects will be paired - one in the right of way reclamation and one adjacent to the right of way in native rangeland at each location. Transects will be located within areas mapped as sagebrush according to the Con/Rec mapping as shown on Project alignment sheets. Transects will be located at representative locations within each sagebrush stand crossed by the Project. For areas where the Project crosses more than 0.1 mile of sagebrush, transects will be located at a frequency of approximately 0.1 mile.

8.3 Limitation of ROW Access

Keystone will offer to install and maintain measures to control unauthorized vehicle access to the construction ROW on federal lands where appropriate. These measures may include the following unless otherwise approved or directed by Keystone based on site-specific conditions or circumstances:

- Signs;
- Fences with locking gates;
- Slash and timber barriers, pipe barriers, or boulders lined across the construction ROW; and
- Conifers or other appropriate trees or shrubs across the construction ROW.

8.4 Reclamation of Access Roads

The objective of reclamation is to return the disturbed areas to approximately pre-construction use, and capability. This involves the treatment of soil as necessary to preserve approximate pre-construction capability and the stabilization of the work surface in a manner consistent with the initial land use. Reclamation required of access roads will be in accordance with the BLM Gold Book (BLM, 2007a). Where applicable, methodologies and BMPs implemented on the pipeline construction ROW as listed in the BLM-Specific CMRP (Appendix C) will be utilized for construction and reclamation of access roads (e.g., post-construction monitoring and repair).

Access roads that cross portions of federally owned lands generally will be used during construction only and will be reclaimed after construction to pre-construction conditions. Four roads on federal land will be utilized as permanent access roads and will be maintained throughout the life of the Project. These road does not cross any wetlands, perennial waterbodies, cultural resource sites or sensitive species habitat.

After construction, Keystone will reclaim temporary roads to pre-construction conditions unless the BLM requests that they be left un-reclaimed. Reclamation of permanent access roads would occur only after the abandonment of the Project, upon BLM's request.

The permanent road could be reduced in width after construction is finalized, if requested, by reclaiming portions of the road not needed for vehicle travel. To achieve this, geotechnical material installed for road pack will be removed, and cut slopes, fill slopes, and borrow ditches will be covered with topsoil and

revegetated wherever possible. This will restore habitat, forage, and visual resources in the restored areas, and would reduce soil erosion and maintenance costs.

New temporary roads constructed for the Project would be reclaimed in their entirety; pre-existing roads that are modified to accommodate construction will be restored to their pre-existing road footprint. Reclamation initially will include removal of any geotechnical material installed for road pack and re-contouring the road back to the original contour. To improve reclamation success, methods such as ripping, scarifying, topsoil, replacement constructing water-bars, pitting, mulching, redistributing woody debris, and barricading could also be employed on a site-specific basis. After the surface contour is restored and the soil prepared, seed mixtures would be applied as specified by the BLM and USACE. If water-bars are used, they will be removed and seeded following successful revegetation.

9.0 Operation and Maintenance

Keystone will operate and maintain the Project's facilities in accordance with 49 CFR Parts 194 and 195, and other applicable federal and state regulations. Operation and maintenance of the pipeline system will be accomplished by Keystone personnel or Keystone contractors.

9.1 Guidelines

The term "Operation Phase" refers to the period beginning immediately following the construction phase whereby the facilities are commissioned and placed in service. Activities in this phase include the transportation of crude oil. This definition also includes normal operations, routine pipeline ground and aerial inspections, emergency response activities, routine internal and external integrity inspections, repairs along short segments of the entire pipeline, and reclamation activities such as reseeding and repair of erosion control structures.

9.2 Definitions

9.2.1 Normal Operations and Routine Maintenance

The pipeline will be inspected periodically via aerial and ground surveillance as operating conditions permit, but no less frequently than as required by 49 CFR Section 195.412 (i.e., a minimum of 26 aerial inspections per year not to exceed three weeks). Aboveground facilities such as IMLVs and MLVs will be inspected at intervals not exceeding 7 1/2 months, but at least twice each calendar year. When conducting ground inspections, inspectors will stay within the ROW unless agreed upon by the appropriate land management agency. Any such agreements will be on an inspection-specific basis. This surveillance will be used to locate and monitor possible encroachments on the ROW as well as nearby construction of other projects; erosion on or near the ROW, including the need for repair of permanent erosion control devices; exposed pipe; repair or replacement of pipeline markers; or other potential concerns that could affect the safety and operation of the pipeline. Any disturbances to the ROW as a result of such maintenance will be rehabilitated in accordance with the BLM-Specific CMRP (Appendix C).

Aerial inspections will not require additional federal lands for aircraft facilities (i.e., landing strips or heliports). These surveillance activities will provide information on possible encroachments and nearby construction activities, erosion, exposed pipe, and other potential concerns that may affect the safety and operation of the pipeline. Evidence of population changes will be monitored and HCAs identified as necessary. MLVs will be inspected twice annually and the results documented.

In order to maintain accessibility of the permanent easement and to accommodate pipeline integrity surveys, trees along the pipeline permanent easement will be periodically cleared. Cultivated crops, native shrubs, and native grassland plants will be allowed to grow in the permanent easement. Trees along the paths of areas where the pipe was installed via HDD will not be cleared.

Keystone will monitor the ROW to identify any areas where soil productivity has been degraded as a result of pipeline construction and reclamation measures will be implemented to rectify any such concerns. Applicable reclamation measures are outlined in the BLM-Specific CMRP (Appendix C).

The Project will have a Supervisory Control and Data Acquisition (SCADA) system and an Operational Control Center (OCC) manned by an experienced and highly trained crew 24 hours per day every day of the year. A fully redundant backup control center has been constructed and is available as needed.

Real time information communication systems, including backup systems, will provide up-to-date information from the pump stations to the control center, plus the ability to contact field personnel. The OCC will have highly sophisticated pipeline monitoring systems.

9.2.2 Abnormal Operations

USDOT prescribes pipeline design and operational requirements that limit the risk of accidental crude oil release (leaks or spills) from pipelines. Keystone will employ multiple safeguards to prevent a pipeline spill and will prepare an Emergency Response Plan (ERP) based upon the plan currently in review by PHMSA for the Keystone Pipeline Project. The ERP will outline the measures designed to meet federal and state standards and that will be implemented in the event of an accidental release to ensure protection of human health and environmental quality.

Due to these safeguards, the chance of spill occurring is very low, and if a spill occurred, the volume is likely to be very small. Keystone has developed a spill risk assessment to quantify the likelihood of an accidental release, and to better identify potential impacts to surface water and groundwater. In the unlikely event of a release, Keystone will initiate its ERP and emergency response teams will contain and clean up the spill. Based on the measures in the ERP, and on the safeguards in place on the pipeline, no potential impacts to human health and environmental resources discussed in this section are anticipated due to an accidental release.

Keystone will comply with 49 CFR Section 195.402 with respect to the preparation of manuals and procedures for responding to abnormal operations. 49 CFR Section 195.402(a) requires a pipeline operator to prepare and follow a manual of written procedures for conducting normal operations and maintenance activities and handling abnormal operations and emergencies. 49 CFR Section 195.402(d) (Abnormal Operation) requires the manual to include procedures to provide safety when operating design limits have been exceeded. These include:

- Responding to, investigating, and correcting the cause of:
  - Unintended closure of valves or shutdowns;
  - Increase or decrease 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.
- Checking variations from normal operation after abnormal operation has ended at sufficient critical locations in the system to determine continued integrity and safe operation.
- Correcting variations from normal operation of pressure and flow equipment and controls.
- Notifying responsible operator personnel when notice of an abnormal operation is received.
- Periodically reviewing the response of operator personnel to determine the effectiveness of the procedures controlling abnormal operation and taking corrective action where deficiencies are found.

