United States Department of State
Final Environmental Impact Statement

For the
KEYSTONE OIL PIPELINE PROJECT
Applicant for Presidential Permit:
TransCanada Keystone Pipeline, LP

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Cooperating Agencies

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January 11, 2008

United States Department of State
Bureau of Oceans and International
Environmental and Scientific Affairs
OES/ENV Room 2657
Washington, D.C. 20520

January 11, 2008

Subject: Keystone Pipeline Final EIS

Dear Colleagues and Stakeholders:

The US Department of State (DOS) has issued the Final Environmental Impact Statement (EIS) for the Keystone Pipeline Project. This document has been prepared in accordance with the National Environmental Policy Act (NEPA). The Consultation for Section 106 of the National Historic Preservation Act (NHPA) is occurring concurrently with the NEPA process. DOS is the lead federal agency in cooperation with U.S. Department of Energy, Army Corps of Engineers, U.S.Fish and Wildlife Service, U.S. Department of Agriculture - Farm Service Agency, U.S. Department of Agriculture - Natural Resources Conservation Service, U.S. Department of Agriculture - Rural Utilities Service, Environmental Protection Agency, and the Advisory Council on Historic Preservation and in consultation with the State Historic Preservation Offices in North Dakota, South Dakota, Illinois, Nebraska, Missouri, Oklahoma, and Kansas and Indian tribes.

The proposed action is to construct and operate a crude oil pipeline and related facilities to transport Western Canadian Sedimentary Basin (WCSB) crude oil from an oil supply hub near Hardisty, Alberta, Canada to destinations in the Midwest United States. The Final EIS assesses the potential impacts of the proposed action and alternatives and identifies the proposed action as the Preferred Alternative of DOS.

DOS intends to issue its Record of Decision (ROD) for the Keystone Pipeline Project 30 days after the Environmental Protection Agency publishes a Notice of Availability for the FEIS in the Federal Register (expected NOA publication date of January 11, 2008).

Options for submitting comments on the Final EIS are:

- Mail comments to: Elizabeth Orlando, Keystone Project Manager, US Department of State, OES/ENV Room 2657, Washington, DC 20520. Please note that mail can be delayed due to security screening
- Fax comments to: (202) 647-1052
- Email comments to: KeystoneEIS@state.gov
- Comment via the Keystone EIS website: www.keystonepipeline.state.gov

DOS will consider any substantive comments on the FEIS prior to issuance of the ROD.

The Final EIS is available at public reading rooms and libraries (please see attached list) and it will be available for download on the project website: www.keystonepipeline.state.gov. Upon request CD copies will be mailed.

Thank you for your interest in the Keystone Pipeline EIS.

Sincerely,

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LIST OF ACRONYMS

µS/cm	microSiemens per centimeter
ACHP	Advisory Council on Historic Preservation
AEUB	Alberta Energy and Utilities Board
amsl	above mean sea level
ANSI	American National Standards Institute
APE	area of potential effect
API	American Petroleum Institute
ARG	American Resources Group, Ltd.
ASME	American Society of Mechanical Engineers
BA	biological assessment
BACT	best available control technology
bbl	barrels
bgs	below ground surface
BMP	best management practice
BNSF	Burlington Northern Santa Fe
BO	biological opinion
bpd	barrels per day
CAA	Clean Air Act
CAPP	Canadian Association of Petroleum Producers
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CMR Plan	Keystone's Construction Mitigation and Reclamation Plan
CNEB	Canadian National Energy Board
COA	Conservation Opportunity Area
COE	U.S. Army Corps of Engineers

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LIST OF ACRONYMS (CONTINUED)

CORE	Coker and Refinery Expansion
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CWA	Clean Water Act
DHS	U.S. Department of Homeland Security
DNV	Det Norske Veritas
DOE	U.S. Department of Energy
DOS	U.S. Department of State
DOT	U.S. Department of Transportation
EIA	U.S. Energy Information Administration
EIS	environmental impact statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ERP	Emergency Response Plan
ESA	Endangered Species Act
FBE	fusion-bonded epoxy
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FR	Federal Register
FSA	Farm Service Agency
FWCA	Fish and Wildlife Coordination Act
FWP	Farmable Wetlands Program
GLO	General Land Office
gpm	gallons per minute
HCA	high-consequence area
HDD	horizontal directional drill

LIST OF ACRONYMS (CONTINUED)

I-	Interstate-
IDNR	Illinois Department of Natural Resources
IPA Plan	Integrated Public Awareness Plan
KDWP	Kansas Department of Wildlife and Parks
Keystone Project	Keystone Pipeline Project
Keystone	TransCanada Keystone Pipeline, L.P.
kV	kilovolt
kW	kilowatt
LWCF	Land and Water Conservation Fund
MDC	Missouri Department of Conservation
Metcalf	Metcalf Archaeological Consultants
mg/L	milligrams per liter
MLV	mainline valve
MP	milepost
NDGFD	North Dakota Game and Fish Department
NEPA	National Environmental Policy Act
NGPC	Nebraska Game and Parks Commission
NHPA	National Historic Preservation Act
NOI	Notice of Intent
NPDES	National Permit Discharge Elimination System
NPMS	National Pipeline Mapping System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWCP	Noxious Weed Control Plan
NWI	National Wetlands Inventory

LIST OF ACRONYMS (CONTINUED)

OCC	Operations Control Center
OKDWC	Oklahoma Department of Wildlife Conservation
OPS	Office of Pipeline Safety
ORV	off-road vehicle
Overthrust	Questar Overthrust Pipeline Company
PA	Programmatic Agreement
PADD	Petroleum Administration for Defense District
PAH	polycyclic aromatic hydrocarbon
PCBs	polychlorinated biphenyls
PCE	primary constituent element
PDVSA	*Petroleos de Venezuela, S. A.*
PHMSA	Pipeline and Hazardous Materials Safety Administration
ppm	parts per million
PS	pump station
psig	pounds per square inch, gauge
PWS	public water supply
RCRA	Resource Conservation and Recovery Act
REX	Rockies Express Western Phase Project
Rockies Express	Rockies Express Pipeline, LLC
ROW	right-of-way
RTU	remote terminal unit
RUS	Rural Utilities Service
RV	recreational vehicle
SATG	Section 106 Agency/Tribal Group
SCADA	Supervisory Control and Data Acquisition
SDGFP	South Dakota Game, Fish and Parks

List of Acronyms (continued)

SHPO	State Historic Preservation Officer
SPCC Plan	Spill Prevention, Control, and Countermeasure Plan
SWCA	SWCA Environmental Consultants
SMYS	specified minimum yield strength
SWPPP	Stormwater Pollution Prevention Plan
TAC	Tribal Advisory Committee
TDS	total dissolved solids
THPO	Tribal Historic Preservation Officer
TPH	total petroleum hydrocarbons
TransColorado	TransColorado Gas Transmission Company
TSS	total suspended solids
UPS	uninterruptible power supply
US-	U.S. Highway-
USC	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
VSS	volatile suspended solids
Western	Western Area Power Administration
WCSB	Western Canadian Sedimentary Basin
WFCR	Western Fordville Conceptual Route
WMA	Wildlife Management Area
WRP	Wetlands Reserve Program

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1.0 INTRODUCTION

TransCanada Keystone Pipeline, L.P. (Keystone) has applied to the U.S. Department of State (DOS) for a Presidential Permit at the border of the United States for the proposed construction, connection, operation, and maintenance of a pipeline and associated facilities for importation of crude oil from Canada. DOS receives and considers applications for Presidential Permits for such oil pipelines pursuant to the authority delegated to it by the President of the United States under Executive Order (EO) 13337 as amended (69 Federal Register [FR] 25299). DOS has determined that issuance of a Presidential Permit would constitute a major federal action that may have a significant impact upon the environment within the context of the National Environmental Policy Act of 1969 (NEPA) (42 United States Code [USC] § 4321 et seq.). To comply with NEPA, the principal objectives of this environmental impact statement (EIS) are to:

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

1.1 KEYSTONE PROJECT OVERVIEW

Keystone proposes to construct and operate a crude oil pipeline and related facilities to transport Western Canadian Sedimentary Basin (WCSB) crude oil from an oil supply hub near Hardisty, Alberta, Canada to destinations in the Midwest United States. The Keystone Project initially would have the nominal transport capacity of 435,000 barrels per day (bpd) of crude oil from the oil supply hub near Hardisty to an existing terminal and refinery at Wood River, Illinois, and an existing terminal at Patoka, Illinois. Additional pumping capacity could be added to increase the average throughput to 591,000 bpd if warranted by future shipper demand and market conditions. Two pipeline extensions are proposed that would transport crude oil from terminals in Ft. Saskatchewan, Alberta to existing facilities in Cushing, Oklahoma. With these extensions, the pipeline would interconnect with existing crude oil pipelines that supply U.S. Gulf Coast refinery markets.

In total, the Keystone Project would consist of the Mainline Project (approximately 1,850 miles of pipeline, including about 767 miles in Canada and 1,082 miles in the United States) and the Cushing Extension (296 miles of pipeline in the United States). Including the Cushing Extension, the total length of pipeline in the United States would be 1,377.9 miles.

In Canada, the Keystone Project would involve purchase of an existing 537-mile, 34-inch-diameter pipeline currently owned by TransCanada Limited and conversion of that pipeline to crude oil service; construction of a new 230-mile pipeline extension from Hardisty to the existing pipeline, and construction of a pipeline extension from the existing pipeline to the U.S./Canada border (Figure 1.1-1). Conversion of the existing natural gas pipeline as opposed to a new pipeline would reduce construction costs associated with the Keystone Project. Appropriate regulatory authorities in Canada have conducted an independent environmental review process for the proposed Canadian facilities.

In the United States, the Mainline Project would comprise a 1,082-mile segment of 30-inch-diameter pipe from the Canadian border to Patoka, Illinois

The Cushing Extension would consist of 296 miles of 36-inch-diameter pipe extending from Steele City, Nebraska to Cushing, Oklahoma. This EIS describes and evaluates the U.S. portion of the proposed Keystone Project, including both the Mainline Project and Cushing Extension, and the additional facilities required to increase throughput capacity to 591,000 bpd.

The length of pipeline proposed within each affected state is listed in Table 1.1-1.

TABLE 1.1-1
Miles of Pipeline by State for the Keystone Project

	ND	SD	NE	KS	MO	IL	OK	Total
Mainline Project	217.8	219.9	214.6	98.7	274.0	56.9	0.0	1,081.9
Cushing Extension	0.0	0.0	2.5	210.4	0.0	0.0	83.1	296.0
Keystone Project total	**217.8**	**219.9**	**217.1**	**309.1**	**274.0**	**56.9**	**83.1**	**1,377.9**

Keystone would construct the 30- -inch-diameter pipelines within a 110-foot-wide corridor, consisting of a temporary 60-foot-wide construction right-of-way (ROW) and a 50-foot-wide permanent ROW.

Ownership of lands that would be crossed by the proposed Keystone Project is identified in Table 1.1-2.

The Keystone Project would require construction of pump stations, pigging[1] facilities, and delivery facilities. Mainline valves (MLVs) would be placed along the pipeline at locations necessary to maintain adequate flow through the pipeline. Valves would be installed and located as dictated by the hydraulic characteristics of the pipeline, as required by federal regulations, and with the intent to provide for public safety and environmental protection as part of pipeline integrity management practices. Delivery metering and power facilities would be located at Wood River and Patoka, Illinois and Ponca City and Cushing, Oklahoma.

Electrical transmission lines and electric substation construction or modification required for the Keystone Project would be constructed by local providers who would be responsible for obtaining any necessary federal, state, and local approvals or authorizations. Construction and operation of these facilities are considered connected actions under NEPA and therefore are evaluated within this EIS.

As currently proposed, the majority of the crude oil to be transported from Canada by the Keystone Project would be delivered to an existing refinery at Wood River, Illinois. A major capital project at the Wood River Refinery is planned in anticipation of receiving Canadian crude oil from the Keystone pipeline. This refinery upgrade is described in more detail in Section 1.7.

[1] A pig is a mechanical device that passes through the interior of a pipeline to clean or to inspect it.

TABLE 1.1-2
Ownership of Land Crossed by the Keystone Project (miles)

	Federal	Tribal	State	Private	Total
Mainline Project					
North Dakota	0.0	0.0	0.8	217.0	217.8
South Dakota	0.0	0.0	0.0	219.9	219.9
Nebraska	0.0	0.0	0.0	214.6	214.6
Kansas	0.0	0.0	0.0	98.7	98.7
Missouri	0.0	0.0	0.5	273.5	274.0
Illinois	3.0	0.0	0.0	53.9	56.9
Mainline Project subtotal	*3.0*	*0.0*	*1.3*	*1,077.6*	*1,081.9*
Cushing Extension					
Nebraska	0.0	0.0	0.0	2.5	2.5
Kansas	3.6	0.0	0.0	206.8	210.4
Oklahoma	0.0	0.0	3.6	79.5	83.1
Cushing Extension subtotal	*3.6*	*0.0*	*3.6*	*288.8*	*296*
Keystone Project total	**6.6**	**0.0**	**4.9**	**1,366.4**	**1377.9**

1.2 PROJECT PURPOSE AND NEED

The primary purpose of the proposed pipeline is to transport incremental crude oil production from the WCSB across the border to meet the growing demand by refineries and markets in the United States. The Keystone Mainline Project would initiate at the crude oil supply hub near Hardisty, Alberta, Canada and terminate near the crude oil storage and pipeline hub near Patoka, Illinois. The Keystone Cushing Extension would interconnect with other existing crude oil pipelines that supply refinery markets in Cushing, Oklahoma, and the U.S. Gulf Coast.

The need for the project is dictated by a number of factors, among them:

- Increasing WCSB heavy crude oil supply combined with insufficient export pipeline capacity,
- Increasing crude oil demand in the United States and static domestic crude supply, and
- Projected oil production capacity in other traditional U.S. oil suppliers.

1.2.1 Increasing Western Canadian Sedimentary Basin Crude Oil Supply

According to the Oil and Gas Journal, Canada has 179 billion barrels of proven oil reserves, with 174 billion of those reserves in oil sands located in the WCSB.[2] The Alberta Energy and Utilities Board also estimates that 174 billion barrels of proven reserves are recoverable from Canada's oil sands. The

[2] Proved reserves are estimated quantities that analysis of geologic and engineering data demonstrates with reasonable certainty are recoverable under existing economic and operating conditions.

province of Alberta is now widely accepted as having the second largest recoverable reserves in the world, second only to Saudi Arabia.

Total production of crude bitumen and synthetic crude oil from the oil sands has increased from 600,000 to 1.1 million bpd by the beginning of 2007.[3] As of mid-2006, the number of major mining, upgrading, and thermal in situ production projects has grown to include over 46 existing and proposed projects, encompassing 135 individual project expansion phases in various stages of execution. Canadian National Energy Board's (CNEB's) 2006 projections indicate a relatively aggressive ramp-up in oil sands production that extends to 2015.[4] CNEB's projected base scenario, in which most but not all announced projects were assumed to go forward, anticipated that production capacity would increase year-over-year to eventually reach 3 million bpd by 2015.[5]

Crude oil production from the entire WCSB, including oil sands and conventional production, is now at 2.3 million bpd. According to CNEB, conventional crude oil production in the WCSB is expected to decline; but as a result of rapidly growing oil sands production, total WCSB production will rise to 3.9 million bpd by 2015.

1.2.2 U.S. Crude Oil Market Demand

According to the U.S. Energy Information Administration (EIA), U.S. consumption of liquid fuels (crude oil and refined products) is projected to total 26.9 million bpd in 2030, an increase of 6.2 million bpd over the 2005 total.[6] Most of this increased demand is expected to be met with crude oil imports. In 2005, net imports of liquid fuels (primarily petroleum) accounted for 60 percent of domestic consumption. The United States is expected to continue its dependence on liquid fuel imports. The import share of domestic consumption declines slightly to 55 percent in 2015 before climbing to 61 percent in 2030.[7] Based on this projection, U.S. imports by 2030 will be 16.5 million bpd, up from 12.4 million bpd in 2005—an increase of 4 million bpd in imported oil.

Canada has traditionally been the United State's largest supplier of oil due to its reliability and proximity to U.S. markets. Canada's share of U.S. oil imports has risen from 15 to 16 percent over the last 10 years, while the whole of the Western Hemisphere now accounts for 41 percent of U.S. oil imports. Demand for the proportion of heavy to light crude used by U.S. refiners has increased over the last 20 years as world supplies of light crude have diminished in proportion to supplies of heavy and extra-heavy crude. Many U.S. refiners have completed or are in the process of completing retrofits to handle the heavier types of crude in response to this change in the world supply. In recent years, crude oil imports from Venezuela (most of which are of heavy grade) have declined. The heavy crude oil that Keystone will deliver to U.S. refiners is ideally suited to replace the loss of these types of crude and meet the expected increase in demand.

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[3] Canadian National Energy Board (CNEB) figures. www.neb.gc.ca.
[4] CNEB. 2006. Canada's Oil Sands Opportunities and Challenges to 2015. Energy Market Assessment. Calgary, Alberta. June. p.12.
[5] Ibid. p. 13.
[6] Energy Information Agency (EIA). 2007. Annual Energy Outlook 2007. (Report #DOE/EIA-0383[2007].) February. p. 96.
[7] Ibid. p. 97.

1.2.3 World Oil Supply

Global oil production capacity and consumption remain tightly balanced after 3 years of rapid demand growth in Asia, the United States, and the Middle East. DOS and industry analysts project that it will remain so into the medium term. The ability and willingness of major oil and gas producers to step up investment in order to meet rising global demand are particularly uncertain. Capital spending by the world's leading oil and gas companies increased sharply in nominal terms over the course of the first half of the current decade and, according to company plans, will rise further to 2010. Expressed in cost inflation-adjusted terms, investment in 2005 was only 5 percent above that in 2000. Planned upstream investment to 2010 is expected to boost slightly the global spare crude oil production capacity. Capacity additions could be smaller because of shortages of skilled personnel and equipment, regulatory delays, cost inflation, and higher decline rates at existing fields.[8] Investment issues are of particular concern in Mexico (the United States' third largest supplier of crude oil) where capital expenditures by its national oil company are insufficient to offset natural declines in oil field output (projected at 12 percent per annum by industry analysts.)

Political instability in several of the United States' top 11 suppliers is also expected to increase demand for crude from Canada. As a result of Nigeria's high rate of violent crime, its large income disparity, its history of tribal/ethnic conflicts, and its frequent internal social protests, oil exports have repeatedly been interrupted. At times during the last several years, as much as 70 percent of Nigeria's output has been shut down due to militant attacks on oil production infrastructure. Venezuela's production has continually declined since 1998 due to a combination of lack of investment to offset natural declines and loss of technical expertise in the state-run *Petroleos de Venezuela, S. A.* (PDVSA). Additionally, President Chavez has repeatedly threatened to divert Venezuela's large exports to markets other than the United States. In Iraq lack of investment due to security concerns, continual attacks by insurgents on oil infrastructure, and the tenuous political situation keep output at or below pre-war levels. In Algeria armed militants have confronted government forces and political instability and protests in Ecuador threaten oil production.

Canada's expected production increases, coupled with the adverse factors affecting other major U.S. suppliers make it likely that an ever larger share of U.S. oil imports will be sourced from this stable and nearby supplier. Even if the share of total imported oil in overall U.S. demand remains the same or declines slightly in coming years, as expected, DOS expects that heavy oil imports from the WCSB will continue to increase.

1.2.4 Pipeline Capacity from Western Canadian Sedimentary Basin

Nearly all of the 1.9 million bpd of crude oil imported from Canada in 2006 came from the WCSB[9], and all of that was transported through three major pipeline systems: Enbridge, Kinder Morgan Express, and Kinder Morgan Trans Mountain. Total capacity from the WCSB for crude oil to U.S. markets now stands at 2.4 million bpd. However, the majority of WCSB crude continues to be sold into U.S. Petroleum Administration for Defense District I (PADD I – the U.S. Midwest) where a large proportion of U.S. refining capacity is located, and an increasing amount is forwarded on to refiners in PADD II (U.S. Gulf Coast) to offset declines in offshore production. These two districts are directly and indirectly served by the Enbridge system and Kinder Morgan Express, which together have a capacity of 2.1 million bpd.

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8 International Energy Agency. 2006. World Energy Outlook 2006. OECD/IEA Paris, France. p. 4.
9 CNEB data. www.neb.gc.ca.

All of the expected increases in WCSB production will come from Alberta's oil sands, which produce a heavy synthetic crude oil when upgraded. The product can also be shipped as a non-upgraded bitumen mixed with diluents. Total capacity for heavy oil on the Enbridge and Kinder Morgan Express systems now stands at 1.2 million bpd.[10] In 2006, approximately 1 million bpd of heavy crude was exported from the WCSB to the United States via these two pipelines.[11]

The CNEB and DOS comparisons of the forecasted growth in heavy crude oil production in the WCSB versus the available pipeline capacity for heavy oil show a potential shortfall as early as 2007. Even with modifications to existing systems and de-bottlenecking efforts that are underway by Enbridge, it is likely that crude oil exports from the WCSB to the United States will exceed available pipeline capacity in 2009, necessitating the construction of a new pipeline to facilitate continued importation of crude oil.[12]

Exactly how much more capacity will be needed in the short term to mid term can be estimated. Given CNEB projections of an additional 1.6 million bpd of WCSB production over the current level by 2015, expected increased U.S. demand, and a similar proportion continued to be consumed by Canada (30 percent), an additional 1.1 million bpd of pipeline capacity would be needed by 2015 to accommodate U.S. crude oil imports from the WCSB. This increase in capacity would justify construction of Keystone's planned 450,000-bpd pipeline, and would necessitate additional pipeline construction to meet the remaining 700,000 bpd of capacity.

1.2.5 Mainline Project and Cushing Extension Demand

In December 2005, Keystone provided shippers an opportunity to participate in the Keystone Project by entering into contractual commitments for pipeline capacity. Shippers committed to binding contracts for 340,000 bpd. These binding commitments demonstrate the need for incremental pipeline capacity and access to Canadian crude supplies, and represent a commitment to utilize the Keystone Project. Keystone expects that the remainder of the excess capacity will be utilized by non-contract shippers at the tariff rate approved by the Federal Energy Regulatory Commission (FERC) (ENSR 2006a). Potential shippers also have expressed strong interest in a proposed pipeline extension to the Cushing market area. TransCanada conducted an Open Season process for the Mainline Project which ran from November 4 to December 1, 2005. As a result of the Open Season, TransCanada has secured firm, long-term contracts totaling 340,000 bpd, with an average duration of 18 years. Keystone anticipates that existing contracts will be renewed and additional contracts will be entered into such that the average contract term will continue beyond 18 years. This reasoning is based on the amount of crude oil reserves in the WCSB and the expected increase in production from the oil sands (TransCanada 2007c). A binding Open Season for the Cushing Extension closed at noon on March 14, 2007 (ENSR 2006a).

1.3 AGENCY PARTICIPATION

DOS, as the lead agency for the EIS, discussed the appropriate level of required participation with other federal agencies that would issue permits associated with the proposed Keystone Project. Federal agencies elected to participate as cooperating agencies in the process or to provide technical assistance to the environmental review. State agencies also were consulted to ensure that their needs for state permitting analyses would be assessed in the EIS. To facilitate agency participation in the EIS review,

[10] Canadian Association of Petroleum Producers (CAPP). 2005. Crude Oil Pipeline Expansion Summary. Calgary, Canada. February. p. 5.
[11] CNEB data. www.neb.gc.ca.
[12] CNEB. 2006. Canada's Oil Sands Opportunities and Challenges to 2015. Energy Market Assessment. Calgary, Alberta. June. p. 33.

state and federal agencies were invited to the scoping meetings (see Section 1.5), and agency advisory meetings were conducted in February 2007 at the following locations:

- St. Louis, Missouri;
- Kansas City, Kansas;
- Oklahoma City, Oklahoma;
- Lincoln, Nebraska;
- Pierre, South Dakota; and
- Bismarck, North Dakota.

1.3.1 Lead Agency – U.S. Department of State

For cross-border oil pipelines, DOS is responsible for issuance of Presidential Permits and is the lead agency for the Keystone Project. As the lead federal agency, DOS is responsible for NEPA compliance and for compliance with Section 106 of the National Historic Preservation Act (NHPA) (16 USC § 470 et seq.). As the lead federal agency, DOS is also responsible for initiating informal consultation with the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act (ESA) [16 USC § 1536] to determine the likelihood of effects on listed species. Additionally, DOS coordinates with the cooperating and assisting agencies to ensure compliance with acts and executive orders addressing:

- Potential effects to prime and unique agricultural lands (Natural Resources Conservation Service [NRCS]),
- Executive Order (EO) 11988 – Floodplain Management,
- EO 11990 – Protection of Wetlands,
- EO 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,
- EO 13007 – Indian Sacred Sites,
- EO 13112 – Invasive Species,
- EO 13175 – Consultation and Coordination with Indian Tribal Governments,
- EO 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds, and
- EO 13212 – Actions to Expedite Energy-Related Projects

EO 11423 (33 FR 11741), as amended by EO 12847 (58 FR 29511) and EO 13337 as amended (69 FR 25299), governs the DOS issuance of Presidential Permits that authorize construction of pipelines carrying petroleum, petroleum products, and other liquids across U.S. international borders. Within DOS, the Bureau of Economic and Business Affairs, Office of International Energy and Commodity Policy, receives and processes Presidential Permit applications. Upon receipt of a Presidential Permit application for a cross-border pipeline, DOS is required to request the views of the Secretary of Defense, the Attorney General, the Secretary of the Interior, the Secretary of Commerce, the Secretary of Transportation, the Secretary of Energy, the Secretary of Homeland Security, the Administrator of the U.S. Environmental Protection Agency (EPA), and such other government department and agency heads as the Secretary of State deems appropriate. DOS must consider the project to be in the national interest to issue a Presidential Permit.

1.3.2 Cooperating Agencies

The following agencies have agreed to cooperate in the NEPA process.

1.3.2.1 Advisory Council on Historic Preservation

Section 106 of the NHPA, as amended, requires the lead federal agency to take into account effects on historic properties or historic resources that are listed in, or eligible for listing in, the National Register of Historic Places (NRHP) and to afford the Advisory Council on Historic Preservation (ACHP) an opportunity to comment if adverse effects on NRHP-eligible properties are anticipated. Historic properties are prehistoric or historic districts, sites, buildings, structures, objects, or properties of traditional religious or cultural importance that are listed or eligible for listing in the NRHP, including artifacts, records, and material remains related to such a property or resource. ACHP's regulations are codified in 36 Code of Federal Regulations (CFR) Section 800.2.

1.3.2.2 U.S. Environmental Protection Agency

Under Section 402 of the Clean Water Act (CWA) (33 USC §1251 et seq.), EPA has jurisdiction over the discharge of pollutants from a point source into waters of the United States. Administration of permit programs for point-source discharges that require a National Pollutant Discharge Elimination System (NPDES) permit has been delegated to the states affected by the Keystone Project. EPA maintains oversight of the delegated authority. Regulated discharges include, but are not limited to, sanitary and domestic wastewater, gravel pit and construction dewatering, hydrostatic test water, and storm water (40 CFR 122).

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

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

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

The proposed Keystone Project is located within EPA Regions 5, 7, and 8. Region 8 is the lead for EPA's involvement as a cooperating agency.

1.3.2.3 Natural Resources Conservation Service

NRCS administers the Wetlands Reserve Program (WRP) (16 USC § 3837 et seq.), under which it purchases conservation easements and provides cost share to landowners for the purposes of restoring and protecting wetlands. Under the WPR, the United States may purchase 30-year or permanent easements. Land eligibility for the WRP is based on NRCS's determination that the land is farmed or converted wetland, that enrollment maximizes wildlife benefits and wetland values, and that the likelihood of successful restoration merits inclusion into the program. Lands under WRP easement are subject to development and other use restrictions in order to ensure protection of wetland and wildlife conservation values. The Keystone Project preferred route will cross land restricted by at least one WRP lease. NRCS also administers the Emergency Watershed Protection Program (Floodplain Easements) and the Healthy Forests Reserve Program, and shares management of the Grasslands Reserve Program with the Farm Service Agency (FSA). The Keystone Project may involve lands included in these other NRCS land conservation programs. NRCS is also responsible for the Farmland Protection Policy Act (7 CFR Part 658), including protection of prime and unique agricultural lands. The Keystone Project would traverse prime farmland and potentially prime farmland.

1.3.2.4 U.S. Army Corps of Engineers

Under Section 404 of the CWA, COE has the authority to issue or deny permits for placement of dredge or fill material in the waters of the United States, including adjacent wetlands. Under Section 10 of the Rivers and Harbors Act (33 USC § 403), COE regulates work and placement of structures in, on, over, or under navigable waters of the United States.

1.3.2.5 U.S. Fish and Wildlife Service

USFWS is responsible for ensuring compliance with the ESA. Section 7 of the ESA, as amended, states that any project authorized, funded, or conducted by any federal agencies should not "…jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined…to be critical…" (16 USC § 1536[a][2] [1988]). USFWS also reviews project plans and provides comments regarding protection of fish and wildlife resources under the provisions of the Fish and Wildlife Coordination Act (FWCA) (16 USC § 661 et seq.). USFWS is responsible for the implementation of the provisions of the Migratory Bird Treaty Act (16 USC § 703) and the Bald and Golden Eagle Protection Act (16 USC § 688). USFWS's Division of Refuges is responsible for managing lands of the national wildlife refuge system, including easements, along the proposed route in North and South Dakota. Easements are protected under the National Wildlife Refuge Systems Administration Act (16 USC § 668dd[c]).

1.3.2.6 Farm Service Agency

The Farm Service Agency (FSA) is a unit of the U. S. Department of Agriculture (USDA) and administers several land conservation programs, including the Conservation Reserve Program (CRP), the Conservation Reserve Enhancement Program (CREP), the Farmable Wetlands Program, and the Grasslands Reserve Program. These programs provide annual rental payments and cost-share assistance to establish long-term resource conservation measures on eligible farmland. The terms of rental agreements are from 10 to 30 years, during which most agricultural uses of the affected lands are prohibited. The Grasslands Reserve Program is managed jointly with NRCS and includes provisions for rental agreements up to 30 years, 30-year-easements, and permanent easements. The Keystone Project involves lands included in FSA land conservation programs.

1.3.2.7 U.S. Department of Energy

The U.S. Department of Energy (DOE) administers multiple federal energy projects and has relevant experience in addressing the environmental review of projects of similar scope to the Keystone Project.

In addition, the Western Area Power Authority (Western) may play a role in determining final NEPA compliance with regard to electric substation construction and operation.

As required by 10 CFR 1022, the DOE is obligated to incorporate floodplain management goals and wetland protection considerations into its planning and regulatory decisionmaking processes. The agency accomplishes this goal by preparing a floodplain or wetland assessment consisting of a description of the proposed action, a discussion of potential effects on the floodplain or wetland, and consideration of alternatives. For actions such as this proposed action where an EIS is required, the assessment can be included in the appropriate NEPA document. Information provided in Section 2.0 (for description of proposed action), 3.2 (floodplain issues) 3.3 (additional floodplain issues), 3.4 (wetlands issues), and 4.0 (alternatives) of this FEIS will be used by DOE to prepare floodplain and wetland assessments and statements of findings consistent with 10 CFR 1022 for inclusion in the Final EIS.

Western Area Power Administration

The Western Area Power Administration (Western) is a federal power-marketing agency within DOE that sells and delivers federal electric power to municipalities, public utilities, federal and state agencies, and Indian tribes in 15 western and central states. A portion of the proposed Keystone Project is located within Western's Upper Great Plains Region, which operates and maintains nearly 90 substations and more than 8,000 miles of federal transmission lines in Minnesota, South Dakota, North Dakota, Montana, Nebraska, and Iowa.

Western has received requests from network customers for unplanned network load delivery points to serve unplanned load growth associated with the Keystone Project in North Dakota and South Dakota. Western, as the network provider and a balancing authority, is responsible for meeting load growth requests from network customers. Western's power transmission system would require either modification of existing electric substation facilities or construction of new Western electric substation facilities. According to DOE's NEPA Implementing Procedures (10 CFR Part 1021), these actions require environmental review.

In responding to the need for agency action, Western must abide by the following:

- Addressing Interconnection Requests. Western's *General Guidelines for Interconnection* establishes a process for addressing applications for interconnection. The process dictates that Western respond to the applications as presented by the network customers.
- Protecting Transmission System Reliability and Service to Existing Customers. Western's purpose and need is to ensure that existing reliability and service is not degraded. Western's General Guidelines for Interconnection provides for transmission and system studies to ensure that system reliability and service to existing customers is not adversely affected. If the existing power system cannot accommodate the applicant's request without modifications or upgrades, the applicant may be responsible for funding the necessary work unless the changes would provide overall system benefits.

Although the DOE is a cooperating agency under NEPA for the Keystone Project, the agency is independently determining its compliance responsibilities under Section 106 of the NHPA. This includes consulting for any new powerlines or substations in Western's system.

1.3.2.8 U.S. Department of Agriculture - Rural Utilities Service

The Rural Utilities Service (RUS) is an agency that administers the U.S. Department of Agriculture's Rural Development Utilities Programs. These programs include the provision of loans and loan guarantees to electric utilities and other entities to serve customers in rural areas, through the construction or expansion of generation, transmission and distribution facilities. Applications for financing have been or may be submitted to RUS by several rural electric cooperatives to enable the cooperatives' provision of electricity to pump stations that would serve the Keystone Pipeline. RUS is responsible for NEPA compliance for facilities proposed by the cooperatives to provide these services including, but not limited to, transmission lines.

1.3.3 Assisting Agencies

The following agencies provided technical assistance to DOS in the environmental review process.

1.3.3.1 U.S. Department of Transportation – Office of Pipeline Safety

The U.S. Department of Transportation's (DOT's) Pipeline and Hazardous Materials Safety Administration (PHMSA) Office of Pipeline Safety (OPS) has responsibility for monitoring the operation of oil pipeline systems in the United States, in compliance with 49 CFR Part 195, Transportation of Hazardous Liquids by Pipeline. OPS provided technical expertise to DOS in the assessment of the Keystone Project and in determination of appropriate mitigating measures.

1.3.3.2 U.S. Department of Transportation – Federal Highway Administration

The Federal Highway Administration (FHWA) is responsible for reviewing and approving the design of proposed Keystone Project federal highway crossings. FHWA assisted DOS in this capacity during the Keystone Project NEPA review.

1.3.3.3 Federal Energy Regulatory Commission

FERC is responsible for, among other things, interstate natural gas transportation pipelines in the United States. In this capacity, FERC has gained extensive experience in issues surrounding pipeline construction and operation. Based on this experience, FERC provided technical assistance to DOS in review of the proposed Keystone Project.

1.3.3.4 Department of Homeland Security

The Department of Homeland Security (DHS) provided technical assistance to DOS in the assessment of security issues surrounding construction and operation of the proposed Keystone Project.

1.3.3.5 Council on Environmental Quality

CEQ provides guidance to all federal agencies on the NEPA implementation process.

1.3.3.6 National Park Service

The National Park Service (NPS) provides technical review of the proposed crossing of NPS-administered lands by the Keystone Project.

1.3.3.7 Bureau of Indian Affairs

The Bureau of Indian Affairs (BIA) provides review and assistance regarding tribal and environmental justice issues.

1.3.4 State Agencies

Various resource agencies from each of the states crossed by the proposed Keystone Project have responsibilities for state and local permit issuance. The permits required by the various state and local jurisdictions crossed by the proposed corridor are discussed in Section 1.6. State agencies participated in project scoping and were invited to the agency advisory meetings described above.

1.4 INDIAN TRIBE CONSULTATION

As the lead federal agency for the NEPA review process, DOS initially contacted over 80 individual Indian tribes to determine whether the tribes were interested in the potential Keystone Project. Tribes were invited to the public scoping meetings held at 13 separate locations in October and November 2006. The United Keetoowah Band of Cherokee, the Upper Sioux Community, the Cherokee Nation, the Pawnee Nation, and the Kaw Nation participated in the scoping process. At publication of the Draft EIS, interested tribes were sent hard copies of relevant Draft EIS sections and electronic (CD) versions of the Draft EIS. The tribes were then invited to participate in the Draft EIS comment meetings held at 13 separate locations in September 2007.

As the lead federal agency for Section 106 of NHPA for the Keystone Project, DOS engaged in consultation with the consulting parties, including federal agencies, State Historic Preservation Officers (SHPOs), the ACHP, and federally recognized Indian tribes (70 FR 71194) within the Keystone Project area of potential effect (APE). Tribes potentially affected by the undertaking were invited to become consulting parties under Section 106 of the NHPA regulations. DOS meetings with consulting agencies and tribes were held in February, May, August, and October 2007 at locations in North Dakota, South Dakota, Missouri, and Oklahoma. A final tribal government-to-government consultation meeting was held in Washington, DC on December 18, 2007.

1.5 SCOPING AND EIS COMMENT PROCESS

1.5.1 Scoping

On October 4, 2006, DOS issued a Notice of Intent (NOI) to prepare an EIS. The NOI informed the public about the proposed action, announced plans for scoping meetings, invited public participation in the scoping process, and solicited public comments for consideration in establishing the scope and content of the EIS. The NOI was published in the Federal Register and distributed to:

- Landowners along the proposed route,
- Federal agencies,
- Indian tribes,
- State agencies,
- Municipalities and counties,
- Elected officials,
- Non-governmental organizations,
- The media, and
- Interested individuals.

The official scoping period ended on November 30, 2006; however, any comments received after this date were considered in the Draft EIS.

DOS held 13 separate scoping meetings in the vicinity of the proposed route to provide opportunity for public comment on the scope of the EIS. The dates, and locations were:

- October 24 – Michigan, North Dakota ;
- October 25 – Lisbon, North Dakota;
- October 26 – Clark, South Dakota;
- October 24 – Yankton, South Dakota;
- October 25 – Stanton, Nebraska;
- October 26 – Seward, Nebraska;
- November 1 – St. Charles, Missouri;
- November 2 – Collinsville, Illinois;
- November 8 – Carrolton Missouri;
- November 9 – Seneca, Kansas;
- November 14 – Abilene, Kansas;
- November 15 – El Dorado, Kansas; and
- November 16 – Morrison, Oklahoma.

DOS received verbal, written, and electronic comments during the scoping comment period. All verbal comments formally presented at the meetings were recorded and transcribed. Additional written comments were received on comment forms provided to the public at the meetings and in letters. A summary of public comments related to EIS scope follows. Details are provided in Appendix A (Scoping Summary Report).

Table 1.5.1-1 summarizes the issues identified and comments received during the public scoping process for the Keystone Project. For each comment, the table references the section in this EIS that addresses the concern.

1.5.2 Comments on the Draft EIS

The 2007 Keystone Oil Pipeline Project Draft Environmental Impact Statement (Draft EIS) was released for public review on August 10, 2007. The public comment period ended on September 24, 2007; however, additional comments were accepted into November 2007. Comments were sent to DOS by email, website link (e-comments), phone, and U.S. mail. From September 4 through September 20, 2007, 13 public meetings were held to solicit oral testimony on the Draft EIS. Written comments also were accepted. These meetings were held at the following locations along the pipeline corridor and corresponded with the locations of the scoping meetings held in October 2006:

- September 4 – Carrolton Missouri
- September 5 – St. Charles, Missouri
- September 6 – Collinsville, Illinois
- September 11 – Michigan, North Dakota and Yankton, South Dakota
- September 12 – Lisbon, North Dakota and Stanton, Nebraska
- September 13 – Clark, South Dakota and Seward, Nebraska
- September 17 – Seneca, Kansas
- September 18 – Abilene, Kansas
- September 19 – El Dorado, Kansas
- September 20 – Ponca City, Oklahoma.

In total, 67 people provided oral testimony at these meetings, incorporating 230 individual comments on the 2007 Draft EIS. These comments were recorded and transcribed. In addition to the oral testimony, 110 letters, cards, emails, e-comments, or telephone conversation records incorporating 1009 comments were received from the public, agencies, the Applicant (Keystone), tribes and other interested groups and stakeholders. All written and oral comments and DOS responses to these comments are summarized in Appendix A.

1.6 PERMITS, APPROVALS, AND REGULATORY REQUIREMENTS

This EIS is intended to fulfill the needs and obligations set forth by NEPA and other relevant laws, regulations, and policies of DOS (the lead agency) and of COE, EPA, DOE, USFWS, NRCS, FSA, RUS, and ACHP (cooperating agencies; see Section 1.3.2). Assisting federal, tribal, state, and local agencies with jurisdiction over various aspects of the Keystone Project participated in the EIS process by providing direct input to DOS or through the EIS review and comment process (see Sections 1.3.3 and 1.3.4).

TABLE 1.5.1-1
Issues Identified and Comments Received during the Public Scoping Process for the Keystone Project

Issue	Comment	Section Where Comment/Issue Addressed in EIS:
Purpose and Need	Need for the Mainline Project and the Cushing Extension, agency involvement, and required approvals.	1.2
Project Description	Distance to adjacent structures, construction methods, abandonment plans, sources of Keystone Project materials, construction schedule, maintenance and inspection plans and procedures, expected service life of the pipeline, right-of-way (ROW) revegetation, pipeline temperature, protection measures, operations, construction impacts to adjacent areas, powering, pipeline security, hydrostatic testing, and pump stations.	2.0
Alternatives	Selection of alternatives, route adjustments, ,route selection, routes that avoid sensitive areas, Kinder Morgan and Enbridge Pipelines, shipping refined products instead of a crude oil pipeline, renewable energy sources, seasonal avoidance of construction in agricultural areas, collocation with other ROWs, and adding a new refinery along the Mainline Project rather than constructing the Cushing Extension.	4.0
Geology	Potential rock slope instability and effects of earthquakes and fault lines.	3.1
Soils and Sediments	Soil compaction and settlement, topsoil segregation during construction, replacement of top soils after construction and abandonment, soil erosion, streambank erosion, pipeline effects on soil temperature, and soil instability.	3.2
Water Resources	Impacts on springs, aquifers, and water wells; water supply contingencies in the event of a spill; impacts to septic systems and sewage treatment facilities; stream channel erosion; impacts to dikes, dams, and reservoirs; runoff during construction; effects on drain tiles and drainage systems; and impacts on flood protection.	3.3
Wetlands	Impacts and mitigation measures, stabilization during construction, enforcement of wetland protection requirements.	3.4
Terrestrial Vegetation	Impacts on prairies and woodlands, impacts of pipeline temperature on vegetation and crops, revegetation of affected area, impacts on crop growth, invasive and noxious weeds, use of herbicides near organic farms, and effects on old-growth trees.	3.5
Fish and Wildlife	Impacts on game animals and their habitats; and impacts on deer, turkey, frogs, toads, bald eagles, beaver, pheasants, and quail.	3.6 and 3.7

TABLE 1.5.1-1 (Continued)		
Issue	**Comment**	**Section Where Comment/Issue Addressed in EIS:**
Land Use, Recreation and Special Interest Areas, and Visual Resources	Use of eminent domain; land use restrictions; impacts on bicycle trails, day care centers, special use areas, agriculture, water lines, drainage facilities; impacts on the Conservation Reserve Program; access and agricultural restrictions during construction; compensation for crop production loss; protection of cattle during construction; and inconvenience to landowners and residents.	3.9
Socioeconomics	Potential loss of conservation easement and lease payments to landowners, impacts to property values, impacts of importing Canadian oil on U.S. trade deficit, revenues and taxes to local governments, costs of road damage related to construction traffic and Keystone Project use, impacts of Keystone Project electricity demand on local electric rates, costs of grassland destruction, impacts of Keystone Project traffic on local transportation infrastructure, and ROW access control.	3.10
Cultural Resources	Impacts on cemeteries and burial grounds, archaeological sites and artifacts, and cultural sites; and impacts of blasting and vibrations on historic structures.	3.11
Air Resources	Air pollution abatement from pump stations.	3.12
Noise	Effects of pump station noise on humans and cattle, noise from blasting, and effects of pipeline vibrations on nearby structures.	3.12
Reliability and Safety	Protection from vandalism and terrorist activities, ROW security, safety of pipeline crossings, spill contamination and cleanup, leak detection, pipeline integrity, compensation to landowners affected by spills, likelihood of spills, pipeline safety requirements, record of spills for similar pipelines, TransCanada's safety record, water supply contamination, emergency response plans, and systems for public notification and complaints.	3.13
Cumulative Impacts	Impacts when combined with the Rockies Express pipeline, Platt pipeline, Stillwater (potable water) pipeline, roads, and highways; potential for additional pipelines in the Keystone ROW; and effects on development of renewable energy resources.	3.14

NEPA directs the federal government to examine major federal actions that may result in significant effects on the environment. Because it is considered a major federal action, authorization of the Keystone Project requires analysis under NEPA (42 USC § 4231 et seq.). Table 1.6-1 lists the permits, licenses, approvals, and consultation requirements for federal agencies that are not cooperating agencies and for state and local agencies.

1.7 CONNECTED ACTIONS

The Keystone Project would require electric power to service the proposed pump stations. Local electric transmission lines that supply power to pump stations would be contracted to local power providers. Therefore, the specific transmission corridors and substation locations would be determined at a later date. For the purposes of this EIS, general environmental concerns associated with typical transmission and substation facilities in the Keystone Project area are considered. When actual power contracts are consummated and specific transmission line and substation locations are identified, Western would determine whether this EIS provides the required compliance with NEPA or whether additional NEPA compliance analyses may be required prior to the issuance of construction permits for electric substation facilities in North Dakota and South Dakota. Western intends to assess its obligations under Section 106 of the NHPA independently of the Keystone Project Section 106 activities that are occurring concurrently with the DOS NEPA compliance process.

Another connected action is the Coker and Refinery Expansion (CORE) Project that is planned for the Wood River Refinery. The project would increase both the refinery's total crude processing capacity and the percentage of heavy crude oil processed. Presently, lighter, low-sulfur crude oil from foreign oil sources supplies the Wood River Refinery. In May 2006, ConocoPhillips, the operator of the Wood River Refinery, submitted applications to the Illinois Environmental Protection Agency for Prevention of Significant Deterioration (PSD) and National Pollutant Discharge Elimination System (NPDES) permits pursuant to the CAA and CWA. Potential impacts on water and air quality due to construction and operation of the refinery upgrade are discussed in Sections 3.3 and 3.12, respectively.

1.8 REFERENCES

ENSR. 2006a. Keystone Pipeline Project Environmental Report. Prepared for the U.S. Department of State. April. Updated November 15, 2006.

TABLE 1.6-1
Other Permits, Licenses, Approvals, and Consultation Requirements for the Keystone Project

Agency	Permit or Consultation Authority	Agency Action
Federal		
National Park Service (NPS)	16 United States Code (USC) § 1271 et seq.	Permit for geothermal drilling pipeline crossing of the Missouri River, classified as a National Recreational River under the Wild and Scenic Rivers Act and NPS lands
U.S. Department of Energy U.S Department of Commerce U.S. Department of Homeland Security U.S Department of Justice	Executive Order (EO) 11423 (33 Federal Register [FR] 11741), as amended by EO 12847 (58 FR 29511) and EO 13337 (69 FR 25299)	U.S. Department of State (DOS) is required to request the views of these agencies regarding applications for Presidential Permits
Federal Energy Regulatory Commission (FERC)	42 USC § 4231 et seq.	Advise DOS on proper implementation of the National Environmental Policy Act of 1969 (NEPA) for assessment of pipeline projects. (FERC has jurisdiction over natural gas pipelines and has well established procedures for environmental impact statement evaluations of pipelines.)
U.S. Department of Transportation (DOT) – Federal Highway Administration	Encroachment Permits	Permits for crossing federally funded highways
DOT – Office of Pipeline Safety	49 CFR Part 195	Review and approval of Integrity Management Plan for high-consequence areas
	49 CFR Part 194	Review and approval of Emergency Preparedness Plan
Council on Environmental Quality (CEQ)	NEPA (42 USC § 4321 et seq.), EO 11514	Coordination of federal programs related to environmental quality, including implementation of NEPA
North Dakota		
North Dakota State Historical Society	Consultation under Section 106, National Historic Preservation Act (NHPA)	Review and comment on activities potentially affecting cultural resources
Public Service Commission	Energy Conversion and Transmission Facility Siting Act Corridor Certificate; Route Permit	Permit for construction of a pipeline within an approved corridor and along an approved route
Department of Health, Division of Water Quality	Section 401 Clean Water Act (CWA), Water Quality Certification	Permit for stream and wetland crossings/consultation for U.S. Army Corps of Engineers (COE) Section 404 process
	National Pollutant Discharge Elimination System (NPDES) Temporary Dewatering/ Hydrostatic Testing Permit (NDG07000), Stormwater Discharge Permit NDR10-0000	Permit regulating hydrostatic test water discharge and construction dewatering and stormwater to waters of the state

TABLE 1.6-1
(Continued)

Agency	Permit or Consultation Authority	Agency Action
North Dakota (continued)		
North Dakota State Water Commission	Authorization to Construct a Project within Islands and Beds of Navigable Streams and Waters	Submit application after COE application submitted and approved but prior to construction (at least 90 days)
	Temporary Water Use Permit SWC Form 247	Submit application at least 60 days before construction
Department of Transportation	Encroachment Permits	Permits for encroachment on state highways
County Road Departments	Encroachment Permits	Permits for encroachment on county roads
South Dakota		
South Dakota Historical Society	Consultation under Section 106, NHPA	Review and comment on activities potentially affecting cultural resources
Public Utilities Commission	Energy Conversion and Transmission Facilities Act	Permit for a pipeline and associated facilities
Department of Environment and Natural Resources, Surface Water Quality Program	Section 401 CWA Water Quality Certification	Permit for stream and wetland crossings and consultation for Section 404 process
	NPDES Temporary Discharge Permit (General Permit for Temporary Discharges) and a Temporary Water Use Permit	Permit regulating water use, hydrostatic test water discharge, and construction dewatering to waters of the state
	NPDES Storm Water Discharge (SWD) Permit (General Permit for Storm Water Discharges Associated with Industrial or Construction Activities)	Permit regulating discharge of storm waters from the construction work area; submitted in conjunction with Section 401 application
Department of Transportation	Encroachment Permits	Permits for encroachment on state highways
County Road Departments	Encroachment Permits	Permits for encroachment on county roads
Bon Homme-Yankton Water District	Permit	Permit to cross Bon Homme-Yankton water lines
Nebraska		
Nebraska State Historic Preservation Office	Consultation under Section 106, NHPA	Review and comment on activities potentially affecting cultural resources
Department of Environmental Quality (DEQ), Division of Water Resources	Section 401 CWA Water Quality Certification	Permit for stream and wetland crossings/consultation for Section 404 process
	NPDES Excavation Dewatering and Hydrostatic Testing Permit	Permit regulating hydrostatic test water discharge and construction dewatering to waters of the state
	NPDES Storm Water Discharge Permit	Permit regulating discharge of storm waters from the construction work area
Department of Natural Resources	Water Appropriations DNR Form 675 (temporary or long term)	Permit to use public waters (for hydrostatic test water)

TABLE 1.6-1
(Continued)

Agency	Permit or Consultation Authority	Agency Action
Nebraska (continued)		
Department of Transportation	Encroachment Permits	Permits for encroachment on state highways
County Road Departments	Encroachment Permits	Permits for encroachment on county roads
Kansas		
Kansas State Historic Preservation Office	Consultation under Section 106, NHPA	Review and comment on activities potentially affecting cultural resources
Kansas Corporation Commission	Certificate of Convenience and Authority to Transport the Business of a Liquids Pipeline Carrier	Certificate to construct pipeline and associated facilities across all land
Department of Health and Environment, Division of Water Resources	Section 401 CWA Water Quality Certification	Permit for stream and wetland crossings/consultation for Section 404 process
	NPDES Temporary Discharge Permit	Permit regulating hydrostatic test water discharge
	Action Permit	Permit for potential effects on federally and state-listed species
Kansas Department of Agriculture	Temporary and Term Water Appropriations Permits	Permits for appropriation of water for hydrostatic testing and watering right-of-way (ROW) for dust suppression
	Application for General Permit – Pipeline Crossing or Buried Cable – Channel Modification (open cut)	General pipeline crossing permit or specific permits for stream channel crossings
Department of Transportation	Encroachment Permits	Permits for encroachment on state highways
Kansas Turnpike Authority	Permission to Construct	Permits to construct across jurisdictional roads
County Road Departments	Encroachment Permits	Permits for encroachment on county roads
Missouri		
Missouri State Historic Preservation Office	Consultation under Section 106, NHPA	Review and comment on activities potentially affecting cultural resources
Department of Natural Resources, Division of Water Resources	Section 401 CWA Water Quality Certification	Permit for stream and wetland crossings/ consultation for Section 404 process
	NPDES Storm Water Discharge Permit	Permit regulating discharge of storm waters from the construction work area
	NPDES Temporary Discharge Permit	Permit regulating hydrostatic test water discharge, and construction dewatering to waters of the state
Department of Transportation	Encroachment Permits	Permits for encroachment on state highways
County Planning Departments	Development Permit/ Application	Permit to construct in floodplains. Reviewed in conjunction with Section 401 application
County Road Departments	Encroachment Permits	Permits for encroachment on county roads

TABLE 1.6-1 (Continued)		
Agency	**Permit or Consultation Authority**	**Agency Action**
Illinois		
Illinois Commerce Commission	Certificate of Good Standing	Certificate to construct pipeline and associated facilities across all lands
Illinois State Historic Preservation Office	Consultation under Section 106, NHPA	Review and comment on activities potentially affecting cultural resources
Illinois Environmental Protection Agency (EPA), Division of Water Pollution Control	Joint Application for Section 401 CWA Water Quality Certification	Permit for stream and wetland crossings/consultation for Section 404 process
	NPDES Temporary Discharge Permit (General Forms 1 and 2E and Form ILG67)	Permit regulating hydrostatic test water discharge and construction dewatering to waters of the state
	NPDES Storm Water Discharge Permits (Notice of Intent Form ILR10)	Permit regulating discharge of storm waters from the construction work area
Illinois Department of Natural Resources, Office of Water Resources	Joint Application for Section 401 CWA Water Quality Certification (Statewide Permit 8 – Floodplain Development Permit)	Permit for construction of pipeline in a floodway; submitted in conjunction with Section 401 application
Illinois Department of Natural Resources, Office of Realty and Environmental Planning Division, Review and Coordination	T&E Agency Action Report and Request for Consultation on State Lands	Consultation for assessing impacts on endangered and threatened species and natural areas
Illinois Department of Natural Resources, Division of Natural Heritage	Incidental Take Authorization (ITA)	Submission of authorization to ITA Committee
Illinois Department of Transportation	Encroachment Permits	Permits for encroachment on state highways
County Road Departments	Encroachment Permits	Permits for encroachment on county roads
Oklahoma		
Oklahoma State Historic Preservation Office	Consultation under Section 106, NHPA	Review and comment on activities potentially affecting cultural resources
DEQ, Division of Water Resources	Section 401 CWA Water Quality Certification	Permit for stream and wetland crossings/consultation for Section 404 process
Oklahoma Corporation Commission	Notice of Surface Discharge of Hydrostatic Test Water	Permit regulating hydrostatic test water discharge
Water Resources Board	Water Appropriations Permit, Temporary Water Lease Permit	Permit to withdraw groundwater or surface water from public or private sources for hydrostatic testing and watering ROW for dust suppression
Department of Transportation	Encroachment Permits	Permits for encroachment on state highways
Oklahoma Turnpike Authority	Construction Permits	Permits to construct across jurisdictional roads
County Road Departments	Encroachment Permits	Permits for encroachment on county roads

Note: Regulatory requirements for federal cooperating agencies are described in Section 1.3.2.

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2.0 PROJECT DESCRIPTION

The following subsections describe the proposed project which DOS has chosen as the lead agency preferred alternative.

2.1 PROPOSED FACILITIES AND LAND REQUIREMENTS

Keystone proposes to construct and operate a crude oil pipeline and related facilities from an oil supply hub near Hardisty, Alberta in Canada to existing terminals in the United States. The Keystone Project as defined for this EIS consists of the Mainline Project (extending from the Canada/U.S. border to terminals and refineries in Illinois) and the Cushing Extension (extending from Steele City, Nebraska to Cushing, Oklahoma). The Project would have the capacity to deliver approximately 435,000 bpd, with the ability to increase the pumping capacity to approximately 591,000 bpd. See Figure 2.1-1 for a Project overview.

2.1.1 Mainline Project

Keystone proposes to begin construction of the Mainline Project in April 2008. Construction would occur over an approximately 18-month period, with a proposed in-service date of no later than November 2009.

2.1.1.1 Pipeline

The proposed Mainline Project comprises 1,082 miles of 30-inch-diameter pipeline from the Canada/U.S. border to Patoka, Illinois. Table 2.1-1 summarizes the pipeline mileage per state for the Mainline Project.

TABLE 2.1-1
Miles of Pipe by State for the Keystone Mainline Project

State	Length (miles)	Mileposts (From – To)
North Dakota	217.8	0–218
South Dakota	219.9	218–438
Nebraska	214.6	438–652
Kansas	98.7	652–751
Missouri	274.0	751–1,025
Illinois	56.9	1,025–1,082
Mainline Project total	**1,081.9**	

Sources: ENSR 2006a, TransCanada 2007d.

With the exception of urban/suburban areas around Troy and St. Charles, Missouri and Wood River and Edwardsville, Illinois, the pipeline would be constructed primarily in rural areas. Along the Mainline Project, approximately 705 miles would require new ROW. Figures 2.1-2 through 2.1-5 illustrate the typical construction ROW and equipment work locations in these areas. Approximately 377 miles would be collocated within an approximately 300-foot-wide corridor of existing ROWs for pipelines, utilities, and roads. Figures 2.1-6 through 2.1-9 illustrate the proposed construction ROW in areas where the pipeline would be located parallel to an existing pipeline.

The 30-inch-diameter pipeline would require a 110-foot-wide corridor, consisting of a temporary 60-foot-wide construction ROW and a 50-foot-wide permanent ROW. Keystone would reduce the corridor width to 95 feet in portions of Illinois and 85 feet in certain wetlands, shelterbelts, other forested areas, residential areas, and commercial/industrial areas.

2.1.1.2 Aboveground Facilities

Aboveground facilities for the Mainline Project would include pump stations, Mainline valves (MLVs), and delivery sites. Pigging facilities would be located at some pump stations and delivery sites. Transmission lines and substations required for aboveground facilities would be constructed and operated by local utility providers. Table 2.1-2 summarizes the location of each aboveground facility, and Figures 2.1-10 through 2.1-15 provide state-specific maps that show the pipeline route and general location of aboveground facilities.

Pump Stations

Keystone initially would construct 23 pump stations for the Mainline Project. Expansion to approximately 591,000 bpd would require one additional pump station in Bond County, Illinois (PS-38, see Table 2.1-2) and additional pumps at existing pump stations. Pump stations would be placed along the pipeline at locations necessary to maintain adequate flow. The pipe entering and exiting pump stations would be located below grade; the pipe within the pump stations would be aboveground. Two or three electric pumps driven by an electrical motor with a 3,000-kW rating would be located at each pump station. In total for the Keystone Project, the current design includes 58 motors installed for the initial phase and an additional 64 motors for the expansion (TransCanada 2007c). An electrical building and substation, two sump tanks, a small maintenance building, and parking area would complete each pump station.

Retail electrical power would be purchased locally. Stations would be fully automated. Backup electrical power would be provided by an uninterruptible power supply (UPS) that uses internal batteries to guarantee continuous power in the event of brief electrical service disruption. A 5-kilowatt (kW) gasoline-powered standby generator would provide backup in the event of an extended outage. Keystone anticipates that the backup generator would operate less than 20 hours per year. A small gasoline storage tank with a capacity of about 200 gallons would be located with the backup generator at each pump station. The storage tank would have the appropriate valves and containment structures and would meet applicable federal, state, and local tank regulations.

Valves

Keystone would construct 57 MLVs along the Mainline Project (Table 2.1-2). Proposed MLV locations were determined by the hydraulic characteristics of the pipeline, DOT regulations, and environmental and safety concerns. In addition to the 57 MLVs, each pump station would have one block valve. When not located at pump stations, MLVs would be constructed within a fenced 50-foot- by 50-foot area centered on the 50-foot-wide permanently maintained ROW. Remotely activated valves would be located at pump stations, upstream of major river crossings and sensitive water bodies. These valves can be quickly activated to shut down the pipeline in the event of an emergency.

TABLE 2.1-2 Aboveground Facilities for the Keystone Mainline Project		
Facility	**Location (County, State)**	**Milepost**
Pump Stations		
PS-15	Walsh, North Dakota	34.220
PS-16	Nelson, North Dakota	75.988
PS-17	Steele, North Dakota	123.614
PS-18 and pigging facility	Ransom, North Dakota	170.957
PS-19	Sargent, North Dakota	216.610
PS-20	Day, South Dakota	263.208
PS-21	Beadle, South Dakota	310.201
PS-22	Miner, South Dakota	358.786
PS-23 and pigging facility	Hutchinson, South Dakota	406.558
PS-24	Cedar, Nebraska	454.605
PS-25	Stanton, Nebraska	505.473
PS-26	Butler, Nebraska	552.878
PS-27	Saline, Nebraska	604.323
PS-28 and pigging facility	Jefferson, Nebraska	639.672
PS-29	Nemaha, Kansas	691.557
PS-30	Doniphan, Kansas	741.803
PS-31	Clinton, Missouri	786.631
PS-32	Carroll, Missouri	832.000
PS-33	Chariton, Missouri	867.583
PS-34	Audrain, Missouri	902.005
PS-35	Montgomery, Missouri	947.747
PS-36	Lincoln, Missouri	982.239
PS-37, Wood River Terminal	Madison, Illinois	1,026.814
PS-38	Bond, Illinois	1,053.604
Mainline Valves		
V-01	Cavalier, North Dakota	5.592
V-02	Pembina, North Dakota	8.223
V-03	Pembina, North Dakota	15.685
V-04	Pembina, North Dakota	19.496
V-47	Walsh, North Dakota	49.698
V-55	Steele, North Dakota	100.138
V-05	Barnes, North Dakota	167.877
V-06	Ransom, North Dakota	180.290
V-07	Ransom, North Dakota	185.421
V-51	Sargent, North Dakota	203.611
V-48	Marshall, South Dakota	240.447
V-52	Clark, South Dakota	277.441
V-08	Clark, South Dakota	293.950
V-09	Clark, South Dakota	302.103
V-49	Kingsbury, South Dakota	332.089
V-10	Miner, South Dakota	354.921
V-11	Hanson, South Dakota	373.902
V-12	McCook, South Dakota	389.386
V-13	Yankton, South Dakota	419.491
V-15	Yankton, South Dakota	432.135
V-16	Cedar, Nebraska	445.713

TABLE 2.1-2 (Continued)		
Facility	Location (County, State)	Milepost
Mainline Valves (continued)		
V-56	Wayne, Nebraska	479.927
V-17	Stanton, Nebraska	507.577
V-18	Colfax, Nebraska	534.378
V-19	Colfax, Nebraska	538.509
V-21	Butler, Nebraska	548.672
V-22	Seward, Nebraska	574.391
V-23	Seward, Nebraska	578.476
V-24	Seward, Nebraska	589.666
V-25	Saline, Nebraska	594.130
V-53	Saline, Nebraska	614.300
V-26	Marshall, Kansas	657.355
V-27	Marshall, Kansas	669.919
V-28	Nemaha, Kansas	684.318
V-29	Nemaha, Kansas	701.272
V-54	Brown, Kansas	720.756
V-30	Doniphan, Kansas	743.926
V-31	Buchanan, Missouri	752.296
V-32	Buchanan, Missouri	758.420
V-33	Buchanan, Missouri	766.318
V-57	Caldwell, Missouri	809.080
V-34	Carroll, Missouri	842.299
V-35	Chariton, Missouri	849.877
V-36	Chariton, Missouri	862.459
V-50	Randolph, Missouri	886.727
V-37	Audrain, Missouri	921.505
V-38	Audrain, Missouri	923.098
V-39	Lincoln, Missouri	971.366
V-40	Lincoln, Missouri	976.065
V-41	Lincoln, Missouri	987.053
V-46	St. Charles, Missouri	1,003.161
V-42	St. Charles, Missouri	1,018.380
V-43	Madison, Illinois	1,048.800
V-44	Bond, Illinois	1,069.347
V-45	Marion, Illinois	1,078.828
Terminals (including delivery sites)		
Wood River (includes PS-37)	Madison, Illinois	1,026.814
Patoka Terminal	Marion, Illinois	1,081.798

Sources: TransCanada 2007c, d.

Manually operated values would be installed in conjunction with a check valve, which instantaneously closes in the event of a drop in pressure upstream of the check valve. In essence, the manual valve and check valve combination has the same functionality as a remotely controlled valve. MLVs would be no more than 50 miles apart, with an average spacing of approximately 15 to 20 miles. Keystone's proposed MLV placement along the ROW complies with 40 CFR Part 195, "Transportation of Hazardous Liquids by Pipeline," Subpart A – General, Section 195.260, Valves: Locations, Items(c), (e), and (f) (TransCanada 2007b). This regulation requires valves at locations that:

- Minimize damage or pollution from accidental oil discharges,
- Are on each side of a water crossing more than 100 feet wide, and
- Are on each side of a reservoir holding water for human consumption.

In addition, valve placement considered streams less than 100 feet wide that are near or flow into streams that are greater than 100 feet wide, pump station locations, presence of potential high-consequence areas (HCAs) as defined by DOT, proximity to densely populated areas, and other topographic and environmental considerations.

Delivery Sites

Keystone would install two delivery sites along the Mainline Project route, near Wood River (Madison County) and at the Patoka Terminal (Marion County), both in Illinois (see Table 2.1-2). The proposed Wood River delivery site would be constructed outside the existing Wood River Terminal. The proposed Patoka delivery site would be located within the existing Patoka Terminal. The delivery sites would include equipment for regulating pressure, temperature, sampling, chromatography, tube switching, and measuring crude oil.

Pigging Facilities

The Keystone pipeline is designed to permit full pigging capabilities with a minimum interruption of service. All pig launchers and receivers would be constructed and operated within the boundaries of the pump stations or delivery sites.

2.1.1.3 Ancillary Facilities

Ancillary facilities for the Mainline Project would include additional temporary workspace areas, pipe storage and contractor yards, and access roads.

Additional Temporary Workspace Areas

Over 6,700 temporary work space areas would be required for the Mainline Project (TransCanada 2007c). The general types of workspace areas required including their typical dimensions and acreages are provided in Table 2.1-3. Temporary workspaces would be needed for areas requiring special construction techniques (e.g., river, wetland, and road crossings; horizontal directional drill [HDD] entry and exit points; steep slopes; and rocky soils) and construction staging areas. Specific locations of these workspaces would be modified as the Keystone Project design progresses.

TABLE 2.1-3
Additional Temporary Workspace Areas
for the Keystone Mainline Project

Type of Workspace Area	Typical Dimension (length by width in feet at each side of crossing)	Typical Acreage
Directionally drilled water bodies	300 x 140 on entry and exit sides	2.0
	Plus (length of drill plus 100) x 25 on exit side	Varies
Water bodies > 50 feet wide	250 x 25 in four quadrants (working and spoil sides, both sides of crossing), or	0.6
	250 x 50 in two quadrants (working side, both sides of crossing)	0.6
Water bodies < 50 feet wide	125 x 25 in four quadrants (working and spoil sides, both sides of crossing), or	0.3
	125 x 50 in two quadrants (working side, both sides of crossing)	0.3
Bored highways and railroads	175 x 25 in four quadrants (working and spoil sides, both sides of crossing), or	0.5
	175 x 50 in four quadrants (working side, both sides of crossing)	0.5
Bored interstate and four-lane highways	(Width of crossing plus 50) x 25 in four quadrants (working and spoil sides, both sides of crossing), or	Varies
	(Width of crossing plus 50) x 50 in two quadrants (working side, both sides of crossing)	Varies
Open-cut or bored county or private roads	125 x 25 in four quadrants (working and spoil sides, both sides of crossing), or	0.3
	125 x 50 in two quadrants (working side, both sides of crossing)	0.3
Push-pull wetland crossing	150 x 50 in two quadrants and center length at intersection point	0.2
	(Length of wetland plus 200) x 50 on working side	1.0
Stringing truck turnaround areas	Located adjacent to all-season hard-pack or paved road at spread breaks	5.0
	200 x 80 (working side)	0.4
Full right-of-way topsoil stripping/ steep or side slopes	Length of area x 25 (uphill side)	Varies
Merchantable timber stockpiling or marshalling areas	200 x 50	0.3

Sources: ENSR 2006a; TransCanada 2007b, c, d.

Pipe Storage and Contractor Yards

Keystone has identified required pipe storage and contractor yards for the construction phase of the Mainline Project (Table 2.1-4). Keystone estimates that 44 pipe storage and 36 contractor yards would be required for construction of the Mainline Project. Each 15- to 20-acre contractor yard would reduce construction worker transportation requirements. Each approximately 25-acre pipe staging yard would typically be located at 30-mile intervals along the pipeline route in proximity to railroad siding facilities.

Fuel transfer stations would be located only at contractor yards (TransCanada 2007c) and would be designed to dispense gasoline or diesel fuel directly to project work trucks and heavy equipment, and to other project delivery trucks for dispensing in the field. A typical fuel transfer station would consist of temporary aboveground storage tanks or trailers, rigid steel piping, valves and fittings, and transfer or dispensing pumps and associated containment structures. Two to three 10,000-gallon storage tanks for diesel fuel and one 10,000-gallon storage tank for gasoline would be placed at each yard. The tanks would be located in earthen-berm secondary containment structures with impervious membrane liners and would meet applicable federal, state, and local tank regulations. Total storage capacity would vary among locations, depending on the anticipated fuel requirements for the spread; a 2- to 3-day supply typically is stored at each location, equaling up to 30,000 gallons in storage at a given time.

Fuel would be offloaded into the storage tanks by connecting a 3-inch petroleum-rated hose from a delivery tanker to the fuel transfer line at the fill truck connection at the fuel station. The connection between the fill truck and fill line would be accomplished by using a quick-connect locking fitting, followed by a block valve, rigid steel piping, and one or more tank block valves. One or more check valves would be located immediately upstream of the connection to the storage tank. Offloading of the fuel typically would use a transfer pump powered by the delivery vehicle.

The bulk loading of diesel to fuel distribution trucks for delivery in the field (off-road diesel) would be completed by first connecting a 3-inch petroleum-rated hose between the truck tank and the withdraw truck connection. The withdraw connection and line would consist of rigid steel piping from the tank through one or more block valves to an intrinsically safe, explosion-proof, fuel transfer pump with a downstream quick-connect fastener. The fuel transfer pump would be equipped with an emergency shut-off switch located at the pump; a secondary emergency switch would be located at least 100 feet distant from the fueling operation.

Gasoline and diesel also would be dispensed directly to project vehicles from the storage tanks (on-road diesel). A dispensing pump with petroleum-rated hoses and automatic shut-off nozzles would be used. These would be similar to those at commercial gasoline stations. Table 2.1-5 summarizes the daily and annual throughput of each proposed temporary fuel transfer system site.

All storage tanks or trailers, rigid steel piping valves and fittings, and transfer or dispensing pumps would be enclosed within a containment structure that would provide 110 percent containment of the fuel stored within the structure. The containment structure would be constructed of sandbag or earthen berms that would be lined with a chemically resistant membrane. Figures 2.1-16 and 2.1-17 provide typical layout designs for diesel and gasoline transfer stations, respectively.

TABLE 2.1-4
Potential Pipe Storage Yards and Contractor Yards
for the Keystone Mainline Project

Name and Type of Yard	County	Acreage
North Dakota		
Berea pipe yard	Barnes	30
Valley City-a contractor yard	Barnes	12
Valley City-b contractor yard	Barnes	6
Milton pipe yard	Cavalier	30
Oakes pipe yard	Dickey	30
Emerado contractor yard	Grand Forks	21
Grand Forks-1 contractor yard	Grand Forks	11
Grand Forks-2 contractor yard	Grand Forks	7
Larimore pipe yard	Grand Forks	30
Aneta contractor yard	Nelson	25
Walhalla pipe yard	Pembina	30
Devils Lake contractor yard	Ramsey	20
Lisbon contractor yard	Ranson	17
Verona pipe yard	Ranson	30
Luverne pipe yard	Steele	46
Dahlen pipe yard	Walsh	40
Grafton-a contractor yard	Walsh	15
Grafton-b contractor yard	Walsh	10
Lankin pipe yard	Walsh	30
North Dakota subtotal		*440*
South Dakota		
Yale pipe yard	Beadle	30
Bath contractor yard	Brown	30
Claremont pipe yard	Brown	30
Ashton pipe yard	Clark	30
Iroquois pipe and contractor yard	Kingsbury	50
Emery pipe yard	McCook	40
Mitchell contractor yard	McCook	3
Yankton pipe yard	Yankton	32
Yankton-2 contractor yard	Yankton	21
Yankton-1 contractor yard	Yankton	33
South Dakota subtotal		*299*
Nebraska		
Garrison pipe and contractor yard	Butler	65
Laurel pipe yard	Cedar	30
Columbus pipe and contractor yard	Colfax	50
Plymouth pipe and contractor yard	Jefferson	39
Humphrey pipe yard	Platte	40
Mulford pipe yard	Seward	30
Norfolk contractor yard	Stanton	38
Norfolk pipe yard	Stanton	30
Nebraska subtotal		*322*

TABLE 2.1-4 (Continued)		
Name and Type of Yard	**County**	**Acreage**
Kansas		
Hiawatha-1 pipe and contractor yard	Brown	61
Hiawatha-2 pipe and contractor yard	Brown	44
Woodlawn pipe yard	Brown	40
Highland pipe and contractor yard	Doniphan	63
Marysville pipe and contractor yard	Marshall	160
Summerfield pipe and contractor yard	Marshall	50
Hanover east pipe yard	Washington	40
Kansas subtotal		*458*
Missouri		
Mexico contractor yard	Audrain	20
Mexico east-a pipe and contractor yard	Audrain	45
Mexico east-b pipe and contractor yard	Audrain	30
Elmira pipe and contractor yard	Caldwell	50
Tina pipe yard	Carrol	49
Keytesville pipe and contractor yard	Chariton	56
Cameron east pipe and contractor yard	Clinton	5
Gower pipe yard	Clinton	88
Winston pipe and contractor yard	DeKalb	22
Troy contractor yard	Lincoln	33
Buell pipe yard	Montgomery	33
Clark-1 pipe and contractor yard	Randolph	109
Clark-2 pipe and contractor yard	Randolph	109
Renick pipe yard	Randolph	8
Old Monroe pipe yard	St. Charles	63
Missouri subtotal		*720*
Illinois		
Alton-2 contractor yard	Madison	42
Hartford pipe yard	Madison	60
Greenville contractor yard	Bond	23
Pocahontas pipe yard	Bond	50
Illinois subtotal		*175*

Sources: ENSR 2006a; TransCanada 2007c, d.

TABLE 2.1-5
Maximum Fuel Throughput – Temporary Fuel Transfer Systems for the Keystone Project

Fuel	Daily (gallons/site)	Annual (gallons/site)
Gasoline	400	36,600
Off-road diesel	1,700	175,000
On-road diesel	7,000	723,000

Source: TransCanada 2007c.

To the extent practical, Keystone proposes to use existing commercial/industrial sites or sites that previously have been used for construction. Existing public or private roads would be used to access each yard. Both pipe storage yards and contractor yards would be used on a temporary basis and would be restored to their previous use upon completion of construction.

Access Roads

The Mainline Project would require 142 temporary access roads or expansions of existing roads. The total length of the temporary access roads would be 58.8 miles, each one ranging from 0.01 to 13.5 miles and the majority being less than 0.5 mile. Only five of the access roads would be more than 1 mile. The temporary roads and upgrades to existing roads would disturb approximately 142 acres along the entire Mainline Project ROW. New temporary access roads or expansion of existing private or public roads would be used and maintained only with permission of the landowner or land management agency.

Keystone also would construct short permanent access roads from public roads to the Mainline Project's proposed pump stations, delivery sites, and MLVs. The permanent access roads would disturb approximately 3.5 acres along the entire Mainline Project ROW. Pre-construction drainage patterns would be maintained by installing culverts and ditches as necessary, and the roads would be surfaced with crushed rock (TransCanada 2007c). Prior to construction, Keystone would finalize the locations of the permanent access roads and any additional temporary access roads, and would obtain necessary federal, state, and local approvals. Keystone would be responsible for maintenance of newly created access roads.

2.1.2 Cushing Extension

Keystone proposes to begin construction of the Cushing Extension no later than late 2009 or early 2010, with an in-service date of 2010. See Figure 2.1-1 for a Project overview.

2.1.2.1 Pipeline

The Cushing Extension would consist of 296 miles of 36-inch-diameter pipeline between Steele City in Nebraska near the Nebraska/Kansas border and the existing crude oil terminal in Cushing (Payne County) in Oklahoma. Table 2.1-6 summarizes the pipeline mileage by state.

TABLE 2.1-6
Miles of Pipe by State for the Keystone Cushing Extension

State	Length (miles)	Mileposts (From – To)
Nebraska	2.5	0–3
Kansas	210.4	3–213
Oklahoma	83.1	213–296
Cushing Extension total	**296.0**	

Source: TransCanada 2007b.

Along the Cushing Extension route, approximately 48 miles of the 296 miles of pipeline route would be collocated within 300 feet of existing pipeline, utility, or road ROWs. Approximately 248 miles of the route ROW would be new ROW.

Similar to the Mainline Project, Keystone would construct the Cushing Extension within a 110-foot-wide corridor, consisting of a temporary 60-foot-wide construction ROW and a 50-foot-wide permanent ROW, as described in Section 2.1.1.1. In addition, the Cushing Extension pipeline would be constructed of high-strength steel pipe (American Petroleum Institute [API] 5L) with external coating equivalent to that for the Mainline Project.

2.1.2.2 Aboveground Facilities

Aboveground facilities for the Cushing Extension would include pump stations, MLVs, and a delivery site. Pigging facilities would be located at some pump stations and delivery sites. As described for the Mainline Project, transmission lines and substations would be constructed and operated by local utility providers. Table 2.1-7 summarizes the location of each aboveground facility. Figures 2.1-18 and 2.1-19 provide state-specific maps showing the Cushing Extension pipeline route and general locations of aboveground facilities.

TABLE 2.1-7
Aboveground Facilities for the Keystone Cushing Extension

Facility	Location (County, State)	Milepost
Pump Stations		
CE-30	Dickinson, Kansas	94.459
CE-32 and pigging facility	Cowley, Kansas	186.583
CE-33	Kay, Oklahoma	240.929
Mainline Valves		
V-01	Washington, Kansas	15.674
V-14	Clay, Kansas	36.755
V-02	Clay, Kansas	50.063
V-03	Clay, Kansas	53.959
V-04	Dickinson, Kansas	67.529
V-05	Dickinson, Kansas	77.170
V-06	Marion, Kansas	102.544
V-07	Marion, Kansas	121.604
V-15	Butler, Kansas	145.960
V-08	Cowley, Kansas	194.624
V-09	Cowley, Kansas	210.911
V-10	Noble, Oklahoma	248.260
V-13	Noble, Oklahoma	260.315
V-11	Payne, Oklahoma	281.992
V-12	Payne, Oklahoma	289.209
Terminal (including delivery site)		
Cushing Terminal (includes a pigging facility)	Payne, Oklahoma	295.490

Sources: TransCanada 2007c, d.

Pump Stations

Keystone would construct three pump stations for the Cushing Extension (see Table 2.1-7). Pump stations would be placed along the pipeline at locations necessary to maintain adequate flow. The pump stations would be built and would operate as described for the Mainline Project in Section 2.1.1.2.

Valves

Keystone would construct 15 MLVs along the Cushing Extension (see Table 2.1-7). In addition, each pump station would have one block valve. Proposed MLV locations were determined by the hydraulic characteristics of the pipeline, DOT regulations, and environmental and safety concerns. The valves would be built and would operate as described for the Mainline Project in Section 2.1.1.2.

Delivery Sites

Keystone would install one delivery site along the Cushing Extension route, at the Cushing Terminal (Payne County) in Oklahoma (see Table 2.1-7). The delivery sites would be constructed inside the existing terminal, and would operate as described for the Mainline Project in Section 2.1.1.2.

Pigging Facilities

The Keystone pipeline is designed to permit full pigging capabilities with a minimum interruption of service. All pig launchers or receivers would be constructed and operated within the boundaries of the pump stations or delivery sites.

2.1.2.3 Ancillary Facilities

Ancillary facilities for the Cushing Extension would include additional temporary workspace areas, pipe storage and contractor yards, and access roads.

Additional Temporary Workspace Areas

Over 1,700 temporary workspace areas would be required for the Cushing Extension (TransCanada 2007c). The general types of workspace areas required, and their typical dimensions and acreages are provided in Table 2.1-8. Specific locations of these workspaces would be modified as the Keystone Project design progresses. The temporary workspace areas would be constructed as described in Section 2.1.1.3.

Pipe Storage and Contractor Yards

Keystone has identified required pipe storage and contractor yards for the construction phase of the Cushing Extension (Table 2.1-9). Keystone estimates that 10 pipe storage and six contractor yards would be required for construction of the Cushing Extension. Fuel transfer stations would be located only at contractor yards (TransCanada 2007c), and the pipe storage and contractor yards and temporary fueling stations would be constructed as described in Section 2.1.1.3.

Access Roads

Keystone does not plan to construct any permanent access roads to the construction ROW. Existing public and private roads would be used on a temporary basis. Thirty-one temporary access roads or expansions of existing roads would be required for the Cushing Extension. The total length of the temporary access roads would be 9.5 miles, each ranging from 0.06 to 1.10 miles and the majority less than 0.5 mile. Only one of the access roads would be more than 1 mile. The temporary roads and upgrades to existing roads would disturb approximately 22 acres along the entire Cushing Extension

ROW. New temporary access roads or expansion of existing private or public roads would be used and maintained only with permission of the landowner or land management agency.

TABLE 2.1-8
Additional Temporary Workspace Areas for the Keystone Cushing Extension

Type of Workspace Area	Typical Dimension (length by width in feet at each side of crossing)	Typical Acreage
Directionally drilled water bodies	300 x 140 on entry and exit sides	2.0
	Plus (length of drill plus 100) x 25 on exit side	Varies
Water bodies > 50 feet wide	250 x 25 in four quadrants (working and spoil sides, both sides of crossing), or	0.6
	250 x 50 in two quadrants (working side, both sides of crossing)	0.6
Water bodies < 50 feet wide	125 x 25 in four quadrants (working and spoil sides, both sides of crossing), or	0.3
	125 x 50 in two quadrants (working side, both sides of crossing)	0.3
Bored highways and railroads	175 x 25 in four quadrants (working and spoil sides, both sides of crossing), or	0.5
	175 x 50 in two quadrants (working side, both sides of crossing)	0.5
Bored interstate and four-lane highways	(Width of crossing plus 50) x 25 in four quadrants (Working and spoil sides, both sides of crossing), or	Varies
	(Width of crossing plus 50) x 50 in two quadrants (Working side, both sides of crossing)	Varies
Open-cut or bored county or private roads	125 x 25 in four quadrants (working and spoil sides, both sides of crossing), or	0.3
	125 x 50 in two quadrants (working side, both sides of crossing)	0.3
Push-pull wetland crossing	150 x 50 in two quadrants and center length at intersection point	0.2
	(Length of wetland plus 200) x 50 on working side	1.0
Stringing truck turnaround areas	Located adjacent to all-season hard-pack or paved road at spread breaks	5.0
	200 x 80 (working side)	0.4
Full right-of-way topsoil stripping/ steep or side slopes	Length of area x 25 (uphill side)	Varies
Merchantable timber stockpiling or marshalling areas	200 x 50	0.3

Sources: ENSR 2006a; TransCanada 2007b, c, d.

TABLE 2.1-9 Potential Pipe Storage Yards and Contractor Yards for the Keystone Cushing Extension		
Name and Type of Yard	**County**	**Acreage**
Kansas		
Augusta contractor yard	Butler	13
Towanda pipe yard	Butler	26
Broughton pipe yard	Clay	21
Junction City pipe yard	Dickinson	61
Concordia contractor yard	Cloud	22
Winfield pipe yard	Cowley	31
Grandview Plaza contractor yard	Geary	16
Junction City contractor yard	Geary	26
Florence pipe yard	Marion	42
Lost Springs pipe yard	Marion	55
Hanover SW pipe yard	Washington	26
Kansas subtotal		*339*
Oklahoma		
Ponca City contractor yard	Kay	21
Ponca City pipe yard	Kay	76
Morrison pipe yard	Noble	47
Cushing pipe yard	Payne	43
Stillwater-1 contractor yard	Payne	20
Oklahoma subtotal		*207*

Sources: ENSR 2006a, TransCanada 2007.

2.1.3 Land and Borrow Material Requirements

Table 2.1-10 summarizes the land requirements for the proposed Keystone Project. For the Mainline Project, approximately 17,607 acres of land would be disturbed during construction. This total includes temporary construction workspaces and the approximately 6,667 acres that would be retained as permanent ROW. All disturbed acreage would be restored and returned to its previous aboveground use after construction, except for approximately 109 acres of permanent ROW that would serve to provide adequate space for permanent access roads and aboveground facilities (including pump stations and valves) for the life of the Keystone Project. During construction of pump stations and valves along the Mainline Project, Keystone estimates the need for approximately 500,000 cubic yards of granular borrow material that would be obtained from existing local commercial aggregate suppliers (TransCanada 2007b).

TABLE 2.1-10
Summary of Land Requirements and Surface Disturbances for the Keystone Project

Facility	Land Affected during Construction[a] (acres)	Land Affected during Operation[b] (acres)
MAINLINE PROJECT		
North Dakota		
Pipeline right-of-way (ROW)	2,892	1,320
Additional temporary workspace areas[c]	121	0
Pipe and contractor yards	440	0
Pump station / delivery sites	25	25
Permanent access roads[d]	0.2	0.2
Temporary access roads[e]	40	0
North Dakota subtotal[f]	*3,440*	*1,342*
South Dakota		
Pipeline ROW	2,928	1,332
Additional temporary workspace areas[c]	129	0
Pipe and contractor yards	329	0
Pump station / delivery sites	19	19
Permanent access roads[d]	0.3	0.3
Temporary access roads[e]	20	0
South Dakota subtotal[f]	*3,377*	*1,349*
Nebraska		
Pipeline ROW	2,861	1,301
Additional temporary workspace areas[c]	123	0
Pipe and contractor yards	322	0
Pump station / delivery sites	25	25
Permanent access roads[d]	0	0
Temporary access roads[e]	7	0
Nebraska subtotal[f]	*3,335*	*1,323*
Kansas		
Pipeline ROW	1,314	598
Additional temporary workspace areas[c]	80	0
Pipe and contractor yards	458	0
Pump station / delivery sites	11	11
Permanent access roads[d]	1	1
Temporary access roads[e]	0	0
Kansas subtotal[f]	*1,871*	*608*
Missouri		
Pipeline ROW	3,646	1,660
Additional temporary workspace areas[c]	280	0
Pipe and contractor yards	800	0
Pump station / delivery sites	13	13
Permanent access roads[d]	2	2
Temporary access roads[e]	36	0
Missouri subtotal[f]	*4,675*	*1,687*
Illinois		
Pipeline ROW	655	345
Additional temporary workspace areas[c]	34	0
Pipe and contractor yards	175	0
Pump station / delivery sites	13	13
Permanent access roads[d]	0	0
Temporary access roads[e]	39	0
Illinois subtotal[f]	*909*	*358*
Mainline Project subtotal[e]	***17,607***	***6,667***

TABLE 2.1-10 (Continued)		
Facility	**Land Affected during Construction[a] (acres)**	**Land Affected during Operation[b] (acres)**
CUSHING EXTENSION		
Nebraska		
Pipeline ROW	34	15
Additional temporary workspace areas[c]	4	0
Pipe and contractor yards	0	0
Pump station / delivery sites	0	0
Permanent access roads[d]	0	0
Temporary access roads[e]	0	0
Nebraska subtotal[f]	37	15
Kansas		
Pipeline ROW	2,803	1,275
Additional temporary workspace areas[c]	149	0
Pipe and contractor yards	339	0
Pump station / delivery sites	10	10
Permanent access roads[d]	0	0
Temporary access roads[e]	15	0
Kansas subtotal[f]	3,266	1,275
Oklahoma		
Pipeline ROW	1,094	497
Additional temporary workspace areas[c]	52	0
Pipe and contractor yards	207	0
Pump station / delivery sites	8	8
Permanent access roads[d]	0	0
Temporary access roads[e]	7	0
Oklahoma subtotal[f]	1,363	502
Cushing Extension subtotal[f]	***4,666***	***1,801***
Keystone Project total[f]	**22,273**	**8,468**

[a] Disturbance is based on a total 110-foot-wide construction corridor for 30- and 36-inch pipe and a 95-foot-wide construction corridor in portions of Illinois, except in certain wetlands, shelterbelts, and other forested areas, residential areas, and commercial/industrial areas where an 85-foot-wide construction corridor would be used; or in areas requiring extra width for workspace necessitated by site conditions. Disturbance also includes pipe storage and contractor yards.

[b] Operation acreage was estimated based on a 50-foot-wide permanently maintained ROW in all areas. All pigging facilities would be located within either pump stations or delivery sites. Mainline valves would be constructed within the construction ROW and operated within a 50-foot x 50-foot area or 50-foot x 66-foot area, respectively, centered on the permanently maintained 50-foot-wide ROW. Other mainline valves would be located within the area associated with a pump station. Consequently, the acres of disturbance for these aboveground facilities are captured within the pipeline ROW and pump station/delivery facilities categories within the table.

[c] Additional temporary workspace areas include temporary disturbance for construction of pump stations and/or delivery facilities.

[d] Acreage calculations assume 20-foot wide permanent access roads.

[e] Not all temporary access roads are new. Some temporary access roads are previously existing roads.

[f] Discrepancies in total acreages are due to rounding. Affected lands components total acreage is quantified by component and does not account for overlap between components. For example, portions of a pump station footprint could be located in the pipeline ROW. Therefore, the total acreage of affected lands per state will not be the same as the sum of the individual components.

Sources: ENSR 2006a; TransCanada 2007b, c, d.

For the Cushing Extension, approximately 4,666 acres of land would be disturbed during construction. This total includes temporary construction workspaces and the approximately 1,801 acres that would be retained as permanent ROW. All disturbed acreage would be restored and returned to its previous aboveground use after construction, except for approximately 18 acres of permanent ROW that would serve to provide adequate space for aboveground facilities for the life of the Keystone Project. During construction of pump stations and valves along the Cushing Extension, Keystone estimates the need for approximately 130,000 cubic yards of granular borrow material that would be obtained from existing local commercial aggregate suppliers (TransCanada 2007b).

Almost all land affected by construction and operation of the Keystone Project would be privately owned; less than 1 percent would be public land. Keystone would seek to acquire the necessary ROW for the Keystone Project by negotiating easements with landowners along the pipeline route. Keystone would negotiate permanent easements to construct, operate, and maintain the pipeline in the permanent ROW and temporary easements for additional construction workspaces.

Landowners would receive payment for granting pipeline ROW easements. Landowners would be compensated for temporary loss of land use and loss of crops or other resources attributable to pipeline construction or operation. They also would receive payment for restoration of any unavoidable property damage. If an easement cannot be negotiated with the landowner, state eminent domain laws may be invoked. Keystone also would acquire a limited number of sites in fee for siting pump stations. Keystone began land acquisition in Illinois, eastern Missouri, and for all pump stations in late 2006. All other land acquisitions are occurring in early 2007. Refer to Section 3.9 for additional discussion of easement acquisition procedures.

2.1.4 Connected Actions

2.1.4.1 Power Lines and Substations

Keystone estimates that 23 new/upgraded transmission lines would be required to provide electrical power to the proposed pump stations along the Mainline Project. According to Keystone (ENSR 2006a), approximately 181 miles of new transmission lines and 22 miles of upgraded transmission lines would be constructed in North Dakota, South Dakota, Nebraska, Kansas, Missouri, and Illinois for the Mainline Project. These would include one 25-kilovolt (kV), six 34.5-kV, eight 69-kV, seven 115-kV, and one 161-kV transmission lines. Pole heights would vary depending on line voltage between 40 and 80 feet, and pole spacing would vary between 300 and 400 feet. The width of the poles and attached electrical insulators would range from 4 to 15 feet.

Keystone estimates that three new/upgraded transmission lines would be required to provide electrical power to the proposed pump stations along the Cushing Extension. According to Keystone (ENSR 2006a), approximately 11.5 miles of new transmission lines would be constructed in Kansas and Oklahoma. These would comprise one 230-kV and two 138-kV transmission lines. Pole heights would vary depending on line voltage between 55 and 80 feet, and pole spacing would vary between 370 and 550 feet. The width of the poles and attached electrical insulators would range from 9 to 15 feet.

The power lines would be permitted and built by various utility providers but would be considered a connected activity under NEPA. Keystone assumes that the majority of required transmission lines would parallel existing county road ROWs. Either steel or wooden poles would be used for power lines, with wire conductors installed through pulling or reeling, and insulators installed as needed. Poles would vary in height from 40 to 80 feet, depending on transmission line voltage. Additional power lines would be required for valve sites and would be supplied from distribution service drops from adjacent distribution power lines. Most of these service drops would require installation of one or two poles with a transformer and would typically be less than 200 feet in length.

Existing substations would need to be modified and new substations would need to be constructed in order to provide power to the proposed pump stations along the Mainline Project. Keystone does not anticipate that new substations would be required on any of these transmission systems along the Cushing Extension. Substation modification and construction activities would comply with Western's Construction Standard (Standard 13 – Environmental Quality Protection) and Western's Standard Mitigative Measures for Construction, Operation, and Maintenance of Western Facilities (see Appendix B). The area required for the substation modifications or construction would be surveyed, cleared, and graded prior to installation. The surface would be graded in compliance with storm water control plans and other applicable permit requirements. Gravel would be delivered to the site after all subsurface work is complete and leveled to create a surface for the installation of the above ground substation equipment. A secure chain-link fence would be installed to control and limit access during construction and maintenance activities. The substation equipment would be delivered on tractor-trailer trucks and installed on top of a concrete foundation in the graveled area. All areas would be graded to ensure proper drainage and runoff control in accordance with applicable regulations.

2.1.4.2 Wood River Refinery Expansion

ConocoPhillips operates the Wood River Refinery in Roxana, Illinois. The refinery presently produces a variety of petroleum products for distribution in the St. Louis, Chicago, and Indianapolis areas and for additional markets throughout the Midwest. The majority of crude oil shipped on the proposed pipeline would go to the Wood River Refinery (TransCanada 2007c). To process the growing volume of Canadian heavy crude, the refinery is slated to undergo a Coker and Refinery Expansion (CORE) project, which will increase both the total crude processing ability and the ability of the facility to handle a higher percentage of heavier crude. This will increase the supply of petroleum products to the Upper Midwest markets. Permit applications for federal PSD and NPDES permits, and the State of Illinois permit for Major Stationary Sources Construction and Modifications have been filed for the CORE project.

Key elements of the CORE project include:

- Constructing a new delayed coking unit and other associated coker units that will enable processing higher volumes of heavy crude;
- Upgrading and revising an existing distilling unit and constructing a new vacuum flasher to handle the high-acid, high-sulfur, heavy crude;
- Restarting an existing, but idled, distilling unit to provide additional crude oil processing capacity;
- Upgrading and revising two existing fluid catalytic cracking units to handle the higher acid charge and changes in unit yields, and installing new wet gas scrubbers and selective catalytic reduction systems on the flue gas emissions from these units;
- Restarting an existing, but idled distilling catalytic cracking unit to enable processing of the additional gas oil;
- Constructing a new hydrogen plant;
- Restarting the lube vacuum fractionation column as an ultra-low sulfur diesel hydrotreater;

- Providing for additional sulfur processing capacity and additional amine treating and sour water stripping capabilities; and
- Modifying the wastewater treatment plant to handle the increased loads.

Additional upgrades proposed by ConocoPhillips to handle increased throughput include a new gasoline tank, two new ethanol tanks, and two new distillate oil tanks. The existing truck loading rack also would be expanded.

Approximately 95,000 bpd of the proposed pipeline's crude oil capacity would likely be shipped on a short-term spot-order basis to refineries throughout the country. The refineries receiving the oil would need to meet current permit requirements to receive and refine the new crude oil supply. If existing permits would not cover the refining of this new crude oil source or if refinery upgrades were required, permit upgrades would be required.

2.2 DESIGN AND CONSTRUCTION PROCEDURES

The Keystone Project would be designed, constructed, tested, and operated in accordance with all applicable requirements included in the DOT regulations at 49 CFR Part 195, "Transportation of Hazardous Liquids by Pipeline," and in other applicable federal and state regulations. These regulations are intended to prevent crude oil pipeline accidents and failures. Among other design standards, 40 CFR Part 195 specifies pipeline material and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion.

Throughout the Keystone Project, Keystone would implement:

- **Keystone's Construction Mitigation and Reclamation Plan (CMR Plan).** The CMR Plan contains construction and mitigation procedures that would be used throughout the Project to avoid and minimize impacts, with subsections to address specific environmental conditions. The current CMR Plan is included in Appendix B. Any additional mitigation measures agreed to by Keystone as a result of the EIS process or additional mitigations resulting from permit conditions imposed by regulatory authorities would be added to a revised CMR Plan prior to construction.
- **Keystone's Spill Prevention, Control, and Countermeasure (SPCC) Plan.** The SPCC Plan describes spill prevention practices, emergency response procedures, emergency and personnel protection equipment, release notification procedures, and cleanup procedures to avoid or minimize the potential for harmful spills and leaks. Keystone is required by regulation to submit an SPCC Plan to DOT/OPS prior to operation of the pipeline system (49 CFR Part 195). Although Keystone has not yet submitted a specific SPCC Plan, Section 3.0 of Keystone's CMR Plan (Appendix B) describes spill prevention and containment measures to be followed during construction activities. Other topics related to spill response can be found in Appendix B and in the Emergency Response Plan (ERP) (Appendix C [see below]).
- **Keystone's Emergency Response Plan.** The ERP identifies emergency personnel and the logical sequence of actions that should be taken in the event of an emergency involving the Keystone system facilities during construction or operation, including written emergency shutdown procedures, communication coordination, and cleanup responsibilities. A preliminary draft of Keystone's ERP was submitted to DOS on July 1, 2006 (Appendix C).

Mitigation and other measures identified would constitute the basic construction design applicable to most land disturbed by the Keystone Project. This approach would enable construction to proceed with a single set of specifications. On private land, this basic design may be modified to accommodate specific landowner requests and preferences.

In the event that Keystone encounters abandoned solid waste burial sites during construction, the wastes would be handled according to applicable local, state, and federal laws and regulations.

2.2.1 Pipe Design and Wall Thickness

The regulations require the use of a design safety factor contained in 49 CFR 195.106 to establish a maximum operating pressure. This formula for calculating maximum operating pressure specifies a design safety factor of 0.72 for onshore pipelines. This factor of safety ensures that the maximum allowable operating pressure (MAOP) of the pipeline would not exceed 72% of the specified minimum yield strength (SMYS) of the steel used to construct the pipeline. Under the federal Pipeline Safety Act, a waiver of any regulatory requirement may be granted by the federal Pipeline and Hazardous Materials Safety Administration (PHMSA) if the agency finds that granting the waiver is not inconsistent with pipeline safety (49 USC 60118). On November 17, 2006, Keystone filed a request for waiver of 49 CFR 195.106, seeking permission to use an 0.80 design factor, meaning that the MAOP of the proposed Keystone pipeline would not exceed 80% of the SMYS of the steel used to construct the pipeline. If this waiver were to be granted, the Keystone pipeline at a maximum operating level would still be 20% below the yield strength of the steel used to construct the pipeline.

PHMSA undertook an extensive, detailed technical review of Keystone’s request. PHMSA also engaged outside experts in the field of steel pipeline fracture mechanics, leak detection, and supervisory control and data acquisition (SCADA) systems to assist in the review of Keystone’s application. PHMSA publicly noticed Keystone’s application and incorporated the concerns expressed in public comment into its review. As a result of its review, PHMSA issued a Special Permit allowing Keystone to design, construct, and operate its crude oil pipeline project using a design factor and operating stress level of 80 percent of the steel pipe’s SMYS in most areas.

In issuing the Special Permit, PHMSA found specifically that allowing Keystone to operate at 80 percent of SMYS is consistent with pipeline safety and that it “will provide a level of safety equal to or greater than that which would be provided if the pipelines were operated under existing regulations.” The Special Permit contains 51 conditions that Keystone must comply with, addressing such areas as steel properties, manufacturing standards, fracture control, quality control, puncture resistance, hydrostatic testing, pipe coating, overpressure control, welding procedures, depth of cover, SCADA, leak detection, pigging, corrosion monitoring, pipeline markers, in-line inspection, damage prevention program, and reporting. Failure to comply with any condition may result in revocation of the Special Permit. In addition, the Special Permit is not applicable to certain sensitive areas, including commercially navigable HCAs; high population HCAs; highway, railroad, and road crossings; and pipeline located within pump stations, mainline valve assemblies, pigging facilities, and measurement facilities. Issuance of the Special Permit was based on PHMSA’s determinations that the aggregate effect of Keystone’s actions and PHMSA’s conditions provide for more inspections and oversight than would occur on pipelines installed under the existing regulations, and that PHMSA’s conditions would require Keystone to more closely inspect and monitor its pipeline over its operational life than similar pipelines installed without a Special Permit. Table 2.2-1 provides the approved pipe wall thickness for the Keystone Mainline Project for the length of pipe and type of run.

TABLE 2.2-1 Pipe Wall Thickness for the Keystone Mainline Project				
Type of Run	Specified Minimum Yield Strength (SMYS)	Pipe Wall Thickness (inches)	Length of Pipe (miles)	Pipe Diameter (inches)
Rural Areas	80%	0.386	984.3	30
Urban Areas (HCAs)	72%	0.429	62.7	30
Pump Stations[a] and Valves	72%	0.429/0.437[b]	1.8	30
Road Crossings and Minor Rail Crossings	60%	0.515	24.5	30
Major Rail Crossings	60%	0.622	0.1	30
Pump Stations[c]	50%	0.622	1.0	30
HDDs	50%	0.622	8.7	30

Source: PHMSA Special Permit.

[a]Below ground piping.

[b]0.429" pipe will be used during 2009 construction and 0.437" pipe will be used during 2008 construction.

[c]Above ground piping.

2.2.2 Standard Pipeline Construction Procedures

Construction of the pipeline would proceed as shown in Figure 2.2-1. Keystone would construct the pipeline in 11 construction spreads or completed lengths, with eight spreads along the Mainline Project and three spreads along the Cushing Extension (Section 2.2.4). Separate crews would be used for construction of aboveground facilities. The entire process would be coordinated to minimize the total time a tract of land is disturbed and therefore exposed to erosion and temporarily precluded from normal use. Appropriate erosion and sediment control measures would be installed to control the discharge of pollutants from the construction site. In addition, all construction equipment would be completely washed down when transferring from one potential source of noxious weed contamination into another area.

Standard pipeline construction is composed of specific activities and methods, as described in the following sections. Special pipeline construction methods are described in Section 2.2.2.

2.2.2.1 Survey and Staking

Initial construction involves surveying the limits of the approved work area (the construction ROW boundaries and any additional temporary workspace areas). A survey crew would stake the centerline of the proposed trench. Approved access roads and existing utility lines would be flagged. Wetland boundaries and other environmentally and culturally sensitive areas also would be marked or fenced for protection. Inadvertent discoveries of cultural resources would be managed as described in Section 3.11.4.

2.2.2.2 Clearing and Grading

Removal of vegetation would be confined to those areas absolutely necessary for construction. Clearing and grading crews would protect existing land improvements to the degree practicable, including landowner fences and gates. Livestock would be contained if necessary by temporary gates and fences.

Vegetation and crops would be cleared and rocks, brush, trees, and other debris would be removed. Inadvertent discoveries of cultural resources would be managed as described in Section 3.11.4. If burning is conducted, it would comply with state and local regulations. Where open burning is permitted, such burning would occur within the 110-foot-wide cleared construction ROW, which would provide a buffer from adjacent agricultural or forested lands to prevent the spread of fire. Open burning would not be conducted adjacent to any structure that abuts the ROW.

In wetland or riparian zones, Keystone would install sediment control structures along the construction ROW edges prior to vegetation removal. Sediment control structures across the ROW would be installed immediately after vegetation removal, as specified in Sections 4.5 and 7.7 of Keystone's CMR Plan. Grading would occur in uneven grade areas to level the working surface, and disturbed topsoil would be segregated and piled to prevent mixing of the subsoil and topsoil. Steep side slope areas would require more severe grading due to the need to avoid unusual bending of the pipeline during installation.

2.2.2.3 Trenching

Typically, the trench would be excavated to a depth of approximately 7 to 8 feet. Typical trench widths in stable soils are about 4 to 5 feet. DOT requires a minimum of 36 inches of cover in most areas, and a minimum of 18 inches of cover in rocky areas. Keystone proposes to use a minimum of 36 inches of cover in rocky areas and 48 inches in other locations, as illustrated in Table 2.2-2 and in Figure 2.2-2. In some cases, trenching would occur before contractors weld or bend the pipeline joints. Rock would be excavated by tractor-mounted mechanical rippers or rock trenchers, unless the rock formations are sufficiently resistant to necessitate blasting with explosives (Section 2.2.2.5). Keystone estimates that 37 miles of the Mainline Project and 9.5 miles of the Cushing Extension would require ripping (use of an excavator to remove rock and bedrock formations). Excavated rock would be used to backfill the trench to the top of the existing bedrock profile.

TABLE 2.2-2
Minimum Pipeline Cover for the Keystone Project

Location	Cover, Normal Excavation (inches)	Cover, Rock Excavation (inches)
All water bodies	60	36
Dry creeks, ditches, drains, washes, and gullies	60	36
Drainage ditches at public roads and railroads	60	48
All other land	48	36

Source: ENSR 2006a.

Disturbed topsoil would be separated from underlying soils in agricultural and certain wetland areas, as specified in Keystone's CMR Plan. In areas where only the removal of trench topsoil is required, it would be stored in a pile on one side of the trench and the subsoil would be stored on the other side of the trench (see Figures 2.1-2 through 2.1-9). The location of topsoil placement and storage location would be based on site topography and other obstructions, and might therefore not always be as shown in the typical drawings. In areas where topsoil covering the trench and the spoil pile area would be removed, separated topsoil would be stored either on the edge of the spoil side of the construction ROW or on the edge of the working side of the construction ROW. This special handling of topsoil would ensure that it is replaced to the original soil sequence prior to disturbance. Gaps would be left between the spoil piles to prevent stormwater runoff from backing up or flooding.

To minimize the impact on livestock and wildlife movements during construction, Keystone would leave hard plugs (short lengths of unexcavated trench) or install soft plugs (areas where the trench is excavated and replaced with minimal compaction) to allow livestock or wildlife to safely cross the open trench. Soft plugs would be constructed with a ramp on each side to provide an avenue of escape for animals that fall into the trench. Hard and soft plugs would be installed in consultation with affected landowners.

2.2.2.4 Pipe Stringing, Bending, and Welding

Prior to and/or following trenching, sections of externally coated pipe joints up to 80 feet long would be transported by truck to the ROW and laid in a line along the trench. Prior to welding, individual pipe sections would be bent as necessary to fit the trench contours. Where extreme bend angles are required, the pipe sections would be factory pre-bent prior to delivery to the working ROW. Along the ROW, a track-mounted hydraulic pipe-bending machine would be used.

The pipe joints then would be welded into long strings and placed on temporary supports. Keystone would non-destructively inspect 100 percent of the welds using radiographic, ultrasonic, or other DOT-approved method. Welds that do not meet established specifications would be repaired or removed. Once the welds are approved, a protective epoxy coating would be applied to the weld joints. The pipeline then would be electronically inspected or “jeeped” and visually inspected for any faults in the epoxy coating. Damage to the coating would be repaired before the pipeline is lowered into the trench.

2.2.2.5 Installing and Backfilling

Before the pipeline is installed, the trench would be inspected to ensure that it is free of debris that could damage the pipe or protective coating; the trench would be dewatered where necessary.

After thorough inspection, the pipeline would be lowered into the trench. Trench breakers consisting of foam inserts or stacked sand bags would be used in steeper terrain to inhibit water movement within the trench. Resistant coatings and rock shields would be used in rocky terrain to protect the pipe coating from scratching and abrasion. In some cases, fine sands and gravels would be used as pipe bedding to protect the pipeline from damage during installation and operation. In no case would topsoil be used as bedding material.

After the pipe is installed, the pipeline would be backfilled with previously excavated material. The material would be pushed back into the trench using bladed equipment, backhoes, or auger-type backfilling machines. Erosion would be limited by minimizing the linear distance of cleared ROW and open trench per spread prior to trench closure and ROW stabilization.

2.2.2.6 Hydrostatic Testing, Pipe Roundness Testing, and Final Tie-In

After installation and before operation, the pipeline would be hydrostatically tested to verify that it can withstand the internal pressures expected during typical operations. Keystone has identified 41 surface water sources that could supply water for hydrostatic testing (32 along the Mainline Project route and nine surface along the Cushing Extension route), depending on the flows at the time of testing and the sensitivity of the individual water bodies for other uses (ENSR 2006a). These potential sources are listed in Section 8.2 of Keystone’s CMR Plan (see Appendix B) and Keystone’s Hydrostatic Test Plan (also in Appendix B). The testing would occur in approximately 30-mile isolated sections (up to a maximum of 50 miles). During testing, the pipeline segment would be filled with water and pressurized to at least

1.25 times the MAOP for at least 8 hours, in accordance with 49 CFR Part 195. If leaks are found through pressure loss, they would be repaired, and the pipe section would be retested until integrity is verified. Keystone would obtain the test water from rivers and streams along the pipeline route in accordance with federal, state, and local permit stipulations. After an individual test section is complete, test water would be transferred to another isolated pipe for additional testing for contaminants and harmful biota or would be discharged in compliance with NPDES permit requirements, including pre-treatment if necessary. Keystone estimates that a total volume of 78 million gallons of test water would be required for the Mainline Project and an additional 34 million gallons would be required for testing the Cushing Extension, assuming that test water could be reused in three test sections (TransCanada 2007b). After all hydrostatic testing is concluded, a caliper pig that detects any dents or flaws in the pipeline from fabrication or construction events would be launched. Any detected "out-of-round" problems that could affect pipe integrity would be repaired. Following successful hydrostatic testing and pipe geometry inspection, all hydrostatic test manifolds would be removed and the final pipeline tie-ins would be welded and inspected.

2.2.2.7 Commissioning

Prior to commissioning, the pipeline would be cleaned and dried, if necessary, with up to 10 pounds per square inch, gauge (psig) of dry air. Commissioning includes verification of the pipeline equipment operational integrity, including pump stations, valves, and system controls and communications. The pipeline then would be purged of air, and crude oil pumping and line-filling would begin.

2.2.2.8 Cleanup and Restoration

Cleanup operations along the ROW would begin as soon as weather and site conditions permit, and would include construction debris removal, final grading, topsoil replacement, and installation of permanent erosion control structures. Pre-construction contours would be restored as closely as possible. Depending on weather and site logistics, final cleanup would be completed in most locations within approximately 20 days after trench backfilling. In residential areas, cleanup would be completed within approximately 10 days. All debris would be taken to a disposal facility.

To stabilize soils, reduce erosion, and reestablish vegetation cover, disturbed work areas in non-cultivated fields would be seeded as soon as practicable, and would be subject to the prescribed dates and seed mixes specified by the landowners or regulatory agencies. Agricultural lands would be reseeded as specified in agreements with the landowners. In areas where native prairie grasses are disturbed, Keystone would encourage landowners to reseed with native seed mixes.

ROW access would be restricted through gates and barriers in accordance with landowner agreements. Pipeline markers would identify pipeline ownership and emergency reporting information, and would be installed at road and railroad crossings and other locations as required by 49 CFR Part 195. Special markers visible to aerial patrol pilots also would be installed.

2.2.3 Non-Standard Pipeline Construction Procedures

Keystone would use special construction techniques where warranted by site-specific conditions. These special construction techniques are described in subsequent sections.

2.2.3.1 Road, Highway, and Railroad Crossings

Construction of the pipeline across roads, highways, railroads, and existing water utility lines would be in accordance with required permits and approvals obtained by Keystone. To minimally disrupt traffic, it is Keystone's intent that pipeline crossings of major paved roads, primary gravel roads, highways, and railroads where traffic cannot be interrupted would be accomplished by boring under the road belt, as illustrated in Figure 2.2-3.

Pits would be excavated on each side of the crossing to seat boring equipment. A hole equal to at least the diameter of the pipe then would be bored under the feature, and a pre-fabricated pipe section would be pulled through the bored hole. For longer crossings, pipe sections would be welded prior to the pull beneath the crossing. Construction of these crossings would be expected to take from 1 to 10 days, depending on the length of the crossing.

Keystone intends that most small unpaved roads and driveways would be crossed using an open-cut method that typically would be completed within 1 to 2 days, and would require only temporary road closure and detours. Where detours are not feasible, at least one lane of traffic would be kept open, except during pipeline installation. Signs would be used for traffic safety and to reduce traffic disruption.

Permits will be required to cross water distribution systems. In South Dakota, the Keystone Mainline Project would cross the Bon Homme-Yankton water delivery utility lines at 27 locations. The lines that would be crossed are PVC or iron pipes ranging in diameter from 1.5 to 18 inches. The water district requires a separation distance of 18 inches unless otherwise negotiated, and cathodic protection must be provided by Keystone to protect iron lines and miscellaneous vaults. Permits will be required that detail the responsibilities, process, and methodology associated with crossing these and all water lines.

2.2.3.2 Steep Terrain

Steep slope grades would be reduced as needed for construction safety and pipe contour limitations. The slopes would be contoured prior to pipeline installation and recontoured to the extent practicable during site restoration. Cross-slope construction may require cut-and-fill grading. Prior to grading, topsoil would be stripped and stockpiled—in most cases, on the low side of the ROW. After pipeline installation, the site would be recontoured, topsoil would be replaced, erosion control features would be installed, and site reseeding would be accomplished.

Steep terrain construction would include temporary sediment barriers (e.g., silt fences and straw bales) and slope breakers (e.g., water bars of mounded and compacted soil) to reduce soil erosion and transport. Permanent slope breakers would be installed during ROW restoration. ROW stabilization would include re-seeding, mulching, and installation of erosion control fabric.

2.2.3.3 Water Body Crossings

Site Preparation

Temporary workspace areas would be required on both sides of all water bodies to stage construction, fabricate the pipeline, and store materials. At HDD crossings, some trees and shrubs may be cleared, possibly by hand to minimize disturbance, to allow access along the pipeline route and to facilitate the HDD operation. A minimal amount of activity would take place on the ROW between the entry and exit points of the directional drills during the operation, including placement of tracking cables, placement of pumps and water lines to supply the HDD operation, and pump and hose set-up on the opposite side of the river. These workspace areas would be located at least 50 feet from the water's edge where the adjacent upland consists of actively cultivated or rotated cropland or other disturbed land. Before construction, temporary bridges (e.g., subsoil fill over culverts, timber mats supported by flumes, railcar flatbeds, and flexi-float apparatus) would be installed across all perennial water bodies. Construction equipment would be required to use the bridges, except the clearing crew, which would be allowed one pass through the water bodies before the bridges are installed. Equipment refueling and lubrication typically would take place in upland areas that are 100 feet or more from the edges of lakes, streams, intermittent streams, and wetlands. Section 3.0 of Keystone's CMR Plan (Appendix B) provides procedures for refueling and lubrication of construction vehicles, and identifies spill prevention and contingency planning for these operations.

Perennial Stream and River Crossings

The Mainline Project would cross 213 perennial streams and rivers, and the Cushing Extension would cross 58, using one of four techniques: the open-cut wet method (Keystone's preferred method), the flume method, the dam-and-pump method, or the HDD method. Keystone intends to install the pipeline at an appropriate depth to address the potential hazard represented by scour during high-flow events as determined during final design (TransCanada 2007b). Detailed information on Keystone's proposed methodology for water crossings and general mitigation planning is presented in Appendix D (Site-Specific Water Body Crossing Plans) and in Appendix B (Keystone's CMR Plan).

In the open-cut wet method, trench excavation occurs as water flows along the stream channel (Figure 2.2-4). Backhoes typically would excavate the trench and would access the streambed from either side of the crossing, avoiding the channel if possible, depending on the channel width. In wider streams and rivers, equipment likely would operate within the channel. Relatively impermeable trench plugs would be placed to preclude water flowing into the nearby pipeline trench. Material excavated from the trench typically would be stockpiled at least 10 feet from the active channel, although wider channels may require placement within the stream bed. The stockpiles would be constrained as necessary with sediment barriers to prevent excessive stream siltation.

After trench excavation, the pipe would be carried, pushed, or pulled across the water body and installed in the trench. To prevent pipe flotation, the pipe would be covered with reinforced concrete or concrete weights and then backfilled with either stockpiled or imported material, depending on permit stipulations. Stream banks then would be restored and stabilized.

Keystone occasionally would use the flume and dam-and-pump methods where technically feasible and where determined necessary based on permit stipulations. During flume construction, water would be diverted through the trenching area through one or more flume pipes. During dam-and-pump construction, pumps and hoses would be used to divert water around the trench area. In each method, water flow is not returned to the construction area until pipeline installation and backfilling is complete. These dry stream crossing methods are generally not feasible on streams greater than about 30 feet wide, due to the limitations on the volume of water that can effectively be transferred around the work area through flumes or by pumps, as well as limitations on the distance trenching equipment can reach under flume pipes for excavating/backfilling the trench. For this reason the open cut method would be used for all of the larger streams that are not being crossed by the HDD method.

To minimize any streambank, streambed, or water quality impacts, Keystone intends to use the HDD installation method for 13 crossings along the Mainline Project: the Pembina River, the South Branch Park River, the Missouri River (two crossings), the Elkhorn River, the Platte River, the Chariton River, the Cuivre River (two crossings), the Mississippi River, Silver Creek, the Kaskaskia River, and Hurricane

Creek. The HDD method will be used at four crossings along the Cushing Extension: the Republican River, the Arkansas River, the Salt Fork Arkansas River, and the Cimarron River (TransCanada 2007b, ENSR 2007i). Keystone also has committed to crossing the Sheyenne River in North Dakota using HDD, if determined feasible during future engineering studies. Detailed drawings depicting the HDD crossings for the Mainline Project are provided in Appendix D.

At an HDD crossing (Figure 2.2.5), a drilling unit would first set up on one of the river or stream banks. The setup for HDD would require clearing and disruption of several acres on the entrance side of the crossing and a segment of construction ROW aligned along the drilling trajectory on the exit side of the boring. These workspaces for HDD crossings are included in the overall project workspace disturbance areas. The ROW between the boring point of entry and the point of exit on the opposite side of the river or stream would not be cleared or graded. However, access to the water body is required during the HDD operation, likely resulting in minor disturbance to the vegetation, soils, and stream banks.

The minimum drilled length for a 30-inch-diameter pipeline crossing would be approximately 1,000 feet due to pipe bending constraints (TransCanada 2007b). A pilot hole is drilled under the crossing, using a rotary bit and clay slurry, and enlarged through repeated reamings. Pipe sections long enough to span the entire crossing would be staged and welded along the ROW on the opposite side of the water body and pulled through the drilled and reamed hole. Depth of cover over the pipeline beneath the proposed HDD river crossings would be approximately 45 feet.

Intermittent Water Body Crossings

The Keystone Project would cross approximately 605 intermittent water bodies on the Mainline Project and about 192 intermittent water bodies on the Cushing Extension. If dry during construction, Keystone proposes to cross these features using standard upland construction techniques. If flowing during construction, Keystone proposes to perform open-cut wet crossings, as previously described. When crossing water bodies, Keystone would adhere to the guidelines outlined in its Site-Specific Water Body Crossing Plans (Appendix D), Keystone’s CMR Plan (Appendix B), and the requirements of its water body crossing permits.

Site Restoration

Temporary equipment bridges would be removed following construction. River and stream banks would be temporarily stabilized within 24 hours of completing instream construction. River and stream banks ultimately would be restored to pre-construction contours or another stable configuration. Erosion control measures (e.g., rock riprap or gabion baskets (rock enclosed in wire bins), log walls, vegetated geogrids, and willow cuttings) would be installed as necessary on steep water body banks, as stipulated in permits. Other stream or river banks not receiving structural erosion control would be seeded with native grasses or other species as requested by the landowners, and mulched or covered with erosion control fabric. Keystone would encourage private landowners to replant using native vegetation. Sediment barriers would be maintained across the ROW at all water body approaches until permanent vegetation is established.

2.2.3.4 Wetland Crossings

Keystone has mapped wetland crossing areas using data from wetland delineation field surveys, aerial photography, and National Wetland Inventory (NWI) maps. Acreages of wetlands potentially affected by construction and the specific impacts identified are described in Section 3.4. This section provides the general procedures Keystone intends to use to construct within wetland areas. Actual construction techniques may be modified by permit conditions imposed by USACE and relevant state or local authorities in jurisdictional wetland areas, and also in wetland areas included within easements administered by the USFWS or other state or federal resource agencies.

Site Preparation

Clearing of vegetation in wetlands would be limited to trees and shrubs cut flush with the ground surface and removed from the wetland. Stump removal, grading, topsoil segregation, and excavation would be limited to the area immediately over the trench. All stockpiles would be located at an upland site that is not a wetland, and measures would be taken to ensure that the material cannot enter the watercourse through erosion or any other means. During clearing, sediment barriers (silt fences and stacked straw bales) would be installed and maintained on down slopes adjacent to saturated wetlands, and within additional temporary workspace areas as necessary to minimize the potential for sediment runoff. Temporary workspace areas would be required on both sides of particularly wide saturated wetlands to stage construction, fabricate pipeline, and store materials. These temporary workspace areas would be located in upland areas a minimum of 10 feet and up to 50 feet from the wetland perimeter, as determined by the COE permit process. Typical ROW width in saturated wetlands would be 85 feet unless a wider ROW is needed to address non-cohesive soils.

Construction

Construction equipment would be limited to areas essential for ROW clearing, excavating the trench, fabricating and installing the pipeline, backfilling the trench, and restoring the ROW. In areas where access to the ROW is through wetlands, equipment would be allowed to travel through the wetlands only if the ground is firm enough or has been stabilized to avoid creating ruts.

Construction within wetland areas that can support construction equipment without equipment mats would be accomplished using upland cross-country construction techniques (Figure 2.2-6). Topsoil salvaging and stockpiling would occur to the extent feasible. All stockpiles would be located at an upland site that is not a wetland, and measures would be taken to ensure that the material cannot enter the watercourse through erosion or any other means. Where topsoil has been segregated from subsoil, the subsoil would be backfilled first—followed by the topsoil. Topsoil would be replaced to the original ground level, leaving no crown over the trench line. In some areas where wetlands overlie rocky soils, the pipe would be padded with rock-free soil or sand before backfilling with native bedrock and soil.

Where wetland soils are saturated or inundated, the pipeline can be installed using the push-pull technique. The push-pull technique would involve stringing and welding the pipeline outside the wetland, and excavating and backfilling the trench using a backhoe supported by equipment mats or timber riprap. The prefabricated pipeline is installed in the wetland by equipping it with buoys and pushing or pulling it across the water-filled trench. After the pipeline is floated into place, the floats are removed and the pipeline sinks into place. Most of the pipe installed in saturated wetlands would be coated with concrete or equipped with set-on weights to provide negative buoyancy.

Restoration

Because little or no grading would occur in wetlands, restoration of contours would be accomplished during backfilling. Prior to backfilling, trench breakers would be installed where necessary to prevent subsurface drainage of water from wetlands. Equipment mats, timber riprap, gravel fill, geotextile fabric, and straw mats would be removed from wetlands following backfilling.

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

In wetlands where no standing water is present, the construction ROW would be re-seeded as directed by the landowner, or in accordance with recommendations of the local soil conservation authorities or land management agency. Keystone would encourage private landowners to replant using native vegetation.

2.2.3.5 Blasting

Explosive rock fracturing (blasting) may be required in certain consolidated shallow bedrock areas or where large boulders occur. Keystone estimates that 6.5 miles of the Mainline Project and 1.8 miles of the Cushing Extension would require blasting (TransCanada 2007b). Keystone would implement strict safety precautions during blasting and would work to avoid damage to underground structures, cables, conduits, pipelines, and underground watercourses or springs. Blasting would occur during daylight hours, with adequate notice to adjacent landowners and tenants and in compliance with federal, state, and local codes and ordinances—as well as manufacturer's prescribed safety procedures and industry practices.

2.2.3.6 Residential and Commercial/Industrial Areas

Keystone identified buildings located within 25 feet of the construction ROW, as summarized in Table 2.2-3.   Keystone would develop site-specific construction plans to mitigate construction-related impacts on these areas. Further construction and mitigation measures are identified in Keystone's CMR Plan (Appendix B).

2.2.3.7 Fences and Pasture/Rangelands

Before cutting down any fences in the construction ROW for pipeline construction, each fence would be braced and secured to prevent slacking. To prevent the passage of livestock, openings in the fence line would be closed with temporary gates. Gaps in natural barriers used for livestock control that may be created by pipeline construction would be fenced according to the landowner's requirements. Upon completion of construction, temporary fences would be removed and permanent fences, gates, irrigation ditches, cattle guards, and reservoirs that were maintained during construction would be repaired to pre-construction conditions or better. Further construction and mitigation measures are identified in Keystone's CMR Plan (Appendix B).

TABLE 2.2-3
Areas with Buildings Located within 25 Feet of the Construction Right-of-Way for the Keystone Project

State	County	Milepost	Structures
Mainline Project			
North Dakota	NA	NA	None
South Dakota	Yankton	435.82	Residence
	Yankton	436.52	Commercial
	Yankton	436.55	Commercial
Nebraska	Cedar	472.78	Outbuilding
Kansas	Brown	720.76	Other
	Doniphan	736.21	Residence
	Doniphan	736.82	Outbuilding
Missouri	Buchanan	767.70	Outbuilding
	Buchanan	767.70	Outbuilding
	Buchanan	767.72	Residence
	Clinton	771.34	Residence
	Clinton	785.72	Residence
	Clinton	785.73	Outbuilding
	Clinton	791.53	Industrial
	Caldwell	807.77	Outbuilding
	Caldwell	815.71	Outbuilding
	Carroll	821.28	Residence
	Chariton	849.15	Residence
	Chariton	867.34	Residence
	Audrain	908.68	Residence
	Audrain	917.81	Residence
	Audrain	922.57	Residence
	Audrain	928.80	Outbuilding
	Audrain	931.86	Outbuilding
	Montgomery	939.04	Outbuilding
	Montgomery	939.09	Outbuilding
	Montgomery	939.11	Outbuilding
	Montgomery	949.98	Outbuilding
	Montgomery	952.70	Outbuilding
	Montgomery	954.02	Residence
	Montgomery	954.02	Outbuilding
	Montgomery	954.04	Outbuilding
	Montgomery	955.40	Outbuilding
	Montgomery	955.44	Outbuilding
	Lincoln	964.47	Outbuilding
	Lincoln	969.07	Residence
	Lincoln	970.14	Residence
	Lincoln	971.59	Residence
	Lincoln	973.87	Commercial
	Lincoln	973.93	Commercial
	Lincoln	979.98	Outbuilding
	St. Charles	987.00	Residence
	St. Charles	999.07	Residence
	St. Charles	999.56	Outbuilding
	St. Charles	1015.27	Residence
	St. Charles	1017.55	Other
Illinois	Bond	1059.66	Outbuilding
	Bond	1064.74	Residence
	Marion	1081.20	Residence

TABLE 2.2-3 (Continued)			
State	**County**	**Milepost**	**Structures**
Cushing Extension			
Nebraska	NA	NA	None
Kansas	Marion	124.6	Single
	Butler	156.4	Development
	Butler	162.0	Single
	Cowley	180.3	Single
	Cowley	208.3	Several
Oklahoma	Kay	233.2	Development
	Noble	241.9	Several
	Noble	246.7	Single
	Noble	258.7	Single
	Payne	269.7	Several
	Payne	270.5	Single
	Payne	274.5	Development
	Payne	279.4	Single
	Payne	289.6	Single
	Payne	291.7	Single

NA = Not applicable.

Sources: ENSR 2006a; TransCanada 2007b, d.

2.2.3.8 Forestlands

Keystone would ensure that pipeline construction activities would cause minimal effects on forestlands by managing and minimizing impacts when clearing, grubbing, and grading trees, brush, and stumps. Keystone would follow specific construction and mitigation measures, as identified in Keystone's CMR Plan (Appendix B) and as specified in applicable federal, state, and local permits.

2.2.4 Construction Procedures for Aboveground Facilities

Keystone would construct aboveground facilities as described below.

2.2.4.1 Pump Stations

Site construction activities at pump stations would include clearing and grading, installing foundations for the electrical buildings and support buildings, and erecting the pump station support structures. A block valve would be installed in the main line, with two side block valves—one to the suction piping of the pumps and one from the discharge piping of the pumps. Materials laydown and construction activities would be within the proposed site layout area. Figures 2.2-7 and 2.2-8 illustrate typical plot plans for pump stations without and with pigging facilities, respectively.

Pump station sites would be cleared and graded, and foundations for the pump supports, the electrical building, and the support building would be installed. The electrical building would include electrical systems, communications, and control equipment. The support building would house a small office and washroom. Each pump station would require electricity and telephone facilities, which would be obtained from local utilities. Table 2.2-4 summarizes electric power and distribution line requirements.

Aboveground and below ground crude oil piping would be installed and pressure tested (Section 2.2.1). The pipes then would be tied in to the main pipeline. Piping installed below grade would be coated for corrosion protection prior to backfilling, and all below-grade facilities would be protected by a cathodic protection system. Prior to commissioning the pumps, controls, and safety devices would be checked and tested. The pump station sites then would be regraded, and a permanent security fence would be installed.

2.2.4.2 Mainline Valves

Construction of MLVs would be concurrent with construction of the pipeline. When not located at pump stations, MLVs would be constructed within a fenced 50-foot-wide by 50-foot-long site located in the pipeline construction ROW and centered on the 50-foot-wide permanently maintained ROW. To allow continuous access, MLVs typically would be located near public roads. If necessary, short permanent access roads or approaches would be constructed in the permanent ROW to each MLV site. The MLVs would operate on locally provided power.

Selected MLVs would be remotely monitored. For each remote terminal unit (RTU), a small skid-mounted building with a cabinet attached to a wooden pole would be installed. Conduit and wiring would be installed to connect the RTU to adjacent MLVs.

2.2.4.3 Delivery Sites and Pigging Facilities

Where delivery sites and pigging facilities are collocated with pump stations, construction would occur as part of the pumping station construction schedule, and would be performed similarly to the pump stations. These sites also would require locally provided power. They would be connected to adjacent facilities as described for MLVs in Section 2.2.3.2.

2.2.4.4 Transmission Lines

Construction of transmission lines would be scheduled and performed by local power providers Each of the U.S. pump stations would require a new substation that would receive power from nearby transmission lines. Routing of the overhead transmission lines linking the substations and the existing lines were originally provided in the Keystone Pipeline Project Environmental Report (ENSR 2006a). Subsequent changes to the pump station locations and associated power line reroutes provided in ENSR 2006a have occurred due to reassessment of supply options, electrical loads, and proximity to existing lines (TransCanada 2007c, 2007d). The most recent information is summarized in Table 2.2-4. .

Currently, power providers are proposing to build 26 new/upgraded power lines; the voltage ratings of the lines would range from 25 to 230 kV, with the majority being either 69 or 115 kV. In addition to the substations associated with the pump stations, eight new source substations would be constructed: three in South Dakota, three in Nebraska, and two in Missouri.

TABLE 2.2-4
Summary of Pump Station Electrical Power Supply Requirements for the Keystone Project

Station	Local Utility	Service Description
MAINLINE PROJECT		
North Dakota		
Pump station ML #15	NODAK Electric Cooperative	Approximately 7 miles of new 69-kilovolt (kV) transmission line from existing 69-kV line to main substation at pump station site. Main pump station substation with 15-million volt-amps (MVA) 69/4.16-kV transformer.
Pump station ML #16	NODAK Electric Cooperative	Approximately 1 mile of 69-kV transmission line from existing 69-kV line to main substation at pump station site. Main pump station substation with 15-MVA 69/4.16-kV transformer.
Pump station ML #17	NODAK Electric Cooperative	Approximately 12 miles of 69-kV transmission line from existing 69-kV line to main substation at pump station site. Approximately 18 miles of existing 69-kV line upgrades. Main pump station substation with 15-MVA 69/4.16-kV transformer.
Pump station ML #18	Cass County Electric Cooperative	Approximately 16 miles of 115-kV transmission line to main substation at pump station site. Remote end upgrades. Main pump station substation with 12/16-MVA 115/4.16-kV transformer.
Pump station ML #19	Dakota Valley Electric Cooperative	Approximately 24 miles of 115-kV transmission line from Foreman substation to main substation at pump station site. Remote end upgrades. Main pump station substation with 15/20/25-MVA 115/4.16-kV transformer.
South Dakota		
Pump station ML #20	Lake Region Electric Association, Inc.	Approximately 11.5 miles of 115-kV transmission line from Groten substation to main substation at pump station site. Remote end upgrades. Main pump station substation with 15-MVA 115/4.16-kV transformer.
Pump station ML #21	Dakota Energy Cooperative, Inc.	Approximately 2.7 miles of 69-kV transmission line from a new 230/69-kV substation to main substation at pump station site. Main pump station substation with 15-MVA 69/4.16-kV transformer.
Pump station ML #22	Central Electric Cooperative, Inc.	Approximately 31 miles of 115-kV transmission line from a new 230/115-kV substation to main substation at pump station site. Main pump station substation with 15-MVA 115/4.16-kV transformer.
Pump station ML #23	Southeastern Electric Service Cooperative, Inc.	Approximately 19.4 miles of 115-kV transmission line from a new 230/115-kV substation to main substation at pump station site. Main pump station substation with 15-MVA 115/4.16-kV transformer.
Nebraska		
Pump station ML #24	Cedar Knox Public Power District	Approximately 1.5 miles of 69-kV transmission line from a new 115/69-kV substation to main substation at pump station site. Main pump station substation with 15-MVA 69/4.16-kV transformer.
Pump station ML #25	Stanton County Public Power District	Approximately 8 miles of new 34.5-kV transmission line from a new 115/34.5-kV substation to main substation at pump station site. Main pump station substation with 15-MVA 34.5/4.16-kV transformer.
Pump station ML #26	Butler Public Power District	Approximately 7 miles of new 34.5-kV transmission line tapping an existing 34.5-kV line to main substation at pump station site. Main pump station substation with 15-MVA 34.5/4.16-kV transformer.

TABLE 2.2-4 (Continued)		
Station	**Local Utility**	**Service Description**
MAINLINE PROJECT (CONTINUED)		
Nebraska (continued)		
Pump station ML #27	Norris Public Power District	Approximately 7 miles of 34.5-kV transmission line tapping an existing 34.5-kV line to main substation at pump station site. Remote end upgrades. Main pump station substation with 15-MVA 34.5/4.16-kV transformer.
Pump station ML #28	Norris Public Power District	Approximately 8.3 miles of 69-kV transmission line from local substation to main substation at pump station site. New 115/69-kV substation and rebuilding 4 miles of 34.5-kV line to 69-kV. Main pump station substation with 15-MVA 69/4.16-kV transformer.
Kansas		
Pump station ML #29	Westar Energy	Approximately 6 miles of 115-kV transmission line from South Seneca substation to main substation at pump station site. Remote end upgrades. Main pump station substation with 15-MVA 115/4.16-kV transformer.
Pump station ML #30	Doniphan Electric Cooperative	Approximately 11 miles of 115-kV transmission line from Walnut substation to main substation at pump station site. Main pump station substation with 15-MVA 115/4.16-kV transformer.
Missouri		
Pump station ML #31	Platte-Clay Electric Cooperative	Short 161-kV tap from new 161-kV substation serving Rocky Mountain Express to main substation at pump station site. Main pump station with 15-MVA 161/4.16-kV transformer.
Pump station ML #32	Kansas City Power & Light	Approximately 6.5 miles of 34.5-kV line from an existing substation to main substation at pump station site. Remote end upgrades. Main pump station substation with 7.5-MVA 34.5/4.16-kV transformer.
Pump station ML #33	Kansas City Power & Light	Approximately 0.2 miles of 34.5-kV transmission line tapping an existing line to main substation at pump station site. Main pump station substation with 7.5-MVA 34.5/4.16-kV transformer.
Pump station ML #34	Consolidated Electric Cooperative	Approximately 0.3 mile of 69-kV transmission line tapping an existing 69-kV line to main substation at pump station site. Tap point switches and remote end upgrades. Main pump station substation with 15-MVA 69/4.16-kV transformer.
Pump station ML #35	Consolidated Electric Cooperative	Approximately 0.7 mile of 69-kV transmission line tapping an existing line to main substation at pump station site. Main pump station substation with 15-MVA 69/4.16-kV transformer.
Pump station ML #36	Central Electric Power Cooperative	Short 25-kV tap from a new 161/25-kV substation at Ethlyn to main substation at pump station site. Main pump station substation with 15-MVA 34.5/4.16-kV transformer.
Illinois		
Pump station ML #37	Ameren IP	Less than 0.3 mile of 34.5-kV transmission line from nearby utility line to main substation at pump station site. Remote end upgrades. Main pump station substation with 10-MVA 34.5/4.16-kV transformer.
Pump station ML #38 (future)	Southwest Electric Co-Operative, Inc.	Not required at this time.

TABLE 2.2-4 (Continued)		
Station	**Local Utility**	**Service Description**
CUSHING EXTENSION		
Kansas		
Pump station CE #30	To be determined by utility contacts	Approximately 2.6 miles of 230-kV transmission line from Hillsboro substation to main substation at pump station site. Main pump station substation with 15-MVA 115/4.16-kV transformer.
Pump station CE #32	To be determined by utility contacts	Approximately 8.3 miles of 138-kV transmission line from Cresswell substation to main substation at pump station site. Main pump station substation with 15-MVA 115/4.16-kV transformer.
Oklahoma		
Pump station CE #33	To be determined by utility contacts	Approximately 0.6 mile of 138-kV transmission line from Osage substation to main substation at pump station site. Main pump station substation with 15-MVA 115/4.16-kV transformer.

ML = Mainline Project.
CE = Cushing Extension.

Sources: ENSR 2006a; TransCanada 2007c, d.

Prior to power line construction, easements would be negotiated and that any necessary ROW clearing and grading would proceed after acquisition of required permits. The majority of the required transmission lines would parallel existing county road ROWs, and some substation upgrades would be necessary in addition to the construction of at least one new substation to accommodate Keystone Project power requirements. Steel or wood poles would be installed along the transmission corridors, embedded and anchored as required to achieve appropriate stability. Wire conductors would be installed through pulling or reeling, as determined by the selected contractors. Insulators also would be installed as needed.

2.2.5 Construction Schedule and Workforce

Keystone proposes to begin construction on the Mainline Project in April 2008. Construction is expected to last 18 months, ending in September 2009, with a proposed in-service date of November 30, 2009. Work on the Cushing Extension would begin in late 2009 or early 2010, with a proposed in-service date of 2010.

Keystone proposes to construct the Mainline Project using eight construction spreads and the Cushing Extension using three spreads (Table 2.2-5). Construction would occur simultaneously on Spreads 1 and 2 in 2008 and on Spreads 3, 4, 5, 6, 7, and 8 in 2009. Each spread would require 6 months to complete. Keystone anticipates a workforce of approximately 500 to 600 construction personnel per spread and a total peak work force of approximately 2,500 to 3,000 construction personnel. Construction personnel would consist of Keystone employees, contractor employees, construction inspection staff, and environmental inspection staff.

Keystone proposes to initiate construction of the Mainline Project's aboveground facilities in spring 2008. Construction of each pump station would require approximately 20 to 30 additional workers. Construction of pump stations would be completed in 18 months.

Through its construction contractors and subcontractors, Keystone would attempt to hire temporary construction staff from the local work force. At peak employment, Keystone anticipates that approximately 10 to 15 percent of the construction workforce would be locally hired.

TABLE 2.2-5
Construction Spreads Associated with the Keystone Project

Spread Number	State	State MP	Location	End MP	Location	Spread Length (miles)
Mainline Project						
1	North Dakota	0.0	Canadian border	129.9	West side of 121st Ave SE, a N/S road	129.9
2	North Dakota	129.9	West side of 121st Ave SE, a N/S road	217.8	North Dakota/South Dakota state line	133.3
	South Dakota	217.8	North Dakota/South Dakota state line	263.2	South side of County Road 22 at PS-20	
3	South Dakota	263.2	South side of County Road 22 at PS-20	403.8	East side of 435th Avenue	140.6
4	South Dakota	403.2	East side of 435th Avenue	437.7	South Dakota/ Nebraska state line	130.6
	Nebraska	437.7	South Dakota/ Nebraska state line	534.4	South side of County Road J Valve 18	
5	Nebraska	534.4	South side of County Road J Valve 18	651.9	Nebraska/Kansas state line	140.7
	Kansas	651.9	Nebraska/Kansas state line	675.1	East side of County Road 99	
6	Kansas	675.1	East side of County Road 99	750.8	Kansas/Missouri state line	104.5
	Missouri	750.8	Kansas/Missouri state line	779.6	South side of NW 292nd Street	
7	Missouri	779.6	South side of NW 292nd Street	905.9	East side of County Road Ee	126.3
8	Missouri	905.9	East side of County Road Ee	1024.9	Missouri/Illinois state line	175.8
	Illinois	1024.9	Missouri/Illinois state line	1081.7	End of line in Patoka, Illinois	
Cushing Extension						
9	Nebraska	0.0	PS-28 in Jefferson, NE	2.4	Nebraska/Kansas state line	107.8
	Kansas	2.4	Nebraska/Kansas state line	107.6	South side of 290th Street in Marion, Kansas	
10	Kansas	107.6	South side of 290th Street in Marion, Kansas	211.9	South side of 322nd in Cowley, Kansas	104.9
11	Kansas	211.9	South side of 322nd in Cowley, Kansas	295.5	End of line in Cushing, Oklahoma	83.3

Sources: ENSR 2006a, TransCanada 2007d.

2.3 OPERATIONS AND MAINTENANCE

Keystone would operate and maintain project facilities in accordance with the DOT regulations in 49 CFR Parts 194 and 195 and other applicable federal and state regulations. Operation and maintenance of the pipeline system typically would be performed by Keystone personnel. Keystone estimates that the permanent operational pipeline workforce would comprise about 20 U.S. employees.

2.3.1 Normal Operations and Routine Maintenance

During operations, Keystone would regularly monitor the pipeline both electronically and through aerial and ambulatory pipeline integrity surveys at a frequency consistent with 49 CFR Part 195. These surveys are conducted to identify any encroachments or nearby construction activities, as well as any ROW erosion, exposed pipe, or visual or olfactory evidence of potential crude oil releases. Keystone would encourage local landowners to report any pipeline integrity concerns to Keystone or to OPS. Keystone would monitor evidence of population changes and identify HCAs as necessary. In addition, MLVs would be inspected annually. All operation and maintenance work would be performed in accordance with OPS requirements.