9.2.3 SCADA and Leak Detection

Keystone will utilize a SCADA system to remotely monitor and control the pipeline system. In summary, highlights of Keystone's SCADA system will include:

- Redundancy in the SCADA system and a fully functional backup OCC available for service at all times; and
- Automatic features installed as integral components within the SCADA system to ensure operation within prescribed pressure limits.

Additional automatic features installed at the local pump station level will also be utilized to provide pipeline pressure protection in the event communications with the SCADA host are interrupted.

Keystone will have complimentary leak detection methods and systems available within the OCC, which is manned on a 24 (hours per day) x 7 (days per week) basis. These methods and systems are overlapping in nature and progress in leak detection thresholds. The leak detection methods are as follows:

- Remote monitoring performed by the OCC Operator, which consists primarily of monitoring pressure and flow data received from pump stations and valve sites fed back to the OCC by the Keystone SCADA system. Remote monitoring is typically able to detect leaks down to approximately 25 to 30 percent of pipeline flow rate.
- Software based volume balance systems that monitor receipt and delivery volumes. These systems are typically able to detect leaks down to approximately 5 percent of pipeline flow rate.
- Computational Pipeline Monitoring or model-based leak detection systems that break the pipeline system into smaller segments and monitor each of these segments on a mass balance basis. These systems are typically capable of detecting leaks down to a level approximately 1.5 to 2 percent of pipeline flow rate.
- Computer based, non-real time, accumulated gain/(loss) volume trending to assist in identifying low rate or seepage releases below the 1.5 to 2 percent by volume detection thresholds.
- Direct observation methods, which include aerial patrols, ground patrols, and public and landowner awareness programs that are designed to encourage and facilitate the reporting of suspected leaks and events that may suggest a threat to the integrity of the pipeline.

9.2.4 Emergency Procedures

Keystone is required to prepare a site-specific ERP for the system, which will be submitted to PHMSA prior to operation. Keystone has prepared a comprehensive ERP for the Keystone Pipeline Project which was submitted to PHMSA and approved. A summary of this ERP is provided in Appendix G. Keystone will use the ERP as the basis for preparation of an ERP specific to the Keystone XL Project, incorporating adjustments to reflect Project-specific factors.

Keystone is required to notify immediately the National Response Center (NRC) in the event of a release of crude oil that: 1) violates water quality standards, 2) creates a sheen on water, or 3) causes a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines (40 CFR Part 112). In addition to notifying the NRC, Keystone will make timely notifications to other agencies, including the appropriate local emergency planning committee, sheriff's department, the appropriate state agency, USEPA, and affected landowners.

Under the National Contingency Plan, USEPA is the lead federal response agency for oil spills occurring on land and in inland waters. USEPA will evaluate the size and nature of a spill, its potential hazards, the resources needed to contain and clean it up, and the ability of the responsible party or local authorities to handle the incident. Spills meeting the legally defined criteria (see criteria above per 40 CFR Part 112) must be monitored by USEPA, even though most spills are small and cleaned up by the responsible party. In the unlikely event of a large spill, Keystone will be responsible for recovery and cleanup. The usual role of local emergency responders is to notify community members, direct people away from the hazard area, and address potential impacts to the community, such as temporary road closings.

A fire associated with a spill is unlikely. According to historical data (PHMSA 2008), only about two percent of reportable liquid spills are ignited. In the event of a fire, local emergency responders will execute the roles listed above and firefighters will take actions to prevent the crude oil fire from spreading to residential areas. Local emergency responders typically are trained and able to execute these roles without any additional training or specialized equipment. Keystone also will work with emergency response agencies to provide pipeline awareness education and other support (Appendix H).

9.2.5 Remediation

Corrective remedial actions following a spill will be dictated by federal regulations and enforced by USEPA, PHMSA, and the appropriate state agencies. Required remedial actions may range from the excavation and removal of contaminated soil to allowing the contaminated soil to recover through natural environmental fate processes (e.g., evaporation, biodegradation). Decisions concerning remedial methods and the extent of cleanup will account for state-mandated remedial cleanup levels, potential effects to sensitive receptors, volume and extent of the contamination, potential violation of water quality standards, and the magnitude of adverse impacts caused by remedial activities.

In the event of a spill, several federal regulations define the notification requirements and response actions, including the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300), the CWA, and the Oil Pollution Act. These interlocking programs mandate notification and initiation of response actions in a timeframe and on a scale commensurate with the threats posed. The appropriate remedial measures will be implemented to meet federal and state standards designed to ensure protection of human health and environmental quality.

9.3 Air Resources

9.3.1 Air Quality Regulation Applicability to Project Facilities on Federal Lands

Operational emissions will be limited to the proposed pump stations to be located along the pipeline and backup generators at MLVs and IMLVs (where power is available). No pump stations are located on Federal lands. Project facilities will be subject to federal and state air quality regulations implementing the federal Clean Air Act (CAA) of 1970 and its amendments; however, no permanent facilities producing emissions will be located on federally owned or managed lands. Pipeline pumps will be electrically driven, and will not include emergency generators, so the pump stations will not have combustion emissions. Operational emissions from each of the pump stations will consist exclusively of fugitive emissions. Since there will be a relatively small number of piping components at each of the pumping stations, only negligible amounts of fugitive emissions could occur from crude oil pipeline connections and pumping equipment at the pump stations. Although some pump stations will be within proximity of federal lands, no impacts to these lands are expected. For discussion of federal and state regulations applicable to, as well as potential impacts from the Project on private lands along the Project route, refer to the January 2014 FSEIS.

9.3.2 Climate

No change in local climate is anticipated as a direct result of the Project.

9.4 Noise

No noise-producing aboveground facilities will be located on federal lands. Therefore, impacts during operation would be minimal.

9.5 Geology Resources

Maintenance activities associated with operation of the Project will only occur within previously disturbed areas; therefore, no additional impacts to geology or mineral resources are anticipated.

9.6 Paleontological Resources

Maintenance activities associated with operation of the Project will only occur within previously disturbed areas; therefore, no additional impacts to paleontological resources are anticipated. A paleontological mitigation plan was developed as a part of the MFSA certificate process and is attached as Appendix J.

9.7 Water Resources

9.7.1 Surface Water

There will be a period of time until riparian vegetation is re-established. Until then, the width of disturbance along stream banks will not have vegetative cover, if it existed prior to construction, could lead to increased temperature of that stretch of river/stream (approximately 50-75 feet wide).

Potential operational impacts could include water quality degradation in streams, lakes, impoundments, or surface water-based public water supplies from pipeline spills or leaks, or from spills or leaks of fuel, lubricants, or hazardous materials during operation.

Normal operations will not significantly adversely affect water resources. Minor surface disturbance activities from pipeline inspection and maintenance may occur in previously disturbed areas at isolated, small, and discrete locations.