As part of the regular surveys, Keystone would identify areas where permanent erosion control devices require repair or additional erosion control devices are necessary to prevent future degradation. Keystone would further monitor the ROW to identify any areas where soil productivity has been degraded as a result of pipeline construction, and reclamation measures would be implemented to rectify any such concerns.

Woody vegetation along the pipeline permanent ROW would periodically be cleared using mechanical mowing or cutting. SCADA facilities would be located at all pump stations and delivery facilities. The pipeline SCADA system would:

- Provide MLV position remote indication,
- Provide MLV remote closing and opening control from a control center,
- Provide remote indication of line pressure and temperature, and
- Provide remote indication of delivery flow and total flow.

The Keystone pipeline control center would be manned 24 hours per day and 365 days per year. A backup control center also would be constructed. Primary and backup communications systems would provide real-time information from the pump stations and connection to field personnel. State-of-the-art pipeline monitoring systems in the control center would include a leak detection system capable of identifying abnormal conditions (see Section 2.3.2) and initiating visual and audible alarms if an operating condition that warrants operator investigation is identified. Serious abnormal situations that are not investigated would initiate automatic pipeline shutdown systems.

2.3.2 Abnormal Operations

Abnormal operating procedures would be implemented in accordance with 49 CFR Section 195.402(d). In the event of any unusual situation, the operations manager on duty would alter the pipeline’s operation. If pressure indications change, the pipeline controller would immediately evaluate the situation. If a leak is suspected, Keystone would initiate its ERP. If a pipeline segment is shutdown due to a suspected leak, operation of the affected segment would not be resumed until the cause of the alarm (e.g., false alarm by instrumentation or leak) is identified and repaired. In the event of a reportable leak, DOT approval would be required to resume operation of the affected segment.

As per 49 CFR Part 195, Keystone would perform aerial surveillance of the pipeline ROW at least 26 times a year. Keystone also would use both software associated with the SCADA monitoring system and volumetric balancing to assist in leak detection during pipeline operations.

The smallest leak that Keystone’s SCADA system would be capable of detecting is in the range of 1.5 to 2 percent by volume in approximately 140 minutes (TransCanada 2007b). Therefore, assuming a full pipeline capacity of 435,000 bpd, a leak would be detected after a 635- to 845-barrel loss. It would constantly monitor pipeline operation to detect potential leaks greater than or equal to this minimum detection level. The SCADA system and leak detection software would fully comply with industry standards (API 1149). Using real-time dynamic-flow modeling software, line-pack compensated volumetric balancing, and a hydraulic gradient model, the SCADA system would check pipeline conditions (flow rates, pressure, temperature, and fluid density) every 3 to 5 seconds while the pipeline is actively transporting crude oil. Pressure transducers and other monitoring equipment would be located at pump stations, and data from these locations would be transmitted via satellite to the centralized SCADA location. If a real-time measurement exceeds a predetermined threshold, the information would be sent to the SCADA system and the operator would take corrective actions. It would take approximately 9 minutes to complete the emergency shut-down procedure (shut down operating pumping units) and an additional 3 minutes to close the isolation valves. Compared to older leak detection programs, line-pack compensated volume balancing represents an improved method for volume accounting that calculates changes in fluid volume in the pipeline.

When the Keystone pipeline is not actively transporting oil, the pipeline would enter a "static" mode. Because crude oil would not be moving, the pressures between pressure transducers should remain relatively constant after accounting for temperature changes and other minor pressure changes.

2.3.2.1 Emergency Response Procedures

System emergencies could result from natural or human-induced events that lead to damage to critical components of the pipeline system. In the event of a system emergency, pipeline flow would be stopped and would not resume until the cause of the problem (e.g., instrumentation failure or leak) was detected and if necessary, repaired.

Keystone would be required to prepare site-specific ERPs for the system, which would be submitted to and approved by OPS prior to operation. A preliminary draft ERP was submitted to DOS on July 1, 2006 (see Appendix C). The final ERP would establish:

- Guidelines and procedures to be followed in emergencies in order to minimize hazards resulting from pipeline emergencies;
- Procedures for training Keystone's employees on emergency procedures; and
- Guidelines for continuing educational programs designed to inform the public of the procedures to follow in recognizing and reporting an emergency condition, in compliance with the recommended practice of API 1162.

If an oil release occurred, Keystone would be required to immediately notify the National Response Center in the event that the release of crude oil violates water quality standards, creates a sheen on water, or 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 the National Response Center, Keystone would make timely notifications to other agencies, including the appropriate Local Emergency Planning Committees, sheriff's departments, applicable state's environmental departments, EPA, and affected landowners.

While a typical potential oil spill response could likely be handled by Keystone, significant releases could require assistance from local, state, or federal agencies. Under the National Contingency Plan, EPA is the lead federal response agency for oil spills occurring on land and in inland waters. EPA and cooperating state agencies would 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.

Furthermore, EPA and state agencies would monitor all activities to ensure that the spill is being contained and cleaned up appropriately.

A fire associated with a crude oil spill is relatively rare. According to historical data (OPS 2005), only about 4 percent of reportable liquid petroleum spills are ignited. In the unlikely event of a fire, firefighters would take actions to prevent the conflagration from spreading to adjacent foliage or structures. Fire departments might choose to extinguish a small- or moderate-sized crude oil fire; in certain cases, however, the best course of action may be to let the fire burn itself out. It is Keystone's intent to work with emergency response agencies to provide pipeline awareness education and other support within the local communities along the proposed pipeline corridor.

2.3.2.2 Remediation

In the event of an oil release, corrective remedial actions would be required by relevant federal, state, and local regulations and could be enforced by EPA, OPS, and other state and local agencies with potential jurisdiction. Required remedial actions may include:

- A detailed remedial investigation of environmental contamination resulting from the release,
- Determination of the appropriate scope of cleanup and restoration for contaminated soils,
- Determination of the appropriate scope of cleanup of contaminated surface water and groundwater, and
- Implementation of soil and groundwater remediation.

Several federal and state regulatory programs are involved in spill response, including at the federal level the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300), the CWA, and the Oil Pollution Act of 1990.

2.4 FUTURE PLANS AND ABANDONMENT

The Keystone pipeline initially would be capable of transporting 435,000 bpd and could be expanded to a capacity of approximately 591,000 bpd. The expansion would require one additional pump station to be constructed in Bond County, Illinois and additional pumps at existing pump stations. Additionally, Keystone has determined that sufficient shipper support exists to warrant construction of the Cushing Extension.

The proposed Keystone pipeline is expected to operate for 50 years or more. At this time, Keystone has not submitted plans for abandonment of these facilities at the end of their operational life. If eventually necessary, abandonment would proceed according to regulations in place at the time.

2.5 REFERENCES

ENSR Corporation. 2007i. Keystone Pipeline Project Preliminary Final Biological Assessment. November 2007. Document No. 10623-004. Prepared for the Department of State.

ENSR. 2006a. Keystone Pipeline Project Environmental Report. Updated November 15, 2006.

Office of Pipeline Safety. 2005. Hazardous Liquid Accident Data – 1986 to January 2002 and Hazardous Liquid Accident Data – Pre 1986. Available online at: <http://ops.dot.gov/stats/IA98.htm>.

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TransCanada Keystone Pipeline, L.P. 2007b. Response to Data Request #1. Submitted to U.S. Department of State by TransCanada Keystone Pipeline, L.P. Application for Presidential Permit. January 29.

TransCanada Keystone Pipeline, L.P. 2007c. Response to Data Request #2. Submitted to U.S. Department of State by TransCanada Keystone Pipeline, L.P. Application for Presidential Permit. April 4.

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3.0 ENVIRONMENTAL ANALYSIS

The environmental consequences of constructing and operating the proposed Keystone Project would vary in duration and significance. Four levels of impact duration were considered: temporary, short term, long term, and permanent. Temporary impacts generally occur during construction, with the resources returning to pre-construction conditions almost immediately afterward. Short-term impacts could continue for approximately 3 years following construction. Impacts were considered long term if the resources would require more than 3 years to recover. Permanent impacts would occur as a result of activities that modify resources to the extent that they would not return to pre-construction conditions during the life of the proposed Keystone Project, such as with construction of aboveground structures. An impact resulting in a substantial adverse change in the environment would be considered significant.

This section discusses the affected environment, construction and operations impacts, and mitigation for each affected resource. Keystone has indicated that it would implement certain measures to reduce environmental impacts. These measures have been evaluated and additional measures that might be necessary to further reduce impacts are recommended. The recommended measures are shown as bulleted, boldface paragraphs in the text of the EIS.

Conclusions in this EIS are based on the analysis of environmental impacts and the following assumptions:

- Keystone would comply with all applicable laws and regulations,
- The proposed facilities would be constructed as described in Section 2.0 of this EIS, and
- Keystone would implement the mitigation measures identified in the Environmental Report (ENSR 2006a) and supplemental filings to the DOS.

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3.1 GEOLOGY

3.1.1 Physiography and Surface and Bedrock Geology

3.1.1.1 Affected Environment

The proposed Keystone Project ROW crosses the U.S./Canada border at the western edge of the Lake Agassiz Plain, and then ascends the Pembina Escarpment to the Northern Glaciated Plains (Bryce et al. 1998). The Lake Agassiz Plain is named for glacial Lake Agassiz, the most recent in a series of proglacial lakes that, during the Pleistocene, filled what is now the Red River Valley. The resulting plain is composed of lacustrine sediments underlain by glacial till; it is extremely flat except at its margins, where sandy former deltas and beach ridges mark the multiple shorelines of glacial Lake Agassiz. The Pembina Escarpment marks the northeastern boundary of the Northern Glaciated Plains, a flat to gently rolling region of fertile glacial drift dotted with temporary and seasonal wetlands. The proposed Keystone Project ROW traverses most of North Dakota and all of South Dakota within the Northern Glaciated Plains.

South of its Missouri River crossing at the South Dakota/Nebraska border, the proposed ROW crosses the Western Corn Belt Plains for 65 miles before entering the Central Great Plains near Columbus, Nebraska (Chapman et al. 2001). The proposed route continues south through the Central Great Plains to the Smoky Hills, north of the Kansas/Nebraska border, where the proposed Mainline Project ROW turns east-southeast and crosses Kansas within the Western Corn Belt Plains to another crossing of the Missouri River at the Kansas/Missouri border. The Western Corn Belt Plains are characterized by level to gently rolling plains formed in glacial till, locally interrupted by moraine hills and loess deposits. The Central Great Plains crossed by the proposed ROW include the rolling dissected Central Nebraska Loess Plains, the alluvial Platte River valley, and the Rainwater Basin Plains, flat to rolling loess plains with many closed watersheds that formerly supported natural wetlands. The proposed Cushing Extension branches off at the point where the proposed Mainline Project turns eastward.

Twenty miles into Missouri the proposed Mainline Project ROW crosses into the Central Irregular Plains, where it remains until it descends into the Interior River Valleys and Hills region, approaches the Mississippi River, and crosses into Illinois before reaching its terminus at Patoka, Illinois (Chapman et al. 2002, Woods et al. 2006). The Central Irregular Plains are a region of gentle irregularly-dissected topography built upon clayey glacial drift. Toward the eastern edge of the region, the topography is flatter—with streams that drain east toward the Mississippi, entering the Interior River Valleys and Hills region as they go. The Interior River Valleys and Hills region incorporates wide alluvial valleys and terraces, forested river bluffs and hills, and partially-dissected till plains, underlain by Paleozoic sedimentary rocks.

Because the geological surface traversed by the proposed Keystone Project has been formed by a series of continental glacial advances and retreats, much of the proposed ROW is underlain by thick Quaternary sediments where depth to bedrock is typically much greater than 5 feet. There are about 331 miles of the proposed alignment where soil types suggest the potential for zones of shallow bedrock. This bedrock-controlled terrain is located primarily within the Missouri and Mississippi River valleys and locally found along the more deeply incised stream valleys.

Mainline Project Route

North Dakota

Throughout North Dakota, the proposed Mainline Project ROW lies within the Dakota-Minnesota Drift and Lake-Bed Flats physiographic subdivision (Hammond 1965), an area of low-relief glacial moraines and lakebeds (Radbruch-Hall et al. 1982). The proposed ROW traverses seven EPA Level IV Ecoregions, each with a distinct physiography (Bryce et al. 1998). Regional physiographic characteristics are presented in detail in Table 3.1.1-1.

The proposed Mainline Project ROW crosses the U.S./Canada border in the Red River Valley, part of the Lake Agassiz Plain. After crossing the Pembina River at MP 7, the proposed ROW ascends the Pembina Escarpment, and then runs roughly parallel to the Pembina Hills above the western edge of the Red River Valley for the remainder of its path through North Dakota.

Elevations along the proposed route range between 950 and 1,550 feet above mean sea level (amsl). The greatest local relief is found where the proposed ROW crosses the Pembina and Sheyenne River valleys; elevation changes between river crossing and valley wall are on the order of 200–300 feet (ENSR 2006a).

Surface materials along most of the proposed Mainline Project route consist of unconsolidated alluvium, lake sediments, and glacial drift (Bluemle 1977), although bedrock consisting of Upper Cretaceous marine shale and limestone is exposed at outcrops along gullies and valleys in the Pembina Escarpment (Bluemle and Ashworth 2002). About 4 miles of potential shallow bedrock lie along the proposed Mainline Project ROW in North Dakota.

There are no known areas of karst along the proposed Mainline Project route in North Dakota.

South Dakota

The proposed Mainline Project ROW continues through South Dakota within the Dakota-Minnesota Drift and Lake-Bed Flats physiographic subdivision (Hammond 1965). It traverses five EPA Level IV Ecoregions (Bryce et al. 1998), physiographic characteristics of which are presented in detail in Table 3.1.1-2.

The proposed ROW enters South Dakota at MP 218 and proceeds southward along the James River Valley, a broad north-south trending valley of low relief situated between the Coteau du Prairies to the east and the Coteau du Missouri to the west (SDSGS 1964).

Elevations along the proposed route range between 1,300 and 1,150 feet amsl. Local relief is slight except where the ROW crosses the James River and also where it descends to the Missouri River Valley. Elevation changes at the James River crossing are about 140 feet and those at the edge of the Missouri River valley are about 100 feet (ENSR 2006a).

Surface deposits consist of glacial till, loess, and alluvium (Martin et al. 2004). For the most part the underlying bedrock is similar to that described for North Dakota, consisting of shale, limestone, and sandstone of the Pierre Shale, Niobrara Formation, Carlile Shale, and Greenhorn Formation (Martin et al. 2004). Dakota Formation sandstone and shale may be present in places, and in Hanson County (MP 365–378) some bedrock consists of Precambrian quartzite (ENSR 2006a). Outcrops are occasionally present along road cuts and streams in South Dakota, but the proposed Mainline Project ROW does not cross any areas of known potential shallow bedrock.

TABLE 3.1.1-1
Physiographic Characteristics of Ecoregions Crossed in North Dakota by the Keystone Mainline Project

Milepost Range	Physiographic Description	Elevation Range (feet above mean sea level)	Local Relief (feet)	Surface Geology	Bedrock Geology
Lake Agassiz Plain—Glacial Lake Agassiz Basin [a]					
0–6	Extremely flat glacial lake plain. Streams and rivers sluggish, meandering, and highly turbid with large sediment loads. Ditching and channelization common.	790–1,200	1–50	150–300 feet of glacial drift overlain by up to 95-foot silt/clay lake deposits	Cretaceous shales and sandstones, Ordovician and Precambrian basement
Lake Agassiz Plain—Sand Deltas and Beach Ridges [a]					
6–16	Parallel ridges up to several miles wide composed of medium sand to medium gravel. Deltas comprised of lenses of fine to coarse sands. Thickest sand deposits windblown into dunes. Stream substrates, sand or gravel riffles contrast with clay- and silt-bottom streams elsewhere in Red River Valley.	900–1,200	40–250	Stratified sand and gravel beach deposits interlayered with lacustrine silts and sandy deltaic lenses	Cretaceous shales and sandstones, Ordovician and Precambrian basement
Northern Glaciated Plains—Pembina Escarpment [a]					
16–43	Glaciated. Steep, dissected escarpment. High-gradient perennial streams.	1,225–1,580	100–400	Glacial till	Tertiary sandstone and shale
Northern Glaciated Plains—Drift Plains [a]					
43–111, 134–197, 199–207	Glaciated. Generally flat, with occasional “washboard” undulations. High concentrations of temporary and seasonal wetlands. Simple drainage pattern.	1,080–2,000	0–200	Glacial till	Cretaceous Pierre Shale and Fox Hills Formations
Northern Glaciated Plains—End Moraine Complex [a]					
111–134	Glaciated. A diverse area of hummocky stagnation moraine; parallel end moraine ridges; and other glacial features such as eskers, kames, and thrust ridges.	1,450–1,790	20–179	Glacial till and outwash	--

TABLE 3.1.1-1
(Continued)

Milepost Range	Physiographic Description	Elevation Range (feet above mean sea level)	Local Relief (feet)	Surface Geology	Bedrock Geology
Northern Glaciated Plains—Glacial Outwash [a]					
207–211	Glaciated. Flat to slightly rolling. Ancient channel depressions, relict lakes.	1,300–1,550	0–50	Sand and plane-bedded gravel, sediments of glacial meltwater rivers	--
Northern Glaciated Plains—Glacial Lake Deltas [a]					
211–218	Glaciated. Flat sheets of sand and gravel or rolling sand dunes. Paucity of stream channels.	1,290–1,595	6–85	Sand and gravel deposits over lacustrine sediments	--

-- = Not available.

[a] EPA Level III-IV Ecoregion name.

Sources: Bryce et al. 1998; mile posts taken from TransCanada 2007d.

TABLE 3.1.1-2
Physiographic Characteristics of Ecoregions Crossed in South Dakota by the Keystone Mainline Project

Milepost Range	Physiographic Description	Elevation Range (feet above mean sea level)	Local Relief (feet)	Surface Geology	Bedrock Geology
Northern Glaciated Plains – Glacial Lake Deltas [a]					
218–223, 228–232	*See Table 3.1.1-1.*				
Northern Glaciated Plains–Glacial Lake Basins [a]					
223–228, 232–247	Glaciated. Very level glacial lake floors. Low wetland density.	1,300–1,585	0–30	Glacial lacustrine silts and clays	NA
Northern Glaciated Plains–Drift Plains [a]					
247–265	*See Table 3.1.1-1.*				
Northern Glaciated Plains–Prairie Coteau [a]					
265–273	Glaciated. Platform of hummocky, rolling terrain raised above surrounding drift plains. Stream network lacking. High concentration of large lakes and wetlands.	1,500–2,010	50–150	Glacial till	Cretaceous shales
Northern Glaciated Plains–James River Lowland [a]					
307–436	Glaciated. Level to slightly rolling plain composed of glacial drift. Dense concentrations of temporary and seasonal wetlands.	1,200–1,850	10–150	Glacial till	Cretaceous Pierre Shale and Niobrara sandstone
Western Corn Belt Plains – Missouri Alluvial Plains [a]					
436–438	Smooth to irregular alluvial plain. Channelized streams.	600–1,100	0–50	Alluvium	Pennsylvanian and Cretaceous shale, sandstone, and limestone

NA = Not applicable.

[a] EPA Level III-IV Ecoregion name.

Sources: Bryce et al. 1998; mile posts taken from TransCanada 2007d.

In the southern half of the state, karst may be present from MP 353 to the border with Nebraska; karst features are found in southern portions of Miner County, northern Hanson County, southern Hutchinson County, and all of Yankton County (ENSR 2006a), where carbonate rocks of the Niobrara Formation can form fissures up to 1,000 feet long and 100 feet deep, spaced at intervals of 1,000 feet or more (Tobin and Weary 2005). Where fissures are likely to occur, however, 50 feet or more of Quaternary sediments cover the carbonate rocks.

Nebraska

The proposed Mainline Project ROW crosses Nebraska within the Middle Western Upland Plain and West-Central Rolling Hills physiographic subdivisions (Hammond 1965). It traverses six EPA Level IV Ecoregions (Chapman et al. 2001), physiographic characteristics of which are presented in detail in Table 3.1.1-3.

The proposed ROW enters Nebraska at MP 438 and proceeds southward across the Western Corn Belt Plains to the Platte River Valley. It then continues south across the Central Great Plains to the Smoky Hills, a few miles north of the Kansas/Nebraska border, where it turns to the east-southeast and crosses into Kansas.

Elevations along the proposed route range between 1,150 and 1,800 feet amsl. Significant local relief is found near the Missouri and Elkhorn Rivers; elevation changes along the Elkhorn River crossing are about 140 feet, those at the edge of the Missouri River valley are about 100 feet (ENSR 2006a).

Surface deposits consist of glacial till, loess, and alluvium. Underlying bedrock consists of shale, limestone, and sandstone of the Pierre Shale, Niobrara Formation, Carlisle Shale, Greenhorn Formation, and Graneros Shale (Bennison and Chenowith 1984). Dakota Formation sandstone and shale underlie the proposed route from Butler County to the Kansas border. There are about 3 miles of potential shallow bedrock along the proposed route in Nebraska.

Karst features exist between MP 436 and 520 in Cedar and Wayne Counties (Tobin and Weary 2005) where the proposed ROW is underlain by carbonate rocks of the Niobrara Formation (Burchett 1986).

Kansas

The proposed Mainline Project ROW crosses Kansas within the West-Central Rolling Hills physiographic province (Hammond 1965). It traverses three EPA Level IV Ecoregions (Chapman et al. 2001), physiographic characteristics of which are presented in detail in Table 3.1.1-4.

The proposed ROW enters Kansas at MP 652 and then proceeds east-southeast across the Western Corn Belt Plains to the Missouri River Valley.

Elevations along the proposed route range between 790 and 1,500 feet amsl. The greatest relief is found at the edge of the Missouri River valley, where the proposed route descends about 220 feet from the bluffs to the floodplain. Relatively high local relief—on the order of 100 to 130 feet—is also found where the proposed route crosses the Big Blue and Nemaha Rivers (ENSR 2006a).

TABLE 3.1.1-3
Physiographic Characteristics of Ecoregions Crossed in Nebraska by the Keystone Mainline Project

Milepost Range	Physiographic Description	Elevation Range (feet above mean sea level)	Local Relief (feet)	Surface Geology	Bedrock Geology
Western Corn Belt Plains–Northeastern Nebraska Loess Hills [a]					
438–501	Glaciated. Rolling low hills. Perennial streams.	1,100–1,900	100–300	Deep calcareous loess	Cretaceous shale, sandstone, and limestone, Oglalla Formation
Western Corn Belt Plains–Transitional Sandy Plains [a]					
501–506	Level to rolling plains.	1,400–2,000	5–150	Alluvial sand and gravel, lacustrine silt	Miocene sandstone of the Oglalla Formation
Central Great Plains–Platte River Valley [a]					
532–547	Flat, wide alluvial valley. Shallow, interlacing streams on a sandy bed.	1,300–2,900	2–75	Alluvial sand, silt, clay and gravel	Quaternary and Tertiary unconsolidated sand and gravel
Central Great Plains–Rainwater Basin Plains [a]					
547–634	Flat to gently rolling loess-covered plains. Historically, extensive rainwater basins, and wetlands.	1,300–2,400	5–100	Quaternary loess and sandy alluvium	Tertiary Oglalla sandstone, Cretaceous Niobrara, Carlisle limestone and shale
Central Great Plains–Smoky Hills [a]					
634–652	Undulating to hilly dissected plain. Broad belt of low hills formed by mature dissection of Cretaceous rock layers.	1,200–1,800	100–250	Local thin loess, loamy colluvium	Chalky limestone, Cretaceous sandstone of the Dakota Formation

[a] EPA Level III-IV Ecoregion name.

Sources: Chapman et al. 2001; mile posts taken from TransCanada 2007d.

TABLE 3.1.1-4
Physiographic Characteristics of Ecoregions Crossed in Kansas by the Keystone Mainline Project

Milepost Range	Physiographic Description	Elevation Range (feet above mean sea level)	Local Relief (feet)	Surface Geology	Bedrock Geology
Central Great Plains – Smoky Hills [a]					
652–658	*See Table 3.1.1-3.*				
Western Corn Belt Plains –Glacial Drift Hills [a]					
658–729	Glaciated. Rolling low hills. Perennial streams.	1,000–1,600	40–250	Loess and clay-loam calcareous till	Pennsylvanian shale, sandstone, limestone, Permian shale, limestone
Western Corn Belt Plains–Nebraska-Kansas Loess Hills [a]					
729–751	Glaciated. Deep, rolling loess-covered hills. Perennial streams.	1,000–1,500	100–300	Loess over calcareous till	Pennsylvanian shale, sandstone, limestone

[a] EPA Level III-IV Ecoregion name.

Sources: Chapman et al. 2001; mile posts taken from TransCanada 2007d.

Surface materials consist of glacial drift—till, lake deposits, and loess—with alluvium in river valleys and smaller drainages (SGSK 1964). Glacial deposits are generally not continuous or thick, and bedrock units are exposed along some valleys; but loess deposits can be more than 100 feet deep. Underlying bedrock consists of Pennsylvanian limestone, shale, and localized sandstones of the Shawnee and Wabaunsee Groups and Permian limestone and shale of the Admire, Council Grove, Chase, and Sumner Groups. Permian rocks are found in Marshall, Nemaha, and western Brown Counties, while the Pennsylvanian rocks are found in eastern Brown and Doniphan Counties (SGSK 1964). There are about 4 miles of potential shallow bedrock along the proposed route in Kansas.

There are no known areas of karst along the proposed Mainline Project route in Kansas.

Missouri

The proposed Mainline Project ROW crosses Missouri within the West-Central Rolling Hills, Mid-continent Plains and Escarpments, and Middle Western Upland Plain physiographic provinces (Hammond 1965). It traverses five EPA Level IV Ecoregions (Chapman et al. 2002), physiographic characteristics of which are presented in detail in Table 3.1.1-5.

The proposed ROW enters Missouri at MP 751 and proceeds across irregular plains and low hills until it drops down into the Upper Mississippi Alluvial Plain and crosses into Illinois at approximately MP 1025.

Elevations along the proposed route range from between 790 and 1,165 feet amsl in northwestern Missouri to 400 feet amsl at the Mississippi River (ENSR 2006a). Relief is generally low to moderate, with rolling hills and dissected drainages (Chapman et al. 2002). Areas of steep relief are found adjacent to the major river valleys. The greatest elevation change is in northwest Missouri, where the elevation change at the edge of the Missouri River floodplain is about 250 feet.

Surface deposits consist of alluvium and glacial drift composed of till and loess. Most of northern Missouri is covered with a mantle of glacial drift. Alluvium is present in the river valleys and is especially thick in the flood plains of the Mississippi and Missouri Rivers. Underlying bedrock consists of Pennsylvanian sandstone, limestone, shale, and coal (Oetking et al. 1966) in the northwest corner of the state and for a small distance west of the Mississippi River north of St. Louis, and Mississippian cherty limestone with minor amounts of shale and sandstone from Montgomery County to the Mississippi River. There are about 31 miles of potential shallow bedrock along the Mainline Project route in Missouri.

Karst features are found along the Mainline Project route in Lincoln and St. Charles Counties. Bedrock with karst potential is found from MP 735 through 811 (but karst features are exceptionally rare, if not completely absent) and between MP 946 and the Illinois border. The potential karst has been characterized as fissures, tubes, and caves usually less than 1,000 feet long and less than 50 feet deep (Tobin and Weary 2005).

Illinois

The proposed Mainline Project ROW crosses Illinois within the Middle Western Upland Plain physiographic subdivision (Hammond 1965). It traverses three EPA Level IV Ecoregions (Woods et al. 2006), physiographic characteristics of which are presented in detail in Table 3.1.1-6.

The proposed ROW enters Illinois at MP 1025 and proceeds across the Mississippi Alluvial Plain for approximately 60 miles before climbing the River Hills up to Patoka.

TABLE 3.1.1-5
Physiographic Characteristics of Ecoregions Crossed in Missouri by the Keystone Mainline Project

Milepost Range	Physiographic Description	Elevation Range (feet above mean sea level)	Local Relief (feet)	Surface Geology	Bedrock Geology
Western Corn Belt Plains – Missouri Alluvial Plain [a]					
751–753, 841–846	*See Table 3.1.1-3.*				
Western Corn Belt Plains–Rolling Loess Prairies [a]					
753–768	Irregular plains to open low hills. Intermittent and perennial streams, many channelized.	700–1,300	100–200	Moderate to thick loess, generally less than 25 feet, over clay loam till	Pennsylvanian and Cretaceous shale, sandstone, and limestone
Central Irregular Plains–Loess Flats and Till Plains [a]					
768–841	Glaciated. Low hills and smooth plains. Perennial streams with many channelized.	600–1,200	100–300	Moderate loess over loamy till and clay loam till	Pennsylvanian sandstone, limestone, and shale
Central Irregular Plains–Claypan Prairie [a]					
846–939, 944–947	Glaciated. Smooth plains. Perennial streams with many channelized.	700–1,000	50–100	Loamy till and clay loam till, well developed claypan	Pennsylvanian sandstone, limestone, and shale
Interior River Valleys and Hills–River Hills [a]					
939–944, 947–984	Bluffs, valleys, and low hills. Areas of karst features. Perennial streams. Missouri River channelized.	400–810	50–300	Thin cherty clay and silty to sandy clay solution residuum; areas of clay loam till along the northern boundary along the Missouri River and eastern boundary of the upper Mississippi River; thin loess, 5 to 13 feet, on uplands along bluffs; alluvium along the Missouri and Mississippi Rivers	Ordovician, Mississippian, and Pennsylvanian limestones, sandstones, and shales with considerable bedrock exposures throughout the region

TABLE 3.1.1-5
(continued)

Milepost Range	Physiographic Description	Elevation Range (feet above mean sea level)	Local Relief (feet)	Surface Geology	Bedrock Geology
Interior River Valleys and Hills – Upper Mississippi Alluvial Plain [a]					
984–1001	Broad floodplains and low terraces of the Mississippi River (and its major tributaries) upstream of the confluence with the Missouri River. Levees, oxbow lakes, islands, disjunct sand sheets, and scattered dunes.	420–600	< 50	Quaternary alluvium, outwash deposits, and slackwater deposits	Paleozoic sedimentary rock; bedrock is deeply covered by Quaternary sediments
Interior River Valleys and Hills–Middle Mississippi Alluvial Plain [a]					
1001–1025	Broad floodplains and low terraces, levees, oxbow lakes, islands, spring-fed swamps, sand sheets and scattered dunes.	350–420	< 50	Deep Quaternary alluvial, outwash, and slackwater sediments	Paleozoic sedimentary rocks

[a] EPA Level III-IV Ecoregion name.

Sources: Chapman et al. 2002; mile posts taken from TransCanada 2007d.

TABLE 3.1.1-6
Physiographic Characteristics of Ecoregions Crossed in Illinois by the Keystone Mainline Project

Milepost Range	Physiographic Description	Elevation Range (feet above mean sea level)	Local Relief (feet)	Surface Geology	Bedrock Geology
Interior River Valleys and Hills–Middle Mississippi Alluvial Plain [a]					
1025–1026	Broad floodplains and low terraces, levees, oxbow lakes, islands, spring-fed swamps, sand sheets and scattered dunes.	350–420	< 50	Deep Quaternary alluvial, outwash, and slackwater sediments	Paleozoic sedimentary rocks
Interior River Valleys and Hills–River Hills [a]					
1026–1082	Formerly glaciated rugged hills, bluffs, cliffs, and ravines. Some karst caves and sinkhole ponds.	425–800	50–375	Quaternary loess > 60 inches deep, glacial till	Paleozoic sedimentary rocks, limestone, and sandstone

[a] EPA Level III-IV Ecoregion name.

Sources: Woods et al. 2006; mile posts taken from TransCanada 2007d.

Elevations along the proposed route range between 500 and 600 feet amsl. Local relief is slight along the entire route until it reaches the till plains east of Edwardsville, where it occasionally crosses larger incised drainages with local relief of up to 100 feet (ENSR 2006a).

Surface materials consist of glacial deposits and alluvium. The Mississippi River valley is composed of alluvial sand, silt, and clay, while the uplands to the east are composed of glacial tills between 50 and 200 feet thick (Lineback 1979). Underlying bedrock consists of Mississippian limestone, sandstone, and shale grading eastward to Pennsylvanian sandstone, shale, and coal (Willman et al. 1967). There is less than 1 mile of potential shallow bedrock along the Mainline Project route in Illinois.

Karst features—including numerous sink holes and collapse structures—are present along the western edge of Illinois along the Mississippi River (ISGS 2003). Although the entire Mainline Project route in Illinois is underlain by karst-prone bedrock, no karst features have been identified along the proposed ROW (Tobin and Weary 2005, ENSR 2006a).

Cushing Extension

Nebraska

The proposed Cushing Extension separates from the Mainline Project ROW in the Smoky Hills, then proceeds 2.5 miles south to the Nebraska/Kansas border. Physiographic characteristics of the Smoky Hills are presented in detail in Table 3.1.1-7.

Surface deposits consist of thin loess and loamy colluvium. Underlying bedrock consists of Dakota Formation sandstone and shale (ENSR 2006a). There is less than 0.5 mile of potential shallow bedrock along the proposed Cushing Extension in Nebraska.

No karst features are found along the proposed Cushing Extension route in Nebraska (Tobin and Weary 2005).

Kansas

The proposed Cushing Extension ROW in Kansas traverses three EPA Level IV Ecoregions (Chapman et al. 2001), physiographic characteristics of which are presented in detail in Table 3.1.1-8.

The proposed ROW enters Kansas at MP 3 and then proceeds east-southeast through the Smoky Hills to the Flint Hills and on into the Wellington-McPherson Lowland. At MP 213, it crosses into the Prairie Tableland region of Oklahoma.

Elevations along the proposed route range between 1,070 and over 1,400 feet amsl. Local relief at major drainages along the proposed route is on the order of 100 feet, but slopes are typically not steep (ENSR 2006a).

Surface materials consist of glacial till, loess, alluvium, and colluvium. In upland areas of the Flint Hills region, the colluvium consists of cherty gravels. Underlying bedrock consists of Dakota Formation sandstone and shale in the north, and Permian Council Grove, Chase, and Sumner limestones and shales from southern Washington County to the border with Oklahoma (SGSK 1964). There are about 10 miles of potential shallow bedrock or consolidated sediments along the proposed Cushing Extension route in Kansas.

TABLE 3.1.1-7
Physiographic Characteristics of Ecoregions Crossed in Nebraska by the Keystone Cushing Extension

Milepost Range	Physiographic Description	Elevation Range (feet above mean sea level)	Local Relief (feet)	Surface Geology	Bedrock Geology
Central Great Plains – Smoky Hills [a]					
0–3	Undulating to hilly dissected plain. Broad belt of low hills formed by mature dissection of Cretaceous rock layers.	1,200–1,800	100–250	Local thin loess, loamy colluvium	Chalky limestone, Cretaceous sandstone of the Dakota Formation

[a] EPA Level III-IV Ecoregion name.

Sources: Chapman et al. 2001; mile posts taken from TransCanada 2007d.

TABLE 3.1.1-8
Physiographic Characteristics of Ecoregions Crossed in Kansas by the Keystone Cushing Extension

Milepost Range	Physiographic Description	Elevation Range (feet above mean sea level)	Local Relief (feet)	Surface Geology	Bedrock Geology
Central Great Plains–Smoky Hills [a]					
3–52, 54–82	*See Table 3.1.1-7.*				
Flint Hills [a]					
52–54, 82–157	Undulating to rolling hills, cuestas, cherty limestone, and shale outcrops. Perennial streams and springs common.	1,000–1,600	50–400	Cherty and clayey residuum, some limited glacial drift in the northeast corner of region	Interbedded cherty Permian limestone and shale
Central Great Plains–Wellington-McPherson Lowland [a]					
157–213	Flat alluvial lowlands. Perennial streams and numerous springs.	1,000–1,800	2–75	Loess and silty, sandy, and clayey alluvium	Permian sandstone, shale, and salt deposits (Wellington Formation)

[a] EPA Level III-IV Ecoregion name.

Sources: Chapman et al. 2001; mile posts taken from TransCanada 2007d.

There are 84 miles of potential karst terrain along the proposed Cushing Extension route in Kansas. Where present, karst is likely to consist of fissures, tubes, and caves generally less than 1,000 feet long; 50 feet or less in vertical extent; in gently dipping to flat-lying beds of carbonate rock (Tobin and Weary 2005).

Oklahoma

The Cushing Extension ROW crosses Oklahoma in the Mid-continent Plains and Escarpments physiographic subdivision (Hammond 1965). The terrain is characterized by low- to moderate-relief escarpments formed in gently west-dipping bedrock, similar to the Flint Hills. It traverses two EPA Level IV Ecoregions (Woods et al. 2005), physiographic characteristics of which are presented in detail in Table 3.1.1-9.

The proposed ROW enters Oklahoma at MP 213 and proceeds across the level to slightly rolling plains of the Wellington-McPherson Lowland until approximate MP 254, where it crosses into the rough, broken plains of the Cross-Timbers Transition region. The proposed route terminates at Cushing, Oklahoma, at MP 296.

Between the Kansas/Oklahoma border and the Cimarron River, elevations along the proposed route range between 900 and 1,150 feet amsl. At the Cimarron crossing relief is on the order of 140 to 180 feet. South of the Cimarron River crossing, elevations range between 860 and 1,070 feet amsl (ENSR 2006a)

Surface deposits consist of relatively fine-grained alluvium and terrace deposits. Underlying bedrock consists of Lower Permian Wellington Formation sandstone and limestone from the Kansas/Oklahoma border to the terminus at Cushing (Miser 1954). Upper Pennsylvanian rocks also outcrop at the edge of the Salt Fork Arkansas River floodplain (ENSR 2006a). There is less than 1mile of potential shallow bedrock along the proposed Cushing Extension in Oklahoma.

Karst terrain similar to that described above for Kansas may be found along 4 miles of the proposed Cushing Extension route in Oklahoma (ENSR 2006a).

3.1.1.2 Potential Impacts and Mitigation

Construction Impacts

The proposed Keystone Project does not involve substantial long- or short-term alteration of topography, and no disturbance of geological features that have received state or federal protection. Most of the proposed route is within areas where bedrock is deeply buried by Pleistocene and Holocene sediments. Consequently, impacts to bedrock are expected to be minimal, and limited to areas where bedrock is within 8 feet of the surface. Potential impacts to surface sediments and topography due to accelerated erosion or soil compaction are described in Section 3.2.

During construction, blasting may be required at locations where shallow bedrock is present. In addition to temporary effects, including generation of dust, noise, and vibration, blasting will permanently alter the bedrock surface. Appendix E lists by milepost locations where shallow bedrock may be found, the type of bedrock likely to be found, and whether ripping or blasting is expected to be used at the identified locations. Tables 3.1.1-10 and 3.1.1-11 summarize the approximate locations of expected blasting and ripping operations respectively, by state, county, and approximate milepost.

TABLE 3.1.1-9
Physiographic Characteristics of Ecoregions Crossed in Oklahoma by the Keystone Cushing Extension

Milepost Range	Physiographic Description	Elevation Range (feet above mean sea level)	Local Relief (feet)	Surface Geology	Bedrock Geology
Central Great Plains–Prairie Tableland [a]					
213–254	Level to slightly rolling plains with broad, flat interfluves and low-gradient broad, shallow, and sand- or silt-choked channels; uncommon short reaches with gravel, cobble, or bedrock substrates occur. Streams usually flow strongly after rains, have high suspended sediment concentrations, and go dry in late summer.	850–1,650	10–125	Quaternary alluvium, terrace deposits, and decomposition residuum of clay loam, fine sandy loam, and sandy clay loam	Permian-age red shale, sandstone, and siltstone with some Pennsylvanian-age limestone in northeastern-most areas
Central Great Plains–Cross Timbers Transition [a]					
254–296	Rough plains that are sometimes broken. Incised streams occur and have rocky or muddy substrates.	750–1,950	30–300	Quaternary alluvium; terrace deposits; and decomposition residuum of fine sandy loam, clayey silt, sandy clay loam, silty clay, and clayey loam	Permian- and Pennsylvanian-age sandstone and shale, as well as some limestone and mudstone conglomerate

[a] EPA Level III-IV Ecoregion name.

Sources: Woods et al. 2005; mile posts taken from TransCanada 2007d.

TABLE 3.1.1-10
Potential Blasting Locations
for the Keystone Project

MP Range	State	County	Length (miles)
Mainline Project			
635.4 – 636.2	Nebraska	Jefferson	0.33
747.0 – 747.8	Kansas	Doniphan	0.26
766.9 – 766.9	Missouri	Buchanan	0.02
799.4 – 813.9		Caldwell	1.24
848.7 – 871.4		Chariton	2.07
918.4 – 919.5		Audrain	0.24
948.6 – 953.7		Montgomery	0.71
957.2 – 979.0		Lincoln	1.63
Mainline Project subtotal			6.5
Cushing Extension			
0.5 – 0.7	Nebraska	Jefferson	0.15
14.9 – 15.9	Kansas	Washington	0.15
39.8 – 42.3		Clay	1.11
116.2 – 116.5		Marion	0.38
Cushing Extension subtotal			1.79
Keystone Project total			**8.3**

Source: TransCanada 2007b.

TABLE 3.1.1-11
Potential Ripping Locations
for the Keystone Project

MP Range	State	County	Length (miles)
Mainline Project			
33.0 – 54.6	North Dakota	Walsh	1.90
63.0 – 84.8		Nelson	0.41
104.2 – 109.6		Steele	2.01
439.3 – 449.0	Nebraska	Cedar	1.44
635.6 – 639.8		Jefferson	1.53
658.2 – 662.2	Kansas	Marshall	0.39
685.4 – 685.4		Nemaha	0.03
704.1 – 728.0		Brown	3.18
728.5 – 740.5		Doniphan	0.36
754.3 – 764.8	Missouri	Buchanan	1.13
798.2 – 814.4		Caldwell	1.63
814.5 – 838.3		Carroll	4.68
843.2 – 857.0		Chariton	0.58
876.1 – 890.8		Randolph	4.74
898.6 – 932.8		Audrain	6.55
932.8 – 953.8		Montgomery	3.73
953.8 – 972.1		Lincoln	2.29
1045.5 – 1046.0	Illinois	Madison	0.11
Mainline Project subtotal			6.5
Cushing Extension			
15.0 - 26.0	Kansas	Washington	0.47
44.1 - 61.0		Clay	1.89
67.7 - 98.1		Dickinson	1.01
101.9 - 120.5		Marion	5.46
261.2 - 264.6	Oklahoma	Noble	0.22
280.5 - 287.8		Payne	0.45
Cushing Extension subtotal			1.79
Keystone Project total			**8.3**

Source: TransCanada 2007b.

In its CMR Plan (Appendix B), Keystone has committed to complying with all laws and regulations governing explosives, notifying nearby residents, using blasting mats or subsoil to prevent fly-rock, clearing and cleaning all blasting locations before and after blasting operations, and performing all blasting during regular daylight working hours. In addition, Keystone would prepare a blasting plan for any locations where blasting would be necessary. Prior to construction, Keystone would file required blasting plans with applicable state or local jurisdictions. Required post-blasting testing procedures for surface water resources will be incorporated in these plans.

Operations Impacts

Routine pipeline operation and maintenance activities are not expected to affect physiography or surface or bedrock geology. Potential impacts to surface sediments and topography due to accelerated erosion or soil compaction are described in Section 3.2.

3.1.2 Paleontological Resources

3.1.2.1 Affected Environment

Although no areas of known sensitive paleontological resources would be crossed, surficial materials along the proposed ROW may contain Quaternary vertebrate fossils. Glacial deposits in particular may contain fossils of mastodon, mammoth, horses and other Pleistocene large vertebrates (Paleontology Portal). Vertebrate fossils are relatively rare, and locations containing vertebrate fossils are more likely to be scientifically significant than those containing invertebrate or plant fossils. Where exposed, bedrock may contain Cretaceous and earlier marine fossils. Upper Cretaceous bedrock outcrops may contain fossils of marine organisms, including turtles, fish, ammonites, and various invertebrates. Pennsylvanian bedrock outcrops may contain fossils of marine invertebrates, including mussels, echinoids, bryozoans, crinoids, snails, corals, and trilobites. Pennsylvanian rocks in Illinois may contain plant fossils. Permian outcrops may contain fish and shark fossils. Along the Cushing Extension route in Noble County, Oklahoma, the Wellington Formation has yielded non-mammal vertebrate, invertebrate, and plant fossils (Paleontology Portal).

3.1.2.2 Potential Impacts and Mitigation

Construction Impacts

Potential impacts to paleontological resources during construction include damage to or destruction of fossils resulting from excavation activities, erosion of fossil beds resulting from grading, and unauthorized collection of fossils by construction personnel or the public.

Pleistocene-age mammal fossils may be discovered during construction in areas where the proposed route crosses glacial and glacial-derived surface deposits, which includes the entire length of the proposed Mainline Project, except for bedrock outcrop areas. Keystone does not propose to recover or study any such fossils that may be uncovered during excavation. However, Keystone would consult with the appropriate regulatory agencies in each state on the applicability and requirements for Paleontological Resource Protection Plans. Keystone would prepare and file plans addressing vertebrate fossils with any respective states, as may be required.

Where necessary, blasting and bedrock ripping are likely to destroy any fossils that might be found in shallow bedrock. Because these fossils are unlikely to be of particular scientific importance, Keystone does not propose to log or recover fossils from shallow bedrock locations. If a location that is likely to contain valuable fossils is encountered during blasting, required protection plans would be implemented to identify and protect significant fossil resources.

Table 3.1.1-10 summarizes likely blasting areas. Table 3.1.1-11 summarizes areas where consolidated materials are within 7 feet of the surface, but ripping is likely to be sufficient. More precise location information for blasting and ripping areas is presented in Appendix E. The estimates of blasting and ripping locations were obtained from Keystone's review of depth to bedrock, as recorded in NRCS soils data. Locations where depth to bedrock is shallower than 80 inches are considered as likely to require blasting if the bedrock is indurated, well-cemented, or lithic, and potentially rippable otherwise (TransCanada 2007b). Approximately 37 miles of the proposed Mainline Project route may require ripping, and approximately 7 miles may require blasting. If blasting and ripping are required, Keystone would follow the procedures described in Section 2.2.

Operations Impacts

Routine pipeline operations and maintenance activities are not expected to affect paleontological resources. Although maintenance activities may result in surface disturbance, this would typically occur in areas previously disturbed by construction. Therefore, operational impacts to paleontological resources would be negligible.

3.1.3 Mineral and Fossil Fuel Resources

3.1.3.1 Affected Environment

The proposed route does not cross any active surface mines or quarries, but potentially valuable sand, gravel, clay, and stone resources may lie within the proposed Mainline Project ROW for the approximately 800 miles that traverse glacial deposits. Sand, gravel, crushed stone, and dimensional limestone are also present along the Kansas portion of the Cushing Extension ROW (ENSR 2006a).

The proposed Mainline Project route does not cross the well-pads of any active or proposed oil or gas wells (ENSR 2006a). The proposed Cushing Extension ROW in Kansas crosses or passes near several oil and gas fields. In addition to four abandoned oil-fields in Clay County, the proposed route passes near the active El Dorado oil field (Brooks et al. 1975, in ENSR 2006a). In Oklahoma, numerous oil and gas fields are in the vicinity of the proposed Cushing Extension route. Cushing, the destination of the extension, has been a major crude oil refining and pipeline transportation hub since the early part of the 20^{th} century. Table 3.1.3-1 identifies oil and gas fields that would be crossed by the Mainline Project and Cushing Extension ROWs.

In Kansas, coal beds are present in Pennsylvanian rocks underlying the proposed route; they are too deep to mine, although coal bed methane production is a possibility (Charpentier and Rice 1995). The proposed route crosses approximately 40 miles of underlying coal seams between Wood River and Patoka, Illinois, where coal is mined with underground methods (USGS 2004, ENSR 2006a). Table 3.1.3-2 identifies coal fields that would be crossed by the Mainline Project. No coal fields would be crossed by the Cushing Extension.

TABLE 3.1.3-1 Identified Oil and Gas Fields Crossed by the Keystone Project			
State	**Starting Milepost**	**Ending Milepost**	**Type of Field**
Mainline Project			
Kansas	701.2	701.6	Oil
	1021.3	1024.7	Oil*
	1021.4	1027.7	Oil*
Illinois	1027.7	1038.8	Oil*
	1038.8	1039.9	Oil*
	1039.9	1040.8	Oil*
	1040.8	1041..4	Oil*
	1041.4	1070.1	Oil*
	1070.1	1072.1	Oil*
	1072.1	1072.6	Oil*
	1072.6	1077.9	Oil*
Cushing Extension			
Kansas	118.8	120.8	Inactive
	131.3	133.6	Oil
	133.6	134.4	Oil
	136.4	136.9	Oil
	136.9	137.4	Oil
	137.4	142.6	Oil
	142.6	143.1	Oil
	146.2	146.7	Oil
	148.8	149.3	Oil
	152.3	154.9	Oil
	154.9	156.0	Oil
	156.0	157.0	Oil
	168.6	169.1	Oil
	176.0	178	Oil
	186.6	187.1	Oil
	189.7	190.7	Oil
	199.5	201.5	Oil and gas
	204.2	205.9	Oil and gas
	207.1	208.9	Oil and gas
	209.1	209.5	Oil and gas
	209.5	209.8	Oil and gas
	209.8	210.1	Oil and gas
	210.1	213.3	Oil and gas
Oklahoma	267.3	267.8	Gas
	292.6	292.9	Gas
	296.1	298.5	Gas
	217.8	233.5	Oil and gas
	235.2	236.1	Oil and gas
	289.5	289.8	Oil and gas

TABLE 3.1.3-1 (Continued)			
State	Starting Milepost	Ending Milepost	Type of Field
Mainline Project (continued)			
Oklahoma (continued)			
	290.6	292.2	Oil and gas
	215.8	218.1	Oil
	226.4	227.6	Oil
	228.4	229.4	Oil
	237.0	245.3	Oil
	259.3	259.9	Oil
	270.5	271.1	Oil
	277.8	278.9	Oil
	280.0	280.7	Oil
	281.2	281.5	Oil
	282.5	283.9	Oil
	284.4	286.3	Oil
	286.6	287.0	Oil
	287.8	288.9	Oil
	293.6	295.9	Oil

*Information obtained from oilfields database; however, the field might also produce gas.

Source: TransCanada 2007c.

TABLE 3.1.3-2 Identified Coal Fields Crossed by the Keystone Mainline Project			
State	Starting Milepost	Ending Milepost	Type of Coal
Nebraska	669.2	692.0	Medium and high volatile bituminous/other uses
	692.0	719.2	Medium and high volatile bituminous/other uses
Kansas	719.2	948.0	Medium and high volatile bituminous/potentially minable
Illinois	1026.9	1027.7	Medium and high volatile bituminous/potentially minable
	1027.7	1070.1	Medium and high volatile bituminous/potentially minable
	1070.1	1077.9	Medium and high volatile bituminous/potentially minable

Source: TransCanada 2007c.

3.1.3.2 Potential Impacts and Mitigation

Although the proposed route does not cross any active surface mines or quarries, construction and operation of the Keystone Project would limit access to sand, gravel, clay, and stone resources that are within the width of the permanent pipeline ROW for the approximately 800 miles of proposed pipeline that traverses glacial deposits. In Kansas, Missouri, and Illinois, the proposed route lies in or directly adjacent to an existing pipeline ROW; therefore, no additional restriction on mineral resources would result from the Keystone Project. In North Dakota, South Dakota, and Nebraska, the proposed route would cross deposits of sand, gravel, clay, and stone, but the acreage of deposits covered by the proposed ROW is insignificant compared to the total acreage of deposits present in each state.

The proposed route crosses approximately 40 miles of underlying coal seams between Wood River and Patoka, Illinois, where coal is mined with underground methods (ENSR 2006a). If surface mining was proposed for this area in the future, the pipeline might serve as an impediment. The effect of this impediment is likely to be minimal, however, as the proposed route follows existing pipelines in this area.

The proposed route does not cross the well-pads of any active oil and gas wells. Extraction of oil and gas resources would not be affected by routing operations because any new wells would be located outside of the pipeline ROW.

3.1.4 Geologic Hazards

3.1.4.1 Affected Environment

The proposed Keystone pipeline would be located entirely within the relatively flat and stable continental interior. Consequently, the potential for impacts from geologic hazards is lower than for facilities located in active mountain belts or coastal areas. Nonetheless, at some locations along the proposed route, seismic hazards, landsliding, subsidence, or flooding may occur. Table 3.1.4-1 summarizes by state the miles of proposed pipeline that cross areas of potential geologic hazard.

TABLE 3.1.4-1
Summary of Geological Hazard Areas
for the Keystone Project (miles)

State	High Seismic Hazard[a]	Flood	Landslide	Subsidence
North Dakota	0.0	3.0	0.0	0.0
South Dakota	0.0	21.9	7.7	0.0
Nebraska	0.0	21.9	13.1	0.0
Kansas	0.0	10.9	0.0	0.0
Missouri	0.0	99.5	30.1	0.0
Illinois	0.0	12.8	6.9	0.0
Keystone Project total	**0.0**	**170.0**	**57.8**	**0.0**

[a] Peak ground acceleration with 2 percent probability of exceedance in 50 years >0.5 g.

Source: ENSR 2006a.

Seismic Hazards

Based on a comprehensive review of the fault activity east of the Rocky Mountains (Crone and Wheeler 2000), Keystone concluded that the proposed pipeline would not cross active faults (defined as movement along the fault within the last 10,000 years). Earthquake hazards can occur at a distance from actual faults as a result of earthquake-induced ground motion. The earthquake hazard rank map (Figure 3.1.4-1) shows earthquake hazard risk along the proposed Keystone Project route. There is low seismic hazard in Kansas, Oklahoma, Missouri, and Illinois. Hazard increases to an intermediate level in the Mississippi

Valley and in southern Illinois. This hazard is due to unconsolidated sediments that have the potential of being affected by New Madrid fault motion. The proposed Keystone Project is approximately 120 miles from the nearest active faulting in the New Madrid Seismic Zone (TransCanada 2007b).

As part of its National Pipeline Mapping System (NPMS) program, the DOT has compiled data from a variety of sources to identify areas of high geologic hazard potential for pipelines (DOT 1996). The Integrity Management Rule of 2002 states that segments of pipeline with a high geologic risk and the potential to affect HCAs must implement protective measures. HCAs are specific locales and areas where a release could result in more significant adverse consequences. No earthquake HCAs have been identified along the Keystone Project route.

Landslides

Landslides typically occur on steep or convergent terrain during conditions of partial or total soil saturation. Most of the proposed Keystone Project route is not located in landslide-prone terrain, but the proposed route does cross areas of high landslide potential as described by the NPMS at the Yankton and Mississippi crossings, as shown in Table 3.1.4-2. The areas listed with high landslide potential are based on high-level assessments for the NPMS and tend to overestimate the surficial extent of the hazard; actual areas of potential instability tend to be much smaller and discontinuous within the indicated zone (ENSR 2006a). Keystone has considered landslide potential in its routing work and has selected crossings of these areas where the landslide potential is considered minimal.

TABLE 3.1.4-2
Areas with High Landslide Potential Crossed by the Keystone Project

Area	Start (MP)	End (MP)	Length (miles)
Mainline Project			
Yankton Crossing	428.1	442.9	14.8
	454.0	454.3	0.3
	635.9	641.6	5.7
Mississippi Crossing	979.6	987.7	8.1
	999.4	1,021.1	21.7
	1,023.0	1,027.7	4.7
	1,027.7	1,029.9	2.2
Mainline Project subtotal			*57.5*
Cushing Extension			
Silver Hills	0.0	9.3	9.3
Cushing Extension subtotal	*0.0*	*9.3*	*9.3*
Keystone Project total			**66.8**

Source: ENSR 2006a.

During scoping meetings, issues were raised concerning the potential for rock slope instability in the vicinity of the Whitewater River crossing in Kansas. If required, Keystone would complete a site-specific crossing plan for the Whitewater River. In general, Keystone would complete site-specific crossing plans for water bodies as required by the applicable regulatory agencies, as well as for those water bodies required by federal and state permitting processes.

Subsidence

Although a potential result of soil liquefaction during seismic events, subsidence hazard along the proposed Keystone pipeline corridor would most likely be associated with the presence of karst features, such as sinkholes and fissures and in some areas potential underground coal mine works. Keystone reviewed national karst maps (Tobin and Weary 2005) to determine areas of potential karst terrain (i.e., areas where limestone bedrock is near the surface) along the proposed pipeline route. These areas are summarized in Table 3.1.4-3 and represented in the Karst map shown in Figure 3.1.4-2. Because national-scale karst maps may not incorporate the most recent field data or be of sufficient resolution to determine local subsidence risk due to karst features, prior to construction, Keystone would consult with the respective state geological survey departments to identify the most up-to-date sources of data on karst-related subsidence hazards along the proposed route.

TABLE 3.1.4-3
Karst Areas Crossed by the Keystone Project

Location	Start (MP)	End (MP)	Length (miles)
Mainline Project [a]			
South Dakota, Nebraska	353	520	167
Missouri	735	811	76
Missouri, Illinois	946	1,028	82
Cushing Extension [b]			
Kansas	65	83	18
	118	134	16
	150	200	50
Oklahoma	244	248	4
Keystone Project total			**413**

[a] Type: Fissures, tubes and caves generally less than 1,000 feet (300 meters long; 50 feet (15 meters) or less vertical extent; in gently dipping to flat-lying beds of carbonate rock beneath an overburden of noncarbonate material 10 to 200 feet (3 to 60 meters) thick.

[b] Type: Fissures, tubes, and caves generally less than 1,000 feet (300 meters) long, 50 feet (15 meters) or less vertical extent, in gently dipping to flat-lying beds of carbonate rock.

Source: ENSR 2006a.

Deep (generally 50 feet or more) glacial drift deposits overlie karst terrain in South Dakota, Nebraska, and Kansas. This deep and interbedded glacial material matrix limits the potential for sinkholes to cause fractures and soil displacement at the surface. The overall subsidence hazard risk from sinkholes that form in karst terrain along the proposed route is low. This conclusion is based on Keystone's review of the sinkhole data base for the segment of the route in Missouri where limestone bedrock is at or near the surface. The Missouri Environmental Geology Atlas indicates that the Keystone pipeline alignment would avoid all known sinkhole zones within the state (Missouri Division of Geology and Land Survey

2007, in TransCanada 2007b). Relative to hazards associated with underground coal mine works, no such works are known to underlie the proposed Keystone corridor.

Floods

Floods can cause lateral and vertical scour that can expose the pipeline to damage, particularly in active channel crossings. Keystone has committed to reviewing scour potential at all river crossings using qualified scientific or engineering professionals. River crossing designs would need to be reviewed and accepted by USACE personnel prior to issuing required permits. Keystone has committed to using HDD at major river crossings and to bury the pipeline under at least 5 feet of cover for at least 15 feet on either side of the bank-full width of all rivers, creeks, streams, ditches, and drains. An assessment of hazards and potential environmental impacts related to Keystone's proposed stream crossing procedures can be found in Section 3.3.

3.1.4.2 Potential Impacts and Mitigation

Seismic

Construction and operation of the proposed Keystone Project would not increase the likelihood of earthquakes. Given the assessment of potential seismicity along the proposed corridor, the risk of pipeline rupture from earthquake ground motion is considered to be minimal. The proposed route does not cross any active faults and would be located outside of known zones of high seismic hazard. In addition, no earthquake-induced ruptures in post-1945 electric-arc-welded transmission pipelines in good repair (the type proposed by Keystone) were observed to have resulted from large southern California earthquakes with reported surface wave magnitudes of up to 7.7 (O'Rourke and Palmer 1996). The New Madrid Seismic Zone is unlikely to produce an earthquake with a magnitude greater than 7.7 (NAHB 2003). In accordance with federal regulations (49 CFR 195), Keystone would conduct an internal inspection of the pipeline if an earthquake, landslide, or soil liquefaction event were suspected of causing abnormal pipeline movement. Thus, any damage to the pipeline would quickly be detected and repaired.

Landslides

During construction, landslide risk may be increased due to vegetation clearing and alteration of surface-drainage. Measures to reduce the risk of erosion during construction (described in Section 2.2) also would reduce the likelihood of construction-triggered landslides. Keystone has committed to revegetating areas disturbed by construction along the pipeline corridor. Revegetation would reduce the risk of landslides during the operational phase of the project. The proposed Keystone Project would be designed and constructed in accordance with 49 CFR, Parts 192 and 193. These specifications ensure that pipeline facilities are designed and constructed in a manner to provide adequate protection from washouts, floods, unstable soils, landslides, or other hazards that may cause the pipeline facilities to move or sustain abnormal loads. Proposed pipeline installation techniques, especially padding and use of rock-free backfill, are designed to effectively insulate the pipeline from minor earth movements.

Keystone plans to reduce landslide risk by preserving or improving the contour of native slopes; preserving or improving drainage patterns; and, in some circumstances, using light-weight granular material surrounding the pipe to insulate it from small ground movements. Keystone has proposed erosion and sediment control and reclamation procedures in its CMR Plan that are expected to limit the potential for erosion and enable slopes to remain in a stable configuration following construction. The potential for landslide activity would be monitored during operations through aerial and ground patrols and through landowner awareness programs, which are designed to encourage reporting from local landowners of events that may suggest instability or other threats to the integrity of the pipeline.

Keystone would implement TransCanada's Integrated Public Awareness (IPA) Plan. TransCanada's IPA Plan is consistent with the recommendations of API RP-1162 (Public Awareness Programs for Pipeline Operators). The plan includes the distribution of educational materials to inform landowners of potential threats and information on how to identify threats to the pipeline. TransCanada has a toll-free telephone number (1-888-982-7222) in place for landowners to report potential threats to the integrity of the pipeline and other emergencies.

Subsidence

There is a risk of subsidence where the proposed route crosses karst formations. Table 3.1.4-3 shows the locations by milepost where karst may be found. Where karst terrain is present or suspected to be near the surface, Keystone has proposed to conduct site-specific studies as necessary to characterize the karst features, and will evaluate and modify construction techniques as necessary. Because the karst formations that may be present along the proposed route tend to be deeply covered, karst formations likely would be encountered only where deep HDD is proposed, as described in Section 3.3.2.2. The overall risk to the Keystone Project and environment from karst-related subsidence is expected to be minimal.

In Missouri and in Illinois the proposed route runs through regions that may contain small shafts and adits associated with underground coal mining. Although no known shafts or adits underlie the proposed corridor, there is a small risk of encountering mine-related works that could represent a subsidence hazard. Near surface workings would likely be noticed during construction and the potential hazard eliminated through filling or avoidance. Deeper workings that might .underlie the pipeline invert are unlikely to pose a high risk to pipeline operations, Potential impacts from minor subsidence associated with soil settling in the ROW and recommended mitigation are discussed in Section 3.2.2.2.

Floods

There is a risk of pipeline exposure due to lateral or vertical scour at water crossings. Keystone's CMR Plan (Appendix B), its commitment to review river crossing design with qualified scientific or engineering personnel, and the necessity for USACE permits prior to water crossing construction reduce the risk to the proposed pipeline from potential flooding events. More detail on environmental risk associated with flooding is presented in Section 3.3.

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3.2 SOILS AND SEDIMENTS

3.2.1 Affected Environment

Soil types are highly variable along the length of the proposed Keystone Project. Most of the soils along the proposed route have developed in glacial and alluvial deposits. Soil textures vary widely depending on location and parent material. Some soils have been heavily modified by agriculture. In determining the environmental impact of the proposed Keystone Project, the main concerns with respect to soils are the extent to which a given soil has any of the following characteristics:

- Highly erodible soils—these soils are prone to high rates of erosion when exposed to wind or water by removal of vegetation.
- Prime farmland soils—these soils have combinations of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if they are treated and managed according to acceptable farming methods. (http://soils.usda.gov/technical/handbook/contents/part622.html.)
- Hydric soils—these soils "formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part." (Federal Register, July 13, 1994.)
- Compaction-prone soils—these soils have clay loam or finer textures in somewhat poor, poor, and very poor drainage classes.
- Stony/rocky soils—these soils have (1) a cobbly, stony, bouldery, gravelly, or shaly modifier to the textural class; or (2) >5 percent (weight basis) of stones larger than 3 inches in the surface layer.
- Shallow-bedrock soils—these soils typically are defined as soils that have bedrock within 60 inches of the soil surface. For the purpose of the proposed Keystone Project, however, shallow-bedrock soils are defined as those with bedrock within 80 inches of the surface, because trenching typically would be done to that depth.
- Drought-prone soils—these soils include coarse-textured soils (sandy loams and coarser) that are moderately well to excessively drained.

Keystone provided information regarding the soil types occurring in the Keystone Project area that was derived from NRCS STATSGO and SSURGO databases (available online at http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx). The soil characteristics of concern are erosion potential (wind and water), designation as prime farmland, compaction potential, percentage of stones/rocks, droughty soil, hydric soil, and potential for shallow bedrock. Because the proposed Keystone Project would not cross any drought-prone soils, this soil constraint is not a concern and is not discussed further.

Table 3.2.1-1 is a summary of approximate pipeline miles by state that would cross soils with the above properties. More detail is provided in Appendix F, a table provided by Keystone that lists soil associations from the STATSGO database by milepost along the proposed route—along with the proportion of each map unit that has specific soil limitations.

TABLE 3.2.1-1
Approximate Miles of Sensitive Soils Crossed by the Keystone Project

State	Total Miles Affected[a]	Highly Erodible	Prime Farmland	Hydric	Compaction-Prone	Stony/ Rocky	Shallow Bedrock
North Dakota	218	19	115	28	14	3	30
South Dakota	220	12	100	27	28	12	NA
Nebraska	215	44	135	9	11	1	4
Kansas	99	24	46	2	9	>1	30
Missouri	274	49	146	52	140	17	80
Illinois	57	5	41	16	35	>1	>1
Mainline Project subtotal	1,082	153	583	134	237	33	144
Nebraska	3	1	1	0	0	0	0
Kansas	210	13	157	1	11	10	140
Oklahoma	83	4	53	>1	>1	8	47
Cushing Extension subtotal	296	18	211	>2	11	18	187
Keystone Project total	**1,378**	**171**	**794**	**135**	**248**	**51**	**331**

Sources: ENSR 2006a, TransCanada 2007d updated total miles; rounded to nearest whole mile

NA – Not available

[a]Total miles affected include non-sensitive soils and other substrate.

3.2.1.1 North Dakota

Along the proposed pipeline route in North Dakota, most soils have thick, dark topsoil and mixed mineralogy. They range from well drained undulating soils on upland plains, to very poorly drained soils in "prairie potholes" and along streams. Sodic soils are present in places on glacial lake plains. Soil fertility is naturally high, and prime farmland soils are extensive—occupying approximately half of the proposed ROW. The average freeze-free period ranges from 100 to120 days at the U.S.-Canada border to 120 to 140 days in the southern portion of the state.

3.2.1.2 South Dakota

In the northern portions of South Dakota, the soils are similar to those of North Dakota but experience warmer mean annual temperatures. In the southern portion of the state, upland soils are formed from both loess and medium-textured glacial till. Most of the soils are deep, silty or loamy, with thick, organically enriched topsoil layers. Poorly drained upland depressions contain wet, dark soils. In the Missouri River region, stream valley floors and bottomlands contain poorly-drained soils with thick, dark topsoil, interspersed with the well drained to poorly drained highly stratified soils formed in mixed sediments. Approximately 45 percent of the proposed route within South Dakota consists of prime farmland soils. The average freeze-free period is between 135 and 165 days.

3.2.1.3 Nebraska

From the border with South Dakota into central Nebraska, soil characteristics along the proposed pipeline are similar to those described for southern South Dakota. From Butler County to northeastern Kansas, most of the soils are deep, silty, and loamy—with relatively thick, dark, fertile topsoil. These soils formed in thick loess deposits that lie over glacial deposits buried tens of feet deep. Highly erodible soils are present on slopes in the dissected topography of southern Nebraska. Prime farmland soils occupy approximately 63 percent of the proposed route in Nebraska. The average freeze-free period is between 160 and 180 days.

3.2.1.4 Kansas

In southern Nebraska and northeastern Kansas, shallow soils form where sedimentary bedrock outcrops along valley side slopes and ridge crests. Elsewhere along the western part of the proposed route in Kansas, deep soils with fertile topsoil and loamy or clayey subsoil occur on the silty uplands. East of central Marshall County, the soil moisture regime becomes wetter; loess-mantled ridge ops and side slopes have deep, silty soils with fertile, dark topsoil. Soils in flatter landscape positions have more clayey subsoil. All of these soils have thick topsoil layers. Soils with internal drainage limitations occur in bottomlands. About 46 percent of the proposed route in Kansas consists of prime farmland soils. The average freeze-free period is from 160 to 190 days.

Along the proposed Cushing Extension route in Kansas, shallow soils are found in places where sandstones and limestones are exposed along valley side slopes and ridge crests. Deep soils with fertile topsoils and loamy or clayey subsoils are found in upland areas where loess mantles the bedrock. Deep stratified soils with fertile topsoils are found along smaller streams, while deep loamy, silty, or clayey soils with fertile enriched topsoils that may be wet near the surface during parts of the year are found along major streams. In some locations, the topsoil may be as thick as 20 inches or more. The average freeze-free period is from 170 to 190 days.

3.2.1.5 Missouri

Deep, highly erodible soils formed in thick loess and alluvial deposits are found near the Missouri River in both Kansas and Missouri. Loess deposits thin as the route progresses eastward into Missouri; in places, the route crosses soils formed in clay-rich glacial till. Erosion hazard remains high for several miles into the uplands on either side of the Missouri River floodplain. Poorly drained and very poorly drained soils occur in the Missouri River bottomlands and along tributary drainages. Deep, well drained and moderately well drained soils occur on Missouri uplands, but so do soils with claypan layers; and some soils lack the highly fertile, dark topsoil found further north. In addition, poor soil drainage is common along much of the proposed route in central and eastern Missouri, and shrink-swell potential may be severe in upland areas. About 54 percent of the proposed route in Missouri crosses soils classified as prime farmland. The average freeze-free period ranges from 180 to 190 days.

3.2.1.6 Illinois

Soil characteristics vary widely along the proposed route in Illinois. From the Mississippi River eastward to its terminus in Patoka, the proposed route crosses wide river bottomlands with poorly drained, very deep, and fertile alluvial soils and bordering hillslopes—where shallow to moderately deep limestone-derived soils occur along the edge of the river valley. Upland soils are derived from glacial till and other parent materials; depths range from shallow to deep and textures from sandy to clayey. Most of the upland soils near the Mississippi River are medium textured, well drained or moderately well drained, and lack highly fertile dark topsoil layers. Inland toward Patoka, soils are generally deep and soil wetness is a major land use problem. About 93 percent of the proposed route within Illinois consists of prime farmland. The average freeze-free period ranges from about 180 to 200 days.

3.2.1.7 Oklahoma

Along the Cushing Extension route in Oklahoma, deep soils with dark topsoil layers above subsoil clay accumulations are found in gently sloping upland areas. Shallow to deep well drained soils occur on steeper slopes. Soil erosion potential can be high on these steeper slopes. In small drainages and river valleys, deep, clayey, or loamy soils are found. In these areas, the topsoil can be over 20 inches in depth, and some soils are saturated at depths of 2 feet or more below the surface during part of the year. The average freeze-free period is from 190 to 230 days.

3.2.2 Potential Impacts and Mitigation

3.2.2.1 Construction Impacts

Pipeline construction activities, including clearing, grading, trench excavation, backfilling, heavy equipment traffic, and restoration along the construction ROW, may adversely affect soil resources. Potential impacts include temporary and short-term soil erosion, short-term to long-term soil compaction, permanent increases in the proportion of large rocks in the topsoil, and short-term to permanent soil contamination. Pipeline construction also may result in damage to existing tile drainage systems. In its CMR Plan (see Appendix B), Keystone has proposed construction procedures that are designed to minimize the likelihood and severity of these impacts, and to mitigate where impacts are unavoidable. Additionally, Keystone will develop a comprehensive conservation and reclamation document for construction, operation, and maintenance of the proposed pipeline. This document will contain information from pertinent NRCS Field Office Technical Guides. The specific practices (listed by state) are presented in Appendix M.

Pre-construction clearing of the temporary ROW would remove protective vegetative cover and could potentially increase soil erosion and the transport to sensitive areas. Approximately 14 percent of the overall project surface area would be constructed where the soils are listed as highly erodible. In these areas, some temporary and short-term increases in soil erosion may occur. Where agricultural soils are subject to a construction-related increase in erosion, receiving water bodies may be affected by hazardous substances (such as pesticide or herbicide residues) that might be present in the eroded material. In its CMR Plan (Appendix B), Keystone has proposed construction methods that are designed to minimize impacts resulting from soil erosion. These methods include installation of sediment barriers, temporary slope breaks, erosion control mats, and installation of temporary mulch in the event that construction activities are interrupted. In addition to the measures described in the CMR Plan, Keystone would designate at least one Environmental Inspector (EI) per construction spread, who would have the authority to stop work and/or order corrective action in the event that construction activities violate the provisions of the CMR Plan, landowner requirements, or any applicable permit. The EI will inspect temporary erosion control measures on a daily basis in areas of active construction or equipment operation, on a weekly basis in areas without active construction or equipment operation, and within 24 hours of continuous rainfall greater than 0.5 inch. The EI will have the authority to ensure the repair of any ineffective erosion control measures within 24 hours of their detection, and will keep records of compliance with provisions of the CMR Plan and applicable regulations and permits.

Farmland within the proposed ROW would be removed from production for the duration of construction. In total for both the Mainline Project and the Cushing Extension, agricultural and rangeland production on approximately 22,237 acres would be lost from the construction ROW for the construction season. During the next growing season, production may be reduced but not completely lost. Long-term productivity is not expected to be impaired.

The structure of farmland soils may be degraded by construction. Grading and equipment traffic may compact soil, reducing porosity and percolation rates, which can result in increase runoff potential. As detailed in Appendix B, Keystone has proposed construction methods that are designed to minimize these impacts. These include removing and storing the top 12 inches of topsoil from the trench line and any areas to be graded, ripping to relieve compaction in all areas from which topsoil has been removed, removing all excess rocks exposed due to construction activity, and adding soil amendments to return topsoil as warranted by conditions and agreed to by landowners. Although Keystone plans to minimize impacts to soil productivity that may result from construction activities, some short- to long-term decreases in agricultural productivity are possible. Keystone is negotiating easement agreements with landowners that would require Keystone to restore the productivity of the ROW and compensate landowners for demonstrated losses from decreased productivity resulting from pipeline operations.

Construction and maintenance activities may lead to localized soil compaction in soils listed as hydric or compaction prone, regardless of their suitability for farming, and this compaction may lead to slower or less successful vegetation reestablishment following construction. Approximately 13 percent of the overall proposed route is characterized by hydric soils. Locations where compaction-prone soils are crossed by the proposed ROW are shown in Appendix F. Hydric and otherwise compaction-prone soils are particularly sensitive to the impact of construction activities during wet weather. Section 2.18 of Keystone's CMR Plan (Appendix B) addresses the methodology to be utilized to determine when to restrict or stop work for wet weather and the methods to mitigate impacts of construction activities in wet conditions. Section 2.18 takes into account the depth of rutting by reference to whether rutting may cause mixing of topsoil and subsoil, on a location-specific basis. "Stop work" will be implemented when recommended by the EI. Section 2.18 of the CMR Plan also addresses construction procedures and mitigative measures to minimize compaction in wet conditions.

Construction may result in concentration of large clasts near the surface in areas where rocky soil or near-surface bedrock is found. Locations along the proposed ROW where stony/rocky soils are found are listed in Appendix F. As detailed in Section 2.2 and in Appendix B, Keystone has proposed construction methods to ensure that soils along the proposed route do not become rockier as a result of pipeline construction. These methods include topsoil removal, segregation and redistribution after construction, and removal from the ROW and off-site disposition of excess rocks and rock fragments. In short, the CMR Plan states that Keystone will restore the ROW soils to approximately the same condition they were in prior to construction. Stones of a size and in quantities greater than were present before construction that are unearthed during construction will be removed from the ROW. Revegetation establishment may be slow where stony or rocky soils are crossed in North Dakota, as well as where near-surface bedrock is present in Missouri. Where shallow bedrock is found, blasting may be required. The potential impacts of blasting, and locations where it may be necessary, are described in Section 3.1.1.2.

During construction, potential equipment spills or leakage of fuels, lubricants, and coolants could affect soils. Keystone has proposed construction methods that will minimize these impacts. These procedures include proper storage and disposal of all hazardous and non-hazardous wastes generated during the construction process, use of controlled staging areas for refueling and hazardous material loading/unloading operations, provision of adequate spill-cleanup materials and equipment, and contingency plans for spills that may pose a danger to human health or the environment (see Section 2.23 and Appendix C). In the event that a spill does occur and causes irreparable damage to soil productivity, Keystone’s easement agreements with landowners would require Keystone to restore the productivity of the ROW and compensate landowners for demonstrated losses associated with decreased productivity resulting from pipeline operation. Impacts would be mitigated in compliance with applicable state cleanup standards. It is also possible that Keystone may discover previously contaminated soils during construction. In that event, Keystone would stop work immediately, contact the appropriate state agency, and consult with the agency with respect to an acceptable plan of action. While Keystone may elect to remediate areas of pre-existing contamination, Keystone is not responsible for such remediation and, in most cases, would develop a route deviation to avoid the contaminated area. Keystone also would notify the landowner if contamination is discovered.

Construction of the proposed pipeline would, in places, necessitate disruption of existing drain tile systems. In Section 5 of its CMR Plan (Appendix B), Keystone has committed to identifying and avoiding, repairing, or replacing drainage tiles that may be damaged by pipeline construction. Although these procedures should eliminate or compensate for any long-term impacts to drain tile function, unavoidable temporary impacts would be experienced during construction. Keystone’s easement agreements with landowners would require Keystone to restore the productivity of the ROW and compensate landowners for demonstrated losses associated with decreased productivity resulting from pipeline operation, including flooding that could occur because of temporary disruption of drain tile systems.

In modifying or constructing electric transmission line substations to support the Keystone Project, Western would implement the following mitigation measures for Soils and Sediments:

- Topsoil would be removed, stockpiled, and respread at all heavily disturbed areas not needed for maintenance access.
- Water bars or small terraces would be constructed across all ROW and access roads on hillsides to prevent water erosion and to facilitate natural revegetation.
- Erosion control measures would be implemented on disturbed areas, including areas that must be used for maintenance operations (access ways and areas around structures).

- When no longer required, construction roads would be restored to their original condition. Surfaces of construction roads would be scarified to facilitate natural revegetation, provide for proper drainage, and prevent erosion. If revegetation is required, Keystone would provide native seed mixes.

3.2.2.2 Operations Impacts

Operational maintenance of cleared areas may lead to increased erosion by wind or water. Maintenance activities may lead to localized compaction due to vehicular traffic. Incidental soil contamination due to minor leaks from maintenance vehicles also may occur. None of these impacts are expected to be extensive or severe. In the event that agricultural productivity is impaired, Keystone's easement agreements with landowners would require Keystone to restore the productivity of the ROW and compensate landowners for demonstrated losses associated with decreased productivity resulting from pipeline operation. Potential impacts to soil resources from the accidental release of transported oil are discussed in Section 3.13.5.2.

During scoping meetings prior to development of the EIS, a concern was expressed that soils may be prone to settling in the permanent ROW either during the Keystone Project's operational life or after its retirement. Keystone has committed to returning the ROW to its pre-construction topography. Once construction is complete, the permanent ROW would not be fenced; therefore, the same traffic that is experienced by neighboring soils would be experienced by those within the ROW. Consequently, differential settling is not expected. It is possible, however, that procedures to alleviate soil compaction implemented under Keystone's CMR Plan (Appendix B) may result in relatively excessive soil aeration and subsequent settling of soils within the ROW. In the first year after construction, Keystone would inspect the ROW to identify areas of erosion or settling. Subsequently, Keystone would monitor erosion and settling through aerial patrols, which are part of Keystone's Integrity Management Plan, and through landowner reporting. Landowner reporting would be facilitated through use of Keystone's toll-free telephone number, which would be made available to all landowners on the ROW. Landowner reporting also may be facilitated through contact with Keystone's regional offices.

Also expressed during scoping meetings was a concern that increased soil temperatures resulting from the relatively high temperature of the oil in the pipeline might cause decreases in soil moisture content. Keystone conducted a detailed analysis of the effects of pipeline operations on winter and summer soil temperatures along the proposed route, based on operating volumes of 435,000 and 591,000 bpd (TransCanada 2007c). They found that near-surface soil temperatures would continue to be influenced mainly by climate, with minimal effects from pipeline operations. For the lower operating volume, soil temperatures at 6 inches depth within 3 feet of the pipe centerline would be elevated by less than 5 ˚F in early March, less than 2 ˚F for the rest of the spring and early summer, and by negligible amounts from mid-June through late February. Increases in soil temperature at distances of 7 feet or more from the centerline would be negligible. For the operating volume of 591,000 bpd, the same general pattern was found; but the temperature elevation within 3 feet of the pipe centerline in early March would be approximately 5 ˚F, and the period of approximately 2-˚F temperature increase would begin in late December and extend to late August. Direct temperature effects on vegetation are expected to be minimal, and may even result in enhanced growth. Although decreases in soil moisture content within 3 feet of the pipe centerline may occur, no drought-prone soils have been identified along the proposed route, and any impacts to agricultural productivity would be addressed by Keystone's easement agreements that would require Keystone to restore the productivity of the ROW and compensate landowners for demonstrated losses associated with decreased productivity resulting from pipeline operation.

3.2.3 References

ENSR. 2006a. Keystone Pipeline Project Environmental Report. Updated November 15, 2006.

TransCanada. See TransCanada Keystone Pipeline, L.P.

TransCanada Keystone Pipeline, L.P. 2007c. Response to Data Request #2. Submitted to U.S. Department of State by TransCanada Keystone Pipeline, L.P. Application for Presidential Permit. April 4.

TransCanada Keystone Pipeline, L.P. 2007d. Filing #9. Submitted to U.S. Department of State by TransCanada Keystone Pipeline, L.P. Application for Presidential Permit. September 10, 2007

3.3 WATER RESOURCES

This section describes the groundwater and surface water resources in the Keystone Project area that could be affected by the proposed Keystone Project and evaluates the potential impacts that may result from Keystone Project implementation. The analysis focuses on major aquifers and wells in the vicinity of the pipeline route, streams and rivers that would be crossed, and reservoirs and larger lakes that are downstream of these crossings.

3.3.1 Environmental Setting

3.3.1.1 Groundwater

The proposed Mainline Project route is located within the glaciated Central Lowlands physiographic province. The Central Lowlands physiographic province is characterized by glacial terrain. Buried stream channels, sand and gravel deposits, and glacial till were deposited following glacial retreat. Shallow groundwater is often contained in the buried stream channels or in recently deposited stream alluvium. Deeper wells also have been constructed into bedrock aquifers; however, the presence of the pipeline and associated construction activities are not likely to affect deeper groundwater aquifers because of the presence of glacial till above these zones. Glacial till typically inhibits the downward migration of groundwater.

In the region of the proposed Keystone Project route, unconsolidated deposit aquifers in Quaternary-aged sediments are the most productive aquifers and are the source of water for thousands of shallow wells (Whitehead 1996). Shallow groundwater in this region is often used for agricultural, domestic, and industrial purposes. The Mainline Project route does not overlie any sole source aquifers, as designated by EPA Regions 5, 6, 7, and 8 (EPA 2007).

Major aquifers and wells in the vicinity of the proposed Mainline Project route are described below by state.

North Dakota

Aquifers

In North Dakota, aquifers present beneath the proposed ROW are generally in unconsolidated glacial and alluvial deposits. Major aquifers in the vicinity of the proposed route are described below.

The Pembina River Aquifer is a productive aquifer located in eastern Cavalier and western Pembina Counties, occupying approximately 20 square miles in the area of the proposed route. The aquifer is surficial and is hydraulically connected to the nearby Pembina River. The groundwater table lies at ground surface within the floodplain along the proposed route.

The Pembina Delta Aquifer contains well yields up to 50 gallons per minute (gpm) (Hutchinson 1977), depending on the location along the proposed route. Depth to the saturated zone in this aquifer is approximately 50 feet below ground surface (bgs).

In Walsh County, the Edinburg Aquifer encompasses approximately 13 square miles, and depths to the saturated zone range from approximately 20 to 40 feet near the proposed route (Downey 1973). Adjacent to the proposed route, the Fordville Aquifer is one of the largest and most used surficial (glacial drift) aquifers in the area. The aquifer contains an average saturated thickness of 20 feet, underlies approximately 33 square miles, and contains approximately 63,000 acre-feet of water in storage. The topography in this area lacks drainage features; consequently, the aquifer receives abundant recharge from precipitation. The Fordville Aquifer is unconfined and is hydraulically connected to the Forest River and tributaries (Downey 1973). During periods of high flow, the aquifer obtains recharge from the North Branch Forest River. Groundwater flow is generally southern toward the Forest River and tributaries. Aquifer test data indicate that the aquifer yields up to 500 gpm (Downey 1973).

Adjacent to the proposed route in Steele and Barnes Counties, the McVille Aquifer lies in a buried river valley. Depth to saturation is on average 80 feet and up to 300 feet in southern Steele County (Downey and Armstrong 1977). In northern Barnes County, near Lake Ashtabula, the McVille Aquifer obtains recharge by precipitation.

The McVille Aquifer, Sand Prairie Aquifer, and Englevale Aquifer are present beneath the proposed route in Ransom County. All of these aquifers consist of buried channel deposits. The Englevale Aquifer consists of buried sand and gravel deposits associated with the historical course of the Sheyenne River (Armstrong 1982). The depth to the saturated zone in the Englevale Aquifer ranges from the land surface up to 80 feet bgs. The thickness of sand and gravel is varied and averages 40 feet.

In Sargent County, the proposed route would cross the Spiritwood Aquifer (also hydraulically connected to the Englevale Aquifer), the Brampton Aquifer, and the Oakes Aquifer. All three of these aquifers are characterized by coarse-grained alluvial channels underlying glacial till. The total area occupied by these aquifers is estimated at 450 square miles (Armstrong 1982). Depth to the saturated zone is typically 10 to 30 feet. In the vicinity of the proposed route, aquifer thicknesses range from approximately 100 to 200 feet.

In Sargent and Dickey Counties, excavation activities for the proposed route may penetrate the Oakes Aquifer. The Oakes Aquifer water table lies at the ground surface and extends to the west to the James River (Armstrong 1980, Koch and Bradford 1976). Subsurface materials in the aquifer consist of deltaic and lacustrine deposits of sand and gravel interbedded with silt and clay. In general, over 40 feet of glacial till, silt, and clay isolate the Oakes Aquifer from the underlying Spiritwood Aquifer. Literature indicates that in some areas the two aquifers are hydraulically connected vertically (Armstrong 1980). The average thickness of the saturated zone is approximately 30 feet, ranging from 2 to 100 feet. The aquifer yields from a few to up to a maximum of 1,500 gpm.

Available water quality information for the aquifers described in North Dakota is presented in Table 3.3.1-1. Literature indicates that, in general, water from these aquifers is not contaminated; however, water from two wells screened in the Oakes Aquifer in North Dakota may contain elevated nitrate concentrations resulting from fertilizers (Armstrong 1980).

The majority of the aquifers described are surficial. Principal aquifers, defined as a regionally extensive aquifer or aquifer system that has the potential to be used as a source of potable water (USGS 2003), are not present beneath the proposed route in North Dakota. The closest principal aquifer is the Lower Cretaceous Aquifer that is located adjacent to the Red River of the North, approximately 30 miles to the east (TransCanada 2007b).

Table 3.3.1-2 lists the locations beneath the proposed Mainline Project ROW where water-bearing zones are expected to be present at less than 50 feet bgs.

TABLE 3.3.1-1
Groundwater Quality of Select Subsurface Aquifers

Aquifer	State	County	TDS (mg/L)	Other Water Quality Information
Pembina River	ND	Cavalier/Pembina	625	Calcium magnesium bicarbonate type
Pembina Delta	ND	Cavalier/Pembina	340	Calcium magnesium bicarbonate type
Edinburg	ND	Walsh	450–900	--
Fordville/Medford	ND	Walsh	300–600	Calcium sodium bicarbonate type
McVille	ND	Steele/Barnes/ Ransom	2,200	--
Englevale	ND	Ransom	225–4,670	Calcium bicarbonate type
Spiritwood	ND	Sargent	625–2,260	--
Brampton	ND	Sargent	532–1,290	Calcium bicarbonate type in upper groundwater zone
Oakes	ND	Sargent/Dickey	300–800	Calcium bicarbonate type
Oakes	SD	Brown/Marshall	NA	Saline in many locations
Altamont	SD	Clark	500–1,400	--
Floyd	SD	Clark/Beadle/Miner/ Hanson/McCook	1,500–3,200	Sodium, calcium, sulfate rich
Lower James - Missouri	SD	McCook/Hutchinson/ Yankton	775–3,300	Calcium and sulfate rich
High Plains	NE	Cedar/Wayne	200–600	--
Barneston limestone	KS	Marshall	410–2,500	Sulfate (30–1,540 mg/l)
Alluvial deposits	KS	Marshall	470–650	Sulfate (40–60 mg/l)
Terrace (glacial) deposits	KS	Marshall	190–1,070	Sulfate (20–320 mg/l), nitrate (0.40–97 mg/l)
Permian limestones	KS	--	1,000–3,000	--
Glacial drift aquifers	KS	Brown/Doniphan	250–600	--
Missouri River alluvium	KS	--	500–700	--
Glacial drift	MO	--	350–800	--
Deep sandstone/ limestone aquifers	MO	--	>10,000	--

TABLE 3.3.1-2
Water-Bearing Zones Less Than 50 Feet below Ground Surface beneath the Proposed Right-of-Way for the Keystone Mainline Project

Milepost	Description of Water-Bearing Zone
North Dakota	
7	Surficial aquifer
8–12	Surficial aquifer
12–16	Surficial aquifer
29–30	Surficial aquifer
119–121	Surficial aquifer
123–124	Surficial aquifer
193–196	Surficial aquifer
203–218	Surficial aquifer
South Dakota	
218–219	Surficial aquifer
225–227	Surficial aquifer
261–264	Surficial aquifer
266–270	Unconsolidated sand and gravel aquifers
278–290	Unconsolidated sand and gravel aquifers
296–309	Unconsolidated sand and gravel aquifers
342–349	Unconsolidated sand and gravel aquifers
358–371	Unconsolidated sand and gravel aquifers
377–380	Unconsolidated sand and gravel aquifers
390–393	Unconsolidated sand and gravel aquifers
413–438	Unconsolidated sand and gravel aquifers
Nebraska	
438-439	Unconsolidated sand and gravel aquifers
439-447	Unconsolidated sand and gravel aquifers
447–449	Unconsolidated sand and gravel aquifers
452–453	Unconsolidated sand and gravel aquifers
456–457	Unconsolidated sand and gravel aquifers
470–471	Unconsolidated sand and gravel aquifers
500–506	Unconsolidated sand and gravel aquifers
531–623	Unconsolidated sand and gravel aquifers, sandstone aquifers
627–629	Unconsolidated sand and gravel aquifers, sandstone aquifers
631–635	Unconsolidated sand and gravel aquifers, sandstone aquifers
649–652	Glacier drift aquifers
Kansas	
652-657	Glacier drift aquifers
656–659	Unconsolidated sand and gravel aquifers, alluvial aquifers, glacial drift aquifers
660–661	Glacial drift aquifers

TABLE 3.3.1-2
(Continued)

Milepost	Description of Water-Bearing Zone
Kansas (continued)	
662–688	Glacial drift aquifers
688–691	Unconsolidated sand and gravel aquifers, alluvial aquifers, glacial drift aquifers
692–709	Glacial drift aquifers
710–720	Glacial drift aquifers
721–722	Glacial drift aquifers
723–723	Glacial drift aquifers, unconsolidated sand and gravel aquifers
724–724	Glacial drift aquifers, unconsolidated sand and gravel aquifers
725–727	Glacial drift aquifers
727–739	Glacial drift aquifers
741–742	Glacial drift aquifers
743–747	Glacial drift aquifers, alluvial aquifers, unconsolidated sand and gravel aquifers
748–748	Alluvial aquifers, unconsolidated sand and gravel aquifers
751	Alluvial aquifers, unconsolidated sand and gravel aquifers
Missouri	
751	Alluvial aquifers, unconsolidated sand and gravel aquifers
760–763	Unconsolidated sand and gravel aquifers
771–772	Unconsolidated sand and gravel aquifers
839–847	Unconsolidated sand and gravel aquifers
857–859	Unconsolidated sand and gravel aquifers
860–863	Unconsolidated sand and gravel aquifers
867–869	Unconsolidated sand and gravel aquifers
870–875	Unconsolidated sand and gravel aquifers
954–963	Unconsolidated sand and gravel aquifers
969–972	Unconsolidated sand and gravel aquifers
974–978	Unconsolidated sand and gravel aquifers
981–983	Unconsolidated sand and gravel aquifers
1004–1023	Unconsolidated sand and gravel aquifers
1023.3	Sandstone and carbonate-rock aquifers
1024-1025	Unconsolidated sand and gravel aquifers
Illinois	
1025–1026	Unconsolidated sand and gravel aquifers
1045–1051	Unconsolidated sand and gravel aquifers
1053–1056	Unconsolidated sand and gravel aquifers
1058–1061	Unconsolidated sand and gravel aquifers
1069–1082	Unconsolidated sand and gravel aquifers

Note: Miles updated with information in TransCanada 2007d.

Wells

As presented in Appendix G, six public water supply (PWS) wells are located within 1 mile of the centerline of the pipeline. Five of these six wells are located in Pembina County, and one is in Walsh County; the wells are located in the general vicinity of each other, between MP 20 and 31 along the proposed route.

According to Keystone, no private wells are located within 100 feet of the Keystone Project ROW in North Dakota.

South Dakota

Aquifers

In South Dakota, shallow aquifers consist of glacially deposited sands and gravels or are present within glacially associated features such as buried lakes and channels. Shallow aquifers are present in alluvial deposits along stream channels. Deeper aquifers are also present in sandstone bedrock that is isolated from the surface or these shallow unconsolidated aquifers by glacial till.

In northern Brown and Marshall Counties, the James Aquifer underlies the proposed route. The aquifer ranges in thickness from approximately 10 to 100 feet. The aquifer is under artesian conditions. Depth to the saturated zone ranges from 100 to 190 feet bgs in the low-lying areas and as much as 580 feet bgs at higher land elevations (Koch 1975). The aquifer is composed mainly of buried outwash deposits and alluvium from an historical river. Deposits consist of sorted gravels, sand, and silt (Koch 1975). South of Marshall County, in northern South Dakota, underlying major aquifer zones are not present; the proposed route is located between the Tulare Aquifer and the Vermillion Aquifer (Geological Survey Program 2001, in ENSR 2006a). In Day and Clark Counties, near-surface aquifers in the glacial drift are generally not present; however, a number of small stream deposits containing near-surface aquifers are present in northwestern Day County.

In western Clark County and near the Spink County line, the proposed route would cross the underlying Altamont Aquifer along Foster Creek. This aquifer consists of a buried channel system and contains two saturated zones: from 2 to 10 feet bgs and from 35 to 80 feet bgs (Hamilton and Howells 1996). The average thickness of the Altamont Aquifer is approximately 22 feet.

The Floyd Aquifer (a confined aquifer) is present in southwestern Clark, Beadle, Miner, Hanson, and McCook Counties. According to cross-sections, depth to the saturated zone in Miner County is approximately 100 feet bgs near the county line. Near Carthage, the depth to the saturated zone ranges from the land surface to about 100 feet bgs (Koch and McGarvie 1988). Thickness of the Floyd Aquifer ranges between 4 and 100 feet. Also in this region, groundwater is present in the Niobrara Formation, a chalky shale bedrock aquifer. This aquifer is overlain by as much as 600 feet of glacial drift and shale in northern Miner County and as little as 60 feet in southern Miner County (Koch and McGarvie 1988).

The Lower James–Missouri Aquifer is present beneath the proposed route in southern McCook County, in the northern and southern ends of Hutchinson County and Yankton County (Lindgren and Hansen 1990). This aquifer is isolated from the surface by approximately 150 feet of till (Lindgren and Hansen 1990) and is approximately 50 to 75 feet thick in northern Hutchinson County and 130 feet thick in southern Hutchinson County. In Yankton County, depths to the saturated zone in this aquifer are generally 50 to 100 feet bgs; however, the depth to the saturated zone ranges from the land surface to 50 feet bgs at the James River, at Beaver Creek, and along the Missouri River (McCormick 2003).

Deeper aquifers in the region include the Dakota Formation Aquifer (sandstone) in Clark County, present at depths of 900 to 1,100 feet bgs (Jensen 2001c). The aquifer is isolated from the surface by thick deposits of glacial till and/or shale beds (Hamilton 1986). In Beadle County, the Codell Sandstone member of the Carlisle Shale is present at depths ranging from 350 to 500 feet. This aquifer is isolated from the surface by overlying glacial till and Niobrara Formation (Howells and Stephens 1968).

Available water quality information for the aquifers described in South Dakota is presented in Table 3.3.1-1. Literature indicates that, in general, water from these aquifers is not contaminated.

Principal aquifers, defined as a regionally extensive aquifer or aquifer system that has the potential to be used as a source of potable water (USGS 2003), are not present beneath the proposed route in South Dakota (TransCanada 2007b).

Table 3.3.1-2 lists the locations beneath the proposed Mainline Project ROW where water-bearing zones are expected to be present at less than 50 feet bgs.

Wells

As presented in Appendix G, no PWS wells are identified within 1 mile of the centerline of the pipeline in South Dakota. However, the pipeline passes within 0.04 mile of the Marshall County Source Water area and crosses a Zone B Aquifer Protection Area in Kingsbury County.

According to Keystone, no private wells are located within 100 feet of the Keystone Project ROW in South Dakota.

Nebraska

Aquifers

Mainline Project. In Nebraska, the uppermost (shallow) groundwater-bearing zones along the proposed pipeline route include glacial drift and alluvial aquifers.

In Cedar and Wayne Counties, undifferentiated Quaternary-aged sands and gravels form a portion of the High Plains Aquifer (a principal aquifer).

In Stanton County, shallow aquifers are present in Quaternary sands and gravels. The saturated zone may be at or near the land surface in stream valleys and near water body crossings; however, in upland settings, depth to the saturated zone ranges from 30 to 60 feet.

In Platte and Colfax Counties, Quaternary-aged aquifers are similar to those to the north in Stanton County. Depth to the saturated zone is generally 50 to 100 feet bgs. Approaching the Platte River and in the Platte River valley, the saturated zone is present at depths of 5 to 15 feet bgs (CSD 1958, in ENSR 2006a). Shallow alluvial aquifers are also present in depressional areas and the headwaters of the Big Blue River near Garrison and Ulysses.

To the south, groundwater is present in Butler, Seward, Saline, Jefferson, and Gage Counties in coarse-grained glacial deposits and stream-valley alluvium (Miller and Appel 1997). These unconsolidated deposits are Quaternary aged and collectively comprise the surficial aquifer in the area (Miller and Appel 1997).

Principal aquifers, defined as a regionally extensive aquifer or aquifer system that has the potential to be used as a source of potable water (USGS 2003), beneath the proposed route in Nebraska include the High Plains Aquifer and the Lower Cretaceous Aquifer. The High Plains Aquifer is present beneath the majority of the Mainline Project route in Nebraska. South of the Platte River, the Lower Cretaceous Aquifer is located adjacent and to the east, underlying the proposed route (TransCanada 2007b).

Available water quality information for these aquifers is presented in Table 3.3.1-1. Waters from the unconsolidated Quaternary deposits and the deeper Cretaceous bedrock sources generally appear to be of similar quality (Verstraeten et al. 1998). Additionally, the High Plains Aquifer contains a range of pH values of 6.1–8.8, specific conductance of 320–960 microSiemens per centimeter (µS/cm), and dissolved nitrate and nitrite concentrations of 4.2–7.6 milligrams per liter (mg/L). The Dakota Aquifer contains a range of pH values of 7.0–7.4, specific conductance of 550–570 µS/cm, and a dissolved nitrate and nitrite concentration of 0.26 mg/L. A wider variation and higher upper ranges of these values in the shallower water-bearing zones are likely due to irrigation.

Table 3.3.1-2 lists the locations beneath the proposed Mainline Project ROW where water-bearing zones are expected to be present at less than 50 feet bgs.

Cushing Extension. The proposed Cushing Extension route traverses southern Jefferson County for approximately 2.5 miles before crossing the state line into Kansas. In this area, shallow aquifers are present in glacial deposits and alluvium.

Principal aquifers, defined as a regionally extensive aquifer or aquifer system that has the potential to be used as a source of potable water (USGS 2003), in southern Jefferson County, Nebraska beneath the proposed Cushing Extension include the Lower Cretaceous Aquifer (TransCanada 2007b).

Table 3.3.1-3 lists the locations beneath the proposed Cushing Extension ROW where water-bearing zones are expected to be present at less than 50 feet bgs.

Wells

Mainline Project. As presented in Appendix G, nine well head protection areas of public water supply wells are present within 1 mile of the centerline of the proposed route in Wayne, Colfax, Seward, and Jefferson Counties. Of the nine wells, seven are present within 300 feet of the proposed ROW. These seven wells are located in Colfax, Seward, and Jefferson Counties.

According to Keystone, no private wells are located within 100 feet of the Keystone Project ROW in Nebraska.

Cushing Extension. Crystal Springs, located approximately 12 miles northwest of the beginning of the Cushing Extension route, supplies the Little Blue Public Water Project. This groundwater resource supplies potable water for several hundred domestic, livestock, and business purposes in Jefferson County and nearby Thayer County. Three public water supply wells are located 0.5 mile east of Fairbury, and six public water supply wells are located west of Fairbury; however, these water supply wells are approximately 11 miles west of the proposed Cushing Extension route.

No PWS wells within 1 mile of the centerline are present for the Cushing Extension route in Nebraska. Information regarding private wells within 100 feet of the Cushing Extension ROW is not available at this time

TABLE 3.3.1-3 Water-Bearing Zones Less Than 50 Feet below Ground Surface beneath the Proposed Right-of-Way for the Keystone Cushing Extension	
Milepost	**Description of Water-Bearing Zone**
Kansas	
6–20	Dakota aquifer
8–10	Alluvial aquifer
9–10	Unconsolidated sand and gravel aquifers
10–12	Alluvial aquifer
13–14	Alluvial aquifer
25–30	Dakota aquifer
31–32	Dakota Aquifer and sandstone aquifers
38–43	Dakota Aquifer and sandstone aquifers
49–51	Alluvial aquifer
68–70	Alluvial aquifer
74–77	Alluvial aquifer
112–114	Alluvial aquifer
116–119	Alluvial aquifer
154–160	Alluvial aquifer
160–161	Alluvial aquifer
163–164	Alluvial aquifer
180–181	Alluvial aquifer
185–185	Alluvial aquifer
189–191	Alluvial aquifer
196–213	Alluvial aquifer

Notes: The Cushing Extension route in Nebraska and Oklahoma does not contain water-bearing zones less than 50 feet below ground surface (Oklahoma Water Resources Board 2004, USGS. 2003)

Mileage updated with information in TransCanada 2007d.

Kansas

Aquifers

Mainline Project. In northeastern Kansas along the proposed Mainline Project route, shallow aquifers consist of alluvium and terrace deposits. The Barneston Limestone Formation also contains groundwater in northern Marshall County (Walters 1954).

In eastern Nemaha County, unconsolidated Pleistocene-age deposits of glacial drift and buried channel deposits are the best potential sources of groundwater (Ward 1974, in ENSR 2006a). Several high yield springs flow from these glacial deposits along the proposed route in Nemaha County (Maxwell Spring) and in Brown County (Sycamore Springs and Sun Springs) (Buchanan et al. 1998**).**

Unconsolidated sand and gravel deposits along the Big Blue River and the Missouri River drainages are used locally as water supply sources. Depth to groundwater is typically less than 10 feet bgs in these areas. Glacial drift aquifers yielding between 50 and 100 gpm remain the most significant source of water supply eastward through the Missouri River basin in Brown and Doniphan Counties, Kansas.

Deep groundwater aquifers in Kansas include the Barneston, Wreford, Beattie, Foraker, and Grenola Limestones. These formations generally yield on the order of 50 gpm to wells where fracture zones are present.

Principal aquifers, defined as a regionally extensive aquifer or aquifer system that has the potential to be used as a source of potable water (USGS 2003), are not present beneath the proposed route in Kansas. Shallow aquifers consist primarily of glacial drift aquifers (TransCanada 2007b).

Available water quality information for these aquifers is presented in Table 3.3.1-1.

Table 3.3.1-2 lists the locations beneath the proposed Mainline Project ROW where water-bearing zones are expected to be present at less than 50 feet bgs.

Cushing Extension. In Washington and Clay Counties in Kansas, the Great Plains Aquifer is exposed at the ground surface or underlies the shallow aquifers present in the area. The Great Plains Aquifer consists of semi-consolidated sedimentary rock and consists of two separate aquifers in Cretaceous-aged sandstone, separated by a confining unit composed of shale (Miller and Appel 1997). Saline water conditions are common in deeper zones; total dissolved solids (TDS) values typically range from 1,000 to 10,000 mg/L. In areas where the aquifer is shallower, or present at the surface, freshwater is present and of better quality.

South of Washington County to the Kansas state border, in Clay, Dickinson, Marion, and Cowley Counties, stream-valley aquifers are present in unconsolidated coarse-grained sand and gravel deposits. Larger river valleys, such as the Republican, Smoky Hill, Cottonwood, and Arkansas Rivers, contain the most productive aquifers. The most notable of these aquifers is the stream-valley aquifer along the Smoky Hill River, ranging laterally in width from 3 to 5 miles. The upper 30 to 50 feet of this aquifer contain freshwater and are highly productive (from 200 to 900 gpm). The stream-valley aquifers along the Cushing Extension in Kansas typically yield from 100 to 1,000 gpm and are hydraulically connected to the surface water in the streams. The water in these aquifers is calcium bicarbonate rich. TDS concentrations are typically less than 500 mg/L, although concentrations up to 7,000 mg/L are present in some areas.

From Clay County to Cowley County in Kansas, The Flint Hills Aquifer is oriented north to south and is present beneath the proposed Cushing Extension. The aquifer consists of Permian-aged limestones. This aquifer exhibits yields up to 1,000 gpm (MacFarlane 2000, in ENSR 2006a), is used for public water supplies, and is a source for numerous small springs. Karst features are common in the aquifer; sinkholes and springs are common along the proposed route. The freshwater aquifer is unconfined; water quality decreases in the deeper zones.

The Wellington Aquifer lies adjacent to the proposed Cushing Extension route several miles to the west, from Saline County to the Oklahoma border. In southwest Cowley County, a small portion of the aquifer would be crossed by the proposed route. The Wellington Aquifer lies within Permian-aged fractured shales resulting from dissolution of halite, gypsum, and anhydrite that underlies these shales. Groundwater conditions in the Wellington Aquifer, east of Salina, are saline and contain increased chloride and TDS concentrations. Sinkholes are common at the ground surface in this area.

Principal aquifers, defined as a regionally extensive aquifer or aquifer system that has the potential to be used as a source of potable water (USGS 2003), beneath and adjacent to the proposed route include the

Lower Cretaceous Aquifer and the High Plains Aquifer. The Lower Cretaceous Aquifer is located beneath the proposed Cushing Extension in Kansas, in Washington County and northern Clay County. South of Clay County to central Marion County, the Lower Cretaceous Aquifer is located west of the proposed route. South of Marion County, the High Plains Aquifer is located to the west, in the Arkansas River drainage area (TransCanada 2007b).

Table 3.3.1-3 lists the locations beneath the proposed Cushing Extension ROW where water-bearing zones are expected to be present at less than 50 feet bgs.

Wells

Mainline Project. As presented in Appendix G, only one public water supply well is located within 1 mile of the centerline of the proposed route. That well is in Doniphan County.

According to Keystone, no private wells are located within 100 feet of the Keystone Project ROW in Kansas.

Cushing Extension. As presented in Appendix G, 30 PWS wells are located within 1 mile of the centerline of the Cushing Extension. These wells are located in Washington, Dickinson, Butler, and Cowley Counties. Information regarding private wells within 100 feet of the Keystone Project ROW is not available at this time.

Missouri

Aquifers

Water-bearing zones in Missouri are present in glacially deposited sediments, similar to those described for Nebraska and Kansas. Water-bearing zones in the drift deposits consist of sand and gravel lenses that fill pre-glacial valleys cut into the underlying bedrock. Many of these aquifers drain to nearby surface water bodies or adjacent alluvium. The depth to groundwater follows topography, generally being deeper beneath ridges and shallower (approximately 15 to 20 feet) beneath valley floors (Fuller et al. 1957a, 1957b, 1957c, in ENSR 2006a).

Additionally, unconsolidated deposits of sand and gravel along stream channels (such as the Platte River, the Grand River, and the Chariton River drainages) are used locally as water supply sources. Depth to groundwater is typically less than 10 feet bgs in these areas.

Deeper bedrock aquifers along the proposed pipeline route in western and central Missouri consist of sandstones and limestones. Aquifers in this area include the Burlington-Keokuk formation, Ste. Genevieve Formation, Cotter and Kimmswick Formations, and Ardmore Formation (Fuller et al. 1957a, 1957b, 1957c, in ENSR 2006a). The quality of water from the bedrock formations is typically poor (TDS concentrations >10,000 mg/L). As a result, these deeper bedrock aquifers are not used as sources of drinking water or for other uses.

Karst features, including sinkholes, dissolution cavities, caves, and fissures, are present in the subsurface in central Missouri (Veni 2002, in ENSR 2006a). In Caldwell, Lincoln, and St. Charles Counties in Missouri, karst areas are present but are typically less than 1,000 feet long and less than 50 feet deep (Davies et al. 1984).

Regionally, the Mississippian Aquifer (a principal aquifer) is present beneath portions of the proposed Mainline Project route in eastern Missouri (TransCanada 2007b).

Available water quality information for these aquifers is presented in Table 3.3.1-1.

Table 3.3.1-2 lists the locations beneath the proposed Mainline Project ROW where water-bearing zones are expected to be present at less than 50 feet bgs.

Wells

As presented in Appendix G, 20 PWS wells are located within 1 mile of the proposed route in Chariton, Audrain, Lincoln, and St. Charles Counties in Missouri. Of the 20 wells, one well (well No. 14629) is located within 300 feet of the proposed ROW in Chariton County. According to Keystone, no private wells are located within 100 feet of the Keystone Project ROW in Missouri.

Illinois

Aquifers

In Illinois, shallow aquifers are present in the broad floodplain alluvium in the vicinity of the confluence of the Missouri and Mississippi Rivers. Large quantities of groundwater are withdrawn from terrace deposits of the Cahokia Formation, containing Quaternary-aged river deposits. In Madison County, these deposits extend from the Mississippi River for approximately 12 miles inland (Wehrman et al. 2003). Additional shallow sand and gravel aquifers are present in east-central Madison County, in central Bond County, and all along the Kaskaskia River alluvium in Fayette County (Wehrman et al. 2003).

In areas away from the river, aquifer zones less than 45 feet bgs are scattered along the proposed route in Illinois (Berg undated, in ENSR 2006a). Springs are present along or in the vicinity of the proposed route in eastern Madison County, southwestern Bond County, and Fayette County (Wetzel and Webb 2004). Karst features are not present along the Keystone Project route in westernmost Illinois (Davies et al. 1984).

The Mississippian Aquifer (a principal aquifer) is present beneath the far western portion of the proposed Mainline Project route in eastern Illinois, in the region beneath the confluence of the Illinois River, Mississippi River, and Missouri River (USGS 2003).

Table 3.3.1-2 lists the locations beneath the proposed Mainline Project ROW where water-bearing zones are expected to be present at less than 50 feet below ground surface (bgs).

Wells

As presented in Appendix G, 12 PWS wells within 200 feet of the proposed ROW are present. These wells are located in Madison County, between MP 1030 and 1035 of the proposed Mainline Project route**.**

According to Keystone, no private wells are located within 100 feet of the Keystone Project ROW in Illinois.

Oklahoma

Aquifers

The proposed Cushing Extension route passes through Kay, Noble, and Payne Counties in Oklahoma. Aquifers crossed by the route consist of stream valley alluvial terraces. Significant alluvial aquifers include those associated with the Salt Fork Arkansas River in Kay County and the Cimarron River in

Payne County. These aquifers consist of Quaternary-aged deposits of sand and gravel up to 100 feet in thickness and up to several miles wide. Both of these aquifers are high-yielding and are important water sources in Oklahoma (Ryder 1996, in ENSR 2006a); however, the Salt Fork Arkansas River and associated alluvial aquifers are saline and unsuitable for use (Ryder 1996, in ENSR 2006a).

The Arkansas River is located adjacent to and east of the proposed Cushing Extension in Oklahoma. The alluvium and alluvial terraces associated with the river can yield up to 600 gpm. The aquifer is up to 45 feet thick and 5 miles wide (Ryder 1996, in ENSR 2006a).

At the Cimarron River crossing near Cushing, Oklahoma (at the southern end of the proposed route), alluvial terrace deposits contain calcium-magnesium-bicarbonate rich water that is suitable for domestic and irrigation water supplies (Ryder 1996, in ENSR 2006a). TDS concentrations are 400 mg/L or less, and hardness is less than 200 mg/L.

Principal aquifers are not present beneath or adjacent to the Cushing Extension route in Oklahoma (TransCanada 2007b)

Wells

As presented in Appendix G, four PWS wells are located within 1 mile of the centerline of the Cushing Extension in Oklahoma. Three of these wells are located in Kay County, and one is located in Payne County. The well located in Payne County (MP 290) is present within 200 feet of the ROW.

According to Keystone, no private wells are located within 100 feet of the Keystone Project ROW in Oklahoma.

3.3.1.2 Surface Water

Surface water resources that would be crossed by the proposed pipeline are located within three water resource regions (Seaber 1994):

- Souris-Red-Rainy Rivers region (eastern North Dakota),
- Missouri River region (North Dakota, South Dakota, Nebraska, Kansas, and Missouri), and
- Upper Mississippi region (Missouri and Illinois).

Stream and river crossings are described below by state. Additionally, reservoirs and larger lakes that are present within 10 miles downstream of these crossings are listed in Appendix H. Levees, water control structures, and flood protection structures along the proposed route are presented in Appendix I.

North Dakota

Water Bodies Crossed

As presented in Appendix J, 167 water body crossings are proposed in North Dakota along the proposed Mainline Project route. According to evaluation of aerial photographs from 2006, water bodies greater than 100 feet in width in North Dakota include:

- Pembina River in Pembina County (approximately 125 feet wide, MP 7),
- Tongue River in Pembina County (approximately 50 to 100 feet wide, MP18), and
- Sheyenne River in Ransom County (approximately 50 to 100 feet wide, MP 169).

Major water bodies and reservoirs located within 10 miles downstream of proposed water crossings include Weiler Dam/Reservoir, Herzog Dam/Reservoir, Renwick Dam at Icelandic State Park, Charles C. Cook State Game Management Area and wetlands, Homme Lake, Pickart Lake, Lake Ashtabula, Lone Tree Lake, Lake Taayer, and three unnamed reservoirs. The approximate mileposts of these water bodies and their associated pipeline stream crossings are presented in Appendix H. Small glacially formed water bodies (ponds and potholes) also are present along the Mainline Project route through North Dakota.

Sensitive or Protected Water Bodies

The following streams and rivers along the Mainline Project route in North Dakota contain state water quality designations or use designations (Appendix J):

- Pembina River, Tongue River, and North Branch Park River in Pembina County;
- Middle Branch Forest River in Walsh County;
- North Branch Turtle River and Goose River in Nelson County; and
- Sheyenne River in Ransom County.

Impaired or Contaminated Water Bodies

Keystone identified that contamination has been documented in all seven of these sensitive or protected water bodies in North Dakota (Appendix K). Contamination or impairment in each of these water bodies includes unacceptable levels of at least one of the following parameters: sedimentation/siltation, total fecal coliform, biological indicators, TDS, and cadmium.

Water Supplies

Along the proposed ROW in North Dakota, municipal water supplies are largely obtained from groundwater sources.

South Dakota

Water Bodies Crossed

The proposed route crosses 92 water bodies in South Dakota (Appendix J). Based on evaluation of 2006 aerial photographs, the water bodies that would be crossed that are greater than 100 feet in width include:

- James River in Yankton County (approximately 150 feet wide, MP 424), and
- Missouri River in Yankton County, South Dakota and Cedar County, Nebraska (approximately 1,400 feet wide, MP 438). Marne Creek and a river side channel are adjacent to the proposed river crossing on the northern side.

Gavins Point Dam, a major control structure on the Missouri River, is located about 3 miles upstream of the proposed crossing of the Missouri River in South Dakota.

Major water bodies and reservoirs located within 10 miles downstream of proposed water crossings in South Dakota include Renzienhausen Slough, Amsden Lake, Logan Dam/Reservoir, Fordham Reservoir, an unnamed reservoir, Lake Iroquois, Twin Lakes, and Lake Eli. The approximate mileposts of these water bodies and their associated pipeline stream crossings are presented in Appendix H. Small glacially formed water bodies (ponds, potholes, and small lakes) are also present along the Keystone Project route through South Dakota.

Sensitive or Protected Water Bodies

Seven of the water bodies that would be crossed by the proposed route in South Dakota have been assigned water use classifications (Appendix J). Several of these water bodies are crossed more than once. These water bodies include:

- Pearl Creek in Beadle County;
- Redstone Creek and Rock Creek in Miner Counties;
- Wolf Creek in Hanson, McCook, and Hutchinson Counties; and
- James River, Beaver Creek, and the Missouri River in Yankton County at the border with Nebraska.

Impaired or Contaminated Water Bodies

Keystone identified 10 impaired water bodies that would be crossed by the pipeline route in South Dakota (Appendix K). Specific contamination or impairment was documented in only five of these ten water bodies, including:

- Two streams in Day Country (unnamed and mud Creek flowing from Amsden Lake) are impaired due to nutrient levels,
- Wolf Creek in McCook and in Hutchinson Counties is impaired due to ammonia,
- The James River in Yankton County is impaired due to total suspended solids and turbidity.

Water Supplies

Along the proposed Mainline Project ROW in South Dakota, municipal water supplies are largely withdrawn from groundwater sources.

Nebraska

Water Bodies Crossed

Mainline Project. The proposed route crosses 208 water bodies in Nebraska (Appendix J). Based on evaluation of 2006 aerial photographs water bodies crossed that are greater than 100 feet in width include:

- Missouri River in Yankton County, South Dakota and Cedar County, Nebraska (approximately 1,400 feet wide, MP 438),
- Elkhorn River in Stanton County (approximately 225 feet wide, MP 505),
- Shell Creek in Colfax County (approximately 125 feet wide, MP 535), and
- Platte River in Colfax and Butler Counties (approximately 1,500 feet wide, MP 544).

The Platte River at the proposed pipeline crossing is a highly braided stream that is approximately 1,500 feet wide. The river basin contains sandy floodplain deposits up to 3 miles wide. The Elkhorn River is a meandering river that contains numerous oxbows and sloughs along the floodplain.

Major water bodies and reservoirs located within 10 miles downstream of proposed water crossings in Nebraska include Whitetail State Wildlife Management Area, and five unnamed reservoirs. The approximate mileposts of these water bodies and their associated pipeline stream crossings are presented in Appendix H.

Cushing Extension. The Cushing Extension runs from the Mainline Project route approximately 2.5 miles in Nebraska to the Kansas border. Six water body crossings are proposed in Nebraska along the Cushing Extension (Appendix J). These water bodies consist of small intermittent streams and tributaries to the Little Blue River.

No water bodies and reservoirs are located within 10 miles downstream of proposed water crossings in Nebraska along the Cushing Extension.

Sensitive or Protected Water Bodies

Mainline Project. The six water bodies that would be crossed by the proposed pipeline corridor in Nebraska that have been assigned water use classifications (Appendix J) include:

- Missouri River in Cedar County,
- Elkhorn River in Stanton County,
- Platte River in Colfax County,
- Big Blue River in Seward County, and
- West Fork Big Blue River and Swan Creek in Saline County.

Cushing Extension. None of the water body crossings in Nebraska along the Cushing Extension have been assigned a state water use classification.

Impaired or Contaminated Water Bodies

Mainline Project. Keystone identified 19 water crossings on its list of impaired water bodies in Nebraska (Appendix K). Specific contamination or impairment was documented in six of these water bodies including unacceptable levels of at least one of the following parameters: fecal coliform, dieldrin, polychlorinated biphenyls (PCBs), dissolved oxygen (DO), and selenium.

Cushing Extension. Contamination was not documented in any of the water body crossings in Nebraska along the Cushing Extension.

Water Supplies

Mainline Project. Along the proposed Mainline Project ROW in Nebraska, municipal water supplies are largely obtained from groundwater sources.

Cushing Extension. Information regarding the locations of surface water supplies along the Cushing Extension has been requested from appropriate federal, state, and local agencies; however, the information is not yet available. Keystone has committed that they would obtain and evaluate the locations of public surface water supplies along the Cushing Extension prior to initiation of construction activities to ensure the protection of these water resources.

Kansas

Water Bodies Crossed

Mainline Project. The proposed pipeline corridor would cross 203 water bodies in Kansas (Appendix J). Based on an evaluation of 2006 aerial photographs, water bodies that would be crossed that are greater than 100 feet in width include:

- Big Blue River in Marshall County (approximately 200 feet wide, MP 661); and
- Missouri River in Doniphan County, Kansas and Buchannan County, Missouri (approximately 800 feet wide, MP 751). A system of channel controls (levees and jetties) is located along the west bank, and levees and ditches are located along the east bank

.No major water bodies or reservoirs are located within 10 miles downstream of proposed water crossings in Kansas, as presented in Appendix H.

Cushing Extension. The proposed pipeline corridor would cross 172 water bodies in Kansas along the Cushing Extension (Appendix J).

Based on an evaluation of 2006 aerial photographs, water bodies that would be crossed that are greater than 100 feet in width include:

- Little Blue River in Washington County (approximately 175 feet wide, MP 4),
- Smoky Hill River in Dickinson County (approximately 125 feet wide, MP 77), and
- Arkansas River in Cowley County (approximately 600 feet wide, MP 206).

Major water bodies and reservoirs located within 10 miles downstream of proposed water crossings in Kansas include Milford Lake, Herrington Reservoir, Marion Lake Reservoir, and Kaw Lake (Appendix H). Additionally, Turtle Creek Lake, a very large reservoir, is located approximately 15 to 20 miles downstream of the proposed route.

Sensitive or Protected Water Bodies

Mainline Project. Thirteen of the water bodies and tributaries that would be crossed by the proposed pipeline corridor in Kansas have been assigned water use classifications (Appendix J). Several of these water bodies would be crossed more than once. These water bodies include:

- Deer Creek, North Elm Creek and its tributaries, and Robidoux Creek in Marshall County;
- Wildcat Creek, Nemaha River, and Harris Creek in Nemaha County;
- Walnut Creek, Wolf River Middle and South Forks, Buttermilk Creek, and Squaw Creek in Brown County; and
- Halling Creek, Rock Creek, and Brush Creek in Doniphan County.

Cushing Extension. Thirty of the water bodies and their associated tributaries that would be crossed by the proposed pipeline corridor in Kansas along the Cushing Extension have been assigned water use classifications (Appendix J). Several of these water bodies would be crossed more than once. These water bodies include:

- Little Blue River, Mill Creek, and Coon Creek in Washington County;
- Carter Creek, West Fancy Creek, Lincoln Creek, and Republican River in Clay County;
- Chapman Creek, Smoky Hill River, Carry Creek, and West Branch Lyon Creek in Dickinson County;
- Mud Creek, Cottonwood River, Spring Branch, Catlin Creek, and Doyle Creek in Marion County;
- East Branch Whitewater River, Fourmile Creek, Rock Creek, Spring Branch, Whitewater River, Badger Creek, Dry Creek, Fourmile Creek, and Eightmile Creek in Butler County; and
- Polecat Creek, Stewart Creek, Crooked Creek, Spring Creek, and Arkansas River in Cowley County.

Impaired or Contaminated Water Bodies

Mainline Project. Keystone identified 23 water crossings along the proposed Mainline Project pipeline corridor on its list of impaired water bodies in Kansas; however, specific contamination or impairment was documented in only 15 of these water bodies (Appendix K). Contamination or impairment in these water bodies includes unacceptable levels of at least one of the following parameters: biological impairment, atrazine, beryllium, copper, and pH.

Cushing Extension. Keystone identified 32 water crossings along the Cushing Extension on its list of impaired water bodies in Kansas; however, specific contamination or impairment was documented in only 19 of these water bodies (Appendix K). Contamination in each of these water bodies includes unacceptable levels of at least one of the following parameters: atrazine, fecal coliform, sulfate, chloride, zinc, pH, and biological impairment.

Water Supplies

Mainline Project. Along the proposed route from Jefferson County, Nebraska eastward through Kansas, surface water reservoirs and groundwater wells supply municipal requirements.

In general, Marshall County depends on both surface water and groundwater resources for water supply. Marysville, which historically had depended on Blue River surface water, now obtains its water supply from a wellfield southeast of town along a tributary. This wellfield is located approximately10 miles south of the proposed Blue River crossing. Oketo obtains municipal water from a well on the Big Blue River floodplain. Summerfield and Axtell also are supplied by wells (Walters 1954).

Cushing Extension. Table 3.3.1-4 provides information on surface water intakes within 5 miles of the Cushing Extension ROW in Kansas. There are no surface water intakes within 1 mile of the centerline (TransCanada 2007c).

Missouri

Water Bodies Crossed

The proposed pipeline corridor would cross 560 water bodies in Missouri. Based on an evaluation of 2006 aerial photographs, water bodies greater than 100 feet in width include:

- Missouri River in Doniphan County, Kansas and Buchannan County, Missouri (approximately 800 feet wide, MP 749);
- Platte River in Buchanan County (approximately 200 feet wide, MP 765);
- Grand River in Carroll County (approximately 250 feet wide, MP 843);
- Chariton River in Chariton County (approximately 280 feet wide, MP 865);
- Cuivre River in Lincoln County (approximately 150 feet wide, MP 974);
- Cuivre River in St. Charles County (approximately 225 feet wide, MP 986); and
- Mississippi River in St. Charles County, Missouri and Madison County, Illinois (approximately 2,200 feet wide, MP 1025).

TABLE 3.3.1-4
Surface Water Intakes within 5 Miles of the Keystone Cushing Extension in Kansas

Milepost	County	Approximate Distance from Centerline (miles)
91–100	Marion	2.0
112–122	Marion	1.5
158–166	Butler	2.0
163–173	Butler	1.5
204–210	Cowley	4.8

In this section of the Mainline Project, many levees or embankments are associated with the Missouri River and Mississippi River drainage areas and along the Grand River, Chariton River tributaries, and the Cuivre River (Appendix I). Abandoned stream meanders and ponds are present in the area at the confluence of the Mississippi and Missouri Rivers. At the state border, the proposed route would cross the Mississippi River.

Major water bodies and reservoirs located within 10 miles downstream of proposed water crossings in Missouri include New Mud Lake/Old Mud Lake, Smithville River, five fishing areas, Cut-Off Lake, Middletown Lake, Horseshoe Lake, Mud Lake, and Graus Lake (Appendix H).

Sensitive or Protected Water Bodies

Twenty-eight of the water bodies and tributaries that would be crossed by the proposed pipeline corridor in Missouri have been assigned water use classifications (Appendix J). Several of these water bodies would be crossed more than once. These water bodies include:

- Missouri River, Contrary Creek, Pigeon Creek, and Platte River in Buchanan County;
- Castile Creek, Little Platte River, and Shoal Creek in Clinton County;
- Brush Creek, Crabapple Creek, and Mud Creek in Caldwell County;
- Big Creek and Grand River in Carroll County;
- Salt Creek, Lake Creek, Mussel Fork, and Chariton River and forks, and Puzzle Creek in Chariton County;
- Long Branch, Youngs Creek, Bean Branch, Littleby Creek, and West Fork Cuivre River in Audrain County;
- Brush Creek in Montgomery County;
- Bear Creek and Cuivre River in Lincoln County; and
- Peruque Creek, Dardenne Creek, and Mississippi River in St. Charles County, Missouri.

Impaired or Contaminated Water Bodies

Keystone identified 53 water crossings on its list of impaired water bodies in Missouri; however, specific contamination or impairment was documented in only 13 of these water bodies (Appendix K). Contamination or impairment in each of these water bodies includes unacceptable levels of at least one of the following parameters: chlordane, PCBs, fecal coliform, biological oxygen demand (BOD), volatile suspended solids (VSS), metals, and sediment.

Water Supplies

Along the proposed route eastward through Missouri, surface water reservoirs and groundwater wells are used for municipal requirements.

St. Joseph, Andrews County, is supplied by a groundwater wellfield several miles north of the city (Water-Technology-net 2006). This wellfield would not be crossed by the proposed pipeline, which would be routed south of the city.

Illinois

Water Bodies Crossed

The proposed pipeline corridor would cross 85 water bodyies along the Mainline Project in Illinois. No water body crossings are associated with the 1-mile-long lateral pipeline to the Wood River Terminal. Based on an evaluation of 2006 aerial photographs, water bodies greater than 100 feet in width include:

- Mississippi River in St. Charles County, Missouri and Madison County, Illinois (approximately 2,200 feet wide, MP 1025);
- East Fork Silver Creek/Silver Lake in Madison County (approximately 300 feet wide, MP 1050);

- Hurricane Creek in Fayette County (approximately 100 feet wide, MP 1074); and
- Kaskaskia River in Fayette County (approximately 100 feet wide, MP 1076).

At the state border, the Mississippi River is approximately 2,100 feet wide at the proposed crossing location. The proposed route lies in the floodplain for the next 5 miles. Approximately 3 miles of floodplain associated with the Kaskaskia River would be crossed, upstream from Carlyle Lake (a 26,000-acre multi-purpose lake) and 5 miles east of the proposed eastern end of the pipeline route.

Major water bodies and reservoirs located within 10 miles downstream of proposed water crossings in Illinois include Highland Silver Lake, an unnamed reservoir, and Carlyle Lake (Appendix H). In addition to stream crossings, a number of lakes and ponds are located along the proposed pipeline route.

Sensitive or Protected Water Bodies

Eleven of the water bodies that would be crossed in Illinois have been assigned water use classifications (Appendix J). These water bodies include:

- Mississippi River, Indian Creek, Cahokia Canal, Mooney Creek, Silver Creek, Sugar Fork, Sand Creek, and Silver Lake in Madison County;
- Shoal Creek and Little Beaver Creek in Bond County; and
- Kaskaskia River in Fayette County.

Impaired or Contaminated Water Bodies

Keystone identified 14 water crossings in Illinois along the Mainline Project route that are on its list of impaired water bodies; however, specific contamination or impairment was documented in only seven of these water bodies (Appendix K). Contamination or impairment in each of these water bodies includes unacceptable levels of at least one of the following parameters: fecal coliform, DO, sediments and siltation, total suspended solids, pH, total nitrogen, total petroleum hydrocarbons (TPH), aldrin, chlordane, manganese, aquatic algae, and silver. Additionally, chlordane and PCBs were reported at the proposed Illinois/Missouri border crossing of the Mississippi River.

Water Supplies

Along the proposed route eastward through Illinois, surface water reservoirs and groundwater wells are used for municipal requirements. Municipalities also are served by Highland Silver Lake and Carlyle Lake in Illinois.

Oklahoma

Water Bodies Crossed

The proposed pipeline corridor would cross 88 water bodies in Oklahoma. Based on an evaluation of 2006 aerial photographs, water bodies greater than 100 feet in width include:

- Salt Fork Arkansas River in Kay County (approximately 300 feet wide, MP 243), and
- Cimarron River in Payne County (approximately 800 feet wide, MP 289).

Major water bodies and reservoirs located within 10 miles downstream of proposed water crossings in Oklahoma include Kaw Lake and Sooner Lake. The approximate mileposts of these water bodies and their associated pipeline stream crossings are presented in Appendix H.

Sensitive or Protected Water Bodies

Two water bodies that would be crossed a total of 10 times in Oklahoma have been assigned water use classifications (Appendix J). These water bodies are:

- Bois d'Arc Creek and Salt Fork Arkansas River in Kay County.

Impaired or Contaminated Water Bodies

Keystone identified 13 water crossings on its list of impaired water bodies in Oklahoma; however, specific contamination or impairment was documented in only six of these water bodies (Appendix K). Contamination or impairment in each of these water bodies includes unacceptable levels of at least one of the following parameters: sulfates, pathogens, turbidity, lead, nitrates, and unknown toxicity.

Water Supplies

Table 3.3.1-5 provides information on surface water intakes within 5 miles of the Cushing Extension ROW in Oklahoma. There are no surface water intakes within 1 mile of the centerline (TransCanada 2007c).

TABLE 3.3.1-5
Surface Water Intakes within 5 Miles of the Keystone Cushing Extension in Oklahoma

Milepost	County	Approximate Distance from Centerline (miles)
246–255	Noble/Pawnee	2.5
280–289	Payne/Lincoln	1.5

3.3.2 Potential Impacts and Mitigation

3.3.2.1 Groundwater

Construction Impacts

Potential impacts to groundwater during construction activities include:

- Groundwater quality degradation during or after construction resulting from disposal of materials and equipment, or vehicle spills and leaks;
- Temporary increases in total suspended solids (TSS) concentrations where the water table is disturbed during trenching and excavation activities (drawdown of the aquifer is possible where dewatering is necessary);
- Increased surface water runoff and erosion from clearing vegetation in the ROW; and
- Degradation of groundwater quality because of blasting.

Spills and Leaks

Overall, it is not anticipated that groundwater quality would be affected by construction activities. Many of the aquifers present in the subsurface beneath the proposed route are isolated by the presence of glacial till, which characteristically inhibits downward migration of water and contaminants into these aquifers; however, shallow or near-surface aquifers are also present beneath the proposed route.

Temporary fueling stations would be used to refuel construction equipment. To prevent releases, fuel tanks or fuel trailers would be placed within secondary containment structures equipped with impervious membrane liners.

Implementation of procedures outlined in Sections 2 and 3 of Keystone's CMR Plan (Appendix B) would ensure that (1) contractors would be prepared to respond to any spill incident; and (2) all contaminants would be contained and not allowed to migrate into the aquifer during construction activities, regardless of the depth of the underlying aquifer.

TSS Concentrations

Although there is potential for dewatering of shallow groundwater aquifers and potential changes in groundwater quality (such as increases in TSS concentrations) during trenching and excavation activities, these changes are expected to be temporary. Shallow groundwater aquifers generally recharge quickly because they are receptive to recharge from precipitation and surface water flow.

Runoff and Erosion

Implementation of measures described in Section 4.5 of Keystone's CMR Plan (Appendix B) would reduce erosion and control surface water runoff during vegetation clearing in the ROW.

Blasting

Where required for pipeline construction, blasting has the potential to affect groundwater resources. Keystone would prepare a blasting plan for any locations where blasting would be necessary. Prior to construction, Keystone would file its blasting plan with applicable state or local jurisdictions, where required. Keystone's blasting plan would include provisions to avoid impacts to groundwater and to incorporate post-blasting testing for water wells within 150 feet of the centerline to ensure that water wells are not negatively affected by blasting activities.

Operations Impacts

During the life of the Keystone Project, potential minor short-term groundwater quality degradation would be possible from equipment and vehicle spills or leaks.

Routine operation and maintenance is not expected to affect groundwater resources; however, if a crude oil release occurred, crude oil could migrate into subsurface aquifers and into areas where these aquifers are used for water supplies.

Keystone's ERP describes actions to be taken in the event of a crude oil release or other accident (Appendix C). As noted earlier, the ERP would be finalized prior to initiation of construction. The risk of crude oil releases from the proposed pipeline and an assessment of the potential environmental impacts associated with crude oil releases is addressed in detail in Section 3.13 and Appendix L.

3.3.2.2 Surface Water

Construction Impacts

Potential impacts on surface water resources during construction activities include:

- Temporary to long-term surface water quality degradation during or after construction from disposal of materials and equipment or vehicle spills and leaks,
- Temporary increases in TSS concentrations and increased sedimentation during stream crossings,
- Temporary to short-term degradation of aquatic habitat from in-stream construction activities,
- Changes in channel morphology and stability caused by channel and bank modifications,
- Temporary reduced flow in streams and potential other adverse effects during hydrostatic testing activities, and
- Temporary degradation of surface water quality and alteration of aquatic habitat from blasting activities within or adjacent to stream channels.

Spills and Leaks

Implementation of the procedures in Section 3 in Keystone's CMR Plan (Appendix B) would minimize the potential for spills and leaks to affect surface water resources. During all construction activities, all refueling would be conducted at least 100 feet away from all surface water bodies.

Stream Crossings and In-Stream Construction Activities

Depending on the type of stream crossing, one of four construction methods would be used: the open-cut wet method, the flume method, the dam-and-pump method, or the HDD method. For the most part, open-cut wet crossings are planned for most water bodies along the proposed pipeline route, except for locations where dam-and-pump or flume methods are technically feasible and warranted by resource-specific sensitivities. However, the HDD process would be employed for the following 13 crossings (ENSR 2007i, TransCanada 2007d):

- Pembina River, North Dakota (MP 7);
- South Branch Park River, North Dakota (MP 42);
- Missouri River, South Dakota/Nebraska (MP 438);
- Elkhorn River, Nebraska (MP 505);
- Platte River, Nebraska (MP 544);
- Missouri River, Kansas/Missouri (MP 751);
- Chariton River. Missouri (MP 865);
- Cuivre River, Missouri (MP 974);
- Cuivre River, Missouri (MP 986);
- Mississippi River, Missouri/Illinois (MP 1025);
- Silver Creek, Illinois (MP 1050);
- Hurricane Creek, Illinois (MP 1074); and
- Kaskaskia River, Illinois (MP 1076).

Keystone has committed to the use of the general river crossing procedures and mitigations included in the CMR Plan (Appendix B), and additional mitigations that have been agreed to as a result of this environmental analysis. The CMR Plan would be revised prior to construction to incorporate these additional mitigations, as well as any other mitigations or conditions that COE imposes during final permit negotiations.

For water body crossings greater than 100 feet in width where HDD would be used, no mitigation would be necessary because HDD does not involve direct contact with the surface water body, stream channel bed, or stream channel banks. HDD is not proposed to cross the following streams with widths greater than 100 feet along the Keystone Mainline Project route:

- Tongue River, North Dakota (MP 18);
- Sheyenne River, North Dakota (MP 169);
- James River, South Dakota (MP 424);
- Shell Creek, Nebraska (MP 533);
- Big Blue River, Kansas (MP 661);
- Platte River, Missouri (MP 765); and
- Grand River, Missouri (MP 843).

The following four water bodies along the Cushing Extension route would be crossed using HDD (ENSR 2007i, TransCanada 2007d):

- Republican River, Kansas (MP 51);
- Arkansas River, Kansas (MP 206);
- Salt Fork Arkansas River, Oklahoma (MP 243); and
- Cimarron River, Oklahoma (MP 289).

The Smoky Hill River in Kansas (MP 77) is greater than 100 feet wide but would be crossed by open-cut methods.

Additionally, the following streams contain important fisheries resources:

- West Fork of the Big Blue River, Nebraska (MP 593), and
- Turkey Creek, Nebraska (MP 600).

Where the HDD method is not used for major water body crossings or for water body crossings where important fisheries resources could be impacted, Keystone will submit a site-specific CMR Plan. Water bodies where a site specific CMR Plan would be employed include: Tongue River-North Dakota (MP 18), Sheyenne River-North Dakota (MP 167 [Note: Keystone is considering using HDD for this crossing]), James River-South Dakota (MP 424), Shell Creek-Nebraska (MP 533), West Fork of the Big Blue River-Nebraska (MP 593), Turkey Creek-Nebraska (MP 600), Big Blue River-Kansas (MP 665), Platte River-Missouri (MP 765), Grand River-Missouri (MP 843), Little Blue River-Kansas (MP 4), Smoky Hill River-Kansas (MP 77). Prior to commencing any stream crossing construction activities, Keystone would be required to obtain a permit under Section 404 of the Clean Water Act through the COE . Keystone also would be required to obtain a Section 401 water quality certification as per state regulations.

Construction activities for open-cut wet crossings involve excavation of the channel and banks. Construction equipment and soils excavated thus would be in direct contact with surface water flow. The degree of impact from construction activities depends on flow conditions, stream channel conditions, and sediment characteristics. For the types of crossings listed below, Keystone would implement the following measures on a site-specific basis:

- **Contaminated or Impaired Waters.** Keystone would work with the applicable regulatory agency to develop specific crossing and sediment handling procedures and would provide DOS with a copy of that consultation.
- **Water Bodies within 1 Mile Upstream of HCAs.** Water body crossing methods would be developed in consultation with the applicable permitting agencies for each crossing. Keystone would not necessarily implement dry crossing or other measures for construction.
- **Sensitive/Protected Water Bodies.** Keystone would develop specific construction and crossing methods in conjunction with COE permitting and USFWS consultation. The appropriate method of crossing these water bodies would be determined by COE or USFWS, as applicable.

Implementation of measures in Section 7.4 of Keystone's CMR Plan (Appendix B) would reduce adverse impacts resulting from open-cut wet crossings. All contractors would be required to follow the identified procedures to limit erosion and other land disturbances. Keystone's CMR Plan describes the use of buffer strips, drainage diversion structures, sediment barrier installations, and clearing limits—as well as procedures for water body restoration at crossings. See Section 2.2.3 for a discussion of Keystone's proposed water body crossing methods.

Following completion of water body crossings, water body banks would be restored to preconstruction contours, or at least to a stable slope. Banks would be seeded with native vegetation, mulch, or erosion control fabric, where possible. Additional erosion control measures would be installed, if necessary, in accordance with permit requirements. Erosion control measures can themselves cause adverse environmental impacts, however. Geomorphic assessment of water body crossings could provide significant cost savings and environmental benefits. The implementation of appropriate measures to protect pipeline crossings from channel incision and channel migration can reduce the likelihood of washout-related emergencies, reduce maintenance frequency, limit adverse environmental impacts, and—in some cases—improve stream conditions.

Therefore, all water body crossings would be assessed by qualified personnel in the design phase of the Project with respect to the potential for vertical channel degradation and lateral channel migration. The level of assessment for each crossing would vary based on the professional judgment of the qualified design personnel. Additionally, personnel would consult with each COE office with jurisdiction and with state resource agencies prior to making these determinations. The pipeline would be installed as necessary to address any hazards identified by the assessment. The pipeline would be installed at the design crossing depth for at least 15 feet beyond the design lateral migration zone, as determined by qualified personnel. The design of the crossings also would include the specification of appropriate stabilization and restoration measures.