USDOT prescribes pipeline design and operational requirements that limit the risk of accidental crude oil releases (leaks or spills) from pipelines. Over the operational life of the Project, there will be a very low likelihood of a crude oil release from the pipeline that could enter surface water resources and drinking water supplies. Keystone will prepare an ERP for the Project based upon the plan approved by PHMSA for the Keystone Pipeline Project. The Project ERP will outline the measures that will be implemented in the event of an accidental release. To minimize impacts to surface water resources, appropriate remedial measures will be implemented to meet federal and state standards designed to ensure protection of human health and environmental quality. Keystone has submitted a risk assessment to DOS to better identify potential impacts to groundwater from a spill. Based on preliminary analysis, no impact to surface water associated with the pipeline on federal lands is anticipated.

To reduce the amount of product that could enter surface waters, federal regulation (49 CFR 195.260(3)) stipulates that new pipelines must have valves installed on both sides of any waterbody with 100-foot or greater width between ordinary high-water marks. According to PHMSA, intermittent and ephemeral streams are not considered waterbodies. In general, wetlands also are not considered by PHMSA to be waterbodies. Keystone will comply with these PHMSA requirements. Valve locations, in addition to those required for major waterbody crossings, are discussed in Section 3.3. The location of valves, spill containment measures, and Keystone's ERP will minimize adverse effects to perennial, intermittent, and ephemeral waterbodies.

9.7.2 Groundwater

While routine operation of the Project will not affect groundwater resources, there is the possibility that a crude oil release could migrate through near-surface materials and enter a water-bearing zone or system. However, for reasons stated in Section 9.0, and based on preliminary analysis, no impact to groundwater associated with the pipeline on federal lands is anticipated.

9.8 Vegetation

Long-term impacts to vegetation include the permanent loss of large woody species (i.e., evergreen and deciduous trees) within a 30-foot corridor centered on the pipeline within the 50-foot ROW. This impact will be limited because wooded areas are limited on federal lands. Encroachment of trees onto this strip will be periodically controlled by mechanical means such as chain saws or brush hogs. Use of herbicides to control woody vegetation is not anticipated. If it becomes necessary to use herbicides to control woody vegetation encroachment, herbicide selection, use, and permitting will be in accordance with applicable federal, state and local regulations and follow the same approval procedures from the BLM as within Section 7.74 of this document (Noxious and Invasive Weeds).

The Project ROW will be managed in accordance with Keystone's Operating Procedures for ROW Management, USDOT regulations and other BMPs that are appropriate for conditions encountered on the ROW. The objective of ROW management will be to ensure safe operation of the pipeline while minimizing long-term alterations to pre-construction conditions and land use.

Pipeline operation and maintenance will have minimal impact on revegetated areas. Maintenance impacts will be limited to infrequent traffic along the pipeline ROW. Operation and maintenance of the Project may contribute to the presence of noxious weeds; however, efforts will be made to prevent their spread.

9.9 Wildlife

The effects of long-term habitat loss on native wildlife populations will be relatively small since the majority of habitat disturbance will be restored to the pre-disturbance condition. Rangelands and native habitats will be reclaimed to primarily herbaceous or herbaceous/shrubland communities using appropriate seed mixes prescribed by the BLM. The structure of shrub communities will be long-term (5 to 20 years or more) within reclaimed areas of the construction ROW since these plant species are being seeded on federal land and take at least 20 years for establishing the same structure as pre-existing conditions.

Displacement or loss of nongame species from disturbance areas will be short-term due to repopulation of adjacent lands and high reproduction rates of the species involved.

Noise impacts on wildlife are difficult to assess because these impacts are affected by physical and biological characteristics such as the type, loudness, and duration of noise as influenced by topography, weather/climate, vegetation, and the species, age, and gender of affected wildlife (Janssen 1980; Pater et al. 2009). Janseen (1980) identified three potential effects of noise on wildlife:

- Primary effects are auditory damage, including deafness;
- Secondary effects include physiological responses, behavioral changes, altered reproduction, and reduced ability to obtain or utilize food, water, and cover; and
- Tertiary effects occur at the population level, such as changes in age and sex ratios, population declines, habitat abandonment, and potential species extinction.

For one pump station located adjacent to federal land, pump operations can result in high noise levels, up to 90 dBA (Air and Noise Compliance 2008). Such impacts would not be expected to affect wildlife in the vicinity of operation of the Project because any potentially affected animals would likely be displaced sufficiently to minimize this impact.

Some wildlife species may experience secondary effects, while others may not. For example, elk and mule deer have been shown to habituate to noise (e.g., Krausman et al. 1986), although response may vary by age class and time of year (e.g., Kuck et al. 1985). Secondary effects of noise would be expected to be most severe to wildlife species that rely heavily on auditory signals for survival (Air and Noise Compliance 2008), such as birds. Braun et al. (2002) reported lower rates of greater sage-grouse attendance at leks within one

mile of coal bed methane (CBM) compressor stations. Reijnen et al. (1997) reported that breeding birds in grassland habitats were affected at a threshold noise level of 43-60 dBA while woodland birds were affected at a threshold level of 36-58 dBA. LaGory et al. (2001) found that some bird species were less common during the breeding season in pinyon-juniper habitat exposed to 40-50 dBA of gas well compressor noise, while other species were more common, apparently in response to the habitat edge affect associated with the well development as well as an ability to display successfully despite the noise.

No tertiary effects would be expected from the Project because a comparatively small area would be affected by noise. In order for noise to cause population-level effects, the noise would have to be sufficiently widespread to affect a substantial portion of a wildlife population's critical range.

9.10 Soil Resources

During the operational phase of the Project, pipeline maintenance traffic and incidental repairs may result in isolated surface disturbance impacts, accelerated erosion, soil compaction, potential spills, and minimal reductions in the productivity of desirable vegetation or crops. Impacts related to excavation and topsoil handling are not likely to occur. These effects will be limited to small areas where certain pipeline maintenance activities take place. During operation, these types of impacts will be addressed with the affected land management agency and a mutually agreeable resolution reached.

9.11 Land Use

The 50-foot operational ROW will be maintained in an open condition for the life of the pipeline facilities. Permanent structures will not be built within this ROW during pipeline operation. No operational impacts are anticipated to agriculture and rangeland or special management areas. If there are to be surface disturbances due to future maintenance activities, these will be reclaimed after the disturbance, utilizing measures described in the BLM-Specific CMRP. Recreational use access will not be affected by pipeline operations within special management areas.

9.12 Cultural Resources

Maintenance activities associated with operation of the Project will only occur within previously disturbed areas; therefore, no additional impacts to cultural resources are anticipated.

9.13 Human Health and Safety

Keystone will operate and maintain the Project facilities in compliance with the Pipeline Safety Act regulations contained in 49 CFR Part 195 as administered by the USDOT. During each phase of this Project, the applicable requirements of the Occupational Safety and Health Act will be followed.

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10.0 Termination and Rehabilitation

Prior to termination of the BLM ROW Grant and TUP, or any portion thereof, Keystone will contact the BLM Authorized Officer to arrange for a pre-termination meeting and joint inspection of the ROW/TUP. This meeting and inspection will take place a minimum of 30 days prior to termination. The meeting and inspection will be held so that an agreement on an acceptable termination and reclamation plan is reached. This plan will include, but not be limited to, abandonment and/or removal of facilities, drainage structure and/or surface material, recontouring, replacement of topsoil, seeding, and monitoring (including the monitoring of noxious weeds). The Authorized Officer must approve the plan in writing. Keystone will relinquish all, or those specified portions, of the ROW/TUP.

Properly maintained, the Project is expected to operate for 50 years or more. Keystone has no identified plans for abandonment of these facilities at this time. If abandonment of any facilities is proposed in the future, the abandonment will be subject to approvals by state and/or federal agencies having jurisdiction. Abandonment will be implemented in accordance with then-applicable permits, approvals, codes, and regulations (43 CFR 2886.19). A Decommissioning Plan describing potential abandonment processes and estimated costs to decommission the pipeline and facilities is provided in Appendix T.

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11.0 References

Air and Noise Compliance. 2008. Fact sheet: Effects of Noise on Animals. Available online at http://airandnoise.com/Animals.html.

_____. 2008. Alberta's Energy Reserves 2007 and Supply/Demand Outlook 2008-2017. 5198-2008. June 2008. Available at http://www.ercb.ca/docs/products/sts/st_current.

American Indian Religious Freedom Act (AIRFA). 1978. Oversight hearing before the Subcommittee on Native American Affairs of the Committee on Natural Resources, House of Representatives, One Hundred Third Congress, First Session, on Effectiveness of P.L. 95-346--the American Indian Religious Freedom Act of 1978.

_____. 2008. Annual Energy Outlook. Report No. DOE/EIA-0383. (2008). Energy Resources Conservation Board (ERCB). 2009. Public Zone Oil Sands. Available at: http://www.ercb.ca/portal/server.pt?open=512&objID=249&PageID=0&cached=true&mode=2. (Accessed January 2009.)

Averitt, P. 1963. Coal in Mineral and Water Resources of Montana, Montana Bureau of Mines and Geology Special Publication 28, May 1963. Digital version prepared in 2002-2003. Website: http://www.mbmg.mtech.edu/sp28/intro.htm. (Accessed July 30, 2008.)

Baer, S., Z. Barnes, V. Zietz, N. Hurlburt, T. Witt, S. Doyle, K. Reed, and E. Salisbury. 2010. 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. Addendum 3: Additional Fieldwork Results. SWCA Cultural Resource Report Number 09-435. Submitted to ENSR Corporation, Fort Collins, Colorado.

Bergantino, R. N. 2002. Geologic Map of the Whitewater 30' x 60' Quadrangle, Montana Bureau of Mines and Geology: Open File Report 471, 6 p., 1 sheet(s), 1:100,000.

_____. 2001. Geologic Map of the Opheim 30' x 60' Quadrangle, Eastern Montana, Montana Bureau of Mines and Geology: Open File Report 440, 1 sheet(s), 1:100,000.

_____. 1999. Geologic Map of the Glasgow 30' x 60' Quadrangle, Northeast Montana, Montana Bureau of Mines and Geology: Open File Report 390, 4 p., 2 sheet(s), 1:100,000.

Berg, C., Z. Barnes, N. Klitzka, T. Witt, S. Doyle, J. Cooper, E. Salisbury, G. Hepp, S. Slessman, and M. Retter. 2008a. Class III Cultural Resource Survey for the Steele City Segment in Montana of the Keystone XL Project, Dawson, Fallon, McCone, Phillips, and Valley Counties, Montana. Prepared for AECOM Environment and the Department of State. November 2008.

_____. 2008b. A Level III Cultural Resources Survey for the Steele City Segment in South Dakota of the Keystone XL Project. Prepared for AECOM Environment and the Department of State. November 2008.

Berry, C., M. Wildhaber, and D. Galat. 2004. Population Structure and Habitat Use of Benthic Fishes along the Missouri and Lower Yellowstone Rivers. US Army Corps of Engineers, Omaha, Nebraska.

Bjork, P. 1995. Triceratops, State Fossil of South Dakota. Website: http://www.northern.edu/natsource/earth/Tricer1.htm. (Accessed August 14, 2008.)

Braun, C.E., O.O. Oedekoven and C.L. Aldridge. 2002. Oil and Gas development in Western North America: Effects on Sagebrush Avifauna with Particular Emphasis on Sage Grouse. Trans. N. Amer. Wildl. and Natur. Resour. Conf. 67:337-349.Bureau of Land Management (BLM). 2008a. Correspondence from M. Bloom (BLM) to B. Freeborough (AECOM). October 22, 2008.

_____. 2008b Correspondence from K. Undlin (BLM) to P. Lorenz (ENSR). August 22, 2008.

_____. 2008c. Correspondence from J. Carlson (BLM) to P. Lorenz (ENSR). August 14, 2008.

_____. 2008d. Email correspondence from F. Prellwitz (BLM) to P. Lorenz (ENSR). July 25, 2008.

_____. 2008e. Meeting Notes Regarding Fish, Wildlife and Sensitive Species Potentially Occurring along the Project Route in Montana. Correspondence between J. Carlson (BLM) and P. Lorenz (ENSR). July 29, 2008.

_____. 2007a. Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development. The Gold Book. 4th Edition. Revised 2007. P-417 BLM/WO1ST-06/021 and 3071/REV 07.

_____. 2007b. Record of Decision for the Final Programmatic Environmental Impact Statement for Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States. WO-220-05-1020-JA-VEIS. October 2007.

_____. 2006. Class I Cultural/Paleontological Report, p. 124 to 152. Available at the BLM Miles City Montana Resource Management Plan. Website: http://www.blm.gov/rmp/mt/milescity/Class_I_Paleo.pdf. (Accessed August 12, 2008.)

_____. 1995. Big Dry Resource Management Plan and Final Environmental Impact Statement. Miles City District Office. Big Dry Resource Area. February 1995.

_____. 1994. Montana Bald Eagle Management Plan. Billings, Montana. July 1994.

_____. 1992. Judith Valley Phillips Resource Management Plan Environmental Impact Statement. Montana State Office, October 1992. Website: http://www.blm.gov/mt/st/en/prog/planning/JVP.html. (Accessed August 13, 2008.)

_____. 1986. BLM Manual Section 8400: Visual Resource Management System. US Department of the Interior, Bureau of Land Management, Washington, D.C.

_____. 1985. Final Resource Management Plan. South Dakota Resource Area. Miles City District. November 1985. BLM-MT-ES-86-001-4410.Burke, R. B. 2006. Deep Gas production in North Dakota's Williston Basin – Look Again (abstr). Website: http://www.searchanddiscovery.net/documents/2006/ 06088houston_abs/abstracts/burke.htm. (Accessed July 30, 2008.)

Busby, J. F., B. A. Kimball, J. S. Downey, and K. D. Peter. 1995. Geochemistry of Water in Aquifers and Confining Units of the Northern Great Plains in Parts of Montana, South Dakota, North Dakota, and Wyoming. US Geological Survey Prof. Paper 1402-F.

Call, M. W. 1978. Nesting Habitats and Surveying Techniques for Common Western Raptors. Bureau of Land Management, Denver, Colorado. 115 pp.

Canadian Association of Petroleum Producers (CAPP). 2008a. Canadian Oil Sands; The Future of Oil in Canada to Newcrest. London Oil Sands Forum. January 14, 2008.

_____. 2008b. Crude Oil Forecast, Markets and Pipeline Expansions. June 2008. 41 p.

Clement, J. H. 1987. Cedar Creek: A Significant Paleotectonic Feature of the Williston Basin In: J. A. Longman, (ed.), Williston Basin: Anatomy of a Cratonic Oil Province, Papers collected and edited by J. A. Peterson, D. M. Kent, S. B. Anderson, R. H. Pilaske, and M. W. Longman. The Rocky Mountain Association of Geologists, Denver, Colorado. 1987. Pp. 323-336.