In accordance with the CWA, all construction activities would comply with the NPDES permit and other applicable permitting; this includes following procedures in Keystone's Storm Water Pollution Prevention Plan, which would be required at the permitting stage.

Hydrostatic Testing

Water used for hydrostatic testing would be obtained from nearby surface water resources. These sources include streams, rivers, and privately owned reservoirs. Keystone has identified 32 surface water sources that could supply water for hydrostatic testing along the Mainline Project route and nine surface water sources along the Cushing Extension route, depending on the flows at the time of testing and the sensitivity of the individual water bodies for other uses (TransCanada 2007d. These sources are listed in Section 8.2 of Keystone's CMR Plan (see Appendix B) and Keystone's Hydrostatic Test Plan (also in Appendix B). Whenever possible, hydrostatic test manifolds would be located more than 100 feet away from wetlands and riparian areas.

All surface water resources utilized for hydrostatic testing would be approved by state or federal agencies prior to initiation of any testing activities. Planned withdrawal rates for each water resource would be evaluated and approved by these agencies prior to testing. No resource would be utilized for hydrostatic testing without receipt of applicable permits. As stated in Keystone's CMR Plan, Keystone will be responsible for obtaining required water analyses prior to any filling and discharging operations associated with hydrostatic testing.

Water withdrawal methods described in Section 8.0 of Keystone's CMR Plan (Appendix B) would be implemented and followed. These procedures include screening of intake hoses to prevent the entrainment of fish or debris, keeping the hose at least 1 foot off the bottom of the water resource, prohibiting the addition of chemicals into the test water, and avoiding discharging any water that contains visible oil or sheen following testing activities.

Hydrostatic test water would be discharged such that applicable federal, state, and local environmental standards are met. Discharged water would meet the water quality standards imposed by the discharge permits for the permitted discharge locations. Keystone's CMR Plan incorporates additional measures designed to minimize the impact of hydrostatic test water discharge, including regulation of discharge rate, the use of energy dissipation devices, channel lining, and installation of sediment barriers as necessary (see Appendix B, Section 8.4). Section 3.7 discusses additional mitigation measures necessary to protect fisheries.

Blasting

Where required for pipeline construction, blasting has the potential to affect surface water resources. Keystone would prepare a blasting plan for any locations where blasting would be necessary. Prior to construction, Keystone would file its blasting plan with applicable state or local jurisdictions, where required. Post-blasting testing procedures for surface water resources would be incorporated if required by any applicable state or local jurisdiction.

Connected Actions

Power Lines and Substations. Measures listed below would be implemented by servicing electric cooperatives or their contractors in the modification or construction of electric transmission lines:

- Construction activities would be performed by methods that prevent entrance, or accidental spillage, of solid matter contaminants, debris, any other objectionable pollutants and wastes into streams, flowing or dry watercourses, lakes, and underground water sources. Such pollutants and waste include, but are not restricted to refuse, garbage, cement, concrete, sanitary waste, industrial waste, radioactive substances, oil and other petroleum products, aggregate processing tailing, mineral salts, and thermal pollution.
- Excavated material or other construction materials would not be stockpiled or deposited near or on stream banks, lake shorelines, or other watercourse perimeters where they can be washed away by high water or storm runoff or can in any way encroach upon the actual watercourse itself. Best Management Practices would be utilized to ensure sediments and other pollutants do not enter any water body

Operations Impacts

Minor temporary to short-term surface water quality degradation is possible from maintenance equipment and vehicle spills or leaks. Although washout-related spills are not considered a part of routine operations, in the event that channel migration or streambed degradation would threaten to expose the pipeline, protective activities such as reburial or bank armoring would be implemented. These activities could result in temporary short-term or long-term adverse impacts to water resources. In its CMR Plan (Appendix B), Keystone has committed to a minimum depth of cover of 5 feet below the bottom of all water bodies, maintained for a distance of at least 15 feet to either side of the edge of the water body. However, in Keystone's Frequency and Volume Analysis Report (DNV 2007) the likelihood of washout-related spills for cover depths less than or equal to 10 feet is estimated to be twice that for cover greater than 10 feet. Channel incision of several meters is typical of many Midwestern streams and rivers; such incision would expose and threaten pipelines buried 5 feet (1.5 meters) below the channel bed. Channel incision could sufficiently increase bank heights to destabilize the slope, ultimately widening the stream. Sedimentation within a channel could also trigger lateral bank erosion, such as the expansion of a channel meander opposite a point bar. Bank erosion rates could exceed several meters per year. Maintaining an adequate burial depth for pipelines in a zone that extends 15 feet (5 meters) beyond either side of the active stream channel may necessitate bank protection measures that would increase both maintenance costs and environmental impacts.

As stated in Section 3.3.2.2, all water body crossings would be assessed by qualified personnel in the design phase of the Project with respect to the potential for vertical channel degradation and lateral channel migration. The level of assessment for each crossing would vary based on the professional judgment of the qualified design personnel. The pipeline would be installed as determined to be necessary to address any hazards identified by the assessment. The pipeline would be installed at the design crossing depth for at least 15 feet beyond the design lateral migration zone as determined by qualified personnel. The design of the crossings would also include the specification of appropriate stabilization and restoration measures

Although spills are not considered a part of routine operations, there is the possibility of a crude oil release occurring with the potential to affect surface water bodies. Keystone has submitted a draft ERP (Appendix C) that describes actions to reduce the potential for crude oil releases to affect surface water and groundwater resources. Potential impacts on water resources from accidental crude oil spills are described in Section 3.13.

As described in Section 3.13, control valves would be installed on both sides of larger perennial streams for the Mainline Project and the Cushing Extension pipelines. In the event of a crude oil release, the presence of valves and enactment of Keystone's ERP and spill containment measures would reduce the potential for any crude oil releases to affect surface water resources.

Connected Actions

Wood River Refinery Expansion. As part of ConocoPhillips' Wood River Refinery expansion, the daily average flows at outfalls 001 and 002 would increase from 7.93 and 7.78 mgd to 10.97 and 10.82 mgd, respectively. These outfalls discharge treated process, sanitary, and stormwater. Outfall 003 discharges stormwater and fire water intermittently, and outfalls 004–008 discharge storm water intermittently. The wastewater treatment system would be upgraded, including construction of a new activated sludge unit. The sludge unit would include a preanoxic denitrification zone that would convert nitrates to nitrogen gas.

Due to the increased flow and production associated with these modifications, load limits in the NPDES permit were increased and phosphorous limits were added (phosphorous additives are necessary for biological activity). These changes were made to existing discharge points (outfalls 001–008). The locations of these outfalls are described in Table 3.3.3-1.

TABLE 3.3.3-1
Locations of Outfalls at the Conoco Phillips' Wood River Refinery

Outfall	Receiving Stream	Latitude	Longitude
001	Mississippi River	38 deg 50' 25" N	90 deg 06' 15" W
002	Mississippi River	38 deg 50' 24" N	90 deg 06' 08" W
003	Unnamed Ditch (tributary to Little Grassy Lake/Mississippi River)	38 deg 49' 40" N	90 deg 04' 03" W
004	Mississippi River	38 deg 50' 35" N	90 deg 06' 14" W
005	Mississippi River	38 deg 50' 25" N	90 deg 06' 14" W
006	Mississippi River	38 deg 50' 27" N	90 deg 06' 14" W
007	Mississippi River	38 deg 50' 13" N	90 deg 06' 15" W
008	Mississippi River	38 deg 50' 13" N	90 deg 06' 15" W

All discharges (outfalls) are located in Madison County, Illinois. The Mississippi River and the unnamed ditch at these locations are classified as General Use streams and do not contain biological stream characterization ratings. According to the IDNR WIRT system, there are no threatened or endangered species inhabiting either of the receiving streams.

The Mississippi River (receiving discharge from outfalls 001, 002, and 004–008) is identified on the Section 303(d) list of impaired waterbodies. Impairment includes PCBs, manganese, and fecal coliform.

An Antidegradation Assessment was conducted pursuant to the Illinois Pollution Control Board regulation for antidegradation. The regulation can be found at 35 Ill. Adm. Code 302.105 (Antidegradation Standard).

Although daily average flows at outfalls 001 and 002 would increase, wastewater treatment improvements are planned as part of the modifications. It was concluded as part of the assessment that both phosphorous and nitrogen would decrease. Biological oxygen demand is not likely to increase. Although sulfate and chloride are expected to increase, because of abundant dilution in the Mississippi River, it was concluded that these parameters would be quickly diluted to below the water quality standard.

The assessment concluded that the proposed upgrades would result in attainment of water quality standards and that all existing uses of the surface water bodies would be fully protected.

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3.4 WETLANDS

3.4.1 Environmental Setting

Wetlands are areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of wetland vegetation typically adapted for life in saturated soil conditions (Cowardin et al. 1979). Many wetlands in eastern North Dakota and South Dakota are isolated depressional wetlands of the Prairie Potholes region. This formerly glaciated landscape is pockmarked with an immense number of potholes that fill with melted snow and rain in spring. The hydrology of prairie pothole marshes varies from temporary to permanent; concentric circle patterns of submerged and floating aquatic plants generally form in the middle of the pothole, with bulrushes and cattails growing closer to shore, and wet sedge marshes next to the upland areas.

Wetlands throughout Nebraska, Kansas, Oklahoma, Missouri, and Illinois include isolated depressional wetlands associated with the Rainwater Basin wetlands, glaciated kettle-hole wetlands, and sinkhole wetlands, as well as isolated floodplain wetlands such as oxbows (naturally caused by changes in river channel configuration or artificially caused by levee construction or other diversions). States also contain wetlands with direct connections to minor and major drainages of the Red River basin in North Dakota and the Mississippi River basin in all seven states.

Wetland functions provided by both isolated and connected wetlands include surface water storage (flood control), shoreline stabilization (wave damage protection/shoreline erosion control), stream flow maintenance (maintaining aquatic habitat and aesthetic appreciation opportunities), groundwater recharge (some types replenish water supplies), sediment removal and nutrient cycling (water quality protection), supporting aquatic productivity (fishing, shell fishing, and waterfowl hunting), production of trees (timber harvest), production of herbaceous growth (livestock grazing and haying), production of peaty soils (peat harvest), and provision of plant and wildlife habitat (hunting, trapping, plant/wildlife/nature photography, nature observation, and aesthetics) (USFWS 2007).

Wetland types in the Keystone Project area (Table 3.4.1-1) were identified based on photo interpretation of 1:6,000-scale aerial photography dated 2006. Some wetlands have been verified by ground surveys, in accordance with direction provided by COE staff in the Omaha, Kansas City, St. Louis, and Tulsa districts, during 2005 to 2007 for the Keystone Mainline Project and Cushing Extension routes and for contractor yards, pipe storage yards, and access roads. Small linear features such as windbreaks were included with the surrounding land use when less than 50 feet wide; and perennial, intermittent, and ephemeral streams were identified at a resolution of about 10 feet wide. Descriptions of plant communities typical of emergent, forested, and scrub-shrub wetland types within the pipeline ROW are presented in Section 3.5 (Table 3.5.1-1).

As part of federal regulatory requirements under the Clean Water Act (CWA), inventories of wetlands and other waters of the United States involving field surveys are required to evaluate the potential for adverse effects to waters of the United States along the proposed pipeline ROW and other associated areas of disturbance related to Project construction. Information gathered during the inventories will be used to complete notification and permitting requirements under Sections 401 and 404 of the CWA, as managed by COE and applicable state agencies.

TABLE 3.4.1-1
Description of Wetlands Communities in the Keystone Project Area

Wetland Type	National Wetland Inventory Code	Description
Palustrine emergent wetland	PEM	Emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. All water regimes are included except subtidal and irregularly exposed. In areas with relatively stable climatic conditions, emergent wetlands maintain the same appearance year after year. In other areas, such as the prairies of the central United States, violent climatic fluctuations cause them to revert to an open water phase in some years. Emergent wetlands are known by many names, including marsh, meadow, fen, prairie pothole, and slough. (See Table 3.5.1-1 for habitat types within this group for the Keystone Project area.)
Palustrine forested wetland	PFO	Forested wetlands are characterized by woody vegetation that is 6 meters tall or taller. All water regimes are included except subtidal. Forested wetlands are most common in the eastern United States and in those sections of the West where moisture is relatively abundant, particularly along rivers and in the mountains. Forested wetlands normally possess an overstory of trees, an understory of young trees or shrubs, and a herbaceous layer.
Palustrine scrub-shrub wetland	PSS	Scrub-shrub wetlands include areas dominated by woody vegetation less than 6 meters tall. Vegetation forms found in this wetland include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. All water regimes are included except subtidal. Scrub-shrub wetlands may represent a successional stage leading to a forested wetland or they may be relatively stable communities.
Riverine-perennial water	R2	The lower perennial subsystem includes low-gradient rivers and streams (riverine system) where some water flows throughout the year and water velocity is slow. The upper perennial subsystem includes high-gradient rivers and streams where some water flows throughout the year, water velocity is high, and there is little floodplain development. Perennial streams have flowing water year-round during a typical year, the water table is located above the stream bed for most of the year, groundwater is the primary source of water, and runoff is a supplemental source of water.
Riverine-intermittent water	R4	The intermittent subsystem includes channels where the water flows for only part of the year, when groundwater provides water for stream flow. When water is not flowing, it may remain in isolated pools or surface water may be absent. Runoff is a supplemental source of water.
Open water	OW	Open water habitats are rivers, streams, lakes, and ponds (riverine, lacustrine, and palustrine systems) where, during a year with normal precipitation, standing or flowing water occurs for a sufficient duration to establish an ordinary high-water mark. Aquatic vegetation within the area of standing or flowing water is either non-emergent, sparse, or absent. Vegetated shallows are considered as open waters.

Sources: Cowardin et al. 1979, COE 2002.

The Keystone Project crosses four COE districts:

- Mainline Project: Omaha District (North Dakota, South Dakota, and Nebraska), Kansas City District (Kansas and Missouri), St. Louis District (eastern Missouri and Illinois), and Tulsa District (Oklahoma).
- Cushing Extension: Omaha District (Nebraska), Kansas City District (Kansas), and Tulsa District (Oklahoma).

Each of these districts has slightly different surveying and permitting requirements. Keystone will continue consultations with the COE district offices and state resource agencies to develop the specific wetland and waters of the United States information required for permit applications.

3.4.2 Wetlands of Special Concern or Value

Depressional wetlands of the Prairie Potholes region in North Dakota and South Dakota support large numbers of migrating and nesting waterfowl, as do depressional wetlands associated with the Rainwater Basin in Nebraska (EPA 2007). USFWS has negotiated wetland easements with private landowners throughout North Dakota and South Dakota to protect depressional wetlands of the Prairie Potholes region. Wetlands are protected by the USFWS easement under 16 USC 668dd(c). USFWS will oppose any pipeline project activity that results in easement wetlands being filled or drained as an easement violation under 16 USC 668dd(c). The USFWS' procedure with any cooperating entity such as Keystone is to restore the ponding capability of the wetland(s). If fill material remains in any easement wetland(s) after the pipeline is installed, USFWS will work with Project personnel to remove the fill material from the basin. If a wetland(s) no longer ponds water after the pipeline is installed, USFWS will work with Project personnel to improve soil compaction and water retention capability in that wetland(s). If measures taken to restore the ponding capability of a wetland(s) are unsuccessful, USFWS will require Keystone to locate a similar wetland and execute an exchange for a replacement wetland(s) according to USFWS guidance. Karst or sinkhole wetlands and forested floodplains associated with the Missouri, Mississippi, and Arkansas Rivers also are wetland habitats of conservation concern due primarily to their rarity (sinkhole wetland) and previous destruction (floodplain forest) (EPA 2007). No fen wetlands have been identified within the Keystone Project ROW.

The COE Riverlands Management Area at the Mississippi River and Missouri River confluence in St. Charles County, Missouri, contains a 2,500-acre prairie marsh restoration site that has been designated as an Important Bird Area by the Audubon Society. This restoration area is designed as a flow-through wetland, with controlled water levels, and supports an abundant array of waterfowl, shorebirds, and raptors. The Missouri Confluence State Park is also located within this region where the Missouri River joins the Mississippi River; wetlands restoration projects, including tree plantings to restore floodplain forests, also have been established within this park. The Missouri Department of Natural Resources considers this region to be a Conservation Opportunity Area (COA) and has designated the region at the confluence in St. Charles and Lincoln Counties in Missouri as the Mississippi/Missouri Confluence COA. The COE will require additional specific mitigation and management practices should construction be unavoidable through the Mississippi/Missouri Confluence COA or Carlyle Lake WMA. For any habitat losses within these areas COE will require additional compensatory mitigation. After discussions with the COE Riverlands Office and local landowners, Keystone has routed the pipeline west of the Confluence Point State Park to a location that avoids COE property adjacent to the County Highway. Keystone has routed the pipeline through the Confluence Point State Park in such a way as to avoid an area of recently planted hardwood trees and an area where decurrent false aster are located.

3.4.3 Potential Impacts and Mitigation

Wetland and riverine communities that would be affected by the proposed Keystone Project, including valve, meter, ancillary facilities, contractor yards, pipe storage yards, and access roads, are summarized in Tables 3.4.3-1, 3.4.3-2, and 3.4.3-3. The delineation of jurisdictional and non-jurisdictional wetlands will occur prior to the issuance of required permits. Wetland impacts that affect non-jurisdictional wetlands under the CWA Section 404 would not require mitigation. A table of all water body crossings is located in Appendix J. The table includes the location of crossing by state and approximate milepost, and the water body use and state classification where applicable.

Emergent wetlands are the most common type of wetland community that would be crossed by the pipeline routes, followed by forested wetlands, intermittent and perennial streams, open water, and scrub-shrub wetlands (Table 3.4.3-3). Most (70 percent, 284 of 403 acres)of the emergent wetland habitats are located in the Prairie Pothole region of North Dakota and South Dakota. Most of the forested wetlands (72 percent, 58 of 80 acres) are riparian woodlands of the Missouri and Arkansas drainages in Chariton, St. Charles, and Lincoln counties in Missouri and Clay, Dickinson, and Butler counties in Kansas. Other wetland communities that would be disturbed by the Keystone Project include perennial riverine wetlands (37 acres), intermittent riverine wetlands (107 acres), and scrub-shrub wetlands (32 acres).

Table 3.4.3-4 summarizes wetlands that would be crossed by the Mainline Project and Cushing Extension that are considered important for conservation—as indicated by inclusion within state forestlands, state park lands, conservation areas and reserves, wetland easements, and wildlife areas. A total of 95.4 miles of conservations lands with 8.8 miles of wetlands would be crossed by the pipelines. Conservation wetlands include perennial and intermittent riverine wetlands, emergent wetlands, forested wetlands, and scrub-shrub wetlands.

Construction of the pipeline primarily would affect wetlands and their functions during and immediately following construction activities, but permanent changes also are possible. Wetlands function as natural sponges that trap and slowly release surface water, rain, snow melt, groundwater, and flood waters. Trees, root mats, and other wetland vegetation slow flood waters and distribute them over the floodplain. Wetlands at the margins of lakes, rivers, and streams protect shorelines and stream banks against erosion. Wetland plants hold the soil in place with their roots, absorb the energy of waves, and break up the flow of stream or river currents. This combined water storage and braking can lower flood heights and reduce erosion. The water-holding capacity of wetlands reduces flooding and prevents water logging of crops. Preserving and restoring wetlands, together with other water retention, can help or supplant flood control otherwise provided by expensive dredge operations and levees (EPA 1995, in USFWS 2007).

TABLE 3.4.3-1
Wetlands Estimated Impact Summary for the Keystone Mainline Project

Wetland Classification [a]	Length of Wetlands Crossed (miles)	Wetland Area Affected during Construction (acres) [a]	Wetland Area Affected by Operations (acres) [a]	Number of Crossings
North Dakota				
Palustrine emergent wetland	13.7	187	73	318
Palustrine forested wetland	0.3	4	2	9
Palustrine scrub-shrub wetland	0.0	0	0	0
Riverine-perennial water	0.1	2	1	7
Riverine-intermittent water	0.5	9	4	157
Open water	0.1	1	<1	3
North Dakota subtotal	*14.7*	*203*	*80*	*494*
South Dakota				
Palustrine emergent wetland	6.9	97	39	184
Palustrine forested wetland	0.0	0	0	2
Palustrine scrub-shrub wetland	0.1	1	<1	2
Riverine-perennial water	0.1	1	<1	8
Riverine-intermittent water	0.3	5	2	82
Open water	0	0	0	2
South Dakota subtotal	*7.4*	*104*	*41*	280
Nebraska				
Palustrine emergent wetland	1.5	19	8	56
Palustrine forested wetland	0.2	3	1	8
Palustrine scrub-shrub wetland	0.1	3	1	5
Riverine-perennial water	0.2	3	1	21
Riverine-intermittent water	1.0	13	5	178
Open water	0.1	1	1	5
Nebraska subtotal	*3.1*	*43*	*17*	*273*
Kansas				
Palustrine emergent wetland	0.4	10	3	27
Palustrine forested wetland	0.3	8	3	9
Palustrine scrub-shrub wetland	0.0	0	0	2
Riverine-perennial water	0.2	3	1	32
Riverine-intermittent water	0.7	10	3	157
Open water	0.2	3	1	10
Kansas subtotal	*1.8*	*34*	*11*	*237*

TABLE 3.4.3-1 (Continued)				
Wetland Classification [a]	Length of Wetlands Crossed (miles)	Wetland Area Affected during Construction (acres) [a]	Wetland Area Affected by Operations (acres) [a]	Number of Crossings
Missouri				
Palustrine emergent wetland	1.9	29	10	113
Palustrine forested wetland	2.6	40	14	41
Palustrine scrub-shrub wetland	0.5	7	3	11
Riverine-perennial water	0.9	13	5	80
Riverine-intermittent water	2.0	30	18	449
Open water	0.4	6	2	47
Missouri subtotal	*8.3*	*125*	*45*	*741*
Illinois				
Palustrine emergent wetland	1.3	28	11	19
Palustrine forested wetland	0.7	15	6	16
Palustrine scrub-shrub wetland	1.4	30	12	10
Riverine-perennial water	0.2	3	1	24
Riverine-intermittent water	0.8	10	4	37
Open water	0.1	1	<1	12
Illinois subtotal	*4.5*	*87*	*34*	*118*
Mainline Project				
Palustrine emergent wetland	25.7	380	148	717
Palustrine forested wetland	4.1	70	26	85
Palustrine scrub-shrub wetland	2.1	31	12	30
Riverine-perennial water	1.7	25	9	172
Riverine-intermittent water	5.3	78	29	1,060
Open water	0.9	12	4	79
Mainline Project total	**39.8**	**596**	**228**	**2,143**

[a] Acres disturbed on a temporary basis (permanent right-of-way width plus temporary workspace) during construction, and acres disturbed (maintained) on a permanent basis during operation of the proposed Keystone Project.

Source: TransCanada 2007d, Tables 3.5-8 and 4.2-3.

TABLE 3.4.3-2 Wetlands Estimated Impact Summary for the Keystone Cushing Extension				
Wetland Classification	**Length of Wetlands Crossed (miles)**	**Wetland Area Affected during Construction (acres) [a]**	**Wetland Area Affected by Operations (acres) [a]**	**Number of Crossings**
Nebraska				
Palustrine emergent wetland	0.0	0	0	0
Palustrine forested wetland	0.0	0	0	0
Palustrine scrub-shrub wetland	0.0	0	0	0
Riverine-perennial water	0.0	0	0	3
Riverine-intermittent water	0.0	0	0	3
Open water	0.0	0	0	1
Nebraska subtotal	*0*	*0*	*0*	*7*
Kansas				
Palustrine emergent wetland	1.1	14	5	47
Palustrine forested wetland	0.8	10	4	11
Palustrine scrub-shrub wetland	0.0	0	0	2
Riverine-perennial water	0.3	9	4	43
Riverine-intermittent water	0.7	21	8	106
Open water	0.1	3	1	14
Kansas subtotal	*3.0*	*57*	*22*	*223*
Oklahoma				
Palustrine emergent wetland	0.7	9	4	36
Palustrine forested wetland	0	0	0	3
Palustrine scrub-shrub wetland	0.1	1	<1	1
Riverine-perennial water	0.2	3	1	33
Riverine-intermittent water	0.5	8	3	32
Open water	0.1	1	<1	8
Oklahoma subtotal	*1.6*	*22*	*8*	*113*
Cushing Extension				
Palustrine emergent wetland	1.8	23	9	83
Palustrine forested wetland	0.8	10	4	14
Palustrine scrub-shrub wetland	0.1	1	<1	3
Riverine-perennial water	0.5	12	5	79
Riverine-intermittent water	1.2	29	11	141
Open water	0.2	4	1	23
Cushing Extension total	**4.6**	**79**	**30**	**343**

[a] Acres disturbed on a temporary basis (permanent right-of-way width plus temporary workspace) during construction, and acres disturbed (maintained) on a permanent basis during operation of the proposed Keystone Project.

Source: TransCanada 2007d, Tables 3.5-8 and 4.2-3.

TABLE 3.4.3-3 Wetlands Estimated Impact Summary for the Keystone Project				
Wetland Classification	Length of Wetlands Crossed (miles)	Wetland Area Affected during Construction (acres) [a]	Wetland Area Affected by Operations (acres) [a]	Number of Crossings
Mainline Project				
Palustrine emergent wetland	25.7	380	148	717
Palustrine forested wetland	4.1	70	26	85
Palustrine scrub-shrub wetland	2.1	31	12	30
Riverine-perennial water	1.7	25	9	172
Riverine-intermittent water	5.3	78	29	1,060
Open water	0.9	12	4	79
Mainline Project subtotal	*39.8*	*596*	*228*	*2,143*
Cushing Extension				
Palustrine emergent wetland	1.8	23	9	83
Palustrine forested wetland	0.8	10	4	14
Palustrine scrub-shrub wetland	0.1	1	<1	3
Riverine-perennial water	0.5	12	5	79
Riverine-intermittent water	1.2	29	11	141
Open water	0.2	4	1	23
Cushing Extension subtotal	*4.6*	*79*	*30*	*343*
Keystone Project				
Palustrine emergent wetland	27.5	403	157	800
Palustrine forested wetland	4.9	80	30	99
Palustrine scrub-shrub wetland	2.2	32	12	33
Riverine-perennial water	2.2	37	14	251
Riverine-intermittent water	6.5	107	40	1,201
Open water	1.1	16	5	102
Keystone Project total	**44.4**	**675**	**258**	**2,486**

[a] Acres disturbed on a temporary basis (permanent right-of-way width plus temporary workspace) during construction, and acres disturbed (maintained) on a permanent basis during operation of the proposed Keystone Project.

Source: TransCanada 2007d, Tables 3.5-8 and 4.2-3.

TABLE 3.4.3-4
Wetlands of Special Interest or Conservation Concern for the Keystone Project

Mileposts	Miles Crossed	Name	Ownership	Wetland Types	Wetlands Crossed
MAINLINE PROJECT					
North Dakota					
6.8–7.7	0.8	Tetrault Woods State Forest	North Dakota Forest Service	R2	0.02
76.2–77.2	1.0	U.S. Fish and Wildlife Service (USFWS) wetland easement	Private	PEM	0.05
79.3–79.9	0.5	USFWS wetland easement	Private	R4, PEM	0.11
80.4–82.5	2.1	USFWS wetland easement	Private	PEM	0.15
86.0–86.7	0.7	USFWS wetland easement	Private	PEM	0.07
87.2–88.3	1.0	USFWS wetland easement	Private	R4, PEM	0.01
89.7–90.1	0.4	USFWS wetland easement	Private	PEM	0.09
91.9–92.9	1.0	USFWS wetland easement	Private	PEM	0.09
98.0–98.5	0.6	USFWS wetland easement	Private	PEM	0.06
101.1–101.4	0.3	USFWS wetland easement	Private	R4	0.01
109.8–110.3	0.5	USFWS wetland easement	Private	None	
110.8–111.3	0.5	USFWS wetland easement	Private	R4, PEM	0.01
117.5–118.0	0.5	USFWS wetland easement	Private	R4, PEM	0.02
119.1–119.4	0.3	USFWS wetland easement	Private	None	
122.0–122.6	0.5	USFWS wetland easement	Private	None	
127.9–128.1	0.3	USFWS wetland easement	Private	R4	0.01
128.2–128.4	0.2	USFWS wetland easement	Private	None	
137.6–138.4	0.8	USFWS wetland easement	Private	None	
139.2–140.3	1.1	USFWS wetland easement	Private	PEM	0.10
169.9–170.9	1.0	USFWS wetland easement	Private	R4, PEM	0.05
171.2–171.6	0.4	USFWS wetland easement	Private	PEM	0.07
172.8–173.6	0.8	USFWS wetland easement	Private	R4, PEM	0.05
173.9–174.0	0.1	USFWS wetland easement	Private	None	
174.7–175.3	0.5	USFWS wetland easement	Private	PEM	0.03
176.3–176.8	0.5	USFWS wetland easement	Private	PEM	0.03
178.5–178.8	0.3	USFWS wetland easement	Private	PEM	0.05

TABLE 3.4.3-4
(Continued)

Mileposts	Miles Crossed	Name	Ownership	Wetland Types	Wetlands Crossed
MAINLINE PROJECT(CONTINUED)					
North Dakota (Continued)					
179.1–179.8	0.7	USFWS wetland easement	Private	None	
182.4–184.1	1.8	USFWS wetland easement	Private	R4, PEM	0.31
185.1–185.4	0.3	USFWS wetland easement	Private	None	
187.4–187.9	0.5	USFWS wetland easement	Private	PEM	0.04
188.5–190.0	1.5	USFWS wetland easement	Private	PEM	0.04
South Dakota					
218.8–219.9	1.0	USFWS wetland easement	Private	PEM	0.10
311.7–312.2	0.5	USFWS wetland easement	Private	PEM	0.02
317.6–318.1	0.5	USFWS wetland easement	Private	R4, PEM	0.04
320.1–320.6	0.5	USFWS wetland easement	Private	PEM	0.16
322.7–323.2	0.5	USFWS wetland easement	Private	PEM	0.10
326.8–328.0	1.2	USFWS wetland easement	Private	PEM	0.59
332.0–332.1	0.1	USFWS wetland easement	Private	None	
333.7–334.2	0.5	USFWS wetland easement	Private	PEM	0.32
335.2–336.2	1.0	USFWS wetland easement	Private	None	
339.2–339.3	0.1	USFWS wetland easement	Private	PEM	0.27
340.3–341.4	1.0	USFWS wetland easement	Private	R4, PEM	0.21
350.6–351.3	0.7	USFWS wetland easement	Private	PEM	0.14
358.0–358.1	0.1	Game production area	South Dakota Game, Fish and Parks Department	None	
365.5–366.1	0.7	USFWS wetland easement	Private	PEM	0.03
368.8–369.3	0.5	USFWS wetland easement	Private	None	
380.2–380.6	0.4	USFWS wetland easement	Private	PEM	0.07
387.1–387.3	0.3	USFWS wetland easement	Private	PEM	0.22
387.6–387.8	0.3	USFWS wetland easement	Private	PEM	0.09
395.0–395.3	0.3	USFWS wetland easement	Private	PEM	0.06
435.8–437.5		Missouri National Recreational River	Private and designated Wild and Scenic	R2, PEM	0.30

TABLE 3.4.3-4
(Continued)

Mileposts	Miles Crossed	Name	Ownership	Wetland Types	Wetlands Crossed
MAINLINE PROJECT (CONTINUED)					
Missouri					
Unknown		USDA Wetlands Reserve Program easement	Private		
750.9–755.2	4.1	Western Missouri River Alluvial Plain/ Missouri River Loess Woodland Conservation Opportunity Area (COA)	Private and Missouri Department of Conservation	R2, R4, PEM, PFO	0.31
750.0–751.1	0.1	Jentell Brees Access	Missouri Department of Conservation		
760.9–761.3	0.4	Pigeon Hill Conservation Area	Missouri Department of Conservation	R4	0.01
770.0–771.4	1.4	Little Prairie River Woodland/Forest Scarped Hills COA	Private	R2, R4	0.01
773.5–775.0	1.0	Little Platte River Woodland/Forest Scarped Hills COA	Private	R4, PEM, PFO	0.02
781.9–784.0	2.1	Cameron Upland Prairie Plain COA	Private	R2, R4, PFO	0.05
825.8–829.2	1.3	Shoal Creek Prairie/Woodland Scarped Plain COA	Private	R4, PEM, OW	0.10
841.6–844.4	2.8	Lower Grand River Lowland Plains/Missouri-Grand River Alluvial Plain COA	Private	R2, R4, PEM, PSS	0.11
870.6–875.2	2.2	Chariton River Alluvial Plains COA	Private	R2, R4	0.13
931.8		West Fork Salt River		R2	0.01
958.3–959.7	1.4	Veronica Baier – The Nature Conservancy	The Nature Conservancy	R2, R4	0.02
964.3–976.0	1.9	Cuivre River Woodland/Forest Hills COA	Private	R2, R4, OW, PFO	0.20
987.7–1024.9	37.2	St. Charles/ Lincoln Alluvial Plain, Mairas Temp Clair Alluvial Plain, West Alton Alluvial Plain COA	Private	R2, R4, OW, PEM, PSS, PFO	2.18
1023.5–1024.7	1.2	Edward "Ted" & Pat Jones – Confluence Point State Park	Missouri Department of Natural Resources	R2, PEM, PSS	0.52

TABLE 3.4.3-4
(Continued)

Mileposts	Miles Crossed	Name	Ownership	Wetland Types	Wetlands Crossed
MAINLINE PROJECT (CONTINUED)					
Illinois					
1069.6–1072.7	3.1	Carlyle Lake	U.S. Army Corps of Engineers (COE)COE	R2, R4, PEM	0.05
CUSHING EXTENSION					
Kansas					
4.2		Little Blue River		R2	
9.71–13.59		Mill Creek		R2, R4	0.08
50.0–54.3	3.4	Milford Wildlife Area (Republican River)	COE	R2. R4, PEM	0.29
68.9		Chapman Creek		R2	0.01
76.15		Oxbow		PFO	0.17
76.6		Smokey Hill River		R2	0.04
87.1		Carry Creek		R2	0.01
117.2		Cottonwood River		R2	0.03
128.3		Doyle Creek		R2	0.01
148.8–148.9	0.1	Four Mile Creek		R2	0.06
158.3		Whitewater River		R2, PFO	0.08
205.7		Arkansas River		R2	0.12
Keystone Project total	**95.4**				**8.81**

PEM = Palustrine emergent wetland.
PFO = Palustrine forested wetland.
PSS = Palustrine scrub-shrub wetland.
R2 = Riverine – perennial.
R4 = Riverine – intermittent.

Sources: ENSR 2006a; TransCanada 2007b, d (Tables 3.8-4 and 3.8-5).

Potential construction- and operations-related effects include:

- Modification in wetland productivity due to modification of surface and subsurface flow patterns;
- Temporary and permanent modification of wetland vegetation community composition and structure from clearing and operational maintenance (clearing temporarily affects the wetland's capacity to buffer flood flows and/or control erosion);
- Loss of wetlands due to backfilling or draining;
- Wetland soil disturbance (mixing of topsoil with subsoil with altered biological activities and chemical conditions that could affect reestablishment and natural recruitment of native wetland vegetation after restoration);
- Compaction and rutting of soils from movement of heavy machinery and transport of pipe sections, altering natural hydrologic patterns, inhibiting seed germination, or increasing siltation;
- Temporary increase in turbidity and changes in wetland hydrology and water quality;
- Permanent alteration in water-holding capacity due to alteration or breaching of water-retaining substrates in the Prairie Pothole region; and
- Alteration in vegetation productivity and life stage timing due to increased soil temperatures associated with heat input from the pipeline.
- Alteration in freeze-thaw timing due to increased water temperatures associated with heat input from the pipeline.

Generally, the wetland vegetation community eventually would transition back into a community functionally similar to that of the wetland prior to construction, if pre-construction conditions such as elevation, grade, and soil structure are successfully restored. In emergent wetlands, the herbaceous vegetation would regenerate quickly (typically within 3 to 5 years). In forested and scrub-shrub wetlands, the effects of construction would be extended due to the longer period needed to regenerate a mature forest or shrub community. Following revegetation, there would be little permanent effects on emergent wetland vegetation because these areas naturally consist of, and would remain as, an herbaceous community. Herbaceous wetland vegetation in the pipeline ROW generally would not be mowed or otherwise maintained, although Keystone's CMR Plan (Appendix B) allows for annual maintenance of a 20- to 30-foot-wide strip centered over the pipeline. Tree species that typically dominate forested wetlands in the Keystone Project area (maple, hickory, and oak) have regeneration periods of up to 50 years. Trees and shrubs would not be allowed to regenerate within the maintained ROW; therefore, removal of forested and scrub-shrub wetland habitats due to pipeline construction would be long term, and the maintained ROW would represent a permanent conversion of forested and scrub-shrub wetlands to herbaceous wetlands. The total acreage of affected forested wetland during construction is small (148 acres), as is the total acreage of scrub-shrub wetland affected during construction (33 acres). Restoration of some of these forested and scrub-shrub wetlands may be possible; however, long-term effects would remain.

Operation of the Keystone Project would cause slight increases in soil temperatures at the soil surface (1 to 2 ˚F) primarily during winter months; and at depths of 6 inches (1 to 5 ˚F) ,with most notable increases during spring (March). While many species would not produce root systems that would penetrate much below 6 inches, some species, notably native prairie grasses, trees, and shrubs, have root systems penetrating well below 6 inches. Soil temperatures closer to the pipeline burial depth of 6 feet may be as much as 30 ˚F warmer than the ambient surrounding soil temperatures. In general, increased soil temperatures during early spring would cause early germination and emergence and increased productivity in wetland plant species (TransCanada 2007c). Increased soil temperatures also may stimulate root development (TransCanada 2007c).

Operation of the Keystone Project also would cause slight increases in water temperatures where the pipeline crosses through wetlands. Effects would be most pronounced in small ponds and wetlands, as any excess heat would be quickly dissipated in large waterbodies and flowing waters. Small ponded wetlands may remain unfrozen a few days later than surrounding wetlands and may thaw a few days sooner than surrounding wetlands. Early and late migrant waterfowl may be attracted and concentrated in these areas during spring and fall migrations.

To minimize potential construction- and operations-related effects, Keystone would implement procedures outlined in the CMR Plan (Appendix B) for wetland crossings. Keystone would minimize impacts and restore wetlands affected by construction activities, to the extent practicable. Pipeline construction through wetlands must comply with COE Section 404 permit conditions and NRCS Standards and Practices for Construction in Wetlands (NRCS 2007). Additional specific mitigation measures would be required for crossings in the COE Riverlands Management Area (St. Louis COE, May 1, 2007).

Keystone has committed to the following measures in its CMR Plan:

- Avoid placement of aboveground facilities in a wetland, except where the location of such facilities outside of wetlands would preclude compliance with DOT pipeline safety regulations;
- Directionally drill large river crossings, except as indicated in Section 3.3.2.2, to minimize effects on streamside wetlands or floodplain forests;
- Use open-cut crossing methods for smaller streams and ephemeral or intermittent drainages; trench wetlands;
- Limit the width of the construction zone to 85 feet through non-cultivated wetlands, unless a wider zone is requested on a site-specific basis;
- Limit the operation of construction equipment within wetlands to that equipment essential for clearing, excavation, pipe installation, backfilling, and restoration;
- Limit grading in wetlands to directly over the trenchline, except where necessary to ensure safety;
- Segregate and replace wetland soils (except in areas of standing water, saturated wetlands, or where no topsoil is evident) to aid in restoration;
- Minimize the length of time that topsoil is segregated and the trench is open;
- Install trench breakers at the boundaries of wetlands as needed to prevent draining of a wetland and to maintain original wetland hydrology;
- Prohibit storage of hazardous materials, chemicals, fuels, and lubricating oils within a wetland or within 100 feet of a wetland boundary;
- Limit post-construction maintenance of vegetation within herbaceous wetlands to a 10-foot wide strip of vegetation centered over the pipeline; and
- Limit post-construction maintenance within forested areas to removal of trees greater than 15 feet in height and within 15 feet of the pipeline centerline.

Additional procedures for dry wetlands (those with groundwater levels below the surface and with stable trench excavations and normal trench widths), standard wetlands (those with saturated and non-cohesive soils, and difficult trenching conditions), and flooded wetlands (those with standing water over much of the wetland area) are discussed below.

The following additional measures for dry wetlands are specified in Keystone's CMR Plan (Appendix B):

- A standard construction ROW width would be used,
- Extra work areas may be placed no closer than 10 feet from the wetland edge,
- The use of sediment barriers in jurisdictional dry wetlands will be negotiated as part of the Section 404 permitting process.
- Topsoil would be stripped and segregated using trench and spoil side method at the same depth as adjacent upland areas, and
- Seeding requirements for agricultural lands would be applied to farmed wetlands.

The following additional measures for standard wetlands are specified in Keystone's CMR Plan (Appendix B):

- The width of the construction zone would be limited to 85 feet, unless a wider zone is requested on a site-specific basis;
- Low-ground-pressure construction equipment or support equipment on timber rip-rap or timber mats would be used; and
- Sediment barriers would be installed across the entire ROW where it enters and exits the wetland.

The following additional measures for flooded wetlands are specified in Keystone's CMR Plan (Appendix B):

- Topsoil stripping would not be possible (the trench would be up to 35 feet wide),
- Pipe stringing and fabrication would be conducted in a designated extra workspace adjacent to the wetland,
- Pipe would be pushed or pulled across the wetland, and
- Pipe flotation using metal barrels (or styrofoam floats) may be used.

Restoration and reclamation procedures for wetland crossings that are outlined in Keystone's CMR Plan (Appendix B) include:

- Replace topsoil, spread to its original contours with no crown over the trench;
- Remove any excess spoil, stabilize wetland edges and adjacent upland areas using permanent erosion control measures and revegetation;
- For standard wetlands, install a permanent slope breaker and trench breaker at the base of slopes near the boundary between the wetland and adjacent upland areas;
- Apply temporary cover crop at a rate adequate for germination and ground cover using annual ryegrass or oats unless standing water is present (in the absence of detailed revegetation plans or until appropriate seeding season);
- Apply seeding requirements for agricultural lands or as required by the landowner for farmed wetlands;

- No application of fertilizer, lime, or mulch unless required by the appropriate land management or state agency;
- No herbicides or pesticides may be used within 100 feet of a wetland (unless allowed by the appropriate land management or state agency);
- Monitor the success of wetland revegetation after construction until revegetation is successful (success is defined as at least 80 percent cover by herbaceous or woody vegetation of the type, density, and distribution in undisturbed adjacent wetland areas within 3 years); and
- If revegetation is not successful within 3 years, develop a remedial revegetation plan and continue efforts until successful.

In addition to the mitigation measures committed to by Keystone in the CMR Plan (Appendix B), all wetland areas within conservation lands or easements would be restored to a level consistent with any additional criteria established by the relevant managing agency.

Implementation of the measures identified in Keystone's CMR Plan (Appendix B) would reduce impacts on wetlands. These additional measures could further reduce impacts to wetlands:

- Encouraging landowners to use native vegetation for restoration (Willie R. Taylor, USFWS, October 11, 2007).
- Replacing topsoil, spread to its original contours with no crown over the trench (John Cochnar, USFWS May 27, 2007). The temporary disposition of trench spoils will be addressed in the COE permit for jurisdictional wetlands.
- Removing any excess spoil and stabilize wetland edges and adjacent upland areas, using permanent erosion control measures and revegetation (John Cochnar, USFWS May 27, 2007).
- Restoring wetland areas within conservation lands or easements to the criteria established by the managing agency (John Cochnar, USFWS May 27, 2007; Matthew Judy, NRCS, April 30, 2007).
  - In shallow farmed easement wetlands, USFWS recommends that a gap be left in the spoil so that no fill material is left in the wetlands, and that the spoil be piled outside the wetland basin (Willie R. Taylor, USFWS, October 11, 2007). Final mitigation measures in easement wetlands will be negotiated between Keystone and USFWS.
  - USFWS requires that Keystone restore all easement wetland contours where spoil must be piled, including dry and farmed wetlands, to plus or minus 1 inch to reduce the possibility of filling shallow wetlands.
- Establishing buffer zones of a minimum width of 100 feet around wetland mitigation areas (John Cochnar, USFWS April 28, 2006).
- Developing a wetland restoration monitoring plan that includes:
  - Direct field evaluations of wetlands crossed by the pipeline to ensure that wetland functions and values are recovering;
  - Continued monitoring for a period of time, normally 5 years; (Robert E. Robert, EPA, October 9, 2007); and
  - Evaluation of wetlands for noxious and invasive species (Larry Svoboda, EPA, November 30, 2006).

Keystone has agreed to some of these additional mitigation measures based on discussions during this environmental analysis. Additional mitigation measures for jurisdictional wetlands and wetlands contained within federal conservation easements may be added during final permit and crossing easement negotiations. Keystone has agreed to revise the existing CMR Plan (Appendix B) prior to construction to include the additional mitigation measures to which they have agreed or that are mandated during final permit and easement negotiations.

Various state and federal agencies have expressed concerns and recommendations for compensatory mitigation of jurisdictional wetland losses. The requirements for compensatory mitigation would depend on final COE decisions on jurisdictional delineations. Recommendations for compensatory mitigation provided to DOS by the agencies include:

- Keystone should develop a plan to compensate for permanent wetland losses to include:
  - The type of mitigation to be used: creation of new wetlands, restoration of degraded wetlands, and/or preserving existing wetlands.
  - Identification of compensatory mitigation sites, preferably in areas adjacent or continuous to the project site.
  - Restoration or preservation of existing wetlands should apply a ratio of more than 2:1 (3:1 to 6:1), depending on the vegetation type and if mitigation would occur within the same watershed as the wetland loss.
  - Timing of compensatory mitigation should be specified, preferably prior to or concurrent with project construction.
  - Monitoring should be specified that documents mitigation success, noxious and invasive species, and provisions for corrective actions.
- Keystone should mitigate permanent wetland impacts, including loss of forested wetlands, at ratios of 6:1 to 2:1 for each affected acre (Larry Svoboda, USEPA May 3, 2007; John Cochnar, USFWS April 28, 2006; Michael G. McKenna, NDGFD May 4, 2006; Doyle Brown, Missouri Department of Conservation [MDC], April 27, 2007).

These additional measures are recommended by EPA and USFWS to individual permitting agencies for implementation for the Keystone Project. The actual level of required compensation and mitigation would ultimately be determined by COE regulatory offices with input from USFWS Environmental Services field offices and state fish and wildlife agencies.

Implementation of measures in Keystone's CMR Plan (Appendix B) would avoid or mitigate most impacts on wetlands associated with construction and operation activities, and would ensure that potential effects would be minor and short term. Impacts to forested wetlands in Missouri would not be considered minor, as this community is rapidly decreasing in area and is considered at risk by MDC, Missouri Department of Natural Resources, and others. Impacts to forested wetlands would be long-term and in Missouri typically would require a 6:1 compensatory mitigation for conversion and temporal loss (Doyle Brown, MDC, April 27, 2007). To mitigate wetland and stream impacts that cannot be avoided, the Missouri Department of Natural Resources would require that Keystone follow the guidelines set forth in the *Missouri Stream Mitigation Method* and the State of Missouri Aquatic Resources Mitigation Guidelines (H. Floyd Gilzow, Missouri Department of Natural Resources, April 27, 2007). In addition, USEPA suggests that DOS convene a meeting with the resource agencies and Keystone to discuss the recommended wetland mitigation measures in more detail to develop an appropriate set of measures.

3.4.3.1 Connected Actions

Power Lines and Substations. The primary impacts on wetlands from construction or modification of Western's transmission lines to provide electrical power to pump stations would be cutting, clearing, or removing the existing vegetation within the construction work area and potential invasion by noxious weeds. In general, transmission line construction impacts to wetlands would be minor as most lines would run alongside existing roadways. Trees in forested wetlands crossed by the transmission line ROW would be removed, and the ROW would be maintained free of woody vegetation. Approximately 4 miles of wetlands, primarily emergent wetlands in North Dakota and South Dakota, would be affected during construction and operation of Western's new and upgraded transmission lines for the Keystone Project (Table 3.4.3-5).

TABLE 3.4.3-5
Estimated Impacts on Wetlands Crossed by Proposed Electric Transmission Lines for the Keystone Project

	Miles of Wetland Type Crossed by Right-of-Way (acres)							
	ND	**SD**	**NE**	**KS**	**OK**	**MO**	**IL**	**Totals**
Mainline Project								
Freshwater emergent wetland	1.9 (12)	1.5 (9)	0.0			0.1 (1)	0.1 (1)	3.6 (23)
Freshwater forested/shrub wetland	0.0	0.0	0.0			<0.1 (1)	0.0	0.1 (1)
Freshwater pond	0.1 (1)	0.0	0.0			0.0	0.0	0.1 (1)
Riverine	0.0	0.1 (1)	<0.1 (1)			0.0	0.0	0.2 (2)
Mainline Project subtotal	*2.0 (13)*	*1.6 (10)*	*<0.1 (1)*	*0.0*	*0.0*	*0.2 (2)*	*0.1 (1)*	*3.9 (27)*
Cushing Extension								
Freshwater emergent wetland								
Freshwater forested/shrub wetland								
Freshwater pond								
Riverine				0.1 (1)				0.1 (1)
Cushing Extension subtotal				*0.1 (1)*				*0.1 (1)*
Keystone Project								
Freshwater emergent wetland	1.9 (12)	1.5 (9)	0.0			0.1 (1)	0.1 (1)	3.6 (23)
Freshwater forested/shrub wetland	0.0	0.0	0.0			<0.1 (1)	0.0	0.1 (1)
Freshwater pond	0.1 (1)	0.0	0.0			0.0	0.0	0.1 (1)
Riverine	0.0	0.1 (1)	<0.1 (1)	0.1 (1)		0.0	0.0	0.2 (3)
Keystone Project total	*2.0 (13)*	*1.6 (10)*	*<0.1 (1)*	*0.1 (1)*	*0.0*	*0.2 (2)*	*0.1 (1)*	*4.0 (28)*

Note: Length of wetland impacts calculated from USFWS National Wetlands Inventory mapping; the area of impact was estimated based on a maximum 50-foot right-of-way and proposed transmission line routes provided by Keystone.

Source: TransCanada 2007d, transmission line route sheets.

Measures listed below would be implemented by servicing electric cooperatives or their contractors in the modification or construction of electric transmission lines:

- ROW would be located to avoid sensitive vegetation conditions, including wetlands where practical, or—if they are linear—to cross them at the least sensitive feasible point.
- Clearing for the access roads would be limited to only those trees necessary to permit the passage of equipment.
- Water bars or small terraces would be constructed across all ROW and access roads on hillsides to prevent water erosion and to facilitate natural revegetation.
- Western or its contractor would exercise care to preserve the natural landscape and would conduct construction operations so as to prevent any unnecessary destruction, scarring, or

defacing of the natural surroundings in the vicinity of the work. Except where clearing is required for permanent works, approved construction roads, or excavation operations, all trees, native shrubbery, and vegetation would be preserved and would be protected from damage by construction operations and equipment.

- Construction staging areas would be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. On abandonment, all storage and construction buildings, including concrete footings and slabs, and all construction materials and debris would be removed from the site. The area would be regraded as required so that all surfaces drain naturally, blend with the natural terrain, and are left in a condition that would facilitate natural revegetation, provide for proper drainage, and prevent erosion.
- Topsoil would be removed, stockpiled, and re-spread at all heavily disturbed areas not needed for maintenance access.
- All construction equipment and vehicles would be pressure-washed (especially the undercarriage) to remove foreign soil and debris that may introduce weeds into the Project area.
- On completion of the work, all work areas except access roads needed for maintenance would be scarified or left in a condition that would facilitate natural revegetation, provide for proper drainage, and prevent erosion. All destruction, scarring, damage, or defacing of the landscape resulting from Western or its contractor's operations would be repaired.
- If revegetation is required, regionally native plants would be used.

Wood River Refinery Expansion. No impacts related to wetlands are associated with the Wood River Refinery Expansion other than those evaluated as part of that project.

3.4.4 References

COE. See U.S. Army Corps of Engineers.

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NRCS. See Natural Resources Conservation Service.

TransCanada. See TransCanada Keystone Pipeline, L.P.

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USFWS. See U.S. Fish and Wildlife Service.

3.5 TERRESTRIAL VEGETATION

Vegetative cover is an important component in the classification of ecoregions that reflects differences in ecosystem quality and integrity (EPA 2006). Ecoregions are described through analysis of patterns and composition of geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. The Mainline and Cushing Extension would cross seven Level III Ecoregions of the United States—Lake Agassiz Plain, Northern Glaciated Plains, Western Corn Belt Plains, Central Great Plains, Central Irregular Plains, Interior River Valleys and Hills, and Flint Hills (Figure 3.5-1, Table 3.5-1).

3.5.1 General Vegetation Resources

Vegetation types crossed by the Keystone Project were delineated based on review of aerial photographs, general observations made during reconnaissance, and information collected during wetland delineation and grassland assessment surveys. Plant communities and their occurrence by state within the eight general vegetation types or general land use categories are described in Table 3.5.1-1.

Grassland/rangeland, upland forest, palustrine emergent wetland, palustrine shrub/scrub wetlands, palustrine forested wetland, streams, and open water areas support naturally occurring terrestrial and aquatic vegetation. Residential, commercial, industrial, and special designation areas (e.g., schools, parks, and recreational facilities) primarily include artificially created landscapes with minimal naturally occurring vegetation. Cropland and pivot-irrigated cropland areas primarily include introduced crop species, which provide forage and grain for livestock and human consumption. Right-of-way areas consist of previously disturbed areas associated with pipelines and other utilities that have been restored primarily with native herbaceous species and may include some introduced species.

TABLE 3.5-1
EPA Level III Ecoregions Crossed by the Keystone Project

Ecoregion	Location of Occurrence in Keystone Project Area	Description
Lake Agassiz Plain	North Dakota	Glacial Lake Agassiz was the last in a series of proglacial lakes to fill the Red River Valley in the 3 million years since the beginning of the Pleistocene. Thick beds of lake sediments on top of glacial till create the extremely flat floor of the Lake Agassiz Plain. The historic tall-grass prairie has been replaced by intensive row crop agriculture. The preferred crops in the northern half of the region are potatoes, beans, sugar beets and wheat; soybeans, sugar beets, and corn predominate in the south.
Northern Glaciated Plains	North Dakota and South Dakota	The Northern Glaciated Plains Ecoregion is characterized by a flat to gently rolling landscape composed of glacial till. The sub-humid conditions foster a transitional grassland containing tall-grass and short-grass prairie. High concentrations of temporary and seasonal wetlands create favorable conditions for waterfowl nesting and migration. Although the till soils are very fertile, agricultural success is subject to annual climatic fluctuations.

TABLE 3.5-1 (Continued)		
Ecoregion	**Location of Occurrence in Keystone Project Area**	**Description**
Western Corn Belt Plains	Nebraska, Kansas, and Missouri	Once covered with tall-grass prairie, over 75 percent of the Western Corn Belt Plains now is used for cropland agriculture, and much of the remainder is in forage for livestock. A combination of nearly -level to gently -rolling glaciated till plains and hilly loess plains; an average annual precipitation of 63 to 89 centimeters that occurs mainly in the growing season, and fertile, warm, moist soils make this one of the most productive areas of corn and soybeans in the world. Major environmental concerns in the region include surface water and groundwater contamination from fertilizer and pesticide applications, as well as impacts from concentrated livestock production.
Central Great Plains	Nebraska and Kansas	The Central Great Plains are slightly lower, receive more precipitation, and are somewhat more irregular than the Western High Plains to the west. Once a grassland, with scattered low trees and shrubs in the south, much of this ecological region is now cropland. The eastern boundary of the region marks the eastern limits of the major winter wheat--growing area of the United States.
Central Irregular Plains	Missouri	The Central Irregular Plains have a mix of land use and are topographically more irregular than the Western Corn Belt Plains to the north, where most of the land is in crops. The region is less irregular and less forest covered than the ecoregions to the south and east. The potential natural vegetation of this ecological region is a grassland/forest mosaic, with wider forested strips along the streams compared to the Northern Glaciated Plains to the north. The mix of land use activities in the Central Irregular Plains also includes mining operations of high-sulfur bituminous coal. The disturbance of these coal strata in southern Iowa and northern Missouri has degraded water quality and affected aquatic biota.
Interior River Valleys and Hills	Missouri and Illinois	The Interior River Lowland is made up of many wide, flat-bottomed terraced valleys; forested valley slopes; and dissected glacial till plains. In contrast to the generally rolling to slightly irregular plains in adjacent ecological regions to the north, east, and west—where most of the land is cultivated for corn and soybeans, a little less than one-half of this area is in cropland, about 30 percent is in pasture, and the remainder is in forest. Bottomland deciduous forests and swamp forests were common on wet lowland sites, with mixed oak and oak-hickory forests on uplands. Paleozoic sedimentary rock is typical, and coal mining occurs in several areas.
Flint Hills	Kansas and Oklahoma	The Flint Hills is a region of rolling hills, with relatively narrow steep valleys, and is composed of shale and cherty limestone with rocky soils. In contrast to surrounding ecological regions that are mostly in cropland, most of the Flint Hills region is grazed by beef cattle. The Flint Hills mark the western edge of the tall-grass prairie and contain the largest remaining intact tall-grass prairie in the Great Plains.

Sources: Classification of Level III Ecoregions is based on EPA (2006); descriptions of the regions are based on EPA (2002).

TABLE 3.5.1-1
Vegetation Communities Occurring along the Keystone Project Route

General and Subclass Designation	General Description	Common Species	Occurrence along Right-of-Way by State								
			Mainline Project						Cushing Extension		
			ND	SD	NE	KS	MO	IL	NE	KS	OK
Cropland											
Not applicable	Agricultural fields	Wheat, barley, oats, sorghum, corn, beans, and hay	X	X	X	X	X	X			X
	Horticultural cultivated species										
	Planted perennials										
	Hay meadows										
Urban/Built-Up Areas											
Commercial/residential	Suburban residential areas	Ornamental trees and shrubs	X	X	X	X	X	X			X
Urban	Commercial development areas										
Impervious/no vegetation	Paved areas (roadways and parking lots										
Barren/sand/outcrop	Gravel quarries, rock outcrops	None	X	X	X	X	X	X			X
Herbaceous Rangeland											
Tall grass prairie	Grassland community dominated by tall grasses 3 to 6 feet tall	Big bluestem (A*ndropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*)	X	X	X	X	X		X	X	X
Mid-grass prairie	Grassland community dominated by grasses approximately 1 to 2 feet tall	Blue grama (*Bouteloua gracilis*), needle and thread (*Hesperostipa comata*), green needlegrass (*Nassella viridula*), western wheatgrass (*Pascopyrum smithii*)	X								
Short grass prairie	Grassland community generally dominated by grasses less than 1 foot tall	Blue grama (*Bouteloua gracilis*), buffalograss (*Buchloe dactyloides*)			X						
Sand prairie	Grassland community on sand or gravel soils, dominated by mid to tall grasses	Sand bluestem (*Andropogon hallii*), blue grama (*Bouteloua gracilis*), prairie sandreed (*Calamovilfa longifolia*), needle and thread (*Hesperostipa comata*)	X	X	X						

TABLE 3.5.1-1
(Continued)

General and Subclass Designation	General Description	Common Species	Occurrence along Right-of-Way by State								
			Mainline Project						Cushing Extension		
			ND	SD	NE	KS	MO	IL	NE	KS	OK
Herbaceous Rangeland (continued)											
Non-native grassland	Pasturelands planted with non-native cool-season grasses	Fescue (*Festuca* spp.), smooth brome (*Bromus inermis*), and other seed pasture grasses				X	X				
Deciduous shrubland	Upland or lowland communities dominated by shrubs	Chokecherry (*Prunus virginia*), sandbar willow (*Salix interior*), silver buffaloberry (*Shepherdia argentea*), western snowberry (*Symphoricarpos occidentalis*)	X	X							
Conservation reserve program	Mixed native and non-native grasses and forbs; may include shrubs; land is fallow	A variety of native and introduced grass species	X	X	X	X					
Mixed prairie	Prairie grasses of mixed heights	Grama (*Bouteloua* spp.), little bluestem (*Schizachyrium scoparium*)	X	X	X	X					
Upland Forest											
Deciduous woodland	Woodlands dominated by a wide variety of mixed native and non-native deciduous species	Green ash (*Fraxinus pennsylvanica*), quaking aspen (*Populus tremuloides*), bur oak (*Quercus macrocarpa*), American elm (*Ulmus americana*)	X		X		X				
Maple-basswood forest	Community dominated by sugar maple and basswood; found in valley slopes and bottoms	Sugar maple (*Acer saccharum*), red oak (*Quercus rubra*), american basswood (*Tilia americana*)				X					
Oak-hickory forest	Upland community dominated by multiple oak and hickory species	Bitternut hichory (*Carya cordiformis*), shagbark hickory (*C. ovata*), white oak (*Quercus alba*), black oak (*Q. velutina*)				X	X	X		X	
Green ash woodland	Community dominated by green ash; occurs in floodplains and mesic slopes	Boxelder (*Acer negundo*), green ash (*Fraxinus pennsylvanica*), American elm (*Ulmus americana*)	X								

TABLE 3.5.1-1
(Continued)

General and Subclass Designation	General Description	Common Species	Occurrence along Right-of-Way by State								
			Mainline Project						Cushing Extension		
			ND	SD	NE	KS	MO	IL	NE	KS	OK
Upland Forest (continued)											
Aspen woodland	Woodlands dominated by aspen species	Green ash (*Fraxinus pennsylvanica*), quaking aspen (*Populus tremuloides*), bur oak (*Quercus macrocarpa*)	X								
Bur oak woodland	Woodlands dominated by bur oak, generally in ravines and well-drained uplands	Green ash (*Fraxinus pennsylvanica*), quaking aspen (*Populus tremuloides*), bur oak (*Quercus macrocarpa*)	X								
Evergreen forest	Forest with greater than 60% evergreen trees	Shortleaf pine (*Pinus echinata*)					X				
Mixed oak ravine	Oak forest with multiple species on moderate to steep slopes of ravines and river valleys	Big bluestem (*Andropogon gerardii*), bur oak (*Quercus macrocarpa*), chinquapin oak (*Q. muhlenbergii*)			X	X	X		X	X	
Deciduous	Native deciduous forest communities	Bur oak (*Quercus macrocarpa*), post oak (*Q. stellata*)					X				
Riverine/Open Water											
Open water	Open water, sometimes associated with wetland habitat	None			X			X			
Riverine wetlands	Wetlands contained within a channel		X					X			
Palustrine Forested Wetlands											
Floodplain woodland	Wooded communities in floodplains	Green ash (*Fraxinus pennsylvanica*), eastern cottonwood (*Populus deltoides*), bur oak (*Quercus macrocarpa*), American elm (*Ulmus americana*)	X								
Riparian or floodplain woodland	Temporarily flooded woodlands				X			X			

TABLE 3.5.1-1
(Continued)

General and Subclass Designation	General Description	Common Species	Occurrence along Right-of-Way by State: Mainline Project ND	Mainline Project SD	Mainline Project NE	Mainline Project KS	Mainline Project MO	Mainline Project IL	Cushing Extension NE	Cushing Extension KS	Cushing Extension OK
Palustrine Forested Wetlands (continued)											
Mixed oak floodplain forest	Oak-dominated forests with temporary flooding in floodplains	Bitternut hichory (*Carya cordiformis*), Indian woodoats (*Chasmanthium latifolium*), bur oak (*Quercus macrocarpa*), shumard oak (*Q. shumardii*)				X					
Ash-elm-hackberry floodplain forest	Forest in floodplains and upland ravine bottoms; dominated by ash, elm, and hackberry	Common hackberry (*Celtis occidentalis*), green ash (*Fraxinus pennsylvanica*), elm (*Ulmus* spp.)				X					
Woody-dominated wetland	Semi-permanently or permanently flooded forest community	Maple (*Acer* spp.), hickory (*Carya* spp.), oak (*Quercus* spp.)					X	X			
Cottonwood floodplain woodland	Floodplain forest dominated by cottonwood species	Green ash (*Fraxinus pennsylvanicus*), eastern cottonwood (*Populus deltoides*), willow (*Salis* spp.)				X					
Palustrine Emergent/Scrub-Shrub Wetlands											
Palustrine emergent wetlands	Temporary, seasonal, or semi-permanent wetlands dominated by persistent emergent vegetation	Common spikerush (*Eleocharis palustrisi*), rush (*Juncus* spp.), rice cutgrass (*Leersia oryzoides*), bulrush (*Schoenoplectus* spp.), burreed (*Sparganium* spp.), cattail (*Typha* spp.)	X	X	X	X	X	X	X	X	X
Riparian shrubland	Temporarily flooded shrub community	Sedge (*Arex* spp.), willow (*Salix* spp.), bulrush (*Schoenoplectus* spp.), western snowberry (*Symphoricarpos occidentalis*)	X	X	X						
Aquatic bed wetland	Intermittently, temporarily, or permanently flooded wetlands	Inland saltgrass (*Distichlis spicata*), western wheatgrass (*Pascopyrum smithii*), smartweed and knotweed (*Polygonum* spp.), pondweed (*Potamogeton* spp.)			X						

TABLE 3.5.1-1
(Continued)

General and Subclass Designation	General Description	Common Species	Occurrence along Right-of-Way by State – Mainline Project						Occurrence along Right-of-Way by State – Cushing Extension		
			ND	SD	NE	KS	MO	IL	NE	KS	OK
Palustrine Emergent/Scrub-Shrub Wetlands (continued)											
Cattail or freshwater marsh	Shallow to deep emergent marshes	Rush (*Juncus* spp.), bulrush (*Schoenoplectus* spp.), burreed (*Sparganium* spp.), cattail (*Typha* spp.)	X	X	X	X					
Herbaceous-dominated wetland	Semi-permanently or permanently flooded wetland	Rush (*Juncus* spp.), bulrush (*Schoenoplectus* spp.), cattail (*Typha* spp.), sedge (*Carex* spp.)					X				
Right-of-Way											
None	Pipeline and other utilities	Mixture of grasses and forbs				X	X				

Source: ENSR 2006a.

3.5.2 Vegetation Communities of Conservation Concern

Native grasslands or prairies are considered the most threatened vegetation communities in the United States. In the past, grasslands such as the tall-grass prairies, mixed-grass prairies, and short-grass prairies dominated central North America. Prairies have been lost to agriculture, urbanization, and mineral exploration and have been altered by invasions of non-native plants after fire suppression, establishment of woodlots and shelterbelts, water developments, and tree-lined river and stream corridors. Tall-grass prairie is the wettest of the grasslands composed of sod-forming bunch grasses. Mixed-grass prairies are intergrades between tall-grass and short-grass prairies and are characterized by the warm-season grasses of the short-grass prairie and the cool and warm-season grasses of the tall-grass prairie. Short-grass prairies are dominated by blue grama and buffalo grass—two warm-season grasses that flourish under intensive grazing. The status of native grasslands in states where the pipeline ROW would pass is listed in Table 3.5.2-1. The 49 plant species of conservation concern that have been identified along the pipeline ROW are listed in Table 3.5.2-2; many of these species occupy prairie and wetland habitats.

TABLE 3.5.2-1
Status of Native Prairies—Tall Grass, Mixed Grass and Short Grass—in States Crossed by the Keystone Project

Type	State	Past Area (hectares)	Current Area (hectares)	Current Area (acres)	Decline (%)
Tall grass	North Dakota	130,000	120	297	99.9
	South Dakota	2,600,000	20,000	49,421	99.2
	Nebraska	6,100,000	123,000	303,940	98.0
	Kansas	6,900,000	1,200,000	2,965,265	82.6
	Missouri	6,000,000	32,000	79,074	99.5
	Illinois	8,500,000	2,930	2,298	99.9
	Oklahoma	5,200,000	NA	NA	NA
Mixed grass	North Dakota	14,200,000	4,500,000	11,119,742	68.3
	South Dakota	1,600,000	480,000	1,186,106	70.0
	Nebraska	7,700,000	1,900,00	4,695,002	75.3
	Oklahoma	2,500,000	NA	NA	NA
Short grass	South Dakota	179,000	116,350	287,507	35.0
	Oklahoma	1,300,000	NA	NA	NA

NA = Not available.

Source: Samson et al. 2007.

TABLE 3.5.2-2
Plants of Conservation Concern along the Keystone Project Route

Species	Status [a]	State Conservation Status [b]							Habitat
		ND	SD	NE	KS	MO	IL	OK	
Indian ricegrass (*Achnatherum hymenoides*)	KS-SC	SNR	SNR	SNR	S2	SNR		S1	Sandy, stony, gravelly, shallow soils in upland and semi-desert climatic zones. Adapted to soils high in lime, moderately salt and alkali tolerant. Flowering: May–August.
Woolly milkweed (*Asclepias lanuginosa*)	SD-SC	S1	S4	S3	S1		S1		Dry woods, prairies, hillside prairies, rocky soils. Flowering: June–July.
Subarctic ladyfern (*Athyrium filix-femina*)	ND-SC	S3	SNR	SH	SNR	SNR	SNR	SNR	Swamp margins, wooded banks, and alluvial woods. Aquatic or wetland species.
Texas bergia (*Bergia texana*)	MO-SC		SNR	S1	S2	S2	SNR	SNR	Muddy or sandy shores and flats, rare. Flowering: June–October.
Broad-glumed (earlyleaf) brome (*Bromus latiglumis*)	MO-SC	SNR	SNR	SNR	S1	S3	S3		Wooded slopes and bluffs, alluvial banks of streams, usually in limestone areas. Flowering: July–August.
Nottoway (Valley) brome grass (*Bromus nottowayanus*)	MO-SC				S1	S3	S1	SNR	Rich, loamy soils in bottomland forests along rivers and streams, mesic woods not far (<50 meters) from a river or stream.
Bellow's-beak sedge (*Carex albicans* var. *australis*)	MO-SC				S1	S1	SNR	SNR	Acid, dry soils of sandstone and granite, calcareous regions, wooded slopes, sandstone ridges, woodland clearings in partial shade of deciduous forests. Fruiting: April–June.
Buxbaum's sedge (*Carex buxbaumii*)	ND-SC	S1		S2	S1	S2	SNR	SNR	Bogs, wet meadows, springs, and fens. Flowering: Late May–June.
Crested sedge (*Carex cristatella*)	KS-SC	SNR	SNR	SNR	S2	SNR	S3		Openings in wet meadows, moist woodlands, swamps, soggy thickets, wet prairies, sedge meadows, sloughs, low-lying areas along rivers, power line clearances in woodlands, and ditches. Occurs in both degraded and higher quality habitats. Flowering: late spring–early summer.
Ravenfoot sedge (*Carex crus-corvi*)	KS-SC			S1	S2	SNR	S3	SNR	Wet meadows, wet prairies, swamps, floodplain woods, and roadside ditches. Flowering: May–July.
Bristly-stalk sedge (*Carex leptalea*)	ND-SC	S2	S2			SNR	S2	S1	Bogs and wet woodlands. Flowering: June–July.

TABLE 3.5.2-2
(Continued)

Species	Status [a]	State Conservation Status [b]							Habitat
		ND	SD	NE	KS	MO	IL	OK	
Blue cohosh (*Caulophyllum thalictroides*)	ND-SC	S1	S3	S1	S1	SNR	SNR	SNR	Rich valley woodlands, ravines, north-facing wooded slopes, and moist base of bluffs. Flowering: April–May.
Sand (lanceleaf) coreopsis (*Coreopsis lanceolata*)	KS-SC				S2	SNR	SNR	SNR	Dunes, dry woods, and meadows; in full sun to partial sun; and very dry to somewhat moist sites. Occurs in open sandy banks, roadsides, grasslands, banks, and bluffs in oak-pine woodland and in other sandy areas. Flowering: April–June.
American yellow lady's-slipper (*Cypripedium parviflorum*)	ND-SC	SNR	S3	SNR	SNR	SNR	SNR	SNR	Soft soils in moist tall-grass prairie, especially near trees or shrubs along lakeshores. Flowering: 25 May–20 June.
Showy lady's-slipper (*Cypripedium reginae*)	ND-SC	S2				S2	S1		Calcareous wetlands, wet woodlands. Flowering: 20 June–5 July.
Spinulose shieldfern (woodfern) (*Dryopteris carthusiana*)	ND-SC	S3	SNR	S2		S2	S3		Wet alluvial woods or swamps.
Crested shieldfern (woodfern) (*Dryopteris cristata*)	ND-SC	S3		S1		S1	S2		Wet alluvial woods or swamps.
Walter's barnyard grass (*Echinochloa walteri*)	MO-SC					S1	S3	SNR	Low ground, rarely standing water, basic to alkaline marshes.
Small spikerush (*Eleocharis parvula*)	ND-SC	S1	SNR		S2	SNR	EX	SNR	Wet saline or alkaline flats and shores. Flowering: July–early September.
Green keeled cottongrass (*Eriophorum viridi-carinatum*)	ND-SC	S1					SX		Cold, calcareous sphagnum bogs, and swamps, permafrost tussocks and calcicoles.
Spotted Joe-pyeweed (*Eupatorium maculatum* var. *bruneri*)	KS-SC	SNR	SNR	SNR	S1	SNR			Moist black soil prairies, sand prairies, sedge meadows, marshes, fens, and swampy thickets with small trees or shrubs. Flowering: July–September.
Fringed gentian (*Gentianopsis crinita*)	ND-SC	S1	SNR				SNR		Low, moist native grassland. Flowering: September–October.
Plains frostweed (*Helianthemum bicknellii*)	ND-SC	S1	SNR	S1	SNR	SNR	SNR		Prairies, rocky open areas, dry sandy soil. Also woodlands and glades. Flowering: early June–late July.

TABLE 3.5.2-2
(Continued)

Species	Status [a]	State Conservation Status [b]							Habitat
		ND	SD	NE	KS	MO	IL	OK	
Greater Canadian St. John's wort (*Hypericum majus*)	KS-SC	SNR	SNR	SNR	S2	SH	SNR	S1	Along ponds, lakesides, or other low, wet places; facultative wetland species. Flowering: July–September.
Narrowleaf morning-glory (*Ipomoea shumardiana*)	KS-SC				S1			SNR	Prairie species, eastern Kansas through central Oklahoma to north Texas. Flowering: June–August.
Butternut (*Juglans cinerea*)	MO-SC	SNR			SNR	S2	S2		Mixed hardwood forests, often on stream benches and terraces, on slopes, in the talus of rock ledges, on other sites with good drainage. Flowering: April–May.
Star duckweed (*Lemna trisulca*)	MO-SC	SNR	SNR	SNR	S1	S2	S3		Cool, freshwater creeks and in shallow lakes, ponds, and marshes. Flowering: (rare) late spring to summer.
Loesel's twayblade (*Liparis loeselii*)	ND-SC	S2	S1	S1	SX	S2	S1		Bogs, wet ditches, old sand pits, and moist meadows. Often in acidic soils, also in strongly basic soils; requires lack of competing vegetation. Flowering: 10 July–20 July.
Fourflower (prairie) loosestrife (*Lysimachia quadriflora*)	SD-SC	SNR	S1	SNR		SNR	SNR	S1	Wet meadows and around pond margins, usually where sandy, often on calcareous soils. Flowering: July–August.
Hispid (yellow) falsemallow (*Malvastrum hispidum*)	MO-SC				SNR	S3	S1	SNR	Rocky prairies; limestone, sandstone, or cherty limestone glades; bluffs; open alluvial valleys; along gravel bars. Flowering: July–September.
Tender creeping-cucumber (*Melothria pendula*)	KS-SC				S2	SNR	S1	SNR	Rich or rocky low woods, at base of limestone bluffs, and in alluvial woods—often along streams. Flowering: July–September.
Naked bishop's-cap (*Mitella nuda*)	ND-SC	S3							Moist forests, thickets, bogs, and swamps; often growing among mosses.
Southern adder's tongue (*Ophioglossum vulgatum*)	MO-SC				SX	S3	SNR	SNR	Shaded secondary woods, wooded slopes, forested bottomlands, and floodplain woods. Leaves: spring to early summer. Spores: April–June.

TABLE 3.5.2-2
(Continued)

Species	Status [a]	State Conservation Status [b]							Habitat
		ND	SD	NE	KS	MO	IL	OK	
Lanceolateleaf rock moss (*Orthotrichum speciosum* var. *elegans*)	MO-SC					S1			Epiphytic moss generally on tree trunks and branches.
Pendant-pod point-vetch (*Oxytropis deflexa*)	ND-SC	S1							Drier prairies and plains, open wooded areas. Flowering: June–July.
Oklahoma phlox (*Phlox oklahomensis*)	KS-SC			SNR	S2			S1	Tall–grass and mixed–grass prairies, thrives in low to moderately gazed areas; gently rolling uplands and steeper slopes of canyons; most abundant on north-facing slopes and well–drained grassland soils, weathered from calcareous shales. Flowering: March–May.
Heartleaf plantain (*Plantago cordata*)	MO-SC					S3	S1		Semi–aquatic, areas of dolomitic limestone; often in rock crevices or gravel bars in shallow, clear streams running through heavily wooded areas; requires a specific stream habitat, with regular and predictable erosion and deposition. Flowering: April–June.
Greek valerian (Jacob's ladder) (*Polemonium reptans*)	KS-SC		SNR	S1	S2	SNR	SNR	SNR	Rich low woods, thickets at the base of bluffs, and moist ground near streams. Flowering: April–June.
Prickly gooseberry (*Ribes cynosbati*)	ND-SC	S3	SNR			SNR	SNR	S1	Thin rocky woodlands, wooded slopes, woodland borders, and limestone bluffs; some disturbance beneficial, if it reduces overhead tree canopy.
Prairie willow (*Salix humilis*)	SD-SC	SNR	S1	SNR	SNR	SNR	S3	SNR	Moist to slightly dry black soil prairies, sand prairies, sandy savannas, barrens, and gravelly seeps; lowland or upland areas, depending on variety or local ecotype.
Rocky Mountain bulrush (*Schoenoplectus saximontanus*)	MO-SC		SNR	S1	S1	S1		SNR	Damp sandy soils near freshwater ponds, ditches, or watercourses. Fruiting: summer to fall.
Lesser (oval) ladies'-tresses (*Spiranthes ovalis* var. *erostellata*)	MO-SC				S1	S3	SNR	SNR	Moist, rich woodlands; thickets; old fields; second–growth woodlands; and wooded hillsides. Flowering: September–October.

TABLE 3.5.2-2
(Continued)

Species	Status [a]	State Conservation Status [b]							Habitat
		ND	SD	NE	KS	MO	IL	OK	
Goat's-rue (*Tephrosia virginiana*)	NE-SC			S1	SNR	SNR	SNR	SNR	Sandy soils in open woods, glades, and prairies, and along roadsides. Often indicts shallow soils. Flowering: May–July.
Nodding pogonia (*Triphora trianthophora*)	KS-SC			S1	S1	SNR	S3	S2	Moist lowland woods, ravines, stream valleys, and bottoms in the lower half of Missouri. Flowering: August–September.
Rock elm (*Ulmus thomasii*)	MO-SC	SNR	SNR	S3	S1	S2	S1		Mesic hardwood forests; moist, well-drained uplands; rocky ridges; floodplains; stream banks; and on limestone outcrops.
Flatleaf bladderwort (*Utricularia intermedia*)	ND-SC	S2					S1		Aquatic species in bogs, ponds, swamps, slow-moving streams, and wet sedge or rush meadows. Flowering: July–August.
Lesser bladderwort (*Utricularia minor*)	ND-SC	S2	SNR	S1			S1		Open bogs, sedge meadows, and marshlands; prefers calcium-rich shallow water.
Bird's-foot violet (*Viola pedata*)	NE-SC			S1	SNR	SNR	SNR	SNR	Rocky or dry open woodlands, on slopes, ridges, prairies, glades, and roadsides; almost always in acid soils. Flowering: April–June, September–December.

EX = Exotic species.
SX = Presumed extirpated.
SH = Possibly extirpated.
S1 = Critically imperiled.
S2 = Imperiled.
S3 = Vulnerable.
S4 = Apparently secure.
S5 = Secure.
SNR = Species not ranked.

[a] State listing as species of conservation concern (SC) according to ENSR 2006a.

[b] State conservation status (Natureserve 2006).

Native forests, especially forested floodplains, are also of conservation concern. Forest communities are generally rare within the native prairie grasslands but provide refuge habitats for many wildlife species. Native wooded communities were once an integral component of the landscape throughout the Great Plains. Many of these communities have been lost due to land conversion to agricultural uses, levee construction, and urban development. The current distribution of forested lands, grasslands and prairies, and croplands and pasture in the states crossed by the Keystone Project are illustrated in Figure 3.5.2-1.

3.5.3 Conservation Reserve Program

The Mainline Project and Cushing Extension would potentially cross one easement enrolled in the Conservation Reserve Program (CRP). The CRP is described in Section 3.9.3.2.

3.5.4 Noxious Weeds

Noxious weeds and other invasive plants are non-native, undesirable native, or introduced species that are able to exclude and out-compete desirable native species, thereby decreasing overall species diversity. The term “noxious weed” is legally defined under both 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.” The Federal Plant Protection Act contains a list of 137 federally restricted and regulated federal noxious weeds, as per CFR Title 7, Chapter III, Part 360, including 19 aquatic and wetland weeds, 62 parasitic weeds, and 56 terrestrial weeds. Each state is federally mandated to uphold the rules and regulations set forth by the Federal Plant Protection Act and to manage its lands accordingly. Five federally listed noxious weeds have been reported to occur in states that would be crossed by the construction ROWs (NRCS 2007); one aquatic species (ducklettuce) occurs in Missouri; parasitic species of dodder, including the native bigfruit dodder, occur in North Dakota, South Dakota, Nebraska, and Kansas; the introduced upland species professor-weed occurs in Nebraska, and giant hogweed and serrated tussock occur in Illinois (Table 3.5.4-1).

In addition to federal noxious weed lists, each state that would be crossed by the proposed Mainline Project and Cushing Extension pipelines maintains a list of regulated and prohibited noxious and invasive weed species. County weed control boards or districts are present in most counties that would be crossed by the pipeline route. These county weed control boards monitor local weed infestations and provide guidance on weed control. An additional 68 state-listed noxious, invasive, and regulated weed species occur across the construction ROWs—including nine aquatic and wetland species and 59 upland species (Table 3.5.4-1).

Many of these noxious weeds are widespread across the Keystone Project area but are listed as noxious in only one or a few of the states. Noxious weeds listed as occurring by all states that would be crossed by the construction ROWs include Canada thistle and nodding plumeless (musk) thistle (Table 3.5.4-1). Species listed as noxious by four of the seven affected states include leafy spurge, purple loosestrife, field bindweed, and Johnsongrass (Table 3.5.4-1). The differences in listing terminologies and status for weed species across states may lead to difficulties in obtaining seed sources consistently identified as “weed free” across the Keystone Project area.

TABLE 3.5.4-1
Noxious and Invasive Weeds along the Keystone Project Route

Species [a]	Status / Habitat	Occurrence and State Designations						
		ND	SD	NE	KS	MO	IL	OK
Hardheads (Russian knapweed) (*Acroptilon repens*)	Introduced species / Upland	√ NW	√ CP	√	√ NW	√	√	√
Creasted wheatgrass (*Agropyron cristatum*)	Introduced species / Upland	√ INV	√	√	√		√	√
Garlic mustard (*Alliaria petiolata*)	Introduced species / Upland	√ INV		√	√	√	√	√
Annual ragweed (*Ambrosia artemisiifolia*)	Native species / Upland	√	√	√	√	√	√ NW	√
Wollyleaf burr ragweed (*Ambrosia grayi*)	Native species / Upland			√	√ NW			√
Great ragweed (*Ambrosia trifida*)	Native species / Upland	√	√	√	√	√	√ NW	√
Corn chamomile (*Anthemis arvensis*)	Introduced species / Upland	√ INV		√		√	√	
Lesser burdock (*Arctium minus*)	Introduced species / Upland	√	√ LW	√	√	√	√	√
Absinthium (*Artemisia absinthium*)	Introduced species / Upland	√ NW	√ LW	√	√	√	√	
Smooth brome (*Bromus inermis*)	Introduced species / Upland	√ INV	√	√	√	√	√	√
Japanese brome (*Bromus japonicus*)	Introduced species / Upland	√ INV	√	√	√	√	√	√
Cheatgrass downy brome (*Bromus tectorum*)	Introduced species / Upland	√ INV	√	√	√	√	√	√
Marijuana (*Cannabis sativa*)	Introduced species / Upland	√	√	√	√	√ NW	√ NW	√
Siberian peashrub (*Caragana arborescens*)	Introduced species / Upland	√ INV	√	√			√	
Whitetop (*Cardaria draba*)	Introduced species / Upland	√ INV	√ NW	√	√ NW	√	√	√

TABLE 3.5.4-1
(Continued)

Species [a]	Habitat	Occurrence and Status by State						
		ND	SD	NE	KS	MO	IL	OK
Spiny plumeless thistle (*Carduus acanthoides*)	Introduced species / Upland	√ INV	√ LW	√ NW	√		√	√
Nodding plumeless (musk) thistle (*Carduus nutans*)	Introduced species / Upland	√ NW	√ CP	√ NW	√ NW	√ NW	√ NW	√ NW
Meadow knapweed (*Centaurea debeauxii*)	Introduced species / Upland	INV						
Diffuse (white) knapweed (*Centaurea diffusa*)	Introduced species / Upland	NW	CP	√ NW		√	√	
Bighead knapweed (*Centaurea macrocephala*)	Introduced species / Upland	INV						
Spotted knapweed (*Centaurea stoebe* [*maculosa*])	Introduced species / Upland	√ NW	√ CP	√ NW	√	√	√	
Yellow star-thistle (*Centaurea solstitialis*)	Introduced species / Upland	√ NW	√ CP	√	√	√	√	√
Rush skeletonweed (*Chondrilla juncea*)	Introduced species / Upland		CP					
Chickory (*Cichorium intybus*)	Introduced species / Upland	√	√ CP	√	√	√	√	√
Canada thistle (*Cirsium arvense*)	Introduced species / Upland and wetland	√ NW	√ NW	√ NW	√ NW	√ NW	√ NW	√ NW
Bull thistle (*Cirsium vulgare*)	Introduced species / Upland	√ INV	√ NW	√	√ LW	√	√	√
Poison hemlock (*Conium maculatum*)	Introduced species / Upland	√	√ NW	√	√	√	√	√
Field bindweed (*Convolvulus arvensis*)	Introduced species / Upland	√ NW	√ CP	√	√ NW	√ NW	√	√
Common crupina **(*Crupina vulgaris*)**	Introduced species / Upland		CP					
Dodder **(*Cuscuta* spp. – not inclusive)**	Native and introduced species / Upland	√	√ CP	√	√	√	√	√

TABLE 3.5.4-1
(Continued)

Species [a]	Habitat	Occurrence and Status by State						
		ND	SD	NE	KS	MO	IL	OK
Bigfruit dodder (*Suscuta megalocarpa*)	Native species / Upland	√	√	√	√			
Gypsyflower (*Cynoglossum officinale*)	Introduced species / Upland and woodland	√ INV	√ LW	√	√	√	√	
Fuller's teasel (*Dipsacus fullonum*)	Introduced species / Upland		√	√	√	√ NW	√	√
Cutleaf teasel (*Dipsacus laciniatus*)	Introduced species / Upland			√	√	√ NW	√	
Brazilian waterweed (*Egeria densa*)	Introduced species / Aquatic	INV		√	√	√	√	√
Russian olive (*Elaeagnus angustifolia*)	Introduced species / Upland, wetland, and woodland	√ INV	√	√	√	√	√	√
Quackgrass (*Elymus repens*)	Introduced species / Upland	√ INV	√	√	√ NW	√	√	√
Leafy spurge (*Euphorbia esula*)	Introduced species / Upland	√ NW	√ NW	√ NW	√ NW	√	√	
Professor-weed (Goatsrue) (*Galega officinalis*)	Introduced species / Upland			√				
Giant hogweed (*Heracleum mantegazzianum*)	Introduced species / Upland						√	
Orange hawkweed (*Hieracium aurantiacum*)	Introduced species / Upland	INV					√	
Meadow hawkweed (*Hieracium pratense*)	Introduced species / Upland	INV					√	
Indian rushpea (*Hoffmannseggia densiflora*)	Native species / Upland				√ NW			√
Black henbane (*Hyoscyamus niger*)	Introduced species / Upland	√ INV	√	√			√	
Common St. Johnswort (*Hypericum perforatum*)	Introduced species / Upland	√	√ CP	√	√	√	√	√

TABLE 3.5.4-1
(Continued)

Species [a]	Habitat	Occurrence and Status by State						
		ND	SD	NE	KS	MO	IL	OK
Broadleafed pepperweed (*Lepidium latifolium*)	Introduced species / Upland		CP	√	√	√	√	
Sericea (Chinese) lespedeza (*Lespedeza cuneata*)	Introduced species / Wetland			√	√ NW	√	√	√
Dalmatian toadflax (*Linaria dalmatica*)	Introduced species / Upland	√ NW	√ CP	√	√		√	√
Butter-and-eggs (*Linaria vulgaris*)	Introduced species / Upland	√ INV	√ CP	√	√	√	√	√
Purple loosestrife (*Lythrum salicaria*)	Introduced species / Wetland	√ NW	√ NW	√ NW	√	√ NW	√	√
Black medick (*Medicago lupulina*)	Introduced species / Upland	√ INV	√	√	√	√	√	√
Yellow sweetclover (*Melilotus officinalis*)	Introduced species / Upland	√ INV	√	√	√	√	√	√
Twoleaf watermilfoil (*Myriophyllum heterophyllum*)	Native species / Aquatic	√ INV	√		√	√	√	√
Eurasian (Spike) watermilfoil (*Myriophyllum spicatum*)	Introduced species / Aquatic	√ INV	√ CP	√		√	√	√
Serrated tussock **(*Nassella trichotoma*)**	Introduced species / Upland						√	
Scotch cottonthistle (*Onopordum acanthium*)	Introduced species / Upland	INV	LW	√	√	√ NW		√ NW
Ducklettuce **(*Ottelia alismoides*)**	Introduced species / Aquatic					√		
Reed canarygrass (*Phalaris arundinacea*)	Native species / Wetland	√ INV	√	√	√	√	√	√
Kentucky bluegrass (*Poa pratensis*)	Native and introduced species / Upland	√ INV	√	√	√	√	√	√
Japanese knotweed (*Polygonum cuspidatum*)	Introduced species / Upland	INV	√	√	√	√	√	√

TABLE 3.5.4-1
(Continued)

Species [a]	Habitat	Occurrence and Status by State						
		ND	SD	NE	KS	MO	IL	OK
Giant knotweed (*Polygonum sachalinense*)	Introduced species / Upland	INV	LW				√	
Curly pondweed (*Potamogeton crispus*)	Introduced species / Aquatic	√ INV	√	√	√	√	√	√
Kudzu (*Pueraria lobata*)	Introduced species / Upland			√	√ NW	√ NW	√ NW	√
Common buckthorn (*Rhamnus cathartica*)	Introduced species / Upland and woodland	√ INV	√	√	√	√	√	
Multiflora rose (*Rosa multiflora*)	Introduced species / Upland		CP	√	√ NW	√ NW	√	√
Field sowthistle (*Sonchus arvensis*)	Introduced species / Upland and wetland	√ INV	√ NW	√	√	√	√ NW	
Columbus grass (*Sorghum almum*)	Introduced species / Upland						√ NW	
Johnsongrass (*Sorghum halepense*)	Introduced species / Upland	√	√ CP	√	√ NW	√ NW	√ NW	√
Tamarisk (Salt cedar) (*Tamarix aphylla*, *T. chinensis*, *T. gallica*, *T. parviflora*, *T. ramosissima*)	Introduced species / Upland, wetland, and woodland	√ NW	√ NW	√	√	√	√	√
Common tansy (*Tanacetum vulgare*)	Introduced species / Upland	√	√ LW	√	√	√	√	√
Puncturevine (*Tribulus terrestris*)	Introduced species / Upland	√ INV	√ LW	√	√	√	√	√
Narrowleaf cattail (*Typha angustifolia*)	Introduced species / Wetland	√ INV	√	√	√	√	√	√
Hybrid cattail (*Typha* x. *glauca*)	Native species / Wetland	INV	√			√	√	
Siberian elm (*Ulmus pumila*)	Introduced species / Upland	√ INV	√	√	√	√	√	√
Common mullein (*Verbascum thapsus*)	Introduced species / Upland	√	√ LW	√	√	√	√	√

TABLE 3.5.4-1
(Continued)

√ = Occurs within state (Natureserve 2006).
CP = Classified as a state regulated plant.
INV = Classified as a state invasive species.
LW = Classified as a local noxious weed.
NW = Classified as a state noxious weed.

[a] Species in bold are federal noxious weeds. Source: NRCS 2007.

Source: Adapted from ENSR 2006a.

Noxious weeds are addressed by Executive Order 13112, which directs federal agencies to prevent the introduction of invasive species; provide for their control; and minimize the economic, ecological, and human health impacts that invasive species can cause. The executive order further specifies that federal agencies shall not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless it has been determined that the benefits of such actions outweigh the potential harm caused by invasive species and that all feasible and prudent measures to minimize the risk of harm will be taken in conjunction with the actions.

3.5.5 Potential Impacts and Mitigation

Total miles crossed and acres of terrestrial vegetation affected during construction and operation of the Mainline Project and Cushing Extension are presented in Tables 3.5.5-1, 3.5.5-2, and 3.5.5-3. Individual grasslands that would be crossed by the pipeline ROWs are presented in Table 3.5.5-4.

Potential construction- and operations-related effects include:

- Temporary and permanent modification of vegetation community composition and structure from clearing and operational maintenance;
- Increased risk of soil erosion due to lack of vegetative cover;
- Expansion of invasive and noxious weed populations along the pipeline ROW as a result of construction and operational vegetation maintenance;
- Loss of sensitive plant species and habitats as a result of construction clearing and grading;
- Soil and sod disturbance (mixing of topsoil with subsoil with altered biological activities and chemical conditions that could affect reestablishment and natural recruitment of native vegetation after restoration);
- Compaction and rutting of soils from movement of heavy machinery and transport of pipe sections, altering natural hydrologic patterns, inhibiting seed germination, or increasing siltation; and
- Alteration in vegetation productivity and phenology due to increased soil temperatures associated with heat input from the pipeline.

3.5.5.1 General Vegetation Resources

The primary impacts on vegetation from construction and operation of the Mainline Project and Cushing Extension pipelines would be cutting, clearing, or removing the existing vegetation within the construction work area and potential invasion by noxious weeds. The degree of impact would depend on the type and amount of vegetation affected, the rate at which vegetation would regenerate after construction, and the frequency of vegetation maintenance conducted on the ROW during pipeline operation.

Impacts on pastureland generally would be shorter term, with vegetation typically becoming reestablished within 2 years. Impacts on these communities during operation of the pipeline would be minimal because these areas would be allowed to recover following construction and typically would not require maintenance mowing. Impacts on annually tilled croplands also generally would be short term and limited to the current growing season, provided that topsoil segregation was maintained and soils were not compacted during construction.

TABLE 3.5.5-1 Estimated Impacts on Vegetation Communities for the Keystone Mainline Project			
Vegetation Community Classification	**Length of Community Crossed (miles)**	**Community Area Affected during Construction (acres) [a]**	**Community Area Affected by Operations (acres) [a]**
North Dakota			
Cropland	171.8	2,649	1,033
Grassland/rangeland	26.5	450	175
Upland forest	3.0	48	19
Riverine/open water	0.7	12	5
Forested wetlands	0.3	4	2
Emergent/shrub-scrub wetlands	13.7	187	73
Right-of-way	1.6		
Developed land	0.2	90	35
North Dakota subtotal	*217.8*	*3,440*	*1,342*
South Dakota			
Cropland	163.6	2,504	1,001
Grassland/rangeland	46.3	679	271
Upland forest	0	2	1
Riverine/open water	0.4	6	2
Forested wetlands	0.0	0	0
Emergent/shrub-scrub wetlands	7.0	98	39
Right-of-way	1.9		
Developed land	0.5	88	35
South Dakota subtotal	*219.9*	*3,377*	*1,349*
Nebraska			
Cropland	180.3	2,751	1,091
Grassland/rangeland	26.6	447	177
Upland forest	2.4	44	18
Riverine/open water	1.3	18	7
Forested wetlands	0.2	3	1
Emergent/shrub-scrub wetlands	1.6	22	9
Right-of-way	2.0		
Developed land	0.2	50	20
Nebraska subtotal	*214.6*	*3,335*	*1,323*
Kansas			
Cropland	71.7	1,348	438
Grassland/rangeland	16.9	349	113
Upland forest	7.4	115	37
Riverine/open water	1.1	16	5
Forested wetlands	0.3	8	3
Emergent/shrub-scrub wetlands	0.4	10	3
Right-of-way	0.8		
Developed land	0.1	25	8
Kansas subtotal	*98.7*	*1,871*	*608*

TABLE 3.5.5-1 (Continued)			
Vegetation Community Classification	Length of Community Crossed (miles)	Community Area Affected during Construction (acres) [a]	Community Area Affected by Operations (acres) [a]
Missouri			
Cropland	151.1	2,754	994
Grassland/rangeland	69.7	1,014	366
Upland forest	37.5	600	217
Riverine/open water	3.3	49	18
Forested wetlands	2.6	40	14
Emergent/shrub-scrub wetlands	2.4	36	13
Right-of-way	5.5		
Developed land	1.9	182	66
Missouri subtotal	*274.0*	*4,675*	*1,687*
Illinois			
Cropland	43.6	581	229
Grassland/rangeland	1.9	112	44
Upland forest	4.7	58	23
Riverine/open water	1.1	14	5
Forested wetlands	0.7	15	6
Emergent/shrub-scrub wetlands	2.7	58	23
Right-of-way	1.7		
Developed land	0.5	71	28
Illinois subtotal	*56.9*	*909*	*358*
Mainline Project			
Cropland	782.1	12,587	4,785
Grassland/rangeland	187.9	3,051	1,147
Upland forest	55.2	867	314
Riverine/open water	7.9	115	43
Forested wetlands	4.1	70	26
Emergent/shrub-scrub wetlands	27.8	411	160
Right-of-way	13.5		
Developed land	3.4	506	192
Mainline Project total	**1,081.9**	**17,607**	**6,667**

[a] Acres disturbed on a temporary basis (permanent right-of-way width plus temporary workspace) during construction, and acres disturbed (maintained) on a permanent basis during operation of the proposed Keystone Project. Acreage impacts for right-of-way areas are listed under the appropriate vegetation community. Data for operational impacts by vegetation communities were calculated based on the distribution of impacts for construction area by vegetation community and the total acres reported affected by operations.

Sources: TransCanada 2007a, c, d (Tables 2.1-2; 3.6-2; and 4.2-3).

TABLE 3.5.5-2
Estimated Impacts on Vegetation Communities for the Keystone Cushing Extension

Vegetation Community Classification	Length of Community Crossed (miles)	Community Area Affected during Construction (acres) [a]	Community Area Affected by Operations (acres) [a]
Nebraska			
Cropland	0.9	12	5
Grassland/rangeland	1.3	24	10
Upland forest	0.3	0	0
Riverine/open water	0.0	1	0
Forested wetlands	0.0	0	0
Emergent/shrub-scrub wetlands	0.0	0	0
Right-of-way	0.0		
Developed land	0.0	<1	0
Nebraska subtotal	*2.5*	*37*	*15*
Kansas			
Cropland	133.3	2,097	819
Grassland/rangeland	62.7	934	365
Upland forest	7.9	124	48
Riverine/open water	1.1	33	13
Forested wetlands	0.8	10	4
Emergent/shrub-scrub wetlands	1.1	14	5
Right-of-way	3.3		
Developed land	0.2	54	21
Kansas subtotal	*210.4*	*3,266*	*1,275*
Oklahoma			
Cropland	33.2	578	213
Grassland/rangeland	43.8	681	251
Upland forest	2.6	39	14
Riverine/open water	0.8	12	4
Forested wetlands	0.0	0	0
Emergent/shrub-scrub wetlands	0.8	10	4
Right-of-way	0.8		
Developed land	1.1	43	16
Oklahoma subtotal	*83.1*	*1,363*	*502*
Cushing Extension			
Cropland	167.4	2,687	1,042
Grassland/rangeland	107.8	1,639	628
Upland forest	10.8	163	63
Riverine/open water	1.9	46	18
Forested wetlands	0.8	10	4
Emergent/shrub-scrub wetlands	1.9	24	9
Right-of-way	4.1		
Developed land	1.3	97	37
Cushing Extension total	**296.0**	**4,666**	**1,801**

[a] Acres disturbed on a temporary basis (permanent right-of-way width plus temporary workspace) during construction, and acres disturbed (maintained) on a permanent basis during operation of the proposed Keystone Project. Acreage impacts for right-of-way areas are listed under the appropriate vegetation community. Data for operational impacts by vegetation communities were calculated based on the distribution of impacts for construction area by vegetation community and the total acres reported affected by operations.

Sources: TransCanada 2007a, c, d (Tables 2.1-2; 3.6-2; and 4.2-3)

TABLE 3.5.5-3 Estimated Impacts on Vegetation Communities for the Keystone Project			
Vegetation Community Classification	**Length of Community Crossed (miles)**	**Community Area Affected during Construction (acres) [a]**	**Community Area Affected by Operations (acres) [a]**
Mainline Project			
Cropland	782.1	12,587	4,785
Grassland/rangeland	187.9	3,051	1,147
Upland forest	55.2	867	314
Riverine/open water	7.9	115	43
Forested wetlands	4.1	70	26
Emergent/shrub-scrub wetlands	27.8	411	160
Right-of-way	13.5		
Developed land	3.4	506	192
Mainline Project subtotal	*1,081.8*	*17,607*	*6,667*
Cushing Extension			
Cropland	167.4	2,687	1,042
Grassland/rangeland	107.8	1,639	628
Upland forest	10.8	163	63
Riverine/open water	1.9	46	18
Forested wetlands	0.8	10	4
Emergent/shrub-scrub wetlands	1.9	24	9
Right-of-way	4.1		
Developed land	1.3	97	37
Cushing Extension subtotal	*296.0*	*4,666*	*1,801*
Keystone Project			
Cropland	949.5	15,274	5,827
Grassland/rangeland	295.7	4,690	1,775
Upland forest	66.1	1,030	377
Riverine/open water	9.8	161	61
Forested wetlands	4.9	80	30
Emergent/shrub-scrub wetlands	29.7	435	169
Right-of-way	17.6		
Developed land	4.7	603	229
Keystone Project total	**1,377.8**	**22,273**	**8,468**

[a] Acres disturbed on a temporary basis (permanent right-of-way width plus temporary workspace) during construction, and acres disturbed (maintained) on a permanent basis during operation of the proposed Keystone Project. Acreage impacts for right-of-way areas are listed under the appropriate vegetation community. Data for operational impacts by vegetation communities were calculated based on the distribution of impacts for construction area by vegetation community and the total acres reported affected by operations.

Sources: TransCanada 2007a, c; d (Tables 2.1-2; 3.6-2; and 4.2-3).

TABLE 3.5.5-4 Estimated Impacts on Grasslands Occurring along the Keystone Project Route				
State and County	**Type**	**Quality**	**Number Crossed**	**Milepost [a]**
MAINLINE PROJECT				
North Dakota				
Cavalier	Tall grass prairie	Low	2	4–5
Pembina	Tall grass prairie	Low	3	6–8
Walsh	Tall grass prairie	Low	2	32–42
Nelson	Tall grass prairie	Medium	1	58–59
Barnes	Tall grass prairie	High to low	4	124–163
Ransom	Tall grass prairie	Medium to low	2	168–169
Sargent	Tall grass prairie	Medium	1	207–208
South Dakota				
Day	Tall grass prairie	High to low	3	258–267
Clark	Tall grass prairie	Medium	2	278–280
McCook	Tall grass prairie	Medium	1	385–386
Hutchinson	Tall grass prairie	High	1	392–393
Yankton	Tall grass prairie	High	2	422–424
Nebraska				
Cedar	Mixed grass prairie	High to low	4	440–457
Stanton	Mixed grass prairie	High to low	4	504–517
Colfax	Mixed grass prairie	Medium	1	542–543
Saline	Mixed grass prairie	Low	3	594–606
Jefferson	Mixed grass prairie	High to medium	5	624–644
Kansas				
Nemaha	Mixed grass prairie	Unknown	2	690–693
Brown	Mixed grass prairie	Unknown	2	711–712
Doniphan	Mixed grass prairie	Unknown	2	737–739
Missouri				
Clinton	Mixed grass prairie	Unknown	4	768–788
Chariton	Mixed grass prairie	Unknown	3	847–863
Randolph	Mixed grass prairie	Unknown	22	878–891
Audrain	Mixed grass prairie	Unknown	14	901–917
Illinois				
None				
Mainline Project subtotal			***90***	

TABLE 3.5.5-4 (Continued)				
State and County	Type	Quality	Number Crossed	Milepost [a]
CUSHING EXTENSION				
Nebraska				
Jefferson	Grassland	Unknown	7	0–2.5
Kansas				
Washington	Grassland	Unknown	22	3–31
Clay	Grassland	Unknown	26	33–59
Dickinson	Grassland	Unknown	49	63–98
Marion	Grassland	Unknown	50	100–132
Butler	Grassland	Unknown	59	136–177
Cowley	Grassland	Unknown	23	181–209
Oklahoma				
Kay	Grassland	Unknown	49	212–242
Noble	Grassland	Unknown	51	244–268
Payne	Grassland	Unknown	76	269–295
Cushing Extension subtotal			***412***	
Keystone Project total			**502**	

[a] Approximate.

Sources: ENSR 2006a, b; ENSR 2007; TransCanada 2007d (Table 3.6-3).

Clearing trees within upland forest communities, including riparian forest, would result in long-term impacts on these vegetation communities, given the length of time needed for the community to mature to pre-construction conditions. Permanent impacts would occur within the 30-foot-wide permanent easement, where trees would be removed and prevented from reestablishing through the periodic mowing and brush clearing required for pipeline operation and inspections.

Impacts on shrubland also would be long term because of the time required to reestablish the woody vegetation characteristic of this community type. Permanent impacts on shrubland would result from vegetation clearing over a 10-foot-wide corridor centered over the pipeline and vegetation clearing at 3-year intervals within the 30-foot-wide permanent ROW in non-riparian areas. These clearing activities would prevent larger woody species from reverting to preconstruction form and size.

Operation of the Keystone project would cause slight increases in soil temperatures at the soil surface (from 1 to 2 ˚F) primarily during winter, and at depths of 6 inches (from 1 to 5 ˚F), with most notable increases during spring (March). While many species would not produce root systems that would penetrate much below 6 inches, the root systems of some species—notably native prairie grasses, trees and shrubs—often penetrate well below 6 inches. Soil temperatures closer to the pipeline burial depth of 6 feet may be as much as 30 ˚F warmer than the ambient surrounding soil temperatures. In general, increased soil temperatures during early spring would cause early germination and emergence in annual crops such as corn and soybeans and in tall-grass prairie species (TransCanada 2007c). Increased soil temperatures also may stimulate root growth in oak species (TransCanada 2007c).

To reduce impacts on vegetation within the construction and permanent ROWs and to improve the probability of successful revegetation of disturbed areas, Keystone would implement the following measures in its CMR Plan (Appendix B):

- Provide temporary and permanent erosion control measures.
- Test topsoil and subsoil for compaction at regular intervals in agricultural and residential areas.
- Restore pre-construction contours and natural drainage patterns.
- Fertilize and add soil pH modifiers in accordance with written recommendations from the local soil conservation authority.
- Monitor the ROW for the first year following construction and again during the second growing season; consider revegetation successful if density and cover are similar to adjacent undisturbed lands.
- Complete additional revegetation efforts until revegetation is deemed successful.
- Construction traffic shall be restricted to the construction ROW, existing roads, and approved private roads.
- Construction ROW boundaries, including pre-approved temporary workspaces, shall be clearly staked to prevent disturbance to unauthorized areas.
- If crops are present, they shall be mowed or disced to ground level unless an agreement is made for the landowner to remove for personal use.
- Burning is prohibited on cultivated land.
- The construction ROW at timber shelterbelts in agricultural areas shall be reduced to the minimum necessary to construct the pipeline.
- In agricultural lands, topsoil will be stripped from the area to a maximum of 12 inches.
- In non-cultivated agricultural lands, the actual depth of topsoil (up to 12 inches) shall be stripped from the areas to be excavated unless otherwise agreed to with the landowner.
- When grading is required, the topsoil shall be removed from the entire area to be graded and shall be stored.
- Stripped topsoil is to be stockpiled, and mixing of topsoil and subsoil is to be minimized.
- Topsoil will not be used to fill low areas.
- To prevent wind erosion, topsoil piles shall be tackified, as necessary, using either water or a suitable tackifier.
- The surface drainage network shall be maintained to prevent any accumulation of water.
- Topsoil shall not be used to construct ramps at road or water body crossings.
- Compaction shall be alleviated on all agricultural land crossed by construction equipment. Cropland that has been compacted will be ripped a minimum of three passes at least 18 inches deep, and all pasture and woodland shall be ripped or chiseled a minimum of three passes at least 12 inches deep.
- Areas stripped for topsoil salvage shall be ripped at 18 inches or less a minimum of three passes, graded, and smoothed prior to topsoil replacement.

- Topsoil shall be replaced to pre-existing depths once ripping and discing of subsoil is complete.
- Plowing under of organic matter, including wood chips, manure, or planting a new crop such as alfalfa, to decrease soil bulk density and improve soil structure or any other measures in consultation with the NRCS shall be considered if mechanical relief of compaction is deemed unsatisfactory.
- Seeding shall follow cleanup and topsoil replacement as closely as possible. Seed shall be applied to all disturbed surfaces (except cultivated fields, unless requested by the landowner).
- The final seed mix shall be based on input from the local NRCS and availability of seed at the time of reclamation. The landowner may request specific seeding requirements during easement negotiations.
- Certificates of seed analysis shall be required for all seed mixes, to limit the introduction of noxious weeds.
- Seeds not used within 12 months of seed testing shall be approved by Keystone prior to use.
- Remove and dispose of excess mulch prior to seedbed preparation.
- Evenly re-apply and anchor temporary mulch following seeding.
- Seed at a rate appropriate for the region and stability of the reclaimed surface based on Pure Live Seed.
- Weather conditions, construction ROW constraints, site access, and soil type shall influence the seeding method used. Drill seed unless too steep, temporary cover crop seed shall be broadcast.
- Delay seeding until soil is in an appropriate condition for drill seeding.
- Use Truax or an equivalent-type drill seeder equipped with a cultipacker that is designed and equipped to apply grass and grass-legume seed mixtures, with mechanisms such as seed box agitators to allow even distribution of all species in each seed mix and with an adjustable metering mechanism to accurately deliver the specified seeding rate and depth.
- Calibrate drill seeders so that the specified seeding rate is planted; row spacing shall not exceed 8 inches.
- Seep depths shall be consistent with local or regional agricultural practices.
- Broadcast or hydro-seeding shall be used in lieu of drilling. For these uses, double the recommended seeding rates and use a harrow, cultipacker, or other equipment immediately following broadcasting to incorporate the seed to the specified depth and to firm the seedbed.
- Hand rake all areas that are too steep or otherwise cannot be safely harrowed or cultipacked.
- Use hydro-seeding on a limited basis, where the slope is too steep or soil conditions do not warrant conventional seeding methods.

3.5.5.2 Vegetation Communities of Conservation Concern

Construction affects on previously untilled native prairies may be irreversible, as destruction of the prairie sod during trenching may require more than 100 years for recovery. Short-grass prairie and mixed-grass prairie areas may take 5 or more years to become reestablished due to poor soil conditions and low moisture levels. Invasion of non-native plants also may prevent recovery of prairie grasslands, especially as these are related to altered land management that would require suppression of wildfires that maintain prairie sod. An estimated minimum of 29 miles of native prairie and/or grasslands would be affected during construction of the Keystone Project (Table 3.5.5-4). These impacts would contribute to the decline in native grasslands described in Table 3.5.2-1 and represent an additional loss to current grassland areas across the Keystone Project area.

To minimize impacts to native prairie communities, Keystone would implement the following measures in its CMR Plan (Appendix B):

- Siting extra workspaces outside of native prairie habitats,
- Minimizing the width of the construction area within native prairie areas, and
- Continuing consultation with federal and state management agencies on avoidance of native prairie impacts.
- Contracting a qualified biologist to conduct a survey of sensitive species associated with native tall-grass prairie.
- Monitoring restoration in native prairies to ensure that native species become established and to ensure no net loss of native prairie habitats

If sensitive species are identified in the construction ROW, Keystone would work with the relevant regulatory authorities to determine whether any additional protection measures would be required. Once construction is complete, disturbance in native prairie would be reclaimed to native prairie species, using native seed mixes specified by applicable state and federal agencies such that no net loss of native prairie habitat would occur. To minimize impacts on native prairie, no permanent developments (such as access roads or pump stations) would be constructed in native prairie tracts, if possible.

The following measures would further minimize or mitigate impacts on native prairie communities:

- Encouraging private landowners to replant native prairie communities disturbed during construction with native prairie species.
- Mitigating any remaining unavoidable impacts to native prairie communities at a minimum replacement/restoration of 1 acre of native prairie for each acre of native prairie impact; mitigation compensation should occur offsite and onsite, which may involve a restoration or preservation program (Larry Svoboda, EPA, May 3, 2007).

Native forests, especially forested floodplains, are also of conservation concern. Native wooded communities were once an integral component of the landscape throughout the Great Plains. Many of these communities have been lost due to land conversion to agricultural uses, levee construction, and urban development. An estimated 867 acres of upland forests and 70 acres of forested wetlands would be cut down during construction of the Mainline Project. An estimated 163 acres of upland forests and 10 acres of forested wetlands would be cut down during construction of the Cushing Extension. An estimated 314 acres of upland forests and 26 acres of forested wetland would not be allowed to reestablish within the permanently maintained 30-foot Mainline Project ROW. An estimated 63 acres of upland forest and 4 acres of forested wetlands would not be allowed to reestablish within the permanently maintained 30-foot Cushing Extension ROW. While these areas represent a small proportion of the total area affected by construction of the Keystone Project, these forested communities are already reduced in most areas.

Keystone would implement the following measures in its CMR Plan (Appendix B) for forested uplands and wetlands:

- Prior to the start of clearing, clearly stake ROW boundaries, including pre-approved temporary workspaces, to prevent disturbance to unauthorized areas.
- Consult with the landowner to determine whether any trees are of commercial or other value to the landowner. Salvage timber as requested by the landowner.
- Grub tree stumps only 5 feet on either side of the trench line and only where necessary for grading a level surface for pipeline construction equipment to operate safely.
- Follow the landowner's desires in the easement agreement regarding the disposal of trees, brush, and stumps of no value to the landowner by burning, burial, or complete removal from any affected property.
- Use cut-off-type saw equipment for timber salvage operations. Undertake felling in a manner that minimizes butt shatter, breakage, and off-ROW disturbance. Use skidders or alternate equipment to transport salvaged logs to stacking sites.
- Fell trees in such a way that they fall toward the centre line of the ROW, to avoid breaking trees and branches off the ROW. Salvage leaners or felled trees that inadvertently fall into adjacent undisturbed vegetation.
- Recover and dispose of trees and slash falling outside the ROW.
- Limb and top salvaged logs before removal from the construction ROW. Orient log decks (if required) to best facilitate loading by picker trucks and locate them adjacent to the working side of the ROW where possible.
- The Contractor would not be allowed to dispose of woody debris in wooded areas along the pipeline ROW.
- Prune branches hanging over the ROW only when necessary for construction. Any branch that is broken or seriously damaged should be cut off near its fork, and the collar of the branch should be preserved.
- All tree wastes, stumps, tree crown, brushes, branches, and other forest debris will be either burned, chipped (using a mobile chipper), buried (with landowner approval), or removed from the ROW. Chips must not be spread over cultivated land; however, they may be spread and incorporated with mineral soil over the forest floor at a density that will not prevent revegetation of grass.
- Stump removal and brush clearing would be performed with bulldozers equipped with brush rakes to preserve organic matter.
- Establish decking sites, approximately 2,000 feet apart in timbered areas, on sites located on approved temporary workspaces in existing cleared areas, and size them appropriately to accommodate the loading equipment.
- The Contractor would remove decked timber from the construction ROW and transport it to a designated all-weather access point or mill if the landowner does not want the timber.

The following measures would further minimize or mitigate impacts on native forest communities:

- Siting extra workspaces outside of forested areas (John Cochnar, USFWS, May 27, 2007).
- Minimizing the width of the construction area (John Cochnar, USFWS, May 27, 2007).
- Mitigating unavoidable impacts to native wooded communities at a minimum replacement of 2 acres of native forest for each acre of native forest impact; higher ratios may be applicable if mitigation ratios already have been determined for specific habitat at the state level by federal and/or state resource agencies (John Cochnar, USFWS, May 27, 2007).
- Evaluating terrestrial vegetation impacts and habitat fragmentation impacts to the Mississippi/ Missouri Confluence COA in St. Charles and Lincoln Counties in Missouri and to the COE lands in the Carlyle Lake WMA in Fayette County, Illinois to determine compensatory mitigation for impacts to these habitats (St. Louis District COE, May 2007).
- Continuing consultation with federal and state management agencies on avoidance of forested community impacts.

3.5.5.3 Conservation Reserve Program

Temporary and permanent impacts on CRP land generally would be the same as those described above for vegetation. Keystone has committed to avoiding two of the three NRCS Wetlands Reserve Program (WRP) lands potentially crossed by the pipeline ROW. The NRCS has agreed that Keystone may cross the third WRP tract, subject to an appropriate restoration agreement.

3.5.5.4 Noxious Weeds

After disturbances to the soil, vegetation communities can be susceptible to infestations of invasive or noxious weed species. Vegetation removal and soil disturbance during construction could create optimal conditions for the establishment of undesirable species. Construction equipment traveling from weed-infested areas into weed-free areas could disperse invasive or noxious weed seeds and propagates, resulting in the establishment of noxious weeds in previously weed-free areas.

A number of federal and state agencies submitted comments requesting that disturbed areas be revegetated with native plant species that currently are found in the Keystone Project area. Keystone has agreed to recommend to private landowners that revegetation occur using native plant species. The ultimate decision on the revegetation approach would be made by each individual landowner. Keystone proposes to control the introduction and spread of noxious weeds by implementing the construction and restoration procedures detailed in its CMR Plan (Appendix B). The plan includes coordination with appropriate local, state, and federal agencies to:

- Obtain written recommendations from local soil conservation authorities or land management agencies regarding permanent erosion control and revegetation specification; and
- Develop specific procedures in coordination with the appropriate agency to prevent the introduction or spread of noxious weeds resulting from construction and restoration activities, including:
    - Ensuring that all soil imported for agricultural or residential use has been certified as weed-free,

- Ensuring that only weed-free straw or hay for sediment control devices or mulch application,
- Cleaning all equipment and vehicles prior to beginning of construction, and
- Monitoring restoration for 3 years following construction in wetlands and during the first and second growing seasons in uplands as required by federal and state regulators.

Weed control addressed in Section 2.13 of Keystone's CMR Plan (Appendix B) includes the following measures:

- Thoroughly clean all construction equipment, including timber mats, prior to moving the equipment to the job site, using high-pressure washing equipment.
- Mark all areas of the ROW that contain infestations of noxious, invasive species or soil-borne pests. Clean the tracks, tires, and blades of equipment by hand or compressed air to remove excess soil prior to movement of equipment out of weed- or soil-borne pest-infested areas.
- Use mulch and straw or hay bales that are free of noxious weeds for temporary erosion and sediment control.
- Implement best management practices for vegetation control, including use of agricultural herbicides in consultation with county or state regulatory agencies based on the weed species requiring control.
- Apply pre-construction treatments such as mowing prior to seed development or herbicide application to areas of noxious weed infestation prior to other clearing, grading, and trenching or other soil-disturbing work at the identified locations.
- Where required, apply herbicides by state-licensed or -certified personnel, within 1 week or as deemed necessary for optimum mortality success prior to disturbing the area by clearing, grading, trenching, or other soil-disturbing work.
- Prohibit application of herbicides in or within 100 feet of a wetland or water body.
- Provide weed control on the construction ROW with Keystone surface jurisdiction (i.e., valve sites, metering station, and pump stations).
- Reimburse landowners adjacent to aboveground facilities when landowners must control weeds determined to have spread from land with Keystone aboveground facilities.

As a result of this environmental analysis and based on comments received from regulatory agencies, Keystone has agreed to the following additional mitigation measures:

- Develop a project-wide general Noxious Weed Control Plan (NWCP) that would address pre-construction noxious weed surveys, control methods, herbicide application, equipment washing, and post-construction monitoring.
- Ensure that the NWCP provides for cleaning or washing of equipment used to clear and grade the ROW at an appropriate location to avoid transfer of noxious weeds across the Kansas/Oklahoma state line.

3.5.5.5 Connected Actions

Power Lines and Substations. The primary impacts on vegetation from construction or modification of Western's transmission lines to provide electric power to pump stations would be cutting, clearing, or removing the existing vegetation within the construction work area and potential invasion by noxious weeds. In general, transmission line construction impacts to vegetation would be minor, as most transmission lines would run alongside existing roadways. Trees generally would be removed from the transmission line ROW, and the ROW would be maintained free of woody vegetation. Total miles of terrestrial vegetation affected during construction and operation of Western's 193 miles of new transmission lines for the Mainline Project and the Cushing extension is presented in Table 3.5.5-5.

TABLE 3.5.5-5
Estimated Impacts on Vegetation Communities Crossed by Proposed Electric Transmission Lines for the Keystone Project

	Community Length Crossed by Right-of-Way (miles)							
	North Dakota	**South Dakota**	**Nebraska**	**Kansas**	**Oklahoma**	**Missouri**	**Illinois**	**Totals**
Mainline Project								
Cropland and pasture	18.1	50.4	30.0	15.8		1.7		116.0
Cropland/grassland mosaic	31.7	13.9	0.3			5.0	0.0	50.9
Cropland/woodland mosaic	10.0					0.7	0.9	11.6
Grassland			0.6				0.1	0.7
Savanna						0.3		0.3
Mainline Project subtotal	*59.8*	*64.3*	*30.9*	*15.8*		*7.6*	*1.1*	*179.5*
Cushing Extension								
Cropland and pasture				2.6	0.3			2.8
Cropland/grassland mosaic								0.0
Cropland/woodland mosaic								0.0
Grassland				4.5				4.5
Savanna				4.5				4.5
Cushing Extension subtotal				*11.5*	*0.3*			*11.8*
Keystone Project								
Cropland and pasture	18.1	50.4	30.0	18.4	0.3	1.7		118.9
Cropland/grassland mosaic	31.7	13.9	0.3			5.0	0.0	50.9
Cropland/woodland mosaic	10.0					0.7	0.9	11.6
Grassland			0.6	4.5			0.1	5.2
Savanna				4.5		0.3		4.8
Keystone Project total	**59.8**	**64.3**	**30.9**	**27.3**	**0.3**	**7.6**	**1.1**	**191.3**

Note: Length of vegetation community impacts was calculated from land cover mapping (USGS 1998) and proposed transmission line routes provided by Keystone. Total inexact due to rounding.

Sources: USGS1998; TransCanada 2007d, transmission line route sheets.

Measures listed below would be implemented by servicing electric cooperatives or their contractors in the modification or construction of transmission lines:

- ROW would be located to avoid sensitive vegetation conditions including wetlands where practical, or, if they are linear to cross them at the least sensitive feasible point.
- Clearing for the access roads would be limited to only those trees necessary to permit the passage of equipment.
- Water bars or small terraces would be constructed across all ROW and access roads on hillsides to prevent water erosion and to facilitate natural revegetation.
- Western or its contractor would exercise care to preserve the natural landscape and would conduct construction operations so as to prevent any unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the work. Except where clearing is required for permanent works, approved construction roads, or excavation operations, all trees, native shrubbery, and vegetation would be preserved and would be protected from damage by construction operations and equipment.
- Construction staging areas would be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. On abandonment, all storage and construction buildings, including concrete footings and slabs, and all construction materials and debris would be removed from the site. The area would be regraded as required so that all surfaces drain naturally, blend with the natural terrain, and are left in a condition that would facilitate natural revegetation, provide for proper drainage, and prevent erosion.
- Topsoil would be removed, stockpiled, and respread at all heavily disturbed areas not needed for maintenance access.
- All construction equipment and vehicles would be pressure-washed (especially the undercarriage) to remove foreign soil and debris that may introduce weeds into the project area.
- On completion of the work, all work areas except access roads needed for maintenance would be scarified or left in a condition which would facilitate natural revegetation, provide for proper drainage, and prevent erosion. All destruction, scarring, damage, or defacing of the landscape resulting from Western or its contractor's operations would be repaired.
- If revegetation is required, regionally native plants would be used.

Wood River Refinery Expansion. No impacts related to terrestrial vegetation are associated with the Wood River Refinery Expansion other than those evaluated as part of that project.

3.5.6 References

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3.6 WILDLIFE

The Keystone Project area crosses seven states and includes a diversity of wildlife, including big game animals, small game animals and furbearers, waterfowl and game birds, and other migratory birds. Wildlife habitats along the Keystone Project ROW include croplands, pasture, grasslands (short-grass prairie, mixed-grass prairie, and tall-grass prairie), savannas, forests, and woodlands. These vegetation communities provide foraging, cover, and breeding habitats for wildlife. This section addresses big game animals, small game animals and furbearers, waterfowl and game birds, and other migratory birds in the Keystone Project area.

3.6.1 Wildlife Resources

Representative big game animals, small game animals and furbearers, waterfowl and game birds, and other migratory birds and the habitats they use are described in Table 3.6.1-1, which also lists estimated harvest levels by state during 2005. Most hunting for big and small game animals, upland game birds, and waterfowl occurs during fall. Turkeys are hunted both spring and fall, with most harvest occurring during the spring hunts.

3.6.1.1 Big Game Animals

White-tailed deer is the principal big game species that occurs along the entire pipeline route. White-tailed deer are highly adaptable and inhabit a variety of habitats, including cropland, grasslands, shrublands, orchards, and woodlands. White-tailed deer may be found in close association with humans. In the northern portions of their range, they will aggregate or "yard" during winter in stream bottoms, on south-facing slopes, or other areas where snow accumulations are reduced. Mule deer, pronghorn, and elk are generally found west of the Keystone Project area. Isolated populations of pronghorns extend into eastern South Dakota. Elk have been reintroduced into isolated wildlife areas. The northeast corner of North Dakota is the only area along the proposed route where elk may be present. Moose occur along the proposed route in the northeastern portion of North Dakota. Black bear are common only in southeastern Missouri.

3.6.1.2 Small Game Animals and Furbearers

The small game animals and furbearers most often hunted or trapped in the Keystone Project area include squirrels, cottontails, raccoons, opossums, and coyotes. Squirrels depend on forested habitats, usually deciduous or mixed hardwood forests with abundant supplies of acorns and hickory nuts. Cottontails, raccoons, opossums, and coyotes use a vide variety of habitats, including croplands, hedgerows, and forested habitats. Many furbearers are associated with wetland areas, such as ermine, weasels, mink, raccoon, bobcats, and beavers.

TABLE 3.6.1-1
Wildlife Resources That Occur along the Keystone Project Route

Class and Species	Occurrence and 2005 Harvest Estimate by State							Habitat
	ND	SD	NE	KS	MO	IL	OK	
BIG GAME ANIMALS								
White-tailed deer (*Odocoileus virginianus*)	√	√ 60,000	√	√	√ 313,000	√ 114,000	√ 101,000	Found in various habitats—from forest to fields—with adjacent cover. In northern regions, usually require stands of conifers for winter shelter. In the north and in mountain regions, limited ecologically by the depth, duration, and quality of snow cover; summer ranges are traditional, but winter range may vary with snow conditions.
Mule deer (*Odocoileus hemionus*)	√	√ 14,000	√	√			√	Found in coniferous forests, desert shrub, chaparral, grasslands with shrubs, and badlands. Often associated with successional vegetation, especially near agricultural lands. Generally found west of Keystone Project area.
Pronghorn (*Antilocapra americana*)	√	√	√	√			√	Generally found in grasslands, sagebrush plains, deserts, and foothills. Need for free water varies with succulence of vegetation in the diet. Generally found west of Keystone Project area.
Elk (*Cervus canadensis*)	√	√	√	√				Found over a range of habitats. Uses open areas, such as alpine pastures, marshy meadows, river flats, and aspen parkland, as well as coniferous forests, brushy clear cuts or forest edges, and semi-desert areas.
Moose (*Alces alces*)	√							Prefers mosaic of second-growth forest, openings, swamps, lakes, and wetlands. Requires water bodies for foraging and hardwood-conifer forests for winter cover. Avoids hot summer conditions by using dense shade or bodies of water.
Black bear (*Ursus americanus*)					√			Prefers mixed deciduous-coniferous forests with thick understory but may occur in various situations. In Keystone Project area, restricted to southern and southeast Missouri.

TABLE 3.6.1-1
(Continued)

Class and Species	Occurrence and 2005 Harvest Estimate by State							Habitat
	ND	SD	NE	KS	MO	IL	OK	
SMALL GAME ANIMALS								
Eastern gray squirrel (*Sciurus carolinensis*)	√	√	√	√	√	√	√	Prefers mature deciduous and mixed forests with abundant supplies of acorns and hickory nuts. Diversity of nut trees needed to support high densities. Uses city parks and floodplain forests. Seldom far from permanent open water. Nests in tree cavities or in leaf nests, usually 25 feet or more above ground.
Eastern fox squirrel (*Sciurus niger*)	√	√	√	√	√	√	√	Found in open mixed hardwood forests or mixed pine-hardwood associations; species also has adapted well to disturbed areas, hedgerows, and city parks. Prefers savannas or open woodlands to dense forests. Western range extensions are associated with riparian corridors of cottonwoods and fencerows of osage-orange. Dens are in tree hollows or leaf nests.
Eastern cottontail (*Sylvilagus floridanus*)	√	√ 138,000	√	√	√	√ 331,000	√	Inhabits cropland/hedgerow, grassland/ herbaceous, old field, shrubland/chaparral, suburban/orchard, woodland-hardwood, and woodland-mixed forests. Mix of row crops, small grain, and legume fields with shrubby fencerows, old pasture, and forest edge. Burrows in or using soil and fallen log/debris. Early mid-successional habitats over much of continental United States. May be found in brushy areas, open woodlands, swampy areas, stream valleys, grasslands, and suburbs. Very adaptable species. Nests usually are in shallow depressions, in thick vegetation or in underground burrows.
FURBEARERS								
Coyote (*Canis latrans*)	√	√	√ 34,000	√ 21,800	√ Common	√	√	Wide ranging and found in virtually all habitats. Often considered pest species, especially by the livestock industry. Control programs have been largely ineffective.

TABLE 3.6.1-1
(Continued)

Class and Species	Occurrence and 2005 Harvest Estimate by State							Habitat
	ND	SD	NE	KS	MO	IL	OK	
FURBEARERS (CONTINUED)								
Red fox (*Vulpes vulpes*)	√	√	√ 3,800	√ 459	√ Common	√	√	Found in various open and semi-open habitats. Usually avoids dense forest, although open woodlands are frequently used. Sometimes occurs in suburban areas or cities. Maternity dens are in burrows dug by fox or abandoned by other mammals, often in open fields or wooded areas; sometimes under rural buildings, in hollow logs, or under stumps.
Gray fox (*Urocyon cinereoargenteus*)	√	√	√	√ 89	√ Common	√	√	Found in a variety of habitats, including chaparral, rimrock, riparian, old fields, and early-successional-stage woodlands. Usually prefers diversity of open and wooded areas rather than large tracts of homogeneous habitat.
Swift fox (*Vulpes velox*)	√ Rare	√ Rare	√ Rare	√ 206				Prefers short-grass and mixed-grass prairies over most of the Great Plains. Also will use agricultural lands and irrigated meadows, generally west of Keystone Project area. Protected.
Raccoon (*Procyon lotor*)	√	√	√ 171,800	√ 66,400	√	√	√	Found in variety of habitats but prefers riparian and edges of wetlands, ponds, streams, and lakes.
Ermine (*Mustela erminea*)	√							Found in agricultural lowlands, woodlands, and meadows.
Long-tailed weasel (*Mustela frenata*)	√	√	√	√	√	√	√	Most widespread of the weasels and found in all habitats in Keystone Project area but prefers shrublands, open woodlands, and habitats near water.
Least weasel (*Mustela nivalis*)	√	√	√					Inhabits cultivated fields, brushy areas, open woods, wetland edges, and meadows.
Mink (*Mustela vision*)	√	√	√ 3,990	√ 206	√ Common	√	√	Occurs in wetlands, riparian woodlands, lake and river edges, and near ponds.

TABLE 3.6.1-1
(Continued)

Class and Species	Occurrence and 2005 Harvest Estimate by State							Habitat
	ND	SD	NE	KS	MO	IL	OK	
FURBEARERS (CONTINUED)								
Striped skunk (*Mephitis mephitis*)	√	√	√ 20,520	√ 12,730	√ Common	√	√	Prefers semi-open country with woodland and meadows interspersed with brushy areas, and bottomland woods. Frequently found in suburban areas. Dens often under rocks, logs, or buildings. May excavate burrow or use burrow abandoned by other mammals.
Eastern spotted skunk (*Spilogale putorius*)	√	√	√	√	√		√	Found in forested areas or habitats with significant cover. Also uses open and brushy areas, rocky canyons, and outcrops in woodlands and prairies. When inactive or bearing young, occurs in dens—in burrows abandoned by other mammals, under brush piles, in hollow logs or trees, in rock crevices, under buildings, or in similar protected sites.
Opossum (*Didelphis marsupialis*)		√	√ 32,400	√ 38,900	√ Abundant	√	√	Uses cropland/hedgerow, grassland/ herbaceous, old field, shrubland/chaparral, suburban/orchard, forested wetlands, herbaceous wetland, and riparian habitats in Keystone Project area. Also uses forest and woodland hardwood, and mixed forest. Constructs burrows in or using soil, fallen logs/debris, and standing snags or hollow trees. Very adaptable; may be found in most habitats. Prefers wooded riparian habitats. Also in suburban areas. Generally uses abandoned burrows, buildings, hollow logs, and tree cavities for den sites.
American badger (*Taxidea taxus*)	√	√	√ 3,942	√ 1,312	√	√	√	Prefers open grasslands and field, and may also frequent brushlands with little groundcover. When inactive, occupies underground burrow.
Bobcat (*Felis rufus*)	√		√ 1,308	√ 7,458			√	Found in woodlands, brushlands, and wooded swampy areas.

TABLE 3.6.1-1
(Continued)

Class and Species	ND	SD	NE	KS	MO	IL	OK	Habitat
	Occurrence and 2005 Harvest Estimate by State							
FURBEARERS (CONTINUED)								
American beaver (*Castor canadensis*)	√	√	√ 16,074	√ 7,200	√ Common	√	√	Inhabits permanent sources of water of almost any type in its range, which extends from arctic North America to Gulf of Mexico and arid Southwest, and from sea level to over 6,800 feet in mountains. Prefers low-gradient streams, which it modifies), ponds, and small mud-bottomed lakes with outlets that can be dammed. Associated with deciduous tree and shrub communities.
WATERFOWL								
Dark Geese								
Canada goose (*Branta canadensis*) White-fronted goose (*Anser albifrons*)	√ 133,200	√ 79,800	√ 102,100	√ 100,150	√ 40,430	√ 104,600	√ 31,000	Found in various habitats near water, from temperate regions to tundra. Usually breeds and feeds in areas near lakes, ponds, large streams, and inland and coastal marshes. Forages in pastures, cultivated lands, grasslands, and flooded fields. Canada geese present in Keystone Project area year-round, white-fronted geese occur in Keystone Project area during spring and fall migrations. Widely hunted, with an estimated Mississippi Flyway harvest of 1.0 million and Central Flyway harvest of 735,000 (USFWS 2006).
Light Geese								
Snow goose (*Chen caerulescens*) Ross's goose (*Chen rossii*)	√ 20,100	√ 23,300	√ 11,600	√ 8,150	√ 39,300	√ 6,200	√ 11,500	Found in various habitats near water, from temperate regions to tundra. Winters in both freshwater and coastal wetlands, wet prairies, and extensive sandbars; forages in pastures, cultivated lands, and flooded fields. In Keystone Project area during spring and fall migrations. Widely hunted, with an estimated Mississippi Flyway harvest of 250,000 and Central Flyway harvest of 360,000 (USFWS 2006).

TABLE 3.6.1-1
(Continued)

Class and Species	Occurrence and 2005 Harvest Estimate by State							Habitat
	ND	SD	NE	KS	MO	IL	OK	
WATERFOWL (CONTINUED)								
Light Geese (continued)								
Tundra swan (*Cygnus columbianus*)	√	√ 120	√	√	√	√	√	Generally found in lakes, sloughs, rivers, and sometimes fields during migration. Open marshy lakes and ponds, and sluggish streams in summer. Present in Keystone Project area during spring and fall migration; hunted in North Dakota and South Dakota, with estimated harvest of several hundred birds.
Dabbling Ducks								
Mallard (*Anas platyrhynchos*)	√ 450,200	√ 165,100	√ 156,100	√ 150,000	√ 438,000	√ 339,400	√ 262,650	Primarily found in shallow waters, such as ponds, lakes, marshes, and flooded fields; in migration and in winter, mostly found in fresh water and cultivated fields, less commonly in brackish situations. Both migratory and resident populations may occur in Keystone Project area. Widely hunted, with estimated Mississippi Flyway harvest of 4.7 million and Central Flyway harvest of 2.5 million during 2005 (USFWS 2006).
Gadwall (*Anas strepera*)								
Green-winged teal (*Anas crecca*)								
Blue-winged teal (*Anas discors*)								
Cinnamon teal (*Anas cyanoptera*)								
American wigeon (*Anas americana*)								
Northern shoveler (*Anas clypeata*)								
Northern pintail (*Anas acuta*)								

TABLE 3.6.1-1
(Continued)

Class and Species	Occurrence and 2005 Harvest Estimate by State							Habitat
	ND	SD	NE	KS	MO	IL	OK	
WATERFOWL (CONTINUED)								
Diving Ducks								
Ring-necked duck (*Aythya collaris*) Lesser scaup (*Aythya affinis*) Redhead (*Aythya americana*) Bufflehead (*Buchephala albeola*) Canvasback (*Aythya valisineria*) Greater scaup (*Aythya marila*) Hooded merganser (*Lophodytes cucullatus*)	√ 69,170	√ 13,900	√ 8,600	√ 7,950	√ 27,200	√ 41,000	√ 22,460	Commonly found on marshes, ponds, lakes, rivers, and bays. Widely hunted, with estimated Mississippi Flyway harvest of 580,000 and Central Flyway harvest of 260,000 during 2005 (USFWS 2006).
American coot (*Fulica americanan*)	√ 800	√ 5,300	√ 1,500	√ 400	√ 400	√ 4,300	√ 200	Commonly found on marshes, ponds, lakes, rivers, and bays. Widely hunted, with estimated Mississippi Flyway harvest of 110,000 and Central Flyway harvest of 15,000 during 2005 (USFWS 2006).
GAME BIRDS								
Sandhill crane (*Grus canadensis*)	√ 3,792	√ 190	√	√ 475			√ 513	During migration, roosts at night along river channels, on alluvial islands of braided rivers, or natural basin wetlands. Communal roost site consisting of an open expanse of shallow water is key feature of wintering habitat. Occurs throughout Keystone Project area during spring and fall migrations. Hunted during fall in North Dakota and South Dakota, and during fall and winter in Oklahoma. Estimated Central Flyway harvest of 18,575 during 2005 (Sharp et al. 2006).

TABLE 3.6.1-1
(Continued)

Class and Species	Occurrence and 2005 Harvest Estimate by State							Habitat
	ND	SD	NE	KS	MO	IL	OK	
GAME BIRDS (CONTINUED)								
Wild turkey (*Meleagris gallopavo*)	√	√	√	√	√ 63,000	√ 16,000	√ 45,000	Resident game birds found in forest, open woodland, scrub oak, and deciduous or mixed deciduous-coniferous forests. Also uses agricultural areas, which may provide important food resources. Roosts in trees at night and nests on ground, usually in open areas at the edge of woods. Widely hunted.
Greater prairie chicken (*Tympanus cupido*)	√	√		√	√		√	Inhabits tall grassland prairies and occasionally croplands. Nests in grasslands, prairies, pastures, and hayfields.
Sharp-tailed grouse (*Tympanuchus phasianellus*)	√	√	√					Inhabits short to tall grasslands intermixed with cropland and shrublands.
Ruffed grouse (*Bonasa umbellus*)	√	√ 39,188						Inhabits mixed and deciduous woodlands. Not common in Keystone Project area.
Northern bobwhite (*Colinus virginianus*)		√ 1,717	√	√	√	√	√	Inhabits a wide variety of vegetation types, particularly early-successional stages. Occurs in croplands, grasslands, pastures, fallow fields, grass-brush rangelands, open pinelands, open mixed pine-hardwood forests, and habitat mosaics. In Midwest and Northeast, associated principally with heterogeneous, patchy landscapes comprised of moderate amounts of row crops and grasslands, and abundant woody edge. Nests on the ground, in a scrape lined with grasses or dead vegetation.
Woodcock (*Scolopax mir*) Snipe (*Gallinago gallinago*)	√ 600	√ 100	√ 2,300	√ 900	√ 1,600	√ 7,800	√ 600	Wetlands, marshes, moist woodlands, and thickets. Woodcock harvested in Illinois, Missouri, Nebraska, and Kansas—5,200 during 2005. Snipe harvested in Central and Mississippi Flyways—48,300 during 2005 (USFWS 2006).

TABLE 3.6.1-1
(Continued)

Class and Species	Occurrence and 2005 Harvest Estimate by State							Habitat
	ND	SD	NE	KS	MO	IL	OK	
GAME BIRDS (CONTINUED)								
Ring-necked pheasant (*Phasianus colchincus*)	√	√ 1,653,265	√	√	√ 31,204	√ 155,000	√	Non-native game bird; inhabits open country (especially cultivated areas, scrubby wastes, open woodland, and edges of woods), grassy steppe, desert oases, riverside thickets, swamps, and open mountain forest. Winter shelter includes bushes and trees along streams, shelterbelts, and fencerows. Usually nests in fields, brushy edges, or pastures; also along road rights-of-way. Nest is shallow depression scratched out by female.
Gray partridge (hun) (*Perdix perdix*)	√	√ 9,280	√					Non-native game bird; inhabits cultivated lands, hedgerows, brushy pastures, and meadows.
Mourning dove (*Zenaida macrora*)	√ 55,500	√ 127,700	√ 371,100	√ 680,400	√ 641,800	√ 798,800	√ 828,500	Inhabits open woodlands, forest edge, cultivated lands with scattered trees and bushes, and arid and desert country. Widely hunted—9.0 million estimated harvest during 2005 (USFWS 2006).

√ = Indicates that the species occurs in the state. Numbers that may follow are the 2005 harvest estimate.