Condon, S. M. 2000. Stratigraphic Framework of Lower and Upper Cretaceous Rocks in Central and Eastern Montana. U. S. Geological Survey Digital Data Series DDs-57.

Connelly, J. W., M. A. Schroeder, A. R. Sands, and C. E. Braun. 2000. Guidelines to Manage

Cooper, J., Z. Barnes, C. Berg, N. Klitzka, A. Fife, C. Higgins, R. Byerly, J. Long, T. Witt, S. Doyle, S. Slessman, and E. Salisbury. 2009. 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: Addendum 1: Additional Fieldwork Results. SWCA Cultural Resource Report Number 08-564. Submitted to AECOM Corporation, Fort Collins, Colorado.

Crossland, N., Z. Barnes, E. Salisbury, J. Burkard, T. Witt, S. Doyle, N. Boyer, and N. Hurlburt. 2010. 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: Addendum 5: Additional Fieldwork Results. SWCA Cultural Resource Report Number 10-380. Submitted to Trow Engineering Consultants, Tallahassee Florida.

Doherty, K.E., D.E. Naugle, B.L. Walker, and J.M. Graham. 2008. Greater Sage-Grouse Winter Habitat Selection and Energy Development. Journal of Wildlife Management 72(1):187-195.

Downey, J. S. and G. A. Dinwiddie. 1988. Regional aquifer system underlying the Northern Great Plains in parts of Montana, North Dakota, South Dakota, and Wyoming-Summary. US Geological Survey Professional Paper 1402-A.

Dryden, R. L. and J. M. Stein. 1975. Guidelines for the Protection of the Fish Resources of the Northwest Territories During Highway Construction and Operation. Department of the Environment, Fisheries, and Marine Service, Technical Report Series No. CEN/T-75-1.

Eddy, S. and J. Underhill. 1974. Northern Fishes. University of Minnesota Press, Minneapolis, Minnesota. 414 pp.

Energy Information Administration (EIA). 2007. Annual Energy Review. Report No. DOE/EIA-0384. (2007).

ENSR. 2008. Aerial Overflight Biological Surveys. Unpublished raw data. April 2008.

Erickson, H. D. 1956. Areal Geology of the Willett and Midland No. 1 Quadrangles. South Dakota Geological Survey, scale 1:62,500.

Ethnoscience. 2019a. Class III Cultural Resources Survey Report – Montana, Addendum 9: Additional Fieldwork Results. January 14.

_____. 2019b. Class III Cultural Resources Survey Report – Montana, Addendum 10: Additional Fieldwork Results. December 30.

Federal Emergency Management Agency (FEMA). 2005. National Flood Insurance Program, Flood Insurance Definitions. Website: http://www.fema.gov/nfip/19def2.htm.

Fenneman, N. H. 1928. Physiographic Divisions of the United States. Annals of the Association of American Geographers, Vol. 18, No. 4, (December 1928), pp. 261-353.

Fischer, D. W., J. A. LeFever, J. A. Sorensen, S. A. Smith, L. D. Helms, R. D. LeFever, S. G. Whittaker, E. N. Steadman, and J. A. Harju. 2005. The Influence of Tectonics on the Potential Leakage of CO_2 from Deep Geological Sequestration Units in the Williston Basin. Plains CO_2 Reduction Partnership, University of North Dakota. Website: http://www.netl.doe.gov/technologies/carbon_seq/partnerships/phase1/pdfs/InfluenceTectonicsPotenital.pdf. (Accessed July 29, 3008.)

Frankel, A., C. Mueller, T. Barnhard, D. Perkins, E. V. Leyendecker, N. Dickman, S. Hanson, and M. Hopper. 1997. Seismic-hazard Maps for the Conterminous United States, Map C - Horizontal Peak Acceleration with 2 Percent Probability of Exceedance in 50 Years, US Geological Survey Open-File Report 97-131-F.

Gill, J. R. and W. A. Cobban. 1966. The Red Bird Section of the Upper Cretaceous Pierre Shale in Wyoming, US Geological Survey Professional Paper 393-A, 73 p.

Harksen, J. C. 1964. Tertiary Sedimentary Rocks in Mineral and Water Resources of South Dakota, South Dakota Geological Survey Bulletin Number 16; p. 43-45.

Harlan, J., E. Speaker, and J. Mayhew. 1987. Iowa Fishing and Fishing. Iowa Department of Natural Resources, Des Moines, Iowa.

Hild, A.L., G.E. Schuman, L.E. Vicklund and M.I. Williams. 2006. Canopy Growth and Density of Wyoming Big Sagebrush Sown with Cool-Season Perennial Grasses. Arid Land Research and Management 20:183-194.

Herrick, J.E., J.W. Van Zee, S.E. McCord, E.M. Courtright, J.W. Karl, and L.M. Burkett. 2016. Monitoring Manual for Grassland, Shrubland, and Savanna Ecosystems. Second Edition. Volume I: Core Methods. ISBN 0-975552-0-0.

Hoese, H. D. and R.H. Moore. 1977. Fishes of the Gulf of Mexico, Texas, Louisiana and Adjacent Waters, 3rd Printing. Texas A&M University Press. 327 p.

Institute of Public Law (IPL). 1994. Federal Noxious Weeds Act of 1974. University of New Mexico School of Law. 7 USC §§ 2801-2814. Website: http://ipl.unm.edu/cwl/fedbook/fedweed.html. (Accessed January 29, 2006.)

Janssen, R. 1980. Future scientific activities in effects of noise on animals. American Speech-Language-Hearing Assoc. Rep. No. 10. Cited in Kaseloo (2004). Johnsgard, P. A. 1990. Hawks, Eagles, and Falcons of North America. Smithsonian Institute Press, Washington and London. 403 pp.

_____. 1988. North American Owls - Biology and Natural History. Smithsonian Institute Press, Washington and London. 295 pp. Kennedy, B. B. 1990. Surface Mining. Society for Mining, Metallurgy, and Exploration (US), 1206 p.Kahn, R., L. Fox, P. Horner, B. Giddings, and C. Roy. 1997. Conservation assessment and conservation strategy for swift fox in the United States. Montana Fish, Wildlife and Parks. Helena, Montana, USA. 54 pgs.

Kaseloo, P. 2004. Synthesis of noise effects on wildlife. U.S. Dept. of Transportation, Federal Highway Admin. Publ. No. FHWA-HEP-06-016.

Krausman, P.R., B.D. Leopold and D.L. Scarborough. 1986. Desert Mule Deer Response to Aircraft. Wildl. Soc. Bull. 14:68-70.

Kuck, L., G. Hompland and E. Merrill. 1985. Elk Calf Response to Simulated Mine Disturbance in Southeast Idaho. J. Wildl. Manage. 49:751-757.

Kennedy, B. B. 1990. Surface Mining. Society for Mining, Metallurgy, and Exploration (US), 1206 p.

Kingery, H. E. 1998. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Publishers. 636 pp.

LaGory, K.E., Young-soo Chan, K.C. Chun, T. Reeves, R. Liebich and K. Smith. 2001. A Study of the Effects of Gas Well Compressor Noise on Breeding Bird Populations of the Rattlesnake Canyon Habitat Management Area, San Juan county, New Mexico. U.S. Dept. Energy, Argonne Natl. lab. DOE/BC/.W-31-109-ENG-38-10.

Lange, A. U. 1967. Geology of the Deer's Ears Buttes Quadrangle, South Dakota. South Dakota Geological Survey; scale 1:62,500.

LaRique, G. A. Jr. 1966. General Availability and Depth to the Static Water Level in the Missouri River Basin. US Geological Survey Hydrologic Atlas-217.

Leckie, D. A. 2006. Tertiary Fluvial Gravels and Evolution of the Western Canadian Prairie Landscape (abstr.). Website: http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V6X-4KBDWMH-1&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=6bf0cfd3574e8a10019978f6ed2954db. (Accessed June 28, 2008.)

Libmeyer, D. H. 1985. Freshwater Heads and Groundwater Temperatures in the Aquifers of the Northern Great Plains in Parts of Montana, North Dakota, South Dakota, and Wyoming. US Geological Survey Professional Paper 1402-D.

Martin, J. E., F. Sawyer, M. D. Fehrenbach, D. W. Tomhave, and L. D. Schulz. 2004. Geologic Map of South Dakota. South Dakota Geological Survey General Map 10, scale 1:500,000. June 30, 2004.

McArthur, E.D. and J.R. Taylor. 2004. *Artemisia cana* Pursh. Pp. 57-59 *in* J.K. Francis, ed. Wildland shrubs of the United States and its Territories: Thamnic Descriptions: Vol. 1. IITF-GTR-26. USDA Forest Service, International Institute of Tropical Forestry, San Juan, PR and Rocky Mountain Research Station, Fort Collins, CO.

McDonald, R. E. 1971. Eocene and Paleocene Rocks of the Southern and Central Basins, in Mallory, W. (ed.), 1972, Geologic Atlas of the Rocky Mountain Region, Rocky Mountain Association of Geologists, Denver, Colorado, p 243-256.

Merewether, E. A. 1964. Mesozoic Rocks in Mineral and Water Resources of South Dakota, South Dakota Geological Survey Bulletin Number 16; p.38-43.

Montana Board of Oil and Gas. 2007. Montana Oil and Gas Annual Reviews 1951 to 2006. Department of Natural Resources and Conservation of the State of Montana; Oil and Gas Conservation Division, Billings, Montana. 93 p. Website: http://bogc.dnrc.state.mt.us/annualreviews.asp. (Accessed July 30, 2008.)

Montana Bureau of Mines and Geology/US Geological Survey. 2004. Mineral Industry of Montana. Website: http://minerals.usgs.gov/minerals/pubs/state/mt.html. (Accessed July 1, 2008.)

Montana Bureau of Mines and Geology. 1963. Mineral and Water Resources of Montana, Montana Bureau of Mines and Geology Special Publication 28, May 1963. Digital version prepared in 2002-2003. Website: http://www.mbmg.mtech.edu/sp28/intro.htm. (Accessed July 30, 2008.)

Montana Department of Agriculture (MDA). 2008. Noxious Weed and Pest List. Website: http://agr/mt/gov/weedpest/pdf/weedlist/pdf/weedlist3-08.pdf. (Accessed April 23, 2008.)

_____. 2007. Montana Individual Noxious Weed List. Website: http://agr.mt.gov/weedpest/pdf/county-listed_5-07.pdf. (Accessed April 24, 2008.)

Montana Department of Environmental Quality (MTDEQ), 2006. 2006 Integrated 303(d)/305(b) Water Quality Report for Montana. Montana Department of Environmental Quality, Water Quality Planning Bureau, Helena, Montana. Website: http://cwaic.mt.gov/wq_reps.aspx?yr=2006qryId=37017. (Accessed August 6, 2007.)

_____. 2004. Application Requirements for Linear Facilities, Alternative Siting Study Baseline Study Impact Assessment. Montana DEQ Circular MFSA-2, 2004 edition.

Montana Fish Wildlife and Parks (MFWP). 2008a. Data Request from A. Messer (MFWP) to P. Lorenz (ENSR) Received July 10, 2008.

_____. 2008b. Correspondence from W. Davis (MFWP) to P. Lorenz (ENSR). August 14, 2008.

_____. 2008c. Montana Fisheries Information System (MFISH) Website: http://fwp.mt.gov/fishing/mfish/default.aspx. (Accessed December 22, 2008.)

_____. 2008d. Meeting Notes regarding Fish, Wildlife and Sensitive Species Potentially Occurring along the Project Route in Montana. Correspondence between T. O. Smith, W. Davis, H. Zachheim, and P. Sihler (MFWP) and P. Lorenz and C. Barnes (ENSR). May 8, 2008.

_____. 2008e. Meeting Notes regarding Fish, Wildlife and Sensitive Species Potentially Occurring along the Project Route in Montana. Correspondence between T. O. Smith, P. Gunderson, K. Johnson, R. Bauscher, H. Burt, H. Wentland, M. Ruggles (MFWP) and P. Lorenz (ENSR). July 29, 2008.

Montana Rivers Information System (MRIS). 1999. Website: http://nris.mt.gov. (Accessed 2008.)

National Atlas. 2008. Website: http://nationalatlas.gov/maplayers.html?openChapters=chpgeol. (Accessed July 11, 2008.)

National Research Council. 2004. Partnerships for Reducing Landslide Risk. The National Academies Press, Washington D.C., 144 p. Website: http://www.nap.edu/catalog.php?record_id=10946#toc. (Accessed August 1, 2008.)

Native American Graves Protection and Repatriation Act. 1993. Hearing Before the Committee on Indian Affairs, United States Senate, One Hundred Third Congress, First Session, On Oversight Hearing On Understanding How the Native American Grave Protection and Repatriation Act is Being Implemented. May 27, 1993. Washington, D.C.

Nebraska Department of Environmental Quality (NDEQ). 2006. Nebraska Administrative Code, Title 117. Website: http://www.sos.state.ne.us/rules-and-regs/regsearch/Rules/index.cgi?l=Environmental_Quality_Dept_of&t=Title-117. (Accessed July 8, 2008.)

North Dakota Industrial Commission. 2007. Production Statistics. Website: https://www.dmr.nd.gov/oilgas/stats/statisticsvw.asp. (Accessed July 30, 2008.)

Olive, W. W., A. F. Chleborad, C. W. Frahme, J. Schlocker, R. R. Schneider, and R. L Shuster. 1989. Website: http://pilevoid.com/surevoid_web/soil_maps/reg_rm.html. (Accessed August 14, 2008.)

Pater, L.L., T.G. Grubb and D.R. Delaney. 2009. Recommendations for Improved Assessment of Noise Impacts on Wildlife. Journal of Wildlife Management 73(5):788-795.

Peterson, J. A. and L. M. McCary. 1987. Regional Stratigraphy and General Petroleum Geology of the US Portion of the Williston Basin and Adjacent Areas, in J. A. Longman (ed.), Williston Basin: Anatomy of a Cratonic Oil Province, Papers collected and edited by J. A. Peterson, D. M. Kent, S. B. Anderson, R. H. Pilaske, and M. W. Longman. The Rocky Mountain Association of Geologists, Denver, Colorado, 1987, p. 9-43.

Petersen, M. D., A. D. Frankel, S. C. Harmsen, C. S. Mueller, K. M. Haller, R. L. Wheeler, L. Russell., R. L. Wesson, L. Robert, Y. Zeng, O. S. Boyd, D. M. Perkins, N. Luco, E. H. Field, C. J. Wills, and K. S. Rukstales. 2008. Documentation for the 2008 Update of the United States National Seismic Hazard Maps: US Geological Survey Open-File Report 2008–1128, 61 p.