Sources: Adapted from ENSR 2006a; occurrence information (NatureServe 2006); harvest information (state wildlife management agency web sites, USFWS 2006, Sharp et al. 2006).

3.6.1.3 Waterfowl and Game Birds

All ducks, geese, swans, coots, and sandhill cranes occurring within the Keystone Project area are considered migratory. All migratory birds are protected by the Migratory Bird Treaty Act (MBTA) (16 USC 703–712; 40 Stat. 755 as amended) which prohibits the take of any migratory bird without authorization from USFWS. The MBTA states that "unless and except as permitted by regulations. . . it shall be unlawful at any time, by any means or in any manner, to . . . take, capture, kill, possess. . . any migratory bird, any part, nest, or eggs of any such bird. . .". Non-migratory birds such as upland game birds and non-native birds such as European starling, pigeon (rock dove), and English house sparrow are not protected by the MBTA. Hunting seasons are set and regulated by USFWS and state fish and game departments. Waterfowl are harvested primarily in fall; however, spring light goose seasons (snow and Ross's geese) are open in some areas in response to expanding populations of these birds that nest in arctic Canada. Many waterfowl breed in habitats that would be crossed by the pipeline, and additional migrants pass through the Keystone Project area to northern breeding grounds during both spring and fall. The Keystone Project area crosses both the Central and Mississippi Flyways. Waterfowl that occur only as migrants in the Keystone Project area include snow geese, Ross's geese, white-fronted geese, and sandhill cranes. Sandhill cranes are hunted in North Dakota, eastern portions of South Dakota, Kansas, and Oklahoma. Nebraska is closed to hunting for sandhill cranes (Sharp et al. 2006).

Turkeys, prairie chickens, grouse, and bobwhites are resident game birds and as such are not protected by the MBTA. Seasons and bag limits for these species and introduced game birds such as pheasants and huns are set by state fish and game departments. Turkeys are hunted primarily during spring (bearded birds—males only), when most harvest occurs; but they also may be taken during fall hunts, which are usually open for any turkey. Most other resident game birds are hunted during fall. Woodcock, snipe, and mourning doves are migratory game birds that are protected by the MBTA. Hunting seasons and limits are set and regulated by USFWS and state fish and game departments.

3.6.1.4 Other Migratory Birds

Numerous other migratory birds protected by the MBTA occupy habitats that would be crossed by the pipeline ROWs. Eagles and their nests are further protected by the Bald and Golden Eagle Protection Act (16 USC 688–688d [a and b]). Eagles are discussed in Section 3.8, as are other migratory birds of conservation concern. Destruction or disturbance of a migratory bird nest that results in the loss of eggs or young is a violation of the MBTA.

Aerial surveys were conducted along the entire Mainline Project and Cushing Extension ROWs from January 30 to February 4, 2007, to identify raptor nest sites in deciduous trees within or next to the Keystone Project ROW (ENSR 2007a). A total of 103 nests were documented within 300 feet of the Keystone Project ROW; 86 along the Mainline Project and 17 along the Cushing Extension. Of those nests identified by species, there were 35 red-tailed hawk nests, 14 crow nests, 3 great horned owl nests, 4 Swainson's hawk nests, 2 Cooper's hawk nests, 1 sharp-shinned hawk nest, and 2 osprey nests at artificial nest stands. Of those nests that could not be definitively identified by species, 35 were Cooper's hawk or sharp-shinned hawk nests (3 of these could have been great-horned owl nests), and 2 were unknown. Woodlots (40 percent) were the most common habitats recorded for raptor nests, followed by riparian habitats (35 percent) and shelterbelts (19 percent).

3.6.2 Potential Impacts

The Mainline Project and Cushing Extension pipeline primarily would affect wildlife resources by:

- Habitat loss, alteration, and fragmentation;
- Loss of breeding success from exposure to construction and operations noise, and from increased human activity;
- Direct morality from Keystone Project construction and operation;
- Direct mortality due to collision with or electrocution by power lines;
- Indirect mortality because of stress or avoidance of feeding due to exposure to construction and operations noise, and from increased human activity; and
- Loss of individuals and habitats due to exposure to toxic materials or crude oil releases (addressed in Section 3.13, Safety and Reliability).

The pipeline ROW would cross habitats used by wildlife, as described in Table 3.6.1-1. Estimated wildlife habitat impacts are described in Tables 3.6.2-1, 3.6.2-2, and 3.6.2-3. Estimated impacts to habitats specifically set aside for wildlife conservation are described in Table 3.6.2-4. Pipeline construction would result in short-term disturbance and long-term habitat modification to 11 acres in the Pigeon Hill Conservation Area in Buchanan County, Missouri, and 33 acres in the Carlyle Lake Wildlife Management Area (WMA) in Fayette County, Illinois. The Keystone Project would cross eight Conservation Opportunity Areas (COAs) in Missouri, which are listed in Table 3.6.2-4. The Mississippi/Missouri River Confluence COA is located on the floodplain of Missouri and Mississippi Rivers in St. Charles and Lincoln Counties in Missouri. This COA is important to a large array of wildlife and is a major migratory pathway for birds. During peak migration, ducks, geese, shorebirds, large wading birds, raptors, warblers, and other songbirds use habitats along the Confluence and the river corridor to rest, refuel, and nest. Noted fish and wildlife natural areas in the COA area include Ellis, Dresser, and Maple Islands on the Mississippi River; Pelican and Cora Islands on the Missouri River; MDC's Marais Temps Clair Conservation Area; COE's environmental demonstration area; the Missouri Department of Natural Resource's Confluence Park; and numerous wetland and open water areas associated with duck clubs and county parks. Long-term conversion of wooded habitats to herbaceous communities would result in increased habitat fragmentation in these state WMAs and COAs.

Wildlife habitat fragmentation issues relevant for pipeline construction and ROWs include:

- Barriers to movement,
- Creation of edge effects,
- Habitat disturbance,
- Reduction in patch size of remaining available habitats,
- Facilitation of predator movements,
- Intrusion of invasive species, and
- Intrusion of humans (Hinkle et al. 2002).

TABLE 3.6.2-1 Estimated Wildlife Habitat Impacts for the Keystone Mainline Project			
Habitat Classification [a]	**Habitat Area within 110-foot ROW (acres)**	**Habitat Area within 5 miles of ROW (acres)**	**Proportion of Affected to Available Habitat (%)**
North Dakota			
Cropland and pasture	1,475	681,563	0.2
Cropland/grassland mosaic	1,001	499,834	0.2
Cropland/woodland mosaic	436	200,645	0.2
Grassland	0	1,025	0.0
Deciduous broadleaf forest		119	0.0
Evergreen needleleaf forest			
Mixed forest			
Savanna			
Water bodies		170	0.0
North Dakota subtotal	*2,912*	*1,383,357*	*0.2*
South Dakota			
Cropland and pasture	1,681	824,792	0.2
Cropland/grassland mosaic	1,152	525,305	0.2
Cropland/woodland mosaic	10	3,762	0.3
Grassland	72	43,803	0.2
Deciduous broadleaf forest			
Evergreen needleleaf forest		1,415	0.0
Mixed forest			
Savanna			
Water bodies			
South Dakota subtotal	*2,914*	*1,399,077*	*0.2*
Nebraska			
Cropland and pasture	2,872	1,347,267	0.2
Cropland/grassland mosaic	5	10,812	0.1
Cropland/woodland mosaic			
Grassland	26	11,727	0.2
Deciduous broadleaf forest			
Evergreen needleleaf forest			
Mixed forest			
Savanna		912	0.0
Water bodies		835	0.0
Nebraska subtotal	*2,903*	*1,371,553*	*0.2*
Kansas			
Cropland and pasture	1,060	504,837	0.2
Cropland/grassland mosaic	49	44,813	0.1
Cropland/woodland mosaic			
Grassland	124	46,109	0.3
Deciduous broadleaf forest			
Evergreen needleleaf forest		81	0.0
Mixed forest			
Savanna	43	14,080	0.3
Water bodies			
Kansas subtotal	*1,276*	*609,921*	*0.2*

TABLE 3.6.2-1
(Continued)

Habitat Classification a	Habitat Area within 110-foot ROW (acres)	Habitat Area within 5 miles of ROW (acres)	Proportion of Affected to Available Habitat (%)
Missouri			
Cropland and pasture	1,263	548,602	0.2
Cropland/grassland mosaic	1,047	509,873	0.2
Cropland/woodland mosaic	520	291,312	0.2
Grassland	55	11,158	0.5
Deciduous broadleaf forest	237	94,110	0.3
Evergreen needleleaf forest		1,862	0.0
Mixed forest	20	12,380	0.2
Savanna	477	185,243	0.3
Water bodies	37	21,742	0.2
Missouri subtotal	*3,656*	*1,676,281*	*0.2*
Illinois			
Cropland and pasture	9	6,393	0.1
Cropland/grassland mosaic	41	19,332	0.2
Cropland/woodland mosaic	631	348,186	0.2
Grassland	10	2,306	0.4
Deciduous broadleaf forest	33	25,118	0.1
Evergreen needleleaf forest			
Mixed forest		2,282	0.0
Savanna	29	9,622	0.3
Water bodies	8	13,881	0.1
Illinois subtotal	*761*	*427,119*	*0.2*
MAINLINE PROJECT			
Cropland and pasture	8,358	3,913,454	0.2
Cropland/grassland mosaic	3,295	1,609,969	0.2
Cropland/woodland mosaic	1,596	843,905	0.2
Grassland	288	116,128	0.2
Deciduous broadleaf forest	271	119,346	0.2
Evergreen needleleaf forest	0	3,358	0.0
Mixed forest	20	14,662	0.1
Savanna	549	209,858	0.3
Water bodies	46	36,628	0.1
Mainline Project total	**14,422**	**6,867,309**	**0.2**

Sources: TransCanada 2007d (pipeline shapefiles), USGS 1998.

TABLE 3.6.2-2 Estimated Wildlife Habitat Impacts for the Keystone Cushing Extension			
	Habitat Area within 110-foot ROW (acres)	Habitat Area within 5 miles of ROW (acres)	Proportion of Affected to Available Habitat (%)
Nebraska			
Cropland and pasture	14	35,619	0.0
Cropland/grassland mosaic	12	5,057	0.2
Cropland/woodland mosaic			
Grassland	13	2,574	0.5
Deciduous broadleaf forest			
Evergreen needleleaf forest			
Mixed forest			
Savanna		159	0.0
Water bodies			
Nebraska subtotal	*38*	*43,409*	*0.1*
Kansas			
Cropland and pasture	404	164,797	0.2
Cropland/grassland mosaic	117	68,705	0.2
Cropland/woodland mosaic			
Grassland	969	527,336	0.2
Deciduous broadleaf forest	17	2,576	0.6
Evergreen needleleaf forest		727	0.0
Mixed forest		128	0.0
Savanna	1,295	554,749	0.2
Water bodies		12,542	0.0
Kansas subtotal	*2,802*	*1,098,058*	*0.3*
Oklahoma			
Cropland and pasture	354	180,617	0.2
Cropland/grassland mosaic	41	14,689	0.3
Cropland/woodland mosaic			
Grassland	249	87,547	0.3
Deciduous broadleaf forest		435	0.0
Evergreen needleleaf forest	37	5,233	0.7
Mixed forest		685	0.0
Savanna	410	232,565	0.2
Water bodies		7,909	0.0
Oklahoma subtotal	*1,092*	*529,679*	*0.2*
CUSHING EXTENSION			
Cropland and pasture	772	381,033	0.2
Cropland/grassland mosaic	171	88,451	0.2
Cropland/woodland mosaic	0		
Grassland	1,231	617,456	0.2
Deciduous broadleaf forest	17	3,011	0.6
Evergreen needleleaf forest	37	5,960	0.6
Mixed forest		813	0.0
Savanna	1,705	787,473	0.2
Water bodies		20,450	0.0
Cushing Extension total	**3,932**	**1,904,648**	**0.2**

Sources: TransCanada 2007d (pipeline shapefiles), USGS 1998.

TABLE 3.6.2-3 Summary of Estimated Wildlife Habitat Impacts for the Keystone Project			
	Habitat Area within 110-foot ROW (acres)	Habitat Area within 5 miles of ROW (acres)	Proportion of Affected to Available Habitat (%)
Mainline Project			
Cropland and pasture	8,358	3,913,454	0.2
Cropland/grassland mosaic	3,295	1,609,969	0.2
Cropland/woodland mosaic	1,596	843,905	0.2
Grassland	288	116,128	0.2
Deciduous broadleaf forest	271	119,346	0.2
Evergreen needleleaf forest	0	3,358	0.0
Mixed forest	20	14,662	0.1
Savanna	549	209,858	0.3
Water bodies	46	36,628	0.1
Mainline Project subtotal	*14,422*	*6,867,309*	0.2
Cushing Extension			
Cropland and pasture	772	381,033	0.2
Cropland/grassland mosaic	171	88,451	0.2
Cropland/woodland mosaic		0	
Grassland	1,231	617,456	0.2
Deciduous broadleaf forest	17	3,011	0.6
Evergreen needleleaf forest	37	5,960	0.6
Mixed forest		813	0.0
Savanna	1,705	787,473	0.2
Water bodies		20,450	0.0
Cushing Extension subtotal	*3,932*	*1,904,648*	*0.2*
KEYSTONE PROJECT			
Cropland and pasture	9,130	4,294,488	0.2
Cropland/grassland mosaic	3,465	1,698,420	0.2
Cropland/woodland mosaic	1,596	843,905	0.2
Grassland	1,519	733,584	0.2
Deciduous broadleaf forest	287	122,357	0.2
Evergreen needleleaf forest	37	9,318	0.4
Mixed forest	20	15,475	0.1
Savanna	2,254	997,331	0.2
Water bodies	46	57,079	0.1
Keystone Project total	**18,355**	**8,771,956**	**0.2**

Sources: TransCanada 2007d (pipeline shapefiles), USGS 1998.

TABLE 3.6.2-4
Important Wildlife Habitats along the Keystone Project Route (Mainline Project and Cushing Extension)

Milepost	Name	Ownership and Description	Miles
North Dakota			
ML Various	U.S. Fish and Wildlife Service (USFWS) wetland easements	Private	24.0
ML 6.8–7.7	Tetrault Woods State Forest	North Dakota State Forest	0.8
South Dakota			
ML 358.0–358.1	Game production area	South Dakota Game Fish and Parks Department	0.1
ML Various	USFWS wetland easements	Private	11.8
ML 435.8–437.5	Missouri National Recreational River	Private designated as Wild and Scenic by National Park Service	2.3
Kansas			
CE 50.0–54.3	Milford State Wildlife Management Area	U.S. Army Corps of Engineers (COE)	3.4
Missouri			
ML 750.9–755.2	Western Missouri River Alluvial Plain/Missouri River Loess Woodland Conservation Opportunity Area (COA)	Private and Missouri Department of Conservation	4.1
ML 751.0–751.1	Jentell Brees Access	Missouri Department of Conservation	0.1
ML 760.9–761.3	Pigeon Hill Conservation Area	Missouri Department of Conservation	0.4
ML 770.0–771.4	Little Prairie River Woodland/Forest Scarped Hills COA	Private	1.4
ML 773.5–775	Little Platte River Woodland/Forest Scarped Hills COA	Private	1.0
ML 781.9–784.0	Cameron Upland Prairie Plain COA	Private	2.1
ML 825.8–829.2	Shoal Creek Prairie/Woodland Scarped Plain COA	Private	1.3
ML 841.6–844.4	Lower Grand River Lowland Plains/Missouri Grand River Alluvial Plain COA	Private	2.8
ML 870.6–871.8	Chariton River Alluvial Plain COA	Private	1.3
ML 874.3–875.2	Chariton River Alluvial Plain COA	Private	0.8
ML 931.8	West Fork Cuivre River	State of Missouri	0.1
ML 958.3–959.7	Veronica Baier – The Nature Conservancy	The Nature Conservancy	1.4
ML 964.3–966.2	Cuivre River Woodland/ Forest Hills COA	Private	1.9
ML 973.8–976.0	Cuivre River Woodland/ Forest Hills COA	Private	2.2
ML 987.7–1024.9	St. Charles County Prairie / Woodland Low Hills, Mississippi/Missouri River Confluence Area, other COAs	Private	37.2

TABLE 3.6.2-4 (Continued)			
Milepost	**Name**	**Ownership and Description**	**Miles**
Missouri (continued)			
ML 1023.5–1024.7	Edward "Ted" and Pat Jones – Confluence Point State Park	Missouri Department of Natural Resources	1.2
Illinois			
ML 1069.6–1072.7	Carlyle Lake	Illinois Department of Natural Resources and COE	3.1

Note: No important wildlife habitats were reported for Nebraska, Kansas, or Oklahoma.

Source: TransCanada 2007d.

Habitat fragmentation effects are generally reduced for pipeline corridors compared to road corridors because their widths are usually narrower and there is usually less associated human disturbance; during construction, however, pipelines can be significant barriers to wildlife movements (Hinkle et al. 2002). After construction, pipeline corridors may be used as travel corridors by deer, coyotes, raccoons, and many other animals. Most habitats crossed by the Mainline Project and Cushing Extension have been previously fragmented by road and transmission line networks, and exist as mosaics of croplands with patches of grasslands and woodlands. Only very short segments of new permanent roadways would be constructed for the pipeline (see Section 2). Temporary access roads would be removed and habitats restored after construction, which would generally prevent any increased human access to the ROW following construction. Review of land cover mapping (USGS 1998) indicates that the pipeline could potentially contribute to increased fragmentation of several apparently contiguous areas of grasslands and forestlands that would be crossed by the pipeline ROW. Areas where these apparently contiguous habitats coincide with areas set aside as wildlife habitats include:

- USFWS wetland easements in North Dakota and South Dakota – cropland/grassland mosaic,
- Shoal Creek Prairie/Woodland Scarped Plain COA in Missouri – deciduous broadleaf forest,
- Cuivre River Woodland/Forest Hills COA in Missouri – deciduous broadleaf forest,
- COE Carlyle Lake in Illinois – deciduous broadleaf forest, and
- COE Milford Wildlife Area in Kansas – grasslands and savanna.

Three proposed blasting locations would potentially affect important wildlife habitats along the Keystone Project. These locations are within the Chariton River Alluvial Plains COA (MP 870–871), and the Cuivre River Woodland/ Forest Hills COA (MP 964–966). Blasting can cause both short-term disturbance, in the form of increased noise, dust, and vibration, and permanent habitat modification. Blasting operations and mitigation measures to decrease the effects of blasting are discussed in Section 3.1.1.2.

Loss of shrublands and wooded habitats would be long term (from 5 to 20 years) within reclaimed areas of the construction ROW. Additional shelterbelt habitats along fields that were too small to be quantified (habitats less than 50 feet wide were not mapped) across the 1,300-mile ROW would be lost. Due to the linear nature of the ROW, these long-term habitat losses represent a small total area of available habitat and therefore are expected to have little impact on wildlife species (see Tables 3.6.2-1, 3.6.2-2, and 3.6.2-3).

Total habitat loss due to pipeline construction would be small in the context of available habitat within a 5-mile area surrounding the pipeline (Table 3.6.2-3), both because of the linear nature of the Keystone

Project and because restoration would follow pipeline construction. During restoration, however, Keystone would be obligated to reseed areas as directed by the landowner, such that areas of native vegetation could be converted to non-native species. Such conversion would likely reduce the value of the habitat for wildlife. If disturbance involved important remnant habitats, such as prairie chicken leks, habitat loss would be locally significantly. Normal operation of the pipelines would result in negligible effects on wildlife. Direct impacts from maintenance activities, such as physical pipeline inspections or pipeline repair that would require digging up the pipeline, would be the same as those for construction. Keystone would consult with appropriate state wildlife agencies prior to initiation of maintenance activities beyond standard inspection procedures.

3.6.2.1 Big Game Animals

Keystone Project construction would affect large game animals, primarily white-tailed deer, by loss of potential foraging and cover habitats; and would result in increased habitat fragmentation, especially in areas with continuous forest cover. Noise and increased human activity during construction would lead to short-term displacement and may act as a barrier to movements for some animals. Winter construction at woodlands or in riparian corridors with denning black bears in Missouri could lead to destruction of bears and dens during hibernation. Disturbance of female bears with newborn cubs likely would lead to the death of the newborn cub(s). After construction, maintained ROWs may be used as movement corridors by some big game animals and humans. Human access may be facilitated by vegetation clearing and the perception that the ROW is no longer private property. Increased human use could lead to increased disturbances and hunting pressure (Hinkle et al. 2002).

3.6.2.2 Small Game Animals and Furbearers

Potential impacts on small game animals and furbearers include nest or burrow destruction, or abandonment and loss of young, foraging, and cover habitat. Displacement or attraction of small game animals and furbearers from disturbance areas would be short term, as animals would be expected to return following completion of construction and reclamation activities. Small mammals can fall into and become trapped in the open trench during pipeline construction. Burrowing animals would be expected to return and re-colonize the ROW after construction, although compacted areas such as temporary workspaces may become less suitable habitat. Disturbed areas through native prairie habitats also were found to be used less often by ground squirrels following construction of a gas pipeline, suggesting that these habitats may not be equivalent at least for several years after construction (Lauzon et al. 2002). Some badger, prairie dog, and rodent burrows would likely be destroyed during construction if they occur within the construction ROW. Badgers, prairie dogs, and burrowing rodents may be attracted by the warmth generated by the pipeline, especially during winter months. The heat generated by the pipeline will warm the soils within the proximity of the pipeline out to as much as 11 feet from the pipeline center at the maximum flow rate. Changes from surrounding soil temperature would be most noticeable during spring. The pipeline would generally not affect soil temperatures more than a few degrees at a depth of 6 inches, with soil temperatures at the surface generally unaffected.

For species that use tree and shrub habitats for cover, forage, and nesting, losses of these habitat types would be long term because the permanent ROW would be maintained free of trees and large shrubs. An estimated 1,191 acres of forested habitats (see Table 3.5.5-3) would be affected by construction of the Mainline Project and Cushing Extension, of which an estimated 407 acres would be maintained as herbaceous vegetation. Permanent habitat loss also would occur along shelterbelts, windbreaks, and living snow fences that are intersected by the Keystone Project. Most of these habitats would be identified as cropland due to the resolution of habitat mapping used to generate estimates of habitat impacts. Those areas crossed as part of the construction ROW would be cleared of trees and brush to provide access for construction equipment. Trees and shrubs would not be allowed to reestablish on the permanent ROW. Losses of these habitat types would be most likely to affect small game and furbearer species, as these habitats would be used as refuge next to cropland foraging habitats (Table 3.6.1-1). Differences in vegetation cover between the ROW and the surrounding landscape can act as a barrier for some species, such as squirrels, while acting as a movement corridor for others, such as raccoons and coyotes.

3.6.2.3 Waterfowl and Game Birds

Most waterfowl and game birds nest on the ground, although a few notable species such as wood ducks and mourning doves nest in trees. Habitat loss and fragmentation would occur until vegetation is reestablished; then the habitat may be degraded due to the spread of noxious and invasive species. For species that use tree and shrub habitats for cover, forage, and nesting, losses of these habitats would be long term because trees and shrubs would require from 5 to 20 years to reestablish and the permanent ROW would be maintained free of trees and large shrubs. Migratory waterfowl may be attracted to the pipeline corridor during early spring if it becomes snow free earlier than surrounding habitats. This would be most likely to occur in North Dakota and South Dakota. Early greenup near roadways and the buried portion of the Trans Alaska Pipeline in Northern Alaska attracts waterfowl, shorebirds, and ptarmigan (Trans Alaska Pipeline System Owners 2001).

The greater prairie chicken and sharp-tailed grouse inhabit native prairies and nest in grasslands. These species have disappeared from large portions of their historical ranges, due primarily to habitat loss or degradation resulting from agricultural practices, livestock overgrazing, and habitat succession. Breeding habitats are vulnerable to disturbance as these birds gather to breed where males display, and nesting may be concentrated within several miles of active leks. Prairie chickens and sharp-tailed grouse are also vulnerable to displacement by the creation of roads and power lines and reductions in habitat suitability due to fragmentation.

3.6.2.4 Other Migratory Birds

Removal of trees from the construction ROW and extra workspaces in woodlots, riparian areas, and shelterbelts—habitats supporting 94 percent of raptor nests—would lead to the destruction of some of the approximately 100 raptor nest structures identified within 300 feet of the pipeline alignment. If nests were occupied when trees were cut, nests, eggs, or young would be lost. Because most raptors reuse nest structures, loss of nest structures would require pairs to find new nest trees. If suitable new nest trees are not available within their established territory, new territories would need to be established. These processes would lead to increased energy demands during nesting and could lead to reduced or lost reproduction in subsequent years. Losses of tree and shrub habitats used by migratory birds for cover, forage, and nesting would be long term because it would require from 5 to 20 years to reestablish trees and shrubs, and the permanent ROW would be maintained free of trees and large shrubs. Habitat fragmentation caused by changes in vegetation cover within the pipeline ROW through large blocks of forest habitats would have the greatest effect on raptors and migrant songbirds (Hinkle et al. 2002). Forest-nesting songbird abundance, diversity, and reproduction rates all become depressed as a result of fragmentation associated with linear developments (Jalkotzy et al. 1997). Linear corridors increase songbird nest predation and parasitism by fragmenting forest habitats.

3.6.3 Mitigation

To minimize potential construction- and operations-related effects, Keystone would implement procedures outlined in its CMR Plan (Appendix B). Keystone has identified mitigation procedures in the CMR Plan to minimize adverse effects to shelterbelts, windbreaks, and living snow fences; these additional mitigation measures can be found in Section 3.9.3.2. Pipeline construction would be conducted in accordance with required permits.

Keystone has committed to implementing the following measures in its CMR Plan to protect wildlife:

- Bevel shavings produced during pipe bevel operation would be removed immediately to ensure that livestock and wildlife do not ingest this material.
- Litter and garbage that could attract wildlife would be collected and removed from the construction site at the end of the day's activities.
- Feeding or harassment of livestock or wildlife is prohibited.
- Construction personnel would not be permitted to have firearms or pets on the construction ROW.
- All food and wastes would be stored and secured in vehicles and/or appropriate facilities.
- Areas of disturbance in native range would be seeded with a native seed mix after topsoil replacement.

Keystone has committed to implementing the following measures in its CMR Plan to protect sensitive wildlife species:

- Contracting a qualified biologist to conduct a survey of sensitive species associated with native tall-grass prairie. Locations of sensitive species found would be documented; if sensitive species are identified in the ROW, Keystone would work with the relevant regulatory authorities to determine whether any additional protection measures would be required.
- Reclaiming disturbance to native prairie species in native prairie using native seed mixes specified by applicable state and federal agencies, to ensure no net loss of native prairie habitat.
- Implementing appropriate surveys where avoidance of native tall-grass prairie by the pipeline ROW is infeasible, to ensure that populations of sensitive wildlife species are not affected.
- Contracting a qualified biologist to conduct a survey of breeding bird habitat within 330 feet of proposed surface disturbance activities that would occur during the breeding season. The biologist would document active nests, bird species, and other evidence of nesting (e.g., mated pairs, territorial defense, and birds carrying nesting material or transporting food). If the biologist documents an active nest for a species that is designated as a migratory bird during the survey, Keystone would work with USFWS to identify measures to comply with the MBTA.
- Conducting breeding raptor surveys by a qualified biologist prior to construction activities and during the raptor breeding season (February 1–July 31), through areas of suitable nesting habitat to identify any potentially active nest sites in the Keystone Project area. If raptors are identified within 0.5 mile of the construction ROW, Keystone would work with USFWS and state agency wildlife biologists to determine whether additional mitigation is needed to protect raptors. These measures would be implemented on a site-specific and species-specific basis, in coordination with USFWS and state agency wildlife biologists.

- Identifying pesticides proposed for use and any best management practices that would be implemented to minimize the impacts of pesticides used to maintain the pipeline ROW.

- Providing data from pre-biological surveys to appropriate USFWS Environmental Services field offices.

- Providing construction maps that identify seasonal restrictions and special construction restrictions to contractors, so that contractors would be informed and take the necessary precautions to protect natural resources during construction.

- Encouraging landowners to allow Keystone to use native species for restoration of the construction ROW across their lands.

In addition to the measures listed above, the following additional measures would further reduce impacts to wildlife from construction of the Keystone Project:

- USFWS recommends that all unavoidable impacts to fish and wildlife habitats be mitigated in accordance with guidelines provided by the USFWS Environmental Services field offices and state fish and wildlife agencies (Willie R. Taylor, USFWS, October 11, 2007).

- USFWS recommends restoration or replacement of native prairie and forest, and that replacement occurs in areas adjacent to existing large tracts of native habitat in order to consolidate habitats and reduce habitat fragmentation (Willie R. Taylor, USFWS, October 11, 2007).

- Construction within the Mississippi/Missouri Confluence COA should not occur during fall and spring migration (Willie R. Taylor, USFWS, October 10, 2007).

3.6.4 Connected Actions

3.6.4.1 Power Lines and Substations

Approximately 193 miles of new electric transmission lines would be necessary to power pump stations along the pipeline ROW for the Mainline Project and the Cushing Extension (see Sections 2.1.4.1). Wildlife habitats affected by construction and operation of transmission lines include 119 miles of cropland and pasture, 51 miles of cropland/grassland mosaic, 12 miles of cropland/woodland mosaic, 5 miles of grassland, and 5 miles of savanna (see Table 3.5.5-5). Approximately 64 percent of these lines (124 miles) would be located in proximity to prairie potholes in North Dakota and South Dakota, which are notable waterfowl production areas. Other routes would cross rivers and riparian areas that are likely to attract raptors and migratory birds. Newly constructed power lines would cross croplands and pastures, cropland/grassland mosaics, and grassland habitats that would be used by ground-nesting birds. Transmission line poles would be used as vantage perches by raptors, facilitating predation on ground-nesting birds. Location of poles across grassland habitats also reduces habitat suitability for ground-nesting birds.

New electric power line segments would increase the collision potential for migrating and foraging birds. Factors influencing collision risk are related to the avian species, the environment, and the configuration and location of lines. Species-related factors include habitat use, body size, flight behavior, age, sex, and flocking behavior. Heavy-bodied, less agile birds—or birds within large flocks, as is typical of migrating sandhill cranes—may lack the ability to quickly negotiate obstacles, making them more likely to collide with overhead lines. Environmental factors influencing collision risk include weather, time of day, lighting and line visibility, land use practices that may attract birds (such as grain fields), and human activities that may flush birds (such as nearby roadways). Power line-related factors influencing collision risk include the configuration and location of the line and line placement with respect to other structures or topography (APLIC and USFWS 2005).

Birds are electrocuted by power lines because of two factors: (1) environmental factors such as topography, vegetation, available prey, and other behavioral or biological factors that influence avian use of power poles; and (2) inadequate separation between energized conductors or energized conductors and grounded hardware that provide two points of contact (APLIC and USFWS 2005). Raptors are opportunistic and may use power poles for nesting sites, vantages for territorial defense, or vantages for hunting. Power poles and lines may provide perches for hunting that offer a wide field of view above the surrounding terrain (APLIC and USFWS 2005).

Collision and electrocution impacts on birds resulting from construction of transmission lines would be reduced by provider implementation of the following mitigation measures:

- Standard, safe designs, as outlined in Suggested Practice for Avian Protection on Power Lines (APLIC 2006), into the design of electrical distribution lines in areas of identified avian concern.
- Marking techniques to increase transmission line visibility using balls or flappers.
- A minimum 60-inch separation between conductors and/or grounded hardware and recommended use of insulation materials and other applicable measures, depending on line configuration.
- Standard raptor-proof designs, as outlined in Avian Protection Plan Guidelines (APLIC and USFWS 2005), into the design of the electrical distribution lines to prevent collision by foraging and migrating raptors in the Keystone Project area.

Electrical service providers and, where applicable, the RUS would coordinate with the appropriate state and federal resource agencies to identify specific locations for flight deterrents or other avoidance or minimization measures.

3.6.4.2 Wood River Refinery Expansion

No impacts related to wildlife are associated with the Wood River Refinery Expansion other than those evaluated as part of that project.

3.6.5 References

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3.7 FISHERIES

This section provides information on important fisheries resources in the Keystone Project area (also referred to as "species of special concern"). Species of special concern are those species that have been identified by state agencies as fish that occur in water bodies (e.g., streams, rivers, lakes, and ponds) at or immediately downstream of proposed crossings and have recreational or commercial value. The type of fishery present in a water body can be defined as coldwater or warmwater. No coldwater fisheries (e.g., trout and salmon) are found in the Keystone Project area. Warmwater fisheries present in the Project area include resident families (those that do not have extended migrations) such as Ictaluridae (catfish, bullheads, and madtoms), Centrarchidae (black bass and sunfish), Cyprinidae (carp and minnows), and Moronidae (temperate bass). Special-status species information is provided in Section 3.8. Special-status species include those listed by a state or listed under the federal ESA as threatened, endangered, or sensitive, in terms of the potential for a specific population of animals or plants to continue to exist.

3.7.1 Fisheries Resources

The Fisheries section examines water bodies that would be crossed by the proposed pipeline route and those located within approximately 0.5 mile of the pipeline ROW that are capable of supporting fish species with recreational (important as a sport fishery) or commercial (have a market value) significance. The types of water bodies discussed in this section include lakes, ponds, rivers, and perennial and intermittent streams. For the purposes of this section, the following definitions are assumed:

- "Lake" refers to any water body enclosed or partially enclosed where wind is the dominant mechanism in mixing (Goldman and Horne 1983).
- "Pond" refers to any enclosed or partially enclosed water body where convective mixing (i.e., temperature differences) predominates (Goldman and Horne 1983).
- "Perennial stream" refers to any free-flowing water body with a well-defined channel that contains water at all times, except in cases of extreme drought (Hewlett 1982).
- "Intermittent stream" refers to any free-flowing water body that does not always contain water (e.g., contains water only during the wet season) (Hewlett 1982).

The Mainline Project route would involve 213 perennial water body crossings and 605 intermittent water body crossings in the states of North Dakota, South Dakota, Nebraska, Kansas, Missouri, and Illinois. The Cushing Extension would require an additional 58 perennial crossings in Nebraska, Kansas, and Oklahoma. An additional 192 intermittent water bodies would be crossed through Kansas, Oklahoma, and Nebraska. Table 3.7.1-1 lists the perennial crossings for each state, the proposed crossing method, and the presence or absence of a fishery of special concern. For detailed information on crossing methods for water bodies, refer to Section 2.2.2.3.

Table 3.7.1-2 provides the major recreational and commercial fish species located in the perennial streams and rivers along the Keystone Project route, as identified by the state agencies. While the species listed in Table 3.7.1-2 are not the only fish inhabiting those water bodies affected by the proposed pipeline, they are the ones designated as having recreational or commercial value. These fisheries are discussed in more detail in the following section (Section 3.7.2).

TABLE 3.7.1-1
Stream Name, Crossing Methods, Number of Crossings, Presence or Absence of Fisheries of Special Concern for Perennial Streams, by State along the Mainline Project and Cushing Extension Pipeline Routes

Stream Name	Crossing Method[a]	Number of Crossings	Fisheries of Special Concern Presence (Y) or Absence (N)
MAINLINE PROJECT			
North Dakota			
Goose River	O/C	1	N
Middle Branch Forest River	O/C	1	Y
Pembina River	HDD	1	Y
Sheyenne River	O/C	1	Y
South Branch Park River	HDD	1	N
Tongue River	O/C	1	Y
Unnamed	O/C	2	N
South Dakota			
Beaver Creek	O/C	1	Y
James River	O/C	1	Y
Missouri River	HDD	1	Y
Mud Creek	O/C	1	N
Unnamed	O/C	0	N
Wolf Creek	Dry crossing	1	Y
Wolf Creek	O/C	2	Y
Nebraska			
Unnamed	O/C	2	N
Antelope Creek	O/C	1	N
Cub Creek	O/C	1	N
Dry Creek	O/C	2	N
Elkhorn River	HDD	1	Y
Lincoln Creek	Dry crossing	1	N
Little Indian Creek	O/C	1	N
Middle Logan Creek	O/C	1	N
Missouri River	HDD	1	Y
North Fork Bow Creek	O/C	1	N
Norwegian Bow Creek	O/C	1	N
Platte River	HDD	2	Y
South Fork Bow Creek	O/C	1	N
Shell Creek	O/C	1	Y
Swan Creek	O/C	1	N
Turkey Creek	O/C	1	Y
Union Creek	O/C	1	N
Unnamed	O/C	1	N
West Bow Creek	O/C	1	N
West Fork Big Blue River	O/C	3	Y
Kansas			
Big Blue River	O/C	1	Y
Buttermilk Creek	O/C	1	N
Cedar Creek	O/C	1	N
Deer Creek	O/C	1	N
East Branch Walnut Creek	O/C	2	N
Gregg Creek	O/C	1	N
Halling Creek	O/C	2	N
Harris Creek	O/C	2	N
Indian Creek	O/C	1	N
Middle Fork Wolf River	Dry crossing	1	N
North Elm Creek	Dry crossing	2	N

TABLE 3.7.1-1 (Continued)			
Stream Name	Crossing Method[a]	Number of Crossings	Fisheries of Special Concern Presence (Y) or Absence (N)
MAINLINE PROJECT (CONTINUED)			
Kansas (continued)			
North Fork Wildcat Creek	O/C	1	N
Robidoux Creek	O/C	1	Y
Rock Creek	O/C	1	N
South Fork Big Nemaha River	O/C	2	Y
Squaw Creek	O/C	1	N
Tributary to Gregg Creek	O/C	1	N
Tributary to Halling Creek	O/C	1	N
Tributary to Harris Creek	O/C	1	N
Tributary to Indian Creek	O/C	1	N
Tributary to Missouri River	O/C	4	N
Tributary to Squaw Creek	O/C	1	N
Tributary to North Branch Independence Creek	O/C	1	N
Walnut Creek	O/C	1	N
Wildcat Creek	O/C	1	N
Unnamed	O/C	3	N
Missouri			
Bean Branch	O/C	1	N
Bear Creek	O/C	1	N
Big Creek	O/C	4	N
Branch of Log Creek	O/C	1	N
Brush Creek	Dry crossing	1	N
Brush Creek	O/C	1	N
Castile Creek	O/C	1	N
Chariton River	HDD	1	Y
Contrary Creek	O/C	1	N
Coon Creek	O/C	1	N
Crabapple Creek	O/C	1	N
Cuivre River	HDD	2	Y
Dardenne Creek	O/C	1	N
Deer Creek	O/C	2	N
East Fork Chariton River	O/C	1	N
Elkhorn Creek	O/C	1	N
Goodwater Creek	O/C	1	N
Grand River	O/C	2	Y
Horse Fork	O/C	1	N
Jenkins Branch	O/C	1	N
Lake Creek	O/C	1	Y
Little Platte River	O/C	1	N
Little Shoal Creek	O/C	1	N
Littleby Creek	O/C	1	N
Log Creek	Dry crossing	1	N
Long Branch	O/C	1	N
Long Creek	O/C	1	N
Malden Creek	O/C	1	N
Middle Fork Chariton River	O/C	1	N
Missouri River	HDD	1	Y
Mud Creek	O/C	1	Y
Mussel Fork	O/C	1	N
Palmer Creek	O/C	1	Y
Peruque Creek	O/C	1	N

TABLE 3.7.1-1 (Continued)			
Stream Name	Crossing Method[a]	Number of Crossings	Fisheries of Special Concern Presence (Y) or Absence (N)
MAINLINE PROJECT (CONTINUED)			
Missouri (continued)			
Pigeon Creek	O/C	4	N
Platte River	O/C	1	Y
Potter Slough	O/C	1	N
Puzzle Creek	O/C	2	N
Saline Creek	O/C	1	N
Salt Creek	O/C	1	Y
Shoal Creek	O/C	1	N
Skull Lick Creek	O/C	1	N
South Fork Salt Creek	O/C	1	N
Tributary to Big Creek	O/C	2	N
Tributary to Brush Creek	O/C	1	N
Tributary to Crabapple Creek	O/C	1	N
Tributary to Lake Creek	O/C	2	N
Tributary to Log Creek	O/C	1	N
Tributary to Mud Creek	O/C	2	N
Tributary to North Mud Creek	O/C	7	N
Tributary to Peruque River	O/C	1	N
Tributary to Pigeon Creek	O/C	3	N
Turkey Creek	O/C	2	Y
Unnamed	O/C	17	N
West Fork Salt River	O/C	1	N
Willow Creek	O/C	1	N
Wolf Branch	O/C	1	N
Wolfpen Creek	O/C	1	N
Youngs Creek	O/C	1	N
Illinois			
Beaver Creek	O/C	1	N
Cahokia Creek	O/C	1	Y
Hurricane Creek	HDD	2	N
Indian Creek	O/C	1	N
Kaskaskia River	HDD	1	Y
Little Beaver Creek	O/C	1	N
Mississippi River	HDD	1	Y
Mooney Creek	O/C	1	N
Sand Creek	O/C	1	N
Shoal Creek	O/C	1	Y
Silver Creek	HDD	1	Y
Spring Creek	O/C	1	N
Sugar Creek	O/C	5	N
Sugar Fork Creek	O/C	1	N
Tributary of Spring Branch	O/C	1	N
Tributary to Silver Creek	O/C	5	N
Tributary to Sugar Creek	O/C	1	N
Tributary to Sugar Fork Creek	O/C	1	N
Unnamed	O/C	6	N
Willet Road Creek	O/C	1	N

TABLE 3.7.1-1 (Continued)			
Stream Name	Crossing Method[a]	Number of Crossings	Fisheries of Special Concern Presence (Y) or Absence (N)
CUSHING EXTENSION			
Nebraska			
Unnamed	O/C	1	N
Kansas			
Unnamed	O/C	9	N
Arkansas River	HDD	1	Y
Caitlin Creek	O/C	2	N
Cane Creek	O/C	1	N
Carry Creek	O/C	1	Y
Chapman Creek	O/C	1	N
Cottonwood River	O/C	1	N
Diamond Creek	O/C	1	N
Doyle Creek	O/C	1	N
Dry Creek	O/C	2	N
Eight Mile Creek	O/C	1	N
Four Mile Creek	O/C	1	N
Four Mile Creek Meander	O/C	2	N
Little Blue River	O/C	1	Y
Mill Creek	O/C	2	N
Mill Creek	O/C	1	N
Mud Creek	O/C	1	Y
Na Creek	O/C	1	N
Republican River	HDD	1	Y
Smokey Hill River	O/C	1	Y
Spring Branch Creek	O/C	1	N
Spring Creek	O/C	1	N
Unnamed	O/C	3	N
West Branch Lyon Creek	Dry crossing	1	Y
West Fancy Creek	O/C	1	N
Whitewater River	O/C	1	Y
Oklahoma			
Unnamed	O/C	10	N
Bois D' Arc	O/C	2	N
Cimarron River	HDD	1	Y
Long Branch Creek	O/C	1	N
Red Rock Creek	O/C	1	N
Salt Fork	HDD	1	Y

[a] Stream crossing techniques include O/C = Open-cut construction techniques; Dry crossing = Dry crossing techniques (flume or dam and pump methods); HDD = Horizontal directional drill method. The construction techniques proposed for use in flowing water bodies (i.e., perennial streams) are described in the Project's Construction Mitigation and Reclamation Plan (Appendix B).

Source: TransCanada 2007a, ENSR 2007i

TABLE 3.7.1-2
Recreational and Commercial Species in Water Bodies Crossed by the Keystone Project

Common Name	Scientific Name	Recreational Species	Commercial Species	Mainline Project Occurrence						Cushing Extension Occurrence		
				ND	SD	NE	KS	MO	IL	NE*	KS	OK
Bigmouth buffalo	*Ictiobus cyprinellus*	x	x			x	x	x	x			
Black buffalo	*Ictiobus niger*	x	x			x	x	x	x			
Black crappie	*Pomoxis nigromaculatus*	x			x						x	
Blue catfish	*Ictalurus furcatus*	x			x	x	x	x	x			x
Bluegill	*Lepomis macrochirus*	x		x	x						x	
Brook trout	*Salvelinus fontinalis*	x										
Channel catfish	*Ictalurus punctatus*	x			x	x	x	x	x		x	x
Common carp	*Cyprinus carpio carpio*	x	x			x	x	x	x			
Flathead catfish	*Pylodictis olivaris*	x			x	x	x	x	x			x
Freshwater drum	*Aplodinotus grunniens*	x	x			x	x	x	x			
Largemouth bass	*Micropterus salmoides*	x		x	x	x	x	x	x		x	x
Muskellunge	*Esox masquinongy*	x										
Northern pike	*Esox lucius*	x		x	x	x	x					
Paddlefish	*Polyodon spathula*	x			x			x	x			
Rainbow trout	*Oncorhynchus mykiss*	x										x
River carpsucker	*Carpiodes carpio*	x	x					x	x			
Rock bass	*Ambloplites rupestris*	x				x	x					x
Sauger	*Sander canadensis*	x				x	x	x	x			
Shovelnose sturgeon	*Scaphirhynchus platorynchus*	x	x			x	x	x	x			
Smallmouth bass	*Micropterus dolomieu*	x	x	x	x	x	x	x	x			x
Spotted bass	*Micropterus punctulatus*	x		x	x	x	x					x
Walleye	*Sander vitreus*	x			x	x	x	x	x		x	x
White bass	*Morone chrysops*	x		x	x			x	x			x
White crappie	*Pomoxis annularis*	x			x						x	
Yellow bullhead	*Ameiurus natalis*	x		x	x							
Yellow perch	*Perca flavescens*	x		x	x	x						

Note: Species information not available for stream crossing in Nebraska along the Cushing Extension route.

3.7.2 Fisheries of Special Concern

This section addresses fisheries of special concern found in perennial streams (including rivers), ponds, and lakes that would be directly crossed by the pipeline route and water bodies that are located within approximately 0.5 mile of the pipeline ROW. Although intermittent water bodies may be of substantial value in terms of fisheries resources, they are not addressed in this section because information is not available for these water bodies (ENSR 2006a).

Fisheries management in each state incorporates the respective surface water classification systems. The classifications are based on a water body's water quality and resource value and are intended to create an estimate of the potential use. The classification systems for each of the states crossed by the proposed pipeline route can be found through the following agencies:

- North Dakota Department of Health (2001),
- South Dakota Department of Environmental and Natural Resources (2004),
- Nebraska Department of Environmental Quality (2003),
- Kansas Department of Health and Environment (2004),
- Missouri Department of Conservation (MDC)**,**
- Illinois Environmental Protection Agency (2006), and
- Oklahoma Water Resources Board (2006).

3.7.2.1 Mainline Project

The proposed Mainline Project route would involve 213 perennial and 605 intermittent water body crossings in the states of North Dakota, South Dakota, Nebraska, Kansas, Missouri, and Illinois.

North Dakota

Seven perennial stream crossings and numerous intermittent streams and unnamed ponds occur in North Dakota along the proposed Mainline Project route (Table 3.7.1-1). Four of the seven perennial stream crossings have documented species of special concern. The Sheyenne River supports nine recreational fish species and has been given one of the highest ratings for surface water (Class IA) (ENSR 2006a). In contrast, the other perennial streams (Goose, Pembina, Tongue, and Middle Branch Forest Rivers) contain one to four game fish species.

Northern pike, yellow perch, and black bass species represent the most important species in the state in terms of fisheries management and recreational harvests. Other common recreational species in North Dakota include bluegill, largemouth bass, smallmouth bass, spotted bass, and yellow perch (Table 3.7.1-2). The only known stocking effort among these water bodies was for northern pike in the Sheyenne River in 2005 and 2006 (NDGFD 2006). Information on fish populations in the numerous small intermittent streams and ponds crossed by the proposed route is not available, but they could support recreational fisheries with species such as largemouth bass, bluegill, yellow perch, and black bullheads.

South Dakota

The proposed Mainline Project route includes seven perennial stream crossings, one lake (Amsden Lake), and numerous intermittent streams and small ponds in South Dakota. The Missouri River is the largest water body and contains 19 recreational fish species (ENSR 2006a). The other streams support two to six recreational species.

The Mainline Project Route could affect 15 species of special concern, with all species having recreational fishing value and one species (smallmouth bass) with commercial value. Catfish, northern pike, and black bass species are also popular recreational fish species in these water bodies (Table 3.7.1-2). The only known stocking effort is for paddlefish in the Missouri River (ENSR 2006a). Amsden Lake provides valuable habitat for many species, including pike, bluegill, walleye, largemouth bass, and crappie. Data on species found in ponds within the proposed Project area are not available. However, these ponds probably contain many of the same recreational species found in North Dakota ponds.

Nebraska

Nebraska would require 25 perennial stream crossings along the proposed Mainline Project route. The Missouri River supports 19 recreational fish species, while other streams in the proposed Project area contain one to five recreational species (ENSR 2006a).

None of the fisheries that could be affected by the proposed crossings have been designated as having commercial value by the state. The primary species found in the Missouri River include catfish, yellow perch, sauger, walleye, northern pike, and black basses. The fish groups found in the other streams crossed by the pipeline include catfish, black basses, and sunfish (Table 3.7.1-2).

Kansas

Kansas has 38 perennial stream crossings along the proposed Mainline Project route. All of the streams have at least four recreational species, with the highest number (18) occurring in the Missouri River (ENSR 2006a).

The Missouri River contains both recreational and commercial fish species, including catfish, buffalofish, carp, freshwater drum, and shovelnose sturgeon. Channel catfish and flathead catfish are the primary recreational species in the Big Blue River, Robidoux Creek, Delaware River, and Missouri River. Walleye are caught in the Middle Fork Wolf River.

Missouri

The Missouri portion of the proposed Mainline Project route includes approximately 98 perennial stream and four unnamed perennial lake or pond crossings. Six major streams (rivers) would be crossed (the Missouri, Platte, Grand, Chariton, Cuivre, and Mississippi Rivers), while the others are tributaries in these drainages. All of the streams and rivers contain at least one recreational fish species; the Mississippi and Missouri Rivers have the most—with 17 and 18 species, respectively—followed by the Grand River, with 12 species (ENSR 2006a). While these rivers support many species of fish (100+), this analysis addresses only those that have been recognized by the state as important for recreation and commercial fisheries.

The most popular recreational fish species in these rivers include catfish, walleye, sauger, largemouth bass, and white bass. The Mississippi, Missouri, and Grand Rivers also contain important commercial fish species (ENSR 2006a). These include channel catfish, blue catfish, flathead catfish, paddlefish, and shovelnose sturgeon. Freshwater drum, black buffalo, smallmouth bass, bigmouth buffalo, common carp, and river carpsuckers also are harvested in the Mississippi River.

The Keystone Project would intersect or potentially affect eight aquatic streams designated by the Missouri Code of State Regulations (10-CSR 20-7.031) as “Outstanding State Water Resources.” These areas have been designated as having high integrity or minimal alterations and/or a high number of aquatic species. Potential crossings that contain important recreational or commercial species include Turkey Creek and Sugar Creek. The proposed pipeline route also crosses the Jentell Brees Access in Buchanan County, which is owned by the Missouri Department of Conservation and was developed with Sport Fish Restoration federal monies to provide access to fishing in the Missouri River.

Illinois

There are 35 perennial stream crossings and one lake (Highland Silver Lake) in the Illinois portion of the proposed Mainline Project route. The Mississippi River contains 19 recreational fish species and six commercial species (ENSR 2006a). Highland Silver Lake would be crossed by the pipeline on the East Fork of Silver Creek, located north of Highland, Illinois. The lake is a large reservoir approximately 10 miles downstream of the proposed Project crossing and is popular for recreational fishing.

In addition to the recreational species in the Mississippi River listed in the Missouri section, commercial species are harvested from the river. They include three species of buffalofish, common carp, carpsuckers, and catfish. Catfishes also support a primary recreational fishery in Cahokia Canal and Shoal and Silver Creeks, although the fishing use is lower than for the Mississippi River. Common species found in Amsden Lake include catfish, crappie, bluegill, rockbass, striped bass, largemouth bass, and walleye. The lake is also stocked with trout in the winter season.

3.7.2.2 Cushing Extension

The Cushing Extension would involve 58 perennial crossings in Nebraska, Kansas, and Oklahoma. An additional 192 intermittent water body crossings would occur through Kansas, Oklahoma, and Nebraska.

Nebraska

The proposed route for the Cushing Extension includes one perennial stream and one pond crossing in Nebraska. The water bodies are unnamed, and no fisheries resources information is available (ENSR 2007i).

Kansas

The Kansas portion of the proposed Cushing Extension would require 40 perennial stream crossings. The majority of these streams are minor (less than 10 feet wide) to intermediate (10 to 100 feet wide), with the exception of five streams (the Little Blue, Republican, Smokey Hill, Whitewater, and Arkansas Rivers) (ENSR 2006a). Keystone has proposed using the HDD crossing method at two locations, the Republican River and Arkansas River. Popular recreational fisheries in these streams include bluegill, channel catfish, crappie, largemouth bass, and saugeye (Table 3.7.1-2).

Oklahoma

The Cushing Extension would cross 16 perennial streams in Oklahoma. These streams are home to numerous warmwater recreational fisheries. Popular species include walleye, basses, sunfish, catfish, and rainbow trout (Table 3.7.1-2). Keystone has proposed crossing the Salt Fork Arkansas River and Cimarron River with the HDD method.

3.7.3 Potential Impacts and Mitigation

Keystone proposes five crossing techniques for water bodies, depending on stream size, water flow, and species present (see Section 2.2.2.3 for construction method details). The non-flowing upland cross-country crossing method would be used at all water body crossings with no perceptible flow at the time of construction. For flowing water bodies, Keystone may utilize one of four techniques:

- Flowing open-cut wet,
- Flowing open-cut dry flume,
- Flowing open-cut dry dam and pump, and
- Horizontal directional drill (HDD).

Keystone will develop crossing plans for those water bodies not already committed to HDD that contain recreationally or commercially important fisheries, in conjunction with the appropriate jurisdictional agency, and will utilize the crossing method approved by such agencies. Along the Mainline Project, one water body of particular concern is the Grand River in Missouri, which contains 12 game fish species. It has been recommended by USFWS and local agencies that Keystone consider using the HDD method at the crossings of larger water bodies and water bodies classified as special use. Specific recommendations include the Grand River, Little Blue River, Smokey Hill River, and Whitewater River (Willie R. Taylor, USFWS, October 11, 2007; H. Floyd Gilzow, Missouri Department of Natural Resources, April 27, 2007; Doyle Brown, MDC, April 27, 2007; Robert E. Robert, EPA, October 9, 2007). These four river crossings are not currently scheduled for HDD construction.

Potential impacts from the proposed Project include construction-related impacts as well as impacts due to the operation and maintenance of the pipeline and ROW. The Mainline Project and Cushing Extension pipeline could primarily affect fisheries resources by:

- Instream and streambank habitat loss, alteration, and fragmentation;
- Loss of spawning or rearing success from construction and operations noise and human activity;
- Direct mortality from Keystone Project construction and operation;
- Adverse health effects caused by decreased water quality due to construction;
- Indirect mortality because of stress or avoidance of feeding due to exposure to construction and operations noise, and from increased human activity; and
- Loss of individuals and habitats due to exposure to toxic materials or crude oil releases (addressed in Section 3.13, Safety and Reliability).

The degree of construction-related impacts would depend on the crossing method, existing conditions at each crossing, duration of instream activity, and mitigation measures implemented. The impacts will be avoided and minimized to the degree practical by employing Best Management Practices BMPs. These are accepted procedures that contractors would follow during construction. The proposed crossing methods for the perennial stream crossings can be found in Table 3.7.1-1. Potential operations- and maintenance-related impacts mainly are associated with vegetation control, potential temperature changes, and oil releases.

Keystone's CMR Plan (Appendix B) describes the BMPs that would be used for each type of water body crossing to reduce potential effects on fish and aquatic/streambank habitat. If the proposed mitigation procedures are followed for the crossings, there would most likely be minimal impact to the habitat and aquatic organisms. The short-term disturbance that would be caused by instream activities would likely resemble natural high-flow events in the stream.

3.7.3.1 Non-Flowing Upland Cross-Country Crossing Method

The non-flowing upland cross-country crossing method would be used at water body crossings with no perceptible flow at the time of construction.

Construction Impacts

The non-flowing upland method of crossing dry streambeds would likely cause minimal short-term impacts on the aquatic environment because there would not be flowing water and therefore no species of special concern would be present. This method would also likely result in minimal long-term effects if BMPs are followed that include minimizing disturbance during construction of the crossing. Potential effects could include some increased sedimentation when flowing water returns to the streambed and the potential introduction of hazardous materials to streambed sediments should equipment leak during construction. Potential impacts related to construction activities are discussed in more detail in Section 3.7.3.3.

Operations/Maintenance Impacts

Operation and maintenance impacts would be similar to those described in Section 3.7.3.3. Potential impacts could result from vegetation control, increased temperatures from vegetation removal, oil spills, and introduction of exotic or invasive species of animals or plants. Because this method would be used on small streams and only when flowing water is not present, impacts would be minimal. Potential impacts associated with crude oil releases are addressed in Section 3.13, Reliabiliy and Safety. Potential impacts related to operation and maintenance activities are discussed in more detail in Section 3.7.3.3.

Mitigation

Mitigation would include stabilization of the streambed and streambanks after construction to avoid or minimize erosion and resulting downstream sedimentation. Mitigation related to operation and maintenance would be the same as described in Section 3.7.3.3.

3.7.3.2 Flowing Open-Cut Wet

The flowing open-cut wet method involves trenching through the water body while the water continues to flow through the construction work area.

Construction Impacts

Potential effects associated with this method of construction include increased sedimentation, fragmentation of the stream habitat, and direct mortality due to construction equipment in the stream. The open-cut wet method has the greatest potential for short-term impacts, on the aquatic resources present in the area. These impacts would generally be limited to brief periods of instream construction. Typically, the open-cut wet method is used on streams with smaller channel widths. An advantage of the open-cut wet method is that in most circumstances the length of time that in-channel disturbance occurs is less than other methods. Potential construction impacts are discussed in more detail in Section 3.7.3.3.

Operations/Maintenance Impacts

Potential operation and maintenance impacts would be similar to those described in Section 3.7.3.3. Potential impacts could result from vegetation control, increased temperatures from vegetation removal, oil spills, and introduction of exotic or invasive species of plants. Typically, the open-cut wet method is used on streams with smaller channel widths. In addition to impacts immediately downstream of the construction zone, impacts could occur in downstream habitats where these smaller streams join larger water bodies. Potential impacts associated with crude oil releases are addressed in Section 3.13, Reliabiliy and Safety.

Mitigation

Mitigation would include stabilization of the streambed and streambanks after construction to avoid or minimize erosion and resulting sedimentation. Mitigation related to operation and maintenance would be the same as described in Section 3.7.3.3.

3.7.3.3 Flowing Open-Cut Dry Flume, Dam and Pump

Flowing open-cut dry crossing methods involve allowing the water to continue to flow in the water body by diverting it around the trenching area through either a flume or dam-and-pump system. The dry flume method diverts the water across the trenching area through one or more flume pipes placed in the water body. The dam-and-pump method is similar to the flume, except that pumps and hoses would be used instead of the flumes to divert the flow of water. These methods have been designated for use on environmentally sensitive water bodies where technically feasible, with seven locations identified to date (Table 3.7.1-1).

Construction Impacts

One potential effect from flowing open-cut crossing techniques is an increase in sedimentation in the water body caused by trenching, backfilling, and streambank erosion. The extent of sedimentation would partially depend on the nature of the soil materials encountered during trenching and backfilling. Increases in instream sediment levels can alter a stream's substrate composition and fill inter-gravel spaces and pool habitats. They also can degrade the existing aquatic habitat by reducing spawning habitat, available rearing habitat, and benthic invertebrate production.

Fish populations can be directly affected by suffocation of eggs and newly hatched larvae living in gravels, and by abrasion of the sensitive gill membranes of both young and adult fish (Cordone and Kelley 1961, Chutter 1969, Sutherland 2007). As mentioned previously, fine sediments can reduce the productivity of benthic invertebrates, which would reduce forage available to insectivorous fish. Many fish rely on vision for locating prey and high concentrations of suspended sediments can negatively impact feeding behavior (Chutter 1969, Barrett et al. 1992).

Construction of the pipeline also would require clearing vegetation from the construction ROW. One of the greatest potential impacts related to removal of riparian cover is the direct loss of the bank features that are utilized by fish for cover, nesting, and feeding. An indirect effect would be the loss of larger structures (trees, boulders, and woody debris) that fall into the water body and create cover, as well as enhance the habitat complexity by creating pools and gravel bars (Angermeier and Karr 1984, Abbe and Montgomery 1998). Removal of vegetation also destabilizes the banks and increases the potential for additional erosion, resulting in sedimentation and turbidity in the water body (Tabacchi et al. 1998).

Construction activities in a water body have the potential for the introduction and spread of non-native and exotic species (Cowie and Robinson 2003, Fuller 2003). Introduced species threaten the health of the native species and habitat, human health, and economy (Lovell et al. 2006). In flowing open-cut stream crossings, equipment would have direct contact with the water body and sediments. Organisms can easily attach themselves or become lodged in equipment crevices such as tire treads.

Blasting operations could occur on or near potential water body crossings containing important fisheries. These are all located in the state of Missouri and include Malden Creek, Mud Creek, Lake Creek, Palmer Creek, East Fork Little Chariton River, Salt Creek, and Turkey Creek. Streamside blasting could indirectly affect fish and aquatic invertebrates; effects include increased sedimentation, noise, vibrations, and alteration of channel morphology (Wright and Hopky 1998). Blasting in or near water bodies can cause direct negative impacts on fish populations due to mortality associated with shockwaves propagating through the water (Teleki and Chamberlain 1978, Wright and Hopky 1998). The proposed blasting operations and mitigation measures are discussed in more detail in Section 3.1.1.2.

During construction activities, there is also the potential for spills of fuel or other hazardous liquids. Spills can occur during refueling and lubricating of construction equipment and from leaks from storage containers or equipment working in or near streams. As a general rule, any actions involving the use of hazardous materials would be restricted to areas at least 100 feet distant from the active channel. For a detailed examination of the effects and mitigation measures for spills, refer to Section 3.13 and the SPCC Plan.

Operations/Maintenance Impacts

Although oil spills are not considered a part of routine pipeline operations, a crude oil release would potentially affect nearby water bodies and the aquatic organisms in them. The specific effect depends on the concentration of petroleum present, the length of exposure, and the life stage of the species involved. Larval/juvenile fish are generally more sensitive than adults (Hose et al. 1996, Heintz et al. 1999). Sub-lethal effects include changes in overwintering and spawning behavior, reduction in food resources, consumption of contaminated prey, and temporary displacement (Morrow 1974, Brannon et al. 1986, Purdy 1989). A full discussion of the impacts and mitigation measures related to spills can be found in Section 3.13, Reliability and Safety.

Keystone found that near-surface soil temperatures would continue to be influenced mainly by climate (TransCanada 2007a), with minimal effects from pipeline operations. For all water body crossings, the pipeline would be installed with a minimum cover of 60 inches from the bottom of the water body. The combination of this depth and the flowing nature of the water body would result in minimal effects from the temperature of the pipeline.

During operation of the pipeline, vegetation would be maintained along the ROW. The reduction of large vegetative cover (i.e., trees) would result in a permanent loss of shading, nutrients, and habitat enrichment features for fish. The streambank is also more susceptible to erosion without the stability provided by larger vegetation species. Keystone has proposed that vegetation maintenance and control be accomplished through a combination of pesticides and mechanical methods. The use of pesticides near a water body can potentially affect the aquatic organisms. This can occur through runoff, seepage through the soils, and direct placement during the control operations. A noxious weed plan adopting BMPs for pesticide applications will be developed by Keystone prior to construction. For more information on vegetation control impacts and mitigation, refer to Section 3.5.

Mitigation

To minimize the impacts of construction activities on fish and their habitats, Keystone would complete all instream activity for minor water body crossings (less than 10 feet wide) within 24 hours and within 48 hours for intermediate water bodies (10 to 100 feet wide). Major water body crossings (greater than 100 feet wide) would be completed according to individual Site-Specific Crossing Plans. These plans would be reviewed by COE and relevant resource agencies as part of the permitting process prior to construction

Spawning periods for most fish species in the Keystone Project area extend from April to July (ENSR 2006a). In the FERC Wetland and Water Body Construction and Mitigation Procedures (FERC 2003), instream work for warmwater fisheries is limited to the time window of June 1 through November 30, which avoids most of the sensitive spawning season. Keystone would follow a similar construction timeline to avoid the sensitive breeding periods of the species located in the water bodies.

To minimize streambank erosion, Keystone would use equipment bridges, mats, and pads to support construction equipment that must cross the water body at all perennial stream crossings using an open-cut method. Equipment bridges are not required at minor or dry crossings unless the water body supports a recreationally or commercially valuable fishery. Immediately after the initial disturbance of the soil at all flowing water body crossings, the contractor would install temporary sediment barriers across the entire construction ROW 10 feet from the water's edge to maximize the amount of runoff intercepted. The sediment barriers would act to stop the flow of sediments into the water body, prevent deposition of sediments into sensitive resources, and contain any spill within the construction ROW. All spoil from minor and intermediate water body crossings and upland soil from major water body crossings would be placed within sediment barriers in the construction ROW, at least 10 feet from the active channel or in an additional extra work area. No trench spoil, including spoil from the portion of the trench across the stream channel, would be stored within a water body unless crossing cannot be reasonably completed without doing so.

Flowing open-cut dry crossings generally produce less downstream sedimentation impacts than traditional open-cut methods. To reduce the risk of additional sedimentation in the dry flume method, the Keystone CMR Plan (Appendix B) states that sand bags or plastic sheeting would be used to develop an effective seal and to divert stream flow through the flume pipe. The flume pipe would be aligned to prevent bank erosion and streambed scour, and would not be removed until the final clean up of the streambed and bank is complete. When using the dam-and-pump method, sufficient pumps would be used to maintain 1.5 times the flow present in the stream at the time of construction. To minimize impacts to aquatic species, screening devices would be installed at the intakes.

To reduce the impacts caused by the removal of riparian cover, vegetation would be cut off at ground level, leaving the existing root systems in place to provide streambank stability. Pulling of tree stumps and rooting for grading activities would be limited to directly over the trench line. After construction is complete, the banks of the water bodies would be stabilized with temporary sediment barriers within 24 hours of completing the activities. Where conditions allow, riparian vegetation would be restored with native plant species or conservation grasses and legumes. In the event that a water body crossing is located within or adjacent to a wetland crossing, wetland crossing mitigation measures would be implemented to the extent practicable.

Keystone has proposed locating the primary staging areas for materials and equipment at least 10 feet from the active channel. To further reduce the impacts to the water body, Keystone is encouraged to locate all extra work areas (temporary staging areas, additional spoil storage areas) at least 50 feet from the active channel. If this is not possible, Keystone should coordinate with the appropriate local and state agency(ies) to develop proper buffer guidelines (Robert E. Robert, EPA, October 9, 2007; Willie R.

Taylor, USFWS, October 11, 2007). Relevant state and federal resource agencies would comment on the plan for individual stream crossings prior to the issuance of the COE permit for the crossings.

To reduce the chance of spreading organisms between water bodies, Keystone has agreed to inspect equipment that would be used at water crossings and any visible mud, plants, fish, or animals would be removed before transporting the equipment to the water crossing site.

3.7.3.4 Horizontal Directional Drill

The HDD crossing method would be utilized for certain major and sensitive water bodies. This method involves drilling a pilot hole under and across the water body and banks through which the pipe sections would be pulled through. Keystone has committed to using HDD at 13 crossings along the Mainline Project route (the Pembina River, South Branch Park River, two crossings of the Missouri River, Elkhorn River, Platte River, Chariton River, two crossings of the Cuivre River, Mississippi River, Silver Creek, Hurricane Creek, and Kaskaskia River). Four locations along the Cushing Extension will also be crossed by the HDD method (the Republican, Arkansas, Salt Fork Arkansas, and Cimarron Rivers).

Construction Impacts

HDD crossings would not alter or remove aquatic habitat and would not likely affect fisheries through construction activity. The use of this procedure is limited due to the increase in space requirements, time, cost, and materials needed. HDD crossings for selected major and sensitive water bodies would be constructed in accordance with a site-specific construction and mitigation plan produced by Keystone and approved prior to construction by COE with input from relevant state and federal resource agencies. HDD does carry a risk of the escape of drilling fluids into rivers at the crossings, which could result in short-term sediment transport and water quality impacts that could adversely affect fish.

Operations/Maintenance Impacts

Operational impacts on active stream channels where the HDD installation method is employed would be negligible. Impacts that would result in the unlikely event of an operational pipeline crude oil release are addressed in Section 3.13, Reliability and Safety.

Mitigation

The selection of the HDD crossing methodology is a mitigation for potential environmental impacts associated with other more invasive crossing techniques. This method does however involve longer construction times, specialized equipment, and increased construction effort. The use of best management practices as described in the CMR Plan (Appendix B) would minimize any ancillary impacts associated with the overall construction effort in the vicinity of HDD water crossings.

3.7.3.5 Hydrostatic Testing

Withdrawal and discharge of water for hydrostatic testing also can affect fisheries (Manny 1984). Keystone lists 32 water bodies on the Mainline Project route and nine water bodies on the Cushing Extension route as primary or potential sources for hydrostatic testing (Table 3.7.3-1). Among the list of proposed water sources are six locations that are known to contain sensitive species (the James River, the Platte River, the Elkhorn River, the Big Blue River, and two sections of the Missouri River).

Impacts

Removal of water from water bodies can decrease water volume and flow, resulting in a decrease in habitat (wetted area in a stream or lake); degradation of water quality (increased temperature and decreased dissolved oxygen [DO]); and entrainment of small fish, eggs, and macroinvertebrates during water extraction. Keystone anticipates performing hydrostatic testing during spring, summer, and fall. Almost all of the fish species located along the Keystone Project route spawn from April to July, with some continuing into August. If Keystone performs the testing as planned, there would be a high coincidence with sensitive reproductive periods for multiple fish species. There is potential to affect spawning fish through decreases in water levels (displacing spawning habitat) and water quality degradation. Fish eggs could be affected through desiccation if water levels drop, eggs can be entrained, and development can be affected by impaired water quality. Larval and juvenile fish could be susceptible to entrainment during water withdrawal, survivability can be decreased through poor water quality, and reduced habitat and food sources affected through entrainment of macroinvertebrates and decreased suitability of production areas with lower flows.

The discharge of large volumes of hydrostatic test waters into surface waters could temporarily cause a change in the water temperature and DO levels, could increase downstream flows, and could increase streambank and substrate scour. As stated in Keystone's CMR Plan (Appendix B), discharge locations would not include state-designated exceptional value waters, water bodies that provide habitat for federally listed threatened or endangered species, or water bodies designated as public water supplies unless the appropriate federal, state, and local agencies grant written permission. However, this same policy is not extended to the intake sources for hydrostatic testing. The impacts caused by the hydrostatic testing could be further reduced by avoiding using water bodies as intake sources that contain commercially and/or recreationally important species.

If interbasin transfers of water occur, there is also the potential to introduce and spread aquatic nuisance species. The proposed source water bodies include some locations that have been identified as containing non-native or exotic fish species (USGS 2007). These largely consist of the major recreational and commercial species including carp, crappie, bass, and walleye.