Pipeline and Hazardous Materials Safety Administration (PHMSA). 2008. Pipeline Incident Database. Website: http://primis.phmsa.dot.gov/comm/reports/safety/SIDA.html?nocache=7958. (Accessed June 2008.)

Pipiringos, G. N., W. A. Chisholm, and R.C. Kepferle. 1965. Geology and Uranium Deposits in the Cave Hills Area, Harding County, South Dakota. US Geological Survey Professional Paper 476-A.

Radbruch-Hall, D. H., R. B. Colton, W. E. Davies, I. Lucchitta, B. A. Skipp, and D. J. Varnes. 1982. Landside Overview Map of the United States. US Geological Survey Professional Paper 1183.

Reijnen, R., R. Foppen and G. Veenbaas. 1997. Disturbance by Traffic of Breeding Birds: Evaluation of the Effect and Considerations in Planning and Managing Road Corridors. Biodiversity and Conserv. 6:567-581. *Cited in* La Gory et al. (2001).

Schubert, J. P. and W. S. Vinikour. 1987. "Effects on Suspended and Substrate Sediments in Two Streams Resulting from Different Gas-pipeline Installation Techniques." In: 4th Symposium on Environmental Concerns in Right-of-Way Management, Indianapolis, Indiana.

Schuman, G.E., L.E. Vicklund and S.E. Belden. 2005. Establishing *Artemisia tridentat* ssp. *wyomingensis* on Mined Lands: Science and Economics. Arid Land Research and Management 19:353-362.

Skaar, D. 2001. Spawning Times of Montana Fishes. Montana Fish, Wildlife, and Parks. March 2001.

Smith, L. N. 1998. Geologic framework of hydrologic units in the lower Yellowstone River area: Dawson, Fallon, Prairie, Richland, and Wibaux Counties, Montana. Montana Groundwater Assessment Atlas No. 1, Part B, Map 1.

Smith, L. N., J. I. LaFave, T. W. Patton, J. C. Rose, and D. A. McKenna. 2000. Groundwater Resources of the Lower Yellowstone River Area: Dawson, Fallon, Prairie, Richland, and Wibaux Counties, Montana. Montana Groundwater Assessment Atlas No. 1.

South Dakota Department of Agriculture. 2007. South Dakota State Noxious Weed List. Website: http://www.state.sd.us/doa/das/hp-w&p.htm. (Accessed April 23, 2008.)

South Dakota Department of Environment and Natural Resources (SDDENR). 2008. The 2008 South Dakota Integrated Report for Surface Water Quality Assessment. South Dakota Department of Environment and Natural Resources, Pierre, South Dakota. Website: http://www.state.sd.us/denr/DES/Surfacewater/ TMDL.htm. (Accessed June 20, 2008.)

South Dakota Game, Fish, and Parks (SDGFP). 2008a. Email correspondence from C. Switzer (SDGFP) to P. Lorenz (ENSR). August 20, 2008.

_____. 2008b. Meeting Notes regarding Fish, Wildlife and Sensitive Species Potentially Occurring along the Project Route in South Dakota. Correspondence between J. Kirk, D. Backlund, S. Kempema (SDGFP) and P. Lorenz, S. Patti (ENSR). June 10, 2008.

_____. 2008c. Meeting Notes regarding South Dakota Swift Fox Distribution. Correspondence between D. Backlund (SDGFP) and P. Lorenz (ENSR). June 10, 2008.

South Dakota Geological Survey (SDGS)/US Geological Survey (USGS). 2005. Mineral Industry in South Dakota, 2005 Minerals Yearbook. Website: http://minerals.usgs.gov/minerals/pubs/state/2005/myb2-2005-sd.pdf. (Accessed August 11, 2008.)

South Dakota Oil and Gas Section. 2008. Historical Production Statistics. Website: http://www.state.sd.us/ denr/DES/Mining/Oil&Gas/producti.htm. (Accessed July 30, 2008.)

Stone, J., L. Stetler, A. Schwalm, R. Wintergerst, and L. Walters-Clark. 2006. Study of Abandoned Uranium Mining Impacts on Private Lands Surrounding the North Cave Hills, Custer National Forest, South Dakota. North Cave Hills Uranium Mining Impacts Study, Custer National Forest, South Dakota South Dakota School of Mines and Technology. August 15, 2006. Website: http://www.deq.state.mt.us/ AbandonedMines/NAAMLP/AML/NAAMLP%20Papers/2006%2028th%20Annual%20NAAMLP%20Papers/Paper%205%20--%20Stone-South%20Dakota.pdf. (Accessed August 14, 2008.)

Supreme Court of the United States. 2007. Massachusetts et al. v. Environmental Protection Agency et al. No. 05-1120. Argued November 29, 2006 - Decided April 2, 2007. Website: www.supremecourtus.gov/ opinions/06pdf/05-1120.pdf. Website access date unknown.

SWCA Environmental Consultants (SWCA). 2008. Paleontological Assessment for Federal Land along the Montana Segment of the Keystone XL Pipeline Project. Prepared for ENSR Corporation and BLM, September 12, 2008; 312 p.

Swenson, F. A. and W. H. Drum. 1955. Geology and Groundwater Resources of the Missouri River Valley in Northeastern Montana. US Geological Survey Water Supply Paper 1263.

Thornbury, W. D. 1965. Regional Geomorphology of the United States. John Wiley and Sons, Inc., New York.

TransCanada Keystone L.P (Keystone). 2006. Keystone Pipeline Project ER. Prepared for the Department of State. Submitted April 2006. Updated November 15, 2006.

Trimble, D. E. 1980. The Geologic Story of the Great Plains. US Geological Survey Bulletin 1493.

Tsui, P. T. P. and P. J. McCart. 1981. Effects of Stream Crossing by a Pipeline on the Benthic Macroinvertebrate Communities of a Small Mountain Stream. Hydrobiologia, 79:271-276.

US Army Corp of Engineers (USACE). 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. US Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi. US Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS). 2000. 114 Stat. 438 Public Law 106-224, Title IV, Plant Protection Act. Website: http://www.aphis.usda.gov/ ppq/weeds/PPAText.PDF. (Accessed January 28, 2006.)

_____. 1999. Information Management for Invasive Species: Definition of Invasive Species. Website: http://www.invasivespecies.org/resources/DefineIS.html. (Accessed March 7, 2006.)

US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). 2007. Soil Survey Geographic (SSURGO) Database for all counties crossed. Website: http://soildatamart.nrcs.usda.gov. (Accessed 2007.)

_____. 2006. Plants Database. Version 3.5. Website: http://plants.usda.gov/.

US Department of Agriculture (USDA) Soil Conservation Service (SCS). 1981. Land Resource Regions and Major Land Resource Areas of the United States. Agriculture Handbook 296. US Government Printing Office, Washington, D.C.

US Department of Energy Information Administration (EIA). 2008a. 2007 Annual Energy Review. Energy Information Administration, Office of Energy Markets and End Use, US Department of Energy. Washington, D.C. 20585. Website: http://www.eia.doe.gov/emeu/aer/pdf/aer.pdf. (Accessed June 2008.)

_____. 2008b. New EIA Outlook Projects Flat Oil Consumption to 2030, Slower Growth in Energy Use and Carbon Dioxide Emissions, and Reduced Import Dependence. Energy Information Administration, Office of Energy Markets and End Use, US Department of Energy. Washington, DC 20585. Website: http://www.eia.doe.gov/neic/press/press312.html. (Accessed December 17, 2008.)

US Department of Interior, Bureau of Land Management (BLM). 2008. Standard Environmental Color Chart CC-001. BLM/WY/ST-08/015+8450.

_____. 2015. HiLine District Office Approved Resource Management Plan. BLM/MT/PL-15/012+1610.

_____. 2015a. Miles City Field Office Approved Resource Management Plan, as amended. BLM/MT/PL-15/010+1610.

US Environmental Protection Agency (USEPA). 2003. EPA Drinking Water Standards. EPA-816-F-03-016. June 2003.

_____. 1978. Protective Noise Levels. Condensed Version of USEPA Levels Document. Based on Information of Levels of Environmental Noise Requisite to Protect Public Health and Welfare with Adequate Margin of Safety, EPA/ONAC 550/9-74-004. March 1974.

US Fish and Wildlife Service (USFWS). 2016. Nationwide Standard Conservation Measures. Available at: https://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf Accessed on: March 7, 2018.

_____. 2008a. Meeting Notes regarding Fish, Wildlife and Sensitive Species Potentially Occurring along the Project Route in South Dakota. Correspondence between C. Besskin (USFWS) and P. Lorenz (ENSR). June 10, 2008.

_____. 2008b. Meeting Notes regarding Fish, Wildlife and Sensitive Species Potentially Occurring along the Project Route in Montana. Correspondence between L. Hanebury (USFWS) and P. Lorenz (ENSR). May 8, 2008.

_____. 2002. Mountain Plover Survey Guidelines. US Fish and Wildlife Service, March 2002. 7 pp.

_____. 1989. Black-footed Ferret Survey Guidelines for Compliance with the Endangered Species Act. Denver, Colorado and Albuquerque, New Mexico. April 1989. 10 pp.

US Geological Survey (USGS). 2008a. Assessment of Undiscovered Oil Resources in the Devonian-Mississippian Bakken Formation, Williston Basin Province, Montana and North Dakota. US Geological Survey Fact Sheet 2008-3021.

_____. 2008b. Visual Glossary. Website: http://earthquake.usgs.gov/learning/glossary.php?term=active%20fault. (Accessed August 14, 2008.)

_____. 2008c. Seismicity Map of Montana. Website: http://earthquake.usgs.gov/regional/states/montana/seismicity.php. (Accessed July 1, 2008.)

_____. 2008d. National Earthquake Information Center Earthquake Search; US Geological Survey/National Earthquake Information Center 1073 to present Database. Website: http://neic.usgs.gov/neis/epic/epic_rect.html. (Accessed July 31, 2008.)

_____. 2004. Landslide Types and Processes. USGS Fact Sheet 2004-3072. Website: http://pubs.usgs.gov/fs/ 2004/3072/pdf/fs2004-3072.pdf. (Accessed on July 31, 2008.)

_____. 1999. National Elevation Dataset. Website: http://ned.usgs.gov/. (Accessed in 2007.)

US Geological Survey and Montana Bureau of Mines and Geology. 2006. Quaternary Fault and Fold Database for the United States. Website: http://earthquakes.usgs.gov/regional/qfaults/. (Accessed July 31, 2008.)

Vuke, S. M. and R. B. Colton. 2003. Geologic Map of the Terry 30' x 60' Quadrangle, Eastern Montana, Montana Bureau of Mines and Geology: Open File Report 477, 9 p., 1 sheet(s), 1:100,000.

Vuke, S. M., E. M. Wilde, R. N. Bergantino, and R. B. Colton. 2001. Geologic Map of the Ekalaka 30' x 60' Quadrangle, Eastern Montana and adjacent North and South Dakota, Montana Bureau of Mines and Geology: Open File Report 430, 1 sheet(s), 1:100,000.

Vuke, S. M., E. M. Wilde, R. B. Colton, and M. C. Stickney. 2003. Geologic Map of the Wibaux 30' x 60' Quadrangle, Eastern Montana and Adjacent North Dakota, Montana Bureau of Mines and Geology: Open File Report 465, 11 p., 1 sheet(s), 1:100,000.

Ward, A. L. 1976. Elk behavior in relation to timber harvest operations and traffic on the Medicine Bow Range in south-central Wyoming. In Proceedings Elk-logging-roads Symposium, ed. S. R. Hieb. Pp. 32-43. University of Idaho, Moscow, Idaho.

Ward, A. L., N. E. Fornwalt, S. E. Henry, and R. A. Hodorff. 1980. Effects of Highway Operation Practices and Facilities on Elk, Mule Deer, and Pronghorn Antelope. Report No. FHWA-RD-79-143. National Technical Information Service, Springfield, Virginia.

Weis, P. L. 1963. Sand and Gravel in Mineral and Water Resources of Montana, Montana Bureau of Mines and Geology Special Publication 28, May 1963. Digital version prepared in 2002-2003. Website: http://www.mbmg.mtech.edu/sp28/intro.htm. (Accessed July 30, 2008.)

Weissenborn, A. E. and P. L. Weis. 1963. Uranium in Mineral and Water Resources of Montana, Montana Bureau of Mines and Geology Special Publication 28, May 1963. Digital version prepared in 2002-2003. Website: http://www.mbmg.mtech.edu/sp28/intro.htm. (Accessed July 30, 2008.)

WESTECH Environmental Services, Inc. 2001. Revegetation monitoring report – Montana: Express Pipeline. Unpublished technical report. Helena, Montana. 45 p. and appendices.

Wheeler, R. L. (compiler). 1999. Fault number 707, Brockton-Froid fault zone, in Quaternary Fault and Fold Database of the United States: US Geological Survey. Website: http://earthquakes.usgs.gov/regional/qfaults. (Accessed July 31, 2008.)

Whitehead, R. L. 1996. Groundwater Atlas of the United States, Segment 8: Montana, North Dakota, South Dakota, and Wyoming. US Geological Survey Hydrologic Atlas 730-I.

Wilde, E. M. and R. N. Bergantino. 2004. Geologic Map of the Fort Peck Lake East 30' x 60' Quadrangle, Eastern Montana, Montana Bureau of Mines and Geology: Open File Report 498, 10 p., 1 sheet(s), 1:100,000.

Wilde, E. M. and L. M. Smith. 2003a. Geologic and Structure Contour Map of the Richey 30' x 60' Quadrangle, Eastern Montana, Montana Bureau of Mines and Geology: Open File Report 475, 9 p., 1 sheet(s), 1:100,000.

_____. 2003b. Geologic Map of the Circle 30' x 60' Quadrangle, Eastern Montana, Montana Bureau of Mines and Geology: Open File Report 470, 5 p., 1 sheet(s), 1:100,000.

Wyoming Interagency Vegetation Committee. 2002. Wyoming Guidelines for Managing Sagebrush Communities with Emphasis on Fire Management. Wyoming Game and Fish Department and Wyoming BLM, Cheyenne, Wyoming.

Young, R. J. and G. L. Mackie. 1991. The Effect of Winter Oil-pipeline Construction on the Benthic Invertebrate Community of Hodgson Creek. N.W.T. Can. J. Zool. 69: 2154-2160.

Zietz, V., J. Cooper, Z. Barnes, N. Klitzka, C. Higgins, C. Riordan, N. Kromarek, T. Witt, S. Doyle, S. Slessman, E. Salisbury, and M. Retter. 2009. 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: Addendum 2: Additional Fieldwork Results. SWCA Cultural Resource Report Number 09-159. Submitted to AECOM Corporation, Fort Collins, Colorado.