TABLE 3.7.3-1 Hydrostatic Testing Water Source Locations for the Keystone Project			
Water Source	Legal Description	County	Estimated Volume (gallons)
MAINLINE PROJECT			
Primary Water Source			
North Dakota			
Pembina River	S/W 1/4 T163N R56W Sec 31	Pembina	12,561,669
South branch Park River	N/E 1/4 T157N R57W Sec 24	Walsh	160,000
North branch Turtle River	N/W 1/4 T153N R57W Sec 25	Nelson	3,982,422
Unnamed lake	S/W 1/4 T145N R57W Sec 9	Steele	7,629,929
Sheyenne River	N/W 1/4 T136N R58W Sec 12	Ransom	16,427,319
South Dakota			
Unnamed creek	N/E 1/4 T123N R59W Sec 20	Day	8,325,553
Foster Creek	N/W 1/4 T115N R59W Sec 17	Clark	6,801,790
Redstone Creek	N/W 1/4 T108N R58W Sec 23	Miner	8,102,798
Wolf Creek	N/W 1/4 T103N R57W Sec 25	Hanson	10,968,244
James River	N/E 1/4 T95N R56W Sec 13	Yankton	6,165,037
Marne Creek (Missouri River)	Not available	Yankton	12,708,894
Nebraska			
Elkhorn River	S/E 1/4 T23N R1E Sec 36	Stanton	8,679,834
Platte River	S/W 1/4 T16N R2E Sec 3	Colfax	350,000
Big Blue River	S/W 1/4 T11N R3E Sec 6	Seward	12,633,723
Cub Creek	N/E 1/4 T3N R4E Sec 7	Jefferson	4,094,688
Kansas			
Big Blue River	S/E 1/4 T1S R7E Sec 11	Marshall	9,159,234
Delaware River	N/W 1/4 T3S R15E Sec 4	Brown	9,529,108
Missouri River	N/E 1/4 T4S R22E Sec 20	Doniphan	9,824,818
Missouri			
Long Creek	N/W 1/4 T55N R28W Sec 16	Caldwell	9,109,531
Grand River	S/E 1/4 T54N R21W Sec 17	Carroll	6,606,710
Chariton River	S/W 1/4 T53N R18W Sec 1	Chariton	7,745,268
Cuivre River	N/W 1/4 T49N R1E Sec 29	Lincoln	17,305,675
Cuivre River	ML-MO-LI-4801 (Tract)	Lincoln	200,000
Dardene Creek	S/E 1/4 T47N R4E Sec 3	St. Charles	4,665,184
Mississippi River	N/E 1/4 T47N R8E Sec 9	St. Charles	300,000
Illinois			
East fork Silver Creek	S/W 1/4 T4N R5W Sec 4	Madison	10,563,376
Mississippi River Levee	N/W 1/4 T4N R9W Sec 4	Madison	150,000
Indian Creek (for Highway 255)	N/E 1/4 T4N R8W Sec 7	Madison	150,000
East fork Silver Creek	S/W 1/4 T4N R5W Sec 4	Madison	150,000
Hurricane Creek	S/W 1/4 T4N R1W Sec 8	Fayette	150,000
Kaskaskia River	S/W 1/4 T4N R1W Sec 10	Fayette	150,000

TABLE 3.7.3-1 (continued)			
Water Source	**Legal Description**	**County**	**Estimated Volume (gallons)**
MAINLINE PROJECT (CONTINUED)			
Alternative Water Source			
North Dakota			
North Branch Forest River	S/E 1/4 T156N R57W Sec 11	Walsh	15,421,700
CUSHING EXTENSION			
Primary Water Source			
Kansas			
Carter Creek	N/E 1/4 T6S R4E Sec 18	Clay	18,285,731
Republican River	N/W 1/4 T9S R3E Sec 1	Clay	200,000
Carry Creek	S/E 1/4 T14S R3E Sec 36	Dickinson	10,229,359
Whitewater River	N/E 1/4 T26S R4E Sec 8	Butler	27,639,705
Arkansas River	S/E 1/4 T34S R3E sec 16	Cowley	250,000
Oklahoma			
Bois d Arc Creek	S/W 1/4 T26N R2E Sec 32	Kay	6,015,740
Salt Fork Arkansas River	S/W 1/4 T25N R2E Sec 30	Kay	250,000
Black Bear Creek	S/E 1/4 T21N R2E Sec 2	Noble	16,059,641
Cimarron River	Not available	Payne	300,000

Source: Keystone's Hydrostatic Test Plan (Appendix B).

Mitigation

To minimize the potential for entrainment or impingement of fish during the withdrawal, Keystone's CMR Plan (Appendix B) states that it would install intakes with filtering and screening devices and suspend the intakes above the stream bottom. Withdrawals would be made at controlled rates to protect aquatic life, provide for all water body uses, and avoid effects on downstream withdrawals of water by existing users. Mitigative measures concerning the location and screening of intake manifolds are provided in Section 3.3.2.2.

To minimize potential adverse effects on sensitive breeding periods, Keystone would generally avoid withdrawal of hydrostatic test water from sources where sensitive species are located until after August 1. Where this is not possible, Keystone would obtain specific approval in advance from the appropriate regulatory or resource agencies. There is the potential for small withdrawals to be made in association with HDD crossings before August 1. In this situation, the withdrawal rates would be minor and the pump intakes would be screened with fine mesh to avoid entrainment or impingement of fish or debris.

Discharge controls to reduce water quality affects listed in the CMR Plan (Appendix B) include restrictions on pipeline dewatering rates, energy dissipaters to prevent erosion, and/or temporary synthetic channel linings. The pipeline is constructed of materials that do not require protective additives in the test water. To ensure compliance with Project and permit requirements, Keystone would obtain water samples for analysis from each source before filling the pipeline and prior to the beginning of the discharge after the testing is completed. Any water containing oil or other substances in sufficient amounts to create a visible color film on the surface of the receiving water would not be discharged prior to treatment.

To minimize the risk associated with introduced species, Keystone has stated that the hydrostatic test water would be returned to the same source—or to the same general vicinity—from where it was withdrawn at the completion of the testing. In areas where zebra mussels are known to occur, Keystone has committed to thoroughly cleaning all equipment used during the withdrawal and discharge prior to use at subsequent test locations in order to prevent the transfer of zebra mussels or veligers to new locations. Further mitigation measures to prevent the spread of invasive species are discussed in Section 3.7.3.3.

3.7.3.6 Connected Actions

Power Lines and Substations. A total of 0.2 mile of water bodies would be affected during construction and operation of Western's 192.4 miles of transmission lines (Table 3.4.3.1-1 in Section 3.4). The primary impacts on water bodies would be related to clearing or removing the existing riparian vegetation in the construction work area. In general, transmission line construction impacts to water bodies would be minor, as most lines would run alongside existing roadways.

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3.8 THREATENED AND ENDANGERED SPECIES

This section addresses species that are federally listed as endangered or threatened, or are considered as candidates for listing by USFWS, and those species that are state listed as threatened, or endangered or as a species of conservation concern. A separate Biological Assessment (BA) that addresses federally endangered and threatened species was prepared by Keystone (ENSR 2007i) for DOS. The BA has been accepted by DOS and submitted to USFWS (Appendix S).

Species listed as threatened or endangered are afforded an additional level of protection. In accordance with Section 7 of the Endangered Species Act (ESA), DOS (as the lead agency), in coordination with USFWS, must ensure that any action authorized, funded, or carried out does not jeopardize the continued existence of a federally listed threatened or endangered species, or result in the adverse modification of the federally designated critical habitat of a federally listed species. The DOS Section 7 Consultation with USFWS (directed by Keystone as DOS's non-federal designee) will be completed prior to issuance of the Presidential Permit.

Candidate species (species for which USFWS has sufficient information on biological vulnerability and threats to justify proposing to add them to the threatened and endangered species list but cannot do so immediately because other species have a higher priority for listing) receive no substantive or procedural protection under the ESA; however, USFWS encourages federal agencies and project proponents to consider candidate species in the project-planning process. Actions taken to avoid effects on candidate species may reduce the need to consider listing the species under the ESA in the future.

Keystone initiated Section 7 consultation with USFWS in January 2006 by sending a project overview and information request letter. The USFWS lead office for DOS consultation was the Denver office with significant assistance from the Grand Island Nebraska Field Office. Keystone also contacted the following state wildlife agencies and provided them with a project overview and information request:

- North Dakota Game and Fish Department (NDGFD);
- South Dakota Game, Fish and Parks (SDGFP);
- Nebraska Game and Parks Commission (NGPC);
- Kansas Department of Wildlife and Parks (KDWP);
- Missouri Department of Conservation (MDC);
- Illinois Department of Natural Resources (IDNR); and
- Oklahoma Department of Wildlife Conservation (OKDWC).

Based on input from these state and federal agencies, state natural heritage programs, agency web sites and other applicable web sites (e.g., NaturServe.org); biological packages summarizing potential habitat for special-status species were sent to applicable federal and state agencies for review and input in June 2006. These applicant-prepared summaries and responding correspondence from federal and state agencies provide the basis for the species listings, life history description, impact assessments, and mitigation measure recommendations in the following EIS sections (ENSR 2006c [Agency correspondence binders], TransCanada 2007d, ENSR 2007i)**.** Meetings between Keystone and federal and state resource agencies were held in February and July 2006 and in February and November 2007. Work plans were developed for surveys of protected species in each state. These plans included the species to be surveyed; survey locations (mileposts and maps); survey periods; and requirements for proposed surveys in 2006, 2007, and pre-construction surveys in 2008. All survey locations and plans were reviewed and approved by the appropriate federal and state resource agencies.

3.8.1 Federally Listed Threatened and Endangered Species

Federally protected threatened or endangered species with the potential to occur in the Keystone Project area include three birds, two mammals, four fish, two mollusks, and three plants. Candidate species include one reptile, one insect, and one fish. The distribution, life histories, and habitat requirements for these species are discussed below. Many of these species also are protected by individual states.

3.8.1.1 Federally Protected Birds

Table 3.8.1-1 lists federally and state-protected birds. Federally protected bird species include the bald eagle, piping plover, interior least tern, and whooping crane.

Bald Eagle

The bald eagle is no longer federally listed as threatened; a final rule removing the bald eagle from the federal list of threatened species was adopted on June 28, 2007. However, the bald eagle remains state listed as threatened in South Dakota, Nebraska, Kansas, Illinois, and Oklahoma; and is state listed as endangered in Missouri. Historically, populations of bald eagles were drastically reduced by low productivity from the bioaccumulation of pesticides. Since organochlorine pesticides such as DDT have been banned, bald eagle numbers have been increasing—leading to the species being proposed for federal de-listing on July 4, 1999, as "recovered."

Bald eagles also are protected under the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act (MBTA). The BGEPA not only protects eagles, their young, eggs, and active nests as the MBTA does, it also protects eagles from harm and harassment. "Take" under the BGEPA is defined as to pursue, shoot, shoot at, poison, kill, capture, trap, collect, molest, or disturb. Because bald and golden eagles are afforded more protection than birds protected solely under the MBTA, a discussion of this species and Project-related impacts to the species is retained in this discussion of federally protected birds.

Bald eagles use mature, forested, riparian areas near rivers, streams, lakes, wetlands, and reservoirs. They nest, migrate, and winter in all seven states and within most of the counties along the proposed Mainline Project and Cushing Extension routes. They generally nest from early February through mid-August, and often return to use the same nest and winter roost year after year. The bald eagle's diet consists mostly of fish. Eagles also forage opportunistically on waterfowl, dead fish, jackrabbits, and big game carrion—especially in winter. Southward migration begins as early as October, and the wintering period extends from December to March. Bald eagles roost in a forested area known as a communal roost. A communal roost is generally defined as an area where six or more eagles spend the night within 100 meters of each other.

Interior Least Tern and Piping Plover

The interior least tern is federally listed as endangered and is listed as a state-endangered species in South Dakota, Nebraska, Kansas, Missouri, and Oklahoma. The piping plover is federally listed as threatened and is listed as a state-threatened species in South Dakota, Nebraska, and Kansas.

TABLE 3.8.1-1
Protected Birds Potentially Occurring along the Keystone Project Route

Species	Federal Status	State Status and Occurrence by County [a] ND	SD	NE	KS	MO	IL	OK	Comments
King rail (*Rallus elegans*)				SC – Seward		E – Buchanan, Carroll, Chariton, Lincoln, St. Charles			Suitable nesting habitat in wetlands with abundant grasses, sedges, rushes, and cattails
Least bittern (*Ixobrychus exilis*)						SC – Buchanan, Chariton, Lincoln , St. Charles	T – Madison, Fayette		Nesting habitat in freshwater wetlands with dense, tall growths of emergent vegetation with woody vegetation and open water
Yellow-crowned night heron (*Nyctanassa violacea*)							E – Fayette		Nesting habitat includes trees; winter foraging habitats include wetlands, lakes, and rivers
Bald eagle (*Haliaeetus leucocephalus*)	D	SC – All	T – All	T – All	T – All	E – Buchanan, Carroll, Chariton, Clinton, Lincoln, Montgomery	T – Bond, Fayette, Madison	T	Potential nesting and roosting habitats along river corridors crossed by the Keystone Project; state-designated critical habitat at the Big Blue and Missouri River crossings in Kansas
Northern harrier (*Circus cyaneus*)						E – Buchanan, Clinton, Carroll, Chariton, Montgomery, Lincoln, St Charles	E –		Potential nesting habitats in marshes, meadows, grasslands, and cultivated fields
Osprey (*Pandion haliaetus*)		T – Yankton							Two osprey hack sites for the reintroduction of osprey are located near the ROW at the Missouri River crossing in Yankton County
Barn owl (*Tyto alba*)						E – Buchanan, Chariton, St Charles	E – Fayette, Marion		Nesting habitats include tree cavities, caves, cliff crevices, cut bank burrows, and buildings

TABLE 3.8.1-1
(Continued)

Species	Federal Status	State Status and Occurrence by County [a]							Comments
		ND	SD	NE	KS	MO	IL	OK	
Piping plover (*Charadrius melodus*)	T	SC	T – Day, Yankton	T – Butler, Cedar, Colfax, Platte	T – Cowley			Kay, Noble, Payne	Suitable habitats in open sandy areas, saline flats, sandbars, and sand and gravel beaches along rivers and gravel pits
Interior least tern (*Sterna antillarum athalassos*)	E		E – Yankton	E – Butler, Cedar, Colfax, Platte	E – Cowley	E – St. Charles	E – Madison	E – Kay, Noble, Payne	Nesting habitats in sparsely vegetated sandy, gravelly or silty beaches, and sandbars in wide unobstructed river channels
Whooping crane (*Grus americanan*)	E	SC – Barnes, Cavalier, Dickey, Griggs, Lamoure	E – Beadle, Clark	E – Seward	E – Cowley			E – Noble, Payne	The primary migration route is generally east of the Project area; foraging habitat in croplands, freshwater marshes, and lake margins; roosting habitat on submerged bars in large rivers
Loggerhead shrike (*Lanius ludovicianus*)						SC – Buchanan	T – Bond, Fayette, Marion		Potential nesting habitats in open areas with mixed shrub/brush hedgerows and scattered thorny trees
Henslow's sparrow (*Ammodramus henslowii*)					SC – Butler, Dickinson, Nemaha	SC – Randolph, Clinton	E – Marion		Potential nesting habitat in tall grasslands, meadows, and abandoned fields with wet areas
Greater prairie-chicken (*Tympanuchus cupido*)		SC – Sargent				E – Audrain			Potential nesting habitat in mid- and tall-grass prairies bordered by oak forests and croplands

Notes:

Boldface text indicates a federally protected species.

D = De-listed (removed from listing of threatened or endangered species).
E = Endangered.
SC = Species of conservation concern.
T = Threatened.

[a] Species designated as E, T, or SC by states and reported to occur in counties crossed by the Keystone pipeline ROW.

Sources: ENSR 2006a, c; TransCanada 2007c.

Least terns feed on small fish in the river, and piping plovers forage for invertebrates on exposed beach substrates. These species nest on unvegetated or sparsely vegetated sandbars in river channels and wetlands. Least terns also will nest on bare alluvial or dredge spoil island and sand or gravel bars in or adjacent to rivers, lakes, gravel pits, and cooling ponds. Population estimates indicate there are 8,000 interior least terns (USFWS 2007) and 2,953 piping plovers in the Prairie Canada and U.S. Northern Great Plains region (Morrison et al. 2006). Nesting season for the least tern and piping plover is from April 15 through September 15.

Whooping Crane

Whooping cranes are federally listed as endangered; state listed as endangered by South Dakota, Kansas, Nebraska, and Oklahoma; and listed as species of conservation concern in North Dakota. Whooping cranes use numerous habitats such as cropland and pastures; wet meadows; shallow marshes; shallow portions of rivers, lakes, reservoirs, and stock ponds; and both freshwater and alkaline basins for feeding and loafing during their spring and fall migration. Overnight roosting sites frequently require shallow water in which they stand and rest. Shallow, sparsely vegetated streams and wetlands are required to feed and roost during migration.

The north-south migration corridor through Oklahoma, Kansas, Nebraska, South Dakota, and North Dakota would be crossed by the Mainline Project and Cushing Extension. Migrating whooping cranes could be roosting or feeding in the Keystone Project area. The migration periods are approximately from March 23 through May 10 and from September 16 through November 16. Migration periods throughout the states involved may vary, depending on the northern or southern location during the migration period. Young adult whooping cranes are known to summer in North Dakota.

3.8.1.2 Federally Protected Mammals

Table 3.8.1-2 lists federally and state-protected mammals. Federally-protected mammals include the gray bat, Indiana bat, and gray wolf.

Gray Bat

The gray bat is federally endangered and is state listed as endangered in Missouri, Illinois, Kansas, and Oklahoma. This species has been recorded in Madison County, Illinois, and Lincoln County, Missouri and could occur along the Keystone Project ROW in these counties. Gray bats are not known to occur along the Mainline Project in Kansas or along the Cushing Extension in Kansas and Oklahoma.

The gray bat inhabits caves throughout the year and forages over rivers and reservoirs adjacent to forests. In some areas, the same caves are used in winter and summer; in other areas (e.g., Missouri and Arkansas), many caves used in summer are vacant in winter. This species requires undisturbed caves with a corridor of mature trees, such as oak-hickory floodplain forests, between caves and foraging sites over lakes, reservoirs, streams, and riparian forests. Gray bats feed on aquatic insects and are generally opportunistic feeders. Virtually all prey are associated with water, swamp, or riparian vegetation.

TABLE 3.8.1-2
Protected Mammals Potentially Occurring along the Keystone Project Route

Species	Federal Status	State Status and Occurrence by County [a]							Comments
		ND	SD	NE	KS	MO	IL	OK	
Gray bat (***Myotis grisescens***)	E					E – Lincoln	E – Madison		Forages along streams and lakes and uses caves for winter, summer, and maternity roosts
Indiana bat (***Myotis sodalis***)	E					E – all counties	E – all counties		Maternity roost beneath loose bark in oak and hickory trees; winter hibernation in caves in Shannon, Washington, and Iron Counties, MO
River otter (*Lontra canadensis*)				T – Stanton, Colfax					Suitable habitats include rivers, streams, lakes, ponds, and marshes
Gray wolf (***Canis lupus***)	E, D	SC – Cavalier, Dickey, Grand Forks, Nelson, Pembina, Sargent, Walsh							Suitable habitats in the project area include hardwood forest, mixed forest, and grasslands; has been extirpated from most of the Keystone Project route, although individuals could occur in the project area

Notes:

Boldface text indicates a federally protected species.

D = De-listed (removed from listing of threatened or endangered species).
E = Endangered.
SC = Species of conservation concern.
T = Threatened.

[a] Species designated as T, E, or SC by states and reported to occur in counties crossed by the Keystone pipeline ROW.

Sources: ENSR 2006a, c; TransCanada 2007c.

Summer colonies occupy traditional home ranges that often contain several roosting caves scattered along as much as 43 miles of river or reservoir borders. Individuals forage along rivers or shoreline up to 12 miles from their roost caves. Roost sites are restricted nearly exclusively to caves throughout the year, although only a few percent of available caves are suitable. Large summer colonies use caves that trap warm air and provide restricted rooms or domed ceilings; maternity caves often have a stream flowing through them. Forested areas along the banks of streams and lakes provide important protection for adults and young. Rivers or reservoirs where the forest has been cleared are unsuitable as foraging habitat.

Indiana Bat

The Indiana bat is federally listed as endangered and state listed as endangered in Missouri and Illinois. This species is found east of the Missouri River in all counties in Missouri and Illinois along the proposed Keystone Project route. Potential habitat for this species occurs statewide in Illinois; therefore, Indiana bats are considered as potentially occurring in any area with forested habitat, including Marion County.

Indiana bats have recently been identified at the Swan Lake National Wildlife Refuge in Chariton County, Missouri; approximately 6 miles north of the Keystone Project alignment. Two confirmed winter hibernacula are more than 5 miles south of the Mainline Project in Boone County, Missouri. USFWS also indicated a hibernaculum in St. Louis County, Missouri; approximately 15 miles south of the Mainline Project. Indiana bats are assumed present during summer in all Illinois counties. Known occurrences include non-reproductive Indiana bats in Madison County and capture of lactating females and juveniles in Bond County, Illinois, indicating the presence of a maternity colony. Adult female Indiana bats also have been collected in mid-August in Clinton County on both the east and west side of Carlyle Lake. The distribution of these collections suggests the possible presence of one or more maternity colonies in the vicinity of Carlyle Lake, including the WMA. Indiana bats are not known to occur in North Dakota, South Dakota, Nebraska, or Kansas.

Indiana bats migrate seasonally between winter hibernacula and summer roosting habitats. Winter hibernacula include caves and abandoned mines. These bats hibernate in large, tight clusters that may contain thousands of individuals. Very few caves exist that provide the conditions necessary for hibernation. Stable, low temperatures are required to allow the bats to reduce their metabolic rate and conserve fat reserves.

Females emerge from hibernation in late March or early April to migrate to summer roosts. Females form nursery colonies (1 to 100 individuals) under the loose bark of trees (dead or alive) or cavities, where each female gives birth to a single young in June or early July. A single colony may use a number of roost trees during the summer—typically a primary roost tree and several alternates. The species or size of trees does not appear to influence whether Indiana bats use a tree for roosting, provided the appropriate bark structure is present.

Indiana bats feed entirely on nocturnal flying insects, and a colony of bats can consume thousands of insects each night. During summer, Indiana bats frequent the corridors of small streams with well-developed riparian woods, as well as mature upland and bottomland forests. They forage for insects along stream corridors, within the canopy of floodplain and upland forests, over clearings with early succession vegetation (old fields), along the borders of crop lands, along wooded fence rows, and over farm ponds and in pastures. The foraging range for the bats varies by season, age, and sex, and ranges up to 81 acres.

Indiana bats are subject to natural hazards during hibernation, such as cave flooding; however, humans have been the major cause of declining bat populations. Clusters of hibernating bats are very susceptible to disturbance and vandalism. Clearing of forests has caused a decline in the summer habitat of the Indiana bat.

Gray Wolf

The gray wolf is federally listed as endangered and state listed as a species of conservation concern by North Dakota. The gray wolf is an occasional visitor to the Keystone Project area in North Dakota. The gray wolves in North Dakota and South Dakota are part of the Great Lakes Region Population and the Western Great Lakes Distinct Population Segment. On February 8, 2007, USFWS announced a final rule to change the status of the gray wolf (FR [72] 26i 6052-6103). As of March 12, 2007, the gray wolf was de-listed in the portion of the Keystone Project area where they were most likely to occur—in the portion of North Dakota north and east of the centerline of Highway 83 from Lake Sakakawea to the Canadian border. The gray wolf remains endangered in western North Dakota and the remainder of the Keystone Project area.

3.8.1.3 Federally Protected Reptiles and Insects

Table 3.8.1-3 lists federal candidate and state-protected reptiles and insects. Federal candidates include the eastern massasauga, a pygmy rattlesnake; and the Dakota skipper, a butterfly.

Massasauga

The eastern massasauga rattlesnake (one of three subspecies of massasauga) is a federal candidate species and is state listed as endangered by Missouri and Illinois. The three subspecies of massasauga are the eastern massasauga (*Sistrurus catenatus catenatus*), western massasauga (*Sistrurus catenatus tergeminus*), and desert massasauga (*Sistrurus catenatus edwardsii*). Two of these three subspecies, the eastern and western massasauga, may occur within the Keystone Project area. Taxonomic review of the species has indicated that the three designated subspecies appeared to be arbitrary (Crother et al. 2000). To further complicate the conservation status of this species, Nebraska lists the massasauga at a species level, using the common name for the western subspecies. The federal candidate listing includes only the eastern subspecies within Illinois and Missouri; however, both the eastern and western subspecies may occur in Missouri. Massasauga (c.f. eastern or western) accounts have been recorded in the Keystone Project area within Jefferson and Gage Counties in Nebraska; Chariton, Randolph, and St. Charles Counties in Missouri; and Bond, Fayette, and Madison Counties in Illinois.

Massasaugas live in wet areas, including wet prairies, marshes, and low areas along rivers and lakes. In many areas, massasaugas also use adjacent uplands—including forest—during part of the year. They often hibernate in crayfish burrows, but they also may be found under logs and tree roots or in small mammal burrows. Unlike other rattlesnakes, massasaugas hibernate alone. Small mammal and crayfish burrows are used for winter hibernation.

Females sexually mature in 3 years and breed every few years, giving birth in late July through early September. Movement within the home range occurs between suitable winter and summer habitats, sometimes spanning almost 2 miles; however, most movement occurs within 650 feet from their burrows. Peak activity occurs from about April or May through October.

TABLE 3.8.1-3
Protected Amphibians, Reptiles, and Insects Potentially Occurring along the Keystone Project Route

Species	Federal Status	State Status and Occurrence by County [a]							Comments
		ND	SD	NE	KS	MO	IL	OK	
AMPHIBIANS									
Illinois chorus frog (*Pseudacris strecheri illino*)							T		Sand prairies
REPTILES									
Kirtland's snake (*Clonophis kirtlandi*)							T		Prairie wetlands, herbaceous wetlands, and riparian wetlands; usually associated with crayfish burrows
Western fox snake (*Elaphe vulpine vulpina*)						E			Riparian habitat, woodlands, prairie wetlands, and croplands
Eastern massasauga (*Sistrurus catenatus catenatus*)	C					E – Chariton, Randolph, St. Charles	E – Bond, Fayette, Madison		Wet prairies, marshes, and swamps dominated by emergent vegetation and lowland areas along rivers and lakes
Massasauga (c.f. Western) (*Sistrurus catenatus*)				T - Gage, Jefferson					Wet prairies, marshes, and swamps dominated by emergent vegetation and lowland areas along rivers and lakes
False map turtle (*Graptemys pseudogeo-graphica*)			T						Rivers, streams, sloughs, oxbow lakes, ponds impoundments, and backwaters
INSECTS									
Dakota skipper (*Hesperia dacotae*)	C	SC – Ransom, Sargent	SC						Lowland and upland prairies

Notes:

Boldface text indicates a federally protected species.

E = Endangered.
SC = Species of conservation concern.
T = Threatened.

[a] Species designated as E, T, or SC by states and reported to occur in counties crossed by the Keystone pipeline ROW.

Sources: ENSR 2006a, c; TransCanada 2007c.

Dakota Skipper

The Dakota skipper (butterfly) is federally listed as a candidate species and is state listed as a species of concern by North Dakota and South Dakota. The Dakota skipper is found in North Dakota and South Dakota native prairies containing a high diversity of wildflowers and grasses. In the vicinity of the Keystone Project, the Dakota skipper occurs in Ransom and Sargent Counties in North Dakota; and in Brookings, Brown, Codington, Day, Duel, Edmunds, Grant, Hamlin, Marshall, McPherson, and Roberts Counties in South Dakota.

One of the best indicators for Dakota skipper habitat is the presence of food plants for larva and nectar plants for adults. Habitats include low (wet) prairie dominated by bluestem grasses, wood lily, harebell, and smooth camas; and upland (dry) prairie on ridges and hillsides dominated by bluestem grasses, needlegrass, pale purple and upright coneflowers, and blanketflower. Nectar provides the nutrients and carbohydrates for Dakota skippers to meet the energetic demands of flight. Grassland sites with a diverse mix of native forbs, one or two of the known larvae or pollen plants, and proximity to other native grassland areas are considered suitable habitats.

3.8.1.4 Federally Protected Fish and Mollusks

Table 3.8.1-4 lists federally and state-protected fish and mollusks. Federally protected fish include the pallid sturgeon, Arkansas River shiner, Topeka shiner, and Neosho madtom. Federally protected mollusks include the Higgins' eye pearlymussel, and the scaleshell mussel. Federal candidate species include the Arkansas darter (fish).

Pallid Sturgeon

The pallid sturgeon is a federally listed endangered species and is state listed as endangered in South Dakota, Nebraska, Kansas, Missouri, and Illinois. Within the Keystone Project area, the pallid sturgeon has been identified in the Missouri River in South Dakota, the Missouri and lower Platte Rivers in Nebraska, the Missouri River in Kansas and Missouri, and the Mississippi River in Illinois.

This species inhabits diverse aquatic habitats. It requires large, turbid, free-flowing riverine habitats; however, it also has been found in reservoirs and deep water with low current velocities. Floodplains, backwaters, chutes, sloughs, islands, sandbars, and main channel waters formed the large river ecosystems that provide macrohabitat requirements. Adults are opportunistic feeders with prey including aquatic insects, crustaceans, mollusks, annelids, eggs of other fish, and other fish.

Pallid sturgeons are extremely long-lived fish; their lifespan in the wild is estimated to average 60 years. They usually take a decade to mature and become able to reproduce. The fish spawns between June and August, and can produce thousands of eggs. The eggs produced in the wild are heavily subject to predation and other forces of nature.

Arkansas Darter

The Arkansas darter is federally listed as a candidate species and state listed as threatened in Kansas. Along the Keystone Project route, the Arkansas darter has been identified in one tributary of the Arkansas River in Kansas. Arkansas darters live in shallow, clear, usually spring-fed streams with sandy bottoms. They prefer slow currents of cool water, partially overgrown with rooted aquatic vegetation, such as watercress. The vegetation provides a cover that offers the Arkansas darter hiding places from predators. Arkansas darters feed on a variety of aquatic insects and some plant material, including small seeds.

TABLE 3.8.1-4
Protected Fish and Mollusks Potentially Occurring along the Keystone Project Route

Species	Federal Status	State Status and Occurrence by County [a] ND	SD	NE	KS	MO	IL	OK	Comments
FISH									
Chestnut lamprey (*Ichtyomyzon castaneus*)					T				Rivers and creeks; Missouri River
Pallid sturgeon (*Scaphirhynchus albus*)	E		E – Yankton	E – Cedar	E – Doniphan	E – Buchanon, Carrol, Montgom-ery, St. Charles	E – Madison		Large turbid rivers and sand substrate; Missouri, Platte, and Mississippi Rivers
Lake sturgeon (*Acipenser fulvescens*)						E	E		Large rivers and lakes, and gravel substrate; Missouri and Mississippi Rivers
Arkansas darter (*Etheostoma cragini*)	C				T – Cowley	E –			Tributaries to the Arkansas River; shallow, clear, spring-fed tributaries with sand and sand-gravel substrates
Flathead chub (*Platygobio gracillis*)					T – Clay, Cowley				Turbid rivers and streams, and sand substrate; Nemaha and Missouri Rivers
Silver chub (*Macrhybopsis storeriana*)					E – Clay, Cowley	SC			Large sandy rivers; Missouri, Republican, and Arkansas Rivers
Sturgeon chub (*Macrhybopsis gelida*)			T	E	T	SC			Large, turbid rivers and sand-gravel substrates; Missouri and Platte Rivers
Sicklefin chub (*Machrybopsis meeki*)			T	T	E	SC			Large, turbid rivers and sand-gravel substrates; Rock Creek; Missouri and Platte Rivers
Arkansas River speckled chub (*Machrybopsis tetranema*)					E – Cowley				Shallow channels of perennial streams with clean fine sand; Arkansas River
Western silvery minnow (*Hybognathus argyritis*)				SC	T	SC			Backwaters of large, turbid rivers and prairie streams; South Fork Nemaha and Missouri Rivers
Arkansas River shiner (*Notropis girardi*)	T				E – Cowley			T	Depends on flood flows in June-August for spawning; Arkansas River and main tributaries

TABLE 3.8.1-4
(Continued)

Species	Federal Status	State Status and Occurrence by County [a] ND	SD	NE	KS	MO	IL	OK	Comments
FISH (CONTINUED)									
Silverband shiner (*Notropis shumardi*)				T					Large, turbid rivers
Topeka shiner (*Notropis topeka*)	E		SC – all but Day, Marshall		T – Butler, Dickinson, Marion, Marshall	E			Small, cool (often intermittent) prairie streams; Wolf, North Elm, Castile, Shoal, Log, Crush, and Crabapple Creeks; James, Missouri, West Fork Big Blue, and Little Platte Rivers;
Neosho madtom (*Noturus placidus*)	T				T – Marion	E		T	riffles and sloping gravel bars in relatively clear, moderately large rivers; Cottonwood River
Mollusks									
Higgins' eye pearlymussel (*Lampsilis higginsi*)	E		SC – Yankton	E – Cedar		E	E		Fast-flowing creeks and rivers, and silt substrate; Missouri drainage
Scaleshell mussel (*Leptodea leptodon*)	E		SC – Yankton	E – Cedar					Creeks and rivers; Missouri drainage

Notes:

Boldface text indicates a federally protected species.

E = Endangered.
SC = Species of conservation concern.
T = Threatened.

[a] Species designated as E, T, or SC by states and reported occurring within counties crossed by the Keystone pipeline ROW.

Sources: ENSR 2006a, c; TransCanada 2007c.

Spawning occurs from mid-February to mid-July. Although this darter will live 3 years, most of the spawning population is in its first year. Spawning takes place in open areas of shallow water over a bottom of coarse gravel.

Historically, the biggest threat to the Arkansas darter has been loss of habitat as more water is taken from streams and underlying aquifers for agricultural uses. Livestock grazing near streambanks often destroys the vegetation that darters use as protection and increases the organic matter that enters the streams. Removal of sand and gravel from stream bottoms destroys the Arkansas darter's breeding habitat. Impoundments and reduced stream flows decrease the Arkansas darter's ability to move to new locations.

Arkansas River Shiner

The Arkansas River shiner is federally listed as threatened and state listed as endangered in Kansas and threatened in Oklahoma. In the Keystone Project area, this species has been identified in the Republican and Arkansas Rivers in Kansas, and in the Cimarron River in Oklahoma. Its preferred habitat usually consists of turbid waters of broad, shallow, unshaded channels of creeks and small to large rivers, over mostly silt and shifting sand bottoms. They tend to congregate on the downstream side of large transverse sand ridges. Their diet consists mainly of plankton and organisms that are exposed by moving sand or by drifting downstream. Spawning occurs from June to July in the main stream channel.

Current threats to this species include habitat destruction, water quality degradation, and reduced stream flow, caused by diversion of surface water, groundwater pumping, and construction of impoundments. The decline in populations also may be attributed to competition, accidental capture, drought, and other natural causes.

Topeka Shiner

The Topeka shiner is federally listed as endangered. It is state listed as a species of concern in South Dakota, threatened in Kansas, and endangered in Missouri. The Topeka shiner is a small minnow that historically was distributed throughout much of the Midwestern states. The fish inhabits spring-fed, sandy-bottomed streams with good water quality. This species lives in pools and slack water areas between riffle sequences along a stream course.

Within the Keystone Project area, the Topeka shiner occurs in several drainage basins in South Dakota, Kansas, Missouri, and Nebraska. Topeka shiners are known to occupy numerous small streams in eastern South Dakota, and most are concentrated in the Big Sioux, Vermillion, and James Rivers watersheds. Survey efforts continue to reveal additional inhabited streams. In Missouri, the proposed Keystone pipeline ROW would pass through Caldwell and Clinton Counties. The Topeka shiner's historical range occurred in these two counties; however, it is believed that the fish no longer occurs in this part of its former range.

Topeka shiners are opportunistic omnivore predators; their prey includes insects, algae, fish larvae, and worms. The maximum life span of the Topeka shiner is three summers. Most reach maturity in the spring or summer of their second year. They spawn from late-May to mid-July and deposit their eggs in the nests of green and orange-spotted sunfish.

The Topeka shiner is susceptible to water quality changes in its habitat and has disappeared from several sites because of increased sedimentation resulting from accelerated soil runoff. Stream modifications, sediment deposition, pollution, overgrazing, and predation by introduced fish are thought to have led to the decline of the Topeka shiner across its Midwestern range.

Neosho Madtom

The Neosho madtom is federally listed as a threatened species and state listed as endangered in Missouri, and state listed as threatened in Kansas, and Oklahoma. The preferred habitat of the adult Neosho madtom is shallow riffles with loose, uncompacted gravel bottoms. In the Keystone Project area, the species has been found in the Cottonwood River in Kansas.

Larval, aquatic insects are the major food source of Neosho madtoms. These fish have a short life cycle, with a maximum life expectancy of 3 years. The reproductive cycle begins in March with egg development, and continues through at least the end of July.

The Neosho madtom has declined because of habitat destruction. Construction of dams, dredging of gravel, and an increase in water demands have contributed to habitat loss. Pollution from cattle feedlot runoff also has adversely affected the fish.

Higgins' Eye Pearlymussel

The Higgins' eye pearlymussel is federally listed as endangered and is state listed as a species of conservation concern in South Dakota. This species is native to the Mississippi River and some of its northern tributaries, although it is not known to occur in the Mississippi River within the Keystone Project area. Along the proposed Keystone Project route, the Higgins' eye pearlymussel is expected to occur in the Missouri River in South Dakota. Shells of the endangered Higgins' eye pearlymussel recently have been found below the Gavins Point Dam; however, populations of these mussels are not known to occur in this reach of the Missouri River.

The Higgins' eye pearlymussel prefers areas with deep water and moderate currents; stable but not firmly packed substrates that vary from silt to boulders; low current velocities; and mussel beds that are dense with other associated species.

The exact breeding season for this species is unknown; however, closely related species are gravid from September to June. Sexual maturity is reached in 6–12 years, with a total life expectancy of up to 50 years. This species has been found to use a large variety of fish hosts for their larvae, including the sauger, walleye, yellow perch, largemouth and smallmouth bass, and freshwater drum.

Scaleshell Mussel

The scaleshell mussel is federally listed as endangered; it is state listed as endangered in Kansas and as a species of conservation concern in South Dakota. In the Keystone Project area, the scaleshell mussel is currently found in South Dakota and in a portion of the Missouri River in Nebraska. Shells of the endangered scaleshell mussel recently have been found below the Gavins Point Dam; however, populations of these mussels are not known to occur in this reach of the Missouri River. No scaleshell mussels were found during sampling of the James River crossing for the Keystone pipeline ROW (ENSR 2006h).

Scaleshells live in medium and large rivers with stable channels and good water quality. They are usually found in riffle habitats of the rivers with substrates including gravel, rock, and boulder, and occasionally sand and mud. They bury themselves into the substrate with only the edge of their partially-opened shells exposed. As river currents flow over them, they siphon particles for food out of the water, such as plant debris, plankton, and other microorganisms.

Little is known about the specific reproductive requirements for this species. It is believed to be a long-term brooder that spawns in fall months, with females brooding the larvae in their gills until the following spring or summer. The scaleshell mussel uses the freshwater drum as a fish host for its larvae.

3.8.1.5 Federally Protected Plants

Table 3.8.1-5 lists the federally and state-protected plants potentially occurring in the Keystone Project area. Under common law, plants generally are treated differently than animals; they typically are considered the private property of the landowner. Federal regulations prohibit any commercial activity involving federally listed plant species or the destruction, malicious damage, or removal of these species on federal property. Federally-protected plants include the decurrent false aster, eastern prairie fringed orchid, western prairie fringed orchid, and running buffalo clover.

Decurrent False Aster

The decurrent false aster is federally listed as threatened and is state listed as threatened by Illinois and endangered by Missouri. It occurs in seasonally flooded emergent wetlands. In the Keystone Project area, the plant is known to occur in Madison County in Illinois, in the floodplain of the Mississippi River. A number of populations occur in the Mississippi River and Missouri River floodplains in St. Charles County, Missouri.

Decurrent false asters maintain self-sustaining populations in habitats with moist, sandy soil; regular disturbance (preferably from periodic flooding); and open areas with high light levels. The plant blooms from August through October, and historically has occurred along the Illinois and Mississippi River floodplains. Habitat destruction and modification have contributed to the species decline. The asters are dependent on periodic disturbance from major floods, which are currently controlled by dams and levees, and much of their former habitat has been converted to agricultural use (NatureServe 2006).

Western Prairie Fringed Orchid

The western prairie fringed orchid is federally listed as threatened; it is state listed as endangered in Missouri, threatened in Nebraska, and a species of conservation concern in North Dakota and South Dakota. Along the proposed Keystone pipeline route in Nebraska, populations of western prairie fringed orchid are known to occur in Seward and Stanton Counties, and may occur at other sites in Nebraska. The western prairie fringed orchid has not been documented recently in South Dakota. However, the life cycle of the plant can impede its detection, and populations currently exist in the neighboring states of Nebraska, Minnesota, and North Dakota. Potential habitat still may be found in South Dakota; therefore, the potential exists for the orchid to be found there. In North Dakota, the orchid is found in Ransom County and on the Sheyenne National Grasslands, where the largest population in the United States is known to occur.

The western prairie fringed orchid is similar in appearance to the closely related eastern prairie fringed orchid; but grows west of the Mississippi River and has generally fewer, but larger flowers than the eastern prairie fringed orchid. The western prairie fringed orchid inhabits tall-grass calcareous silt loam or sub-irrigated sand prairies, where it flowers from May to August.

Declines in western prairie fringed orchid populations have been caused by drainage and conversion of its habitats to agricultural production, channelization, siltation, road and bridge construction, grazing, haying, and herbicide application.

TABLE 3.8.1-5
Protected Plants Potentially Occurring along the Keystone Project Route

Species	Federal Status	State Status and Occurrence by County [a]							Comments
		ND	SD	NE	KS	MO	IL	OK	
Decurrent false aster (*Boltonia decurrens*)	T					E – St. Charles	T – Madison		Riparian floodplains and bottomlands subject to periodic flooding
Small white lady's slipper (*Cypripedium candidum*)				T					Herbaceous wetlands, prairie wetlands, and fens
Western prairie fringed orchid (*Platanthera praeclara*)	T	SC – Ransom	SC – Day, Yankton	T – Seward, Stanton					Mesic-wet tall-grass prairie, herbaceous wetlands, and dune complexes
Running buffalo clover (*Trifolium stoloniferum*)	E					E – Buchanan, Chariton, Lincoln, St. Charles			Riparian areas, woodland/prairie edge, and disturbed areas
Royal catchfly (*Silene regia*)							E		Prairies, upland forest clearings, savannas, and disturbed areas
Prairie spiderwort (*Tradescantia bracteata*)							T		Dry, sandy prairies and grazed prairies
Spring ladies' tresses (*Spiranthes vemalis*)							E		Dry to mesic forests, prairies, and croplands

Notes:

Boldface text indicates a federally protected species.

E = Endangered.
SC = Species of conservation concern.
T = Threatened.

[a] Species designated as E, T, or SC by states and reported to occur in counties crossed by the Keystone pipeline ROW.

Sources: ENSR 2006a, c; TransCanada 2007c.

Running Buffalo Clover

Running buffalo clover is federally listed as endangered and is state listed as endangered by Missouri. In the Keystone Project area, the plant occurs on the floodplain of the Cuivre River in Cuivre River State Park in Lincoln County, Missouri.

Running buffalo clover occurs most commonly in mesic woodlands in partial to filtered sunlight, where there is moderate periodic disturbance, such as mowing, trampling, or grazing. Running buffalo clover has been reported in disturbed woodland habitats, including floodplains, streambanks, grazed woodlots, mowed paths, old roads and trails; mowed wildlife openings within mature forests; and steep, weedy ravines. The clover may prefer soils underlain with limestone or other calcareous bedrock. It blooms from mid-May through early June.

Declines of running buffalo clover have been attributed to: (1) habitat destruction, (2) poor dispersal following the elimination of bison and other large herbivores, (3) loss of the natural grazers, (4) increased grazing from cattle and rabbits, and (5) competition from exotic plants (NatureServe 2006).

3.8.1.6 Potential Impacts and Mitigation for Federally Protected Species

Preliminary data identified 55 federally or state-listed threatened, endangered, or candidate species potentially occurring within or near the Keystone Project ROW that could be affected by construction. USFWS Region 6 determined that 14 federally listed species and two candidate species are known to occur along the Keystone Project route and may be affected by its location or construction activities. An additional five federally listed species and two candidate species were identified as occurring along the Keystone Project ROW during consultations with KDWP and SDGFP. Designated critical habitats for federally listed species also were identified along the Keystone Project ROW.

Federally Protected Birds

Types of impacts on protected birds would be generally similar to those described for wildlife in Section 3.6.5. Table 3.8.1-1 lists federally and state-protected birds. The Mainline Project and Cushing Extension pipeline could affect these species by:

- Habitat loss, alteration, and fragmentation;
- Loss of breeding success from exposure to construction and operations noise, and from increased human activity;
- Direct mortality from project construction and operation;
- Direct mortality due to collision with or electrocution by power lines;
- Indirect mortality because of stress or avoidance of feeding due to exposure to construction and operations noise, and from increased human activity; and
- Loss of individuals and habitats due to exposure to toxic materials or crude oil releases (addressed in Section 3.13).

Keystone has committed to implementing the following measures in its CMR Plan (Appendix B):

- Keystone would contract a qualified biologist to conduct a survey of breeding bird habitat within 330 feet from proposed surface disturbance activities that would occur during the breeding season. The biologist would document active nests, birds, and other evidence of nesting (e.g., mated pairs, territorial defense, and birds carrying nesting material or transporting food). If an active nest of a federally or state-protected bird species (Table 3.8.1-1) is documented during the survey, Keystone would work with the relevant regulatory authorities to determine whether any additional protection measures would be required.

- Immediately prior to construction activities during the raptor breeding season (February 1–July 31), breeding raptor surveys would be conducted by a qualified biologist through areas of suitable nesting habitat to identify any potentially active nest sites in the Keystone Project area. If raptors are identified within 0.5 mile of the construction ROW, Keystone would work with the relevant regulatory authorities to develop mitigation measures. These measures would be implemented on a site-specific and species-specific basis, in coordination with federal and state agency wildlife biologists.

Wildlife habitat loss or alteration from construction of the Keystone Project pipeline is described in Section 3.5.5. Most affected habitat would include croplands (13,594 acres) and grasslands (4,112 acres), followed by wetlands and open water (845 acres) and upland and riparian forests (1,078 acres) (Table 3.6.5-1). Loss of shrublands and wooded habitats would be long term (5–20 years) in reclaimed areas of the construction ROW. Additional hedgerow or windrow habitats along fields that were too small to be quantified (habitats less than 50 feet wide were not mapped) across the 1,370-mile ROW also would be lost. The incidence of electrocution and collision mortality would be increased by construction and operation of approximately 161 miles of new electrical power lines from generation sources to the pump stations. Because of the linear nature of the ROW, these long-term habitat losses represent a small area of the total available habitat and therefore are expected to have little effect on wildlife species (Table 3.6.5-1).

In addition to these general impacts, specific impacts and mitigation measures have been identified for the species described below.

Bald Eagle

Potential impacts to bald eagles include long-term loss or alteration of potential breeding, foraging, or winter habitats due to the removal of large trees and snags in the vicinity of large reservoirs, lakes, rivers, or streams—especially in the vicinity of the Missouri and Mississippi Rivers. Habitat fragmentation from ROW crossings through forested floodplains of large rivers and habitat degradation from invasion of noxious species are also potential impacts from construction. Habitat degradation and forage species declines may occur because of water withdrawal for hydrostatic testing. Direct mortality of adults and juveniles may occur due to collisions with construction vehicles or power lines, and mortality of eggs or young may occur due to nest disturbances.

Because bald eagles are particularly sensitive to human disturbance at nests and communal roosts, protective buffers should be implemented around these areas. Disturbances near an active nest or within line-of-sight of the nest could cause adult eagles to discontinue nest building or abandon eggs. Recent survey work and agency consultations have identified 11 bald eagle nests within 1 mile of the Project ROW (Table 3.8.1-6). Generally, bald eagle nest buffer recommendations include restricting activities within 1 mile of bald eagle nests in open country. In more heavily forested or mountainous areas, where the line-of-sight distance from the nest is shorter, this buffer distance potentially could be reduced. During the nesting season, bald eagle nest buffers should receive maximum protection. Seven of nine bald eagle nest sites along the Mainline Project were within 1 mile of the pipeline ROW, and both of the two nest sites along the Cushing Extension were within 1 mile of the pipeline ROW (Table 3.8.1-6).

TABLE 3.8.1-6 Bald Eagle Nest Sites and Territories along the Keystone Project Route				
Milepost	State	County	Distance from Right-of-Way (Observation Date)	Comments
Mainline Project				
7.4	North Dakota	Cavalier	2,859 feet (February 2007)	Historical nest on south bank of Pembina River
435.6	South Dakota	Yankton	220 feet to the east (April–May 2006)	Actively incubating, two adults present, on north bank of Missouri River; immature bald eagle present 0.5 mile west of nest site
658.5	Kansas	Marshall	2,026 feet (January 2007)	Two adults flushed from tree near nest
985.7	Missouri	St. Charles	958 feet (January 2007)	Adult on nest, Cuivre River
985.7	Missouri	St. Charles	1,557 feet (January 2007)	Partially collapsed nest, Cuivre River
989.2	Missouri	St. Charles	7,708 feet (January 2007)	Nest – west side of drainage, Cuivre and Missouri River floodplains
989.4	Missouri	St. Charles	Unknown distance (October 2006)	Active nest
1021.0	Missouri	St. Charles	2,900 feet (January 2007)	Historical nest on west bank in Confluence State Park
1021.0	Missouri	St. Charles	6,744 feet (January 2007)	Alternate nest on island on west side, south of Confluence State Park
Cushing Extension				
76.2	Kansas	Dickinson	2,081 feet (February 2007)	Nest – within 0.5 mile of ROW
285.3	Oklahoma	Payne	4,056 feet (February 2007)	Collapsed nest within 1 mile of ROW

Sources: ENSR 2006c, d; 2007a.

For some activities (construction, seismic exploration, blasting, and timber harvest) a limited-disturbance home-range buffer may be required to extend outward into potential foraging habitat for 2.5 miles from the nest. No identified bald eagle nest sites appeared to occur within 2.5 miles of the proposed blasting locations (Table 3.8.1-6).

Human disturbances to communal winter roosts and loss of eagle wintering habitat can cause undue stress, leading to cessation of feeding and failure to meet winter thermoregulatory requirements. These effects can reduce the carrying capacity of preferred wintering habitat and subsequent reproductive success for the species. Twenty-four major river crossings were selected in consultation with USFWS (John Cochnar, USFWS, February 5, 2007) for surveys of potential bald eagle winter roost areas on the Mainline Project ROW (Table 3.8.1-7). Of these, 14 were found to be frozen solid or supported no suitably sized perch trees near the ROW (ENSR 2007a). Seven major river crossings were selected for surveys of potential bald eagle winter roost areas on the Cushing Extension ROW (Table 3.8.1-7); of these, all were found to contain suitable habitat (ENSR 2007a).

TABLE 3.8.1-7 Bald Eagle Winter Roost Habitat Evaluation along the Keystone Project Route				
Milepost	Status	State, County	Roost/Nest near ROW	Water Body Name – Comments
Mainline Project				
7.4	Frozen (no roost survey)	North Dakota, Cavalier	Nest	Pembina River – 2 golden eagles perched near river
168.4	Frozen (no roost survey)	North Dakota, Ransom	None	Sheyenne River – no eagles observed
436	Open	South Dakota Yankton	None	Missouri River – 10 bald eagles about 5 miles upstream
502.8	Frozen (no roost survey)	Nebraska, Stanton	None	Elkhorn River – no eagles observed
542.0	Limited open water	Nebraska, Colfax/Butler	None	Platte River – roosting more than 1 mile upstream form ROW
591.0	Frozen (no roost survey)	Nebraska, Saline	None	West Fork Big Blue River – no eagles observed
658.5	Open	Kansas, Marshall	Roost/nest	Big Blue River – 2 bald eagles within 1 mile of ROW
689.6	Frozen (no roost survey)	Kansas, Nemaha	None	South Fork Big Nemaha River – no eagles observed
748.5	Open	Kansas/ Missouri	Roosts	Missouri River – ~12 eagles in or near ROW
762.2	Frozen (no roost survey)	Missouri, Buchanan	None	Platte River – no eagles observed
772.9	Frozen (no roost survey)	Missouri, Clinton	None	Castile Creek – no eagles observed
780.9	Frozen (no roost survey)	Missouri, Clinton	None	Little Platte River – no eagles observed
840.6	Open	Missouri, Carroll	None	Grand River – no eagles observed
845.9	Frozen (no roost survey)	Missouri, Chariton	None	Salt Creek – no eagles observed
857.8	Frozen (no roost survey)	Missouri, Chariton	None	Mussel Fork Creek – no eagles observed
862.4	No trees (no roost survey)	Missouri, Chariton	None	Chariton River – no eagles observed
868.0	Frozen (no roost survey)	Missouri, Chariton	None	Middle Fork Little Chariton Creek – no eagles observed
871.6	Frozen (no roost survey)	Missouri, Chariton	None	East Fork Little Chariton Creek – no eagles observed
904.0	Frozen (no roost survey)	Missouri, Audrain	None	Goodwater Creek – no eagles observed
955.0	Open	Missouri, Audrain	Roost	West Fork Cuivre River – ~10 eagles within 1 mile of ROW
971.1	Open	Missouri, Lincoln	Roost	Cuivre River - >5 eagles within 1 mile of ROW
996.7	Open	Missouri, Lincoln	Roost/nest	Cuivre River - >5 eagles within 1 mile of ROW
1021.1	Open	Illinois, Madison	Roost/nest	Mississippi River - >300 eagles within 1 mile of ROW
1072.1	Limited open	Illinois, Bond	None	Kaskaskia River – no eagles observed

TABLE 3.8.1-7 (Continued)				
Milepost	Status	State, County	Roost/Nest near ROW	Water Body Name – Comments
Cushing Extension				
4.1	Open	Kansas, Washington	Roost	Little Blue River – 3 eagles within 1 mile of ROW
9.7	Open	Kansas, Charleston	Roost?	Mill Creek – 2 eagles within 1 mile of ROW
51.2	Open	Kansas, Clay	Roost?	Republican River – several eagles within 1 mile of ROW
76.5	Open	Kansas, Dickson	Roost/nest	Smokey Hill River – nest within 0.5 mile of ROW, eagle within 1 mile of ROW
205.8	Open	Kansas, Cowley	Roosts	Arkansas River – 5 eagles within 1 mile of ROW
241.2	Open	Kansas, Kay	Roosts	Salt Fork Arkansas River – 4 eagles within a mile of ROW
282.0	Open	Oklahoma, Payne	Nest	Cimarron River – no eagles, nest 1 mile from ROW

Source: ENSR 2007a.

Surveys for winter bald eagles identified 19 transitory or communal roosts and winter concentration areas along the Mainline Project, and 14 winter roosts and concentration areas along the Cushing Extension (Table 3.8.1-8). A "transitory roost" is defined as three or more eagles within 100 meters of each other for at least two nights in an area with no previous knowledge of winter communal roosting. A "communal roost" is defined as six or more eagles in a small area for extended periods or that is used for multiple years (John Cochnar, USFWS, January 24, 2007). Of the 19 roost sites along the Mainline Project, seven were within 0.5 mile of the ROW and ten were within 1 mile of the pipeline ROW (Table 3.8.1-8). Of the fourteen roost sites along the Cushing Extension, six were within 0.5 mile and ten were within 1 mile of the pipeline ROW (Table 3.8.1-8).

Proposed blasting sites near bald eagle winter roost sites along the Mainline Project occur at:

- MP 747 to 748 – occupied roosts between MP 747.5 and 748.5,
- MP 953 to 957 – occupied roosts at MP 955 and 958, and
- MP 967 to 970 – occupied roost at MP 971 (Tables 3.8.1-7 and 3.8.1-8).

For bald eagle communal winter roosts, USFWS recommends that disturbance be restricted within 1 mile of known communal winter roosts from November 1 to April 1. USFWS recommends that habitat-altering activities be prohibited within 0.5 mile of active roost sites year-round. The buffers and timing stipulation, as described above, are normally implemented unless site-specific information indicates otherwise. Modification of buffer sizes may be permitted where supported by the biological findings and in coordination with USFWS.

TABLE 3.8.1-8
Bald Eagle Winter Roosts and Concentration Areas along the Keystone Project Route

Milepost	State	County	Distance from Right-of-Way (Observation Date)	Comments
Mainline Project				
658.5	Kansas	Marshall	2,026 feet (January 2007)	Transitory roost? - Two adults flushed from tree near nest, Big Blue River
747.5	Missouri	Buchanan	6,507 feet (January 2007)	Transitory and communal roost – immature and adults on east bank of Missouri River
747.9	Missouri	Buchanan	5,555 feet (January 2007)	Transitory and communal roost – east bank of Missouri River
748.1	Kansas	Doniphan	4,366 feet (January 2007)	Transitory and communal roost – west bank of Missouri River
748.5	Kansas/ Missouri	Doniphan/ Buchanan	1,454 feet (January 2007)	Transitory and communal roost – within 100 feet of ROW, Missouri River
748.5	Kansas/ Missouri	Doniphan/ Buchanan	706 feet (January 2007)	Transitory and communal roost – within 100 feet of ROW, Missouri River
748.5	Kansas/ Missouri	Doniphan/ Buchanan	3,390 feet (January 2007)	Transitory and communal roost – Missouri River
958.0	Missouri	Lincoln	1,793 feet (January 2007)	Communal roost – West Fork Cuivre River
982.1	Missouri	St. Charles	1,998 feet (January 2007)	Communal roost – Cuivre River
983.4	Missouri	St. Charles	244 feet (January 2007)	Communal roost – Cuivre River
987.1	Missouri	St. Charles	1,736 feet (January 2007)	Communal roost – Cuivre River
989.1	Missouri	St. Charles	7,742 feet (January 2007)	Communal roost – immature and adult – Cuivre River
996.7	Missouri	St. Charles	2,737 feet (January 2007)	Communal roost – immature and adult – Cuivre River
1018.0	Missouri	St. Louis	6,179 feet (January 2007)	Communal roost – immature and adult – Missouri River
1019.0	Missouri	St Charles	6,742 feet (January 2007)	Communal roost – west bank of Mississippi River
1019.7	Missouri	St Charles	7,273 feet (January 2007)	Communal roost – west bank of Mississippi River
1020.0	Missouri	St Charles	9,528 feet (January 2007)	Communal roost – west bank of Mississippi River
1020.5	Missouri	St Charles	6,161 feet (January 2007)	Communal roost, winter concentration – 300 Bald Eagles – west bank of Mississippi River
1021.0	Missouri	St. Louis	8,607 feet (January 2007)	Communal roost – west bank of Mississippi River
Cushing Extension				
4.1	Kansas	Washington	0 feet (February 2007)	Transitory roost? – 2 adults, 1 immature within 1 mile of ROW, Little Blue River
9.7	Kansas	Washington	1,461 feet (February 2007)	Transitory roost? – 1 adult – Mill Creek

TABLE 3.8.1-8 (Continued)				
Milepost	State	County	Distance from Right-of-Way (Observation Date)	Comments
Cushing Extension (Continued)				
13.2	Kansas	Washington	685 feet (February 2007)	Transitory roost? – 1 adult – Mill Creek
51.2	Kansas	Clay	1,667 feet (February 2007)	Transitory roost? – 2 adults – Republican River
51.2	Kansas	Clay	4,289 feet (February 2007)	Transitory roost? – 1 adult – Republican River
75.8	Kansas	Dickinson	5,711 feet (February 2007)	Transitory roost? – 1 adult – Smoky Hill River
205.8	Kansas	Cowley	450 feet (February 2007)	Communal roost? – 5 eagles – Arkansas River
206.4	Kansas	Cowley	4,892 feet (February 2007)	Communal roost? – Arkansas River
206.4	Kansas	Cowley	6,835 feet (February 2007)	Communal roost? – Arkansas River
206.4	Kansas	Cowley	2,447 feet (February 2007)	Communal roost? – Arkansas River
238.7	Oklahoma	Kay	4,120 feet (February 2007)	Transitory roost? – 3 eagles – Salt Fork and Bois d'Arc River
241.2	Oklahoma	Noble	2,850 feet (February 2007)	Transitory roost? – 1 eagle – Salt Fork Arkansas River
281.5	Oklahoma	Payne/ Pawnee	>10,580 feet (February 2007)	Roost – 2 eagles – Cimarron River
282.2	Oklahoma	Pawnee	>10,560 (February 2007)	Roost – 2 eagles – Cimarron River

Source: ENSR 2007a.

To protect nesting or winter roosting bald eagles, Keystone:

- Has completed winter roost and spring nest surveys along the pipeline ROW in order to prevent adverse direct and indirect impacts to bald eagles, active eagle nests, and young.
- Would use aerial and/or ground-based surveys, prior to construction, to locate any newly constructed nests and to determine the activity status of nests during the appropriate season (February 1–August 15).
- Would not construct within 1 mile of active bald eagle nests unless otherwise permitted by USFWS between February 1 and August 15 (January 1 and July 15 for Missouri).
- Would avoid construction activities from 3:00 p.m. to 10:00 a.m. within 1 mile of identified communal winter roosting sites between November 1 and April 1.

To further protect the bald eagle the USFWS suggests that Keystone should use the northern alternative at Milepost 1020.6 in the Mississippi/Missouri confluence area to avoid impacts to the active bald eagle nest near this location (Willie R. Taylor, USFWS, October 11, 2007).

Construction of the Mainline Project and Cushing Extension may affect nesting and winter roosting bald eagles and their habitats. Coordination with USFWS and state resource agencies should continue, with the goal of impact avoidance, minimization, or mitigation.

Connected Actions

Approximately 181 miles of new transmission lines and 22 miles of upgraded transmission lines would be required to power pumpstations along the Mainline, with about 12 miles of new lines for the Cushing Extension (see Section 2.1.4.1). New electrical power line segments would increase the collision potential for nesting and roosting bald eagles. Factors influencing collision risk are related to the avian species, the environment, and the configuration and location of lines (see Section 3.6.4). Power line-related factors influencing collision risk include the configuration and location of the line and line placement with respect to other structures or topography (APLIC and USFWS 2005).

Birds are electrocuted by power lines because of two factors: (1) environmental factors such as topography, vegetation, available prey, and other behavioral or biological factors that influence avian use of power poles; and (2) inadequate separation between energized conductors or energized conductors and grounded hardware that provide two points of contact (APLIC and USFWS 2005). Raptors are opportunistic and may use power poles for nesting sites, vantages for territorial defense, or vantages for hunting. Power poles and lines may provide perches for hunting that offer a wide field of view above the surrounding terrain (APLIC and USFWS 2005).

Surveys for bald eagles have not been completed for the proposed transmission line routes. Evaluation of the habitats crossed and data from nearby Keystone ROW raptor surveys indicate that suitable habitats or the occurrence of bald eagle nests within several miles of the proposed transmission lines occurs at the following pump stations:

- MP 171 Mainline PS-18: Sheyenne River – eagle nest within about 3 miles of transmission line crossing.
- MP 742 Mainline PS-30: Missouri River – five eagle nests within 8 to10 miles of transmission line.
- MP 1027 Mainline PS-37: Mississippi River – eagle nest about 2 miles from transmission line.
- MP 243 Cushing Extension PS-33: Salt Fork River – eagle nest about 2 miles from transmission line.

Collision and electrocution impacts on birds resulting from construction of transmission lines would be reduced by provider implementation of the following mitigation measures:

- Standard, safe designs, as outlined in Suggested Practice for Avian Protection on Power Lines (APLIC 2006), into the design of electrical distribution lines in areas of identified avian concern.
- Marking techniques to increase transmission line visibility, using balls or flappers.
- A minimum 60-inch separation between conductors and/or grounded hardware and recommended use of insulation materials and other applicable measures, depending on line configuration.

- Standard raptor-proof designs, as outlined in Avian Protection Plan Guidelines (APLIC and USFWS 2005), into the design of the electrical distribution lines to prevent collision by foraging and migrating raptors in the Keystone Project area.

Electrical service providers and RUS, where applicable, would coordinate with the appropriate state and federal resource agencies to identify specific locations for flight deterrents or other avoidance or minimization measures.

Interior Least Tern and Piping Plover

Channel constrictions caused by bridges, causeways, bridge approaches, roadway embankments, bank stabilization, levees, and other unnatural obstructions can result in the loss of broad, shallow, unobstructed channel and sandbar complexes used as feeding and nesting habitat by least terns and piping plovers. Poorly timed human activities in the vicinity of such feeding and nesting habitats can disturb least terns and piping plovers, resulting in diminished reproduction. Reduction of instream flow rates in the Platte River, Nebraska has negatively affected least terns and piping plovers by reducing water levels surrounding river bars where they nest, thereby allowing terrestrial predators to access the nests.

Interior least terns and/or piping plovers are known to nest on the major river systems in South Dakota, Nebraska, Missouri, Illinois and Oklahoma—including rivers that would be crossed by the Keystone Project (the Platte, Missouri, Mississippi, Elkhorn, and Cimarron Rivers). After consultation with federal and state resource agencies, field surveys for these species were conducted at habitats likely to support these species along the Keystone Project (Table 3.8.1-9).

TABLE 3.8.1-9
Occurrence and Habitat Surveys for the Interior Least Tern and Piping Plover along the Keystone Mainline Project and Cushing Extension (2007)

State	County	Water Body	Occurrence	Habitat
Mainline Project				
South Dakota /Nebraska	Yankton /Cedar	Missouri River	No least terns One pair of piping plovers	Suitable least tern and piping plover nesting and foraging habitat available at crossing location
Nebraska	Stanton	Elkhorn River	No least terns No piping plovers	Marginally suitable least tern and piping plover nesting and foraging habitat available at crossing location
Nebraska	Colfax /Butler	Platte River	No least terns No piping plovers	Suitable least tern and piping plover nesting and foraging habitat available at crossing location
Cushing Extension				
Oklahoma	Noble	Sooner Lake	No least terns	No suitable least tern nesting habitat available at crossing location
Oklahoma	Payne	Cimarron River	No least terns	No suitable least tern nesting habitat available at crossing location (only one bank was surveyed)

Sources: ENSR 2007i, p.

Least tern nesting attempts have occurred north of the Keystone Project area on Ellis Island, in St. Charles County in Missouri (USFWS, Marion, Illinois Ecological Services Field Office, November 2007).

No additional surveys are planned for these species. The locations above would be surveyed during the nesting period in 2008 if construction would occur during the nesting period from April 15 to September 15.

Potential impacts on piping plovers and least terns associated with the Keystone Project include:

- Long-term loss or alteration of potential breeding and foraging habitats from construction-related disturbance in the vicinity of large rivers or streams (especially in the vicinity of the Missouri, Elkhorn, Platte, Cimarron, and Mississippi Rivers);
- Habitat fragmentation from the ROW crossings through floodplains of large rivers;
- Habitat degradation from invasion of noxious species;
- Habitat degradation and declines of fish forage species due to water withdrawal and discharge for hydrostatic testing;
- Direct mortality of adults, juveniles eggs or young;
- Indirect mortality due to disturbance of nests;
- Indirect mortality because of stress or avoidance of feeding due to exposure to construction and operations noise, and from increased human activity; and
- Loss of individuals and habitats due to exposure to toxic materials or crude oil releases (addressed in Section 3.13).

The critical period for water withdrawal from the lower Platte River in Nebraska from Columbus, Nebraska to the Missouri River confluence is from February 1 to July 31 (Carey Grell, NGPC, February 5, 2007). Water use for hydrostatic testing from the Platte River during this period may adversely affect riparian nesting habitats.

To protect interior least terns and piping plovers Keystone would:

- Prior to construction, contract a qualified biologist to conduct a survey of breeding bird habitat according to USFWS protocols within 0.25 mile from the construction ROW at river crossings and adjacent gravel pits in the vicinity of the Missouri, Elk Horn, Platte, Cimarron, and Mississippi Rivers and Sooner Lake during April 15 to September 15. The biologist would document active nests, bird species, and other evidence of nesting (e.g., mated pairs, territorial defense, and birds carrying nesting material or transporting food).
- If an active nest is located during 2008 pre-construction surveys, establish a 0.25-mile buffer area to prevent direct loss of the nest and indirect impacts from human-related disturbance.
- If an active nest is found in the survey area, suspend planned activity for at least 37 days or 7 days post-hatching.
- If a brood of flightless chicks is observed, suspend planned activity for at least 7 days.
- If an active nest is documented during the survey, confer with USFWS and other applicable regulatory authorities to determine whether any additional protection measures would be needed.
- Coordinate water withdrawal with the appropriate USFWS Environmental Services field office when federally listed species inhabit or use the aquatic system.

- Return water withdrawn from the lower Platte River system for hydrostatic testing to the withdrawal location within the same calendar month.

Construction of the Mainline Project and Cushing Extension may affect nesting, brood-rearing, and foraging interior least terns and piping plovers and their habitats. Coordination with USFWS and state resource agencies should continue, with the goal of impact avoidance, minimization, or mitigation.

Connected Actions

Approximately 181 miles of new transmission lines and 22 miles of upgraded transmission lines would be required to power pumpstations along the Mainline, with about 12 miles of new lines for the Cushing Extension (see Section 2.14). New electrical power line segments would increase the collision potential for nesting and migrating interior least terns and piping plovers. Factors influencing collision risk are related to the avian species, the environment, and the configuration and location of lines (see Section 3.6.4). Power line-related factors influencing collision risk include the configuration and location of the line and line placement with respect to other structures or topography (APLIC and USFWS 2005). Power poles and lines may provide perches for hunting raptors that offer a wide field of view above the surrounding terrain (APLIC and USFWS 2005); these vantage perches would be detrimental to ground-nesting least terns and piping plovers if they cross river bars and beaches where these birds nest.

Surveys for nesting least terns and piping plovers have not been completed for the proposed transmission line routes. Least terns and piping plovers may also use other riparian habitats during migration. Migrating terns and plovers would be most likely to collide with transmission lines during periods of poor visibility. Evaluation of the habitats crossed and data from existing sources and nearby Keystone ROW nesting least tern and piping plovers indicate that suitable habitats or the occurrence of least terns or piping plovers within several miles of the proposed transmission lines may occur at the following transmission line river crossing:

- MP 502 Mainline PS-25: Elkhorn River.

Collision and electrocution impacts on birds resulting from construction of transmission lines would be reduced by provider implementation of the following mitigation measures:

- Standard, safe designs, as outlined in Suggested Practice for Avian Protection on Power Lines (APLIC 2006), into the design of electrical distribution lines in areas of identified avian concern.
- Marking techniques to increase transmission line visibility, using balls or flappers.
- A minimum 60-inch separation between conductors and/or grounded hardware and recommended use of insulation materials and other applicable measures, depending on line configuration.
- Standard raptor-proof designs, as outlined in Avian Protection Plan Guidelines (APLIC and USFWS 2005), into the design of the electrical distribution lines to prevent collision by foraging and migrating raptors in the Keystone Project area.

Electrical service providers and RUS, where applicable, would coordinate with the appropriate state and federal resource agencies to identify specific locations for flight deterrents or other avoidance or minimization measures.

Whooping Crane

Alterations to feeding and roosting habitats, human disturbance, and depletions of instream flows to the Platte River in Colorado, Wyoming, and Nebraska would negatively affect the whooping crane. Disturbance (flushing the birds) stresses the birds at critical times of the year, and USFWS recommends vigilance in not disturbing these birds. Generally disturbance can be reduced only by ceasing activity at sites where the birds have been observed. Because whooping cranes do not normally remain in one area for long periods during migration, this potentially would be feasible during construction.

Potential impacts to whooping cranes include:

- Long-term loss or alteration of potential foraging and roosting habitats from construction-related disturbances in the vicinity of large rivers or streams, especially in the vicinity of the Missouri, Platte, and Arkansas Rivers;
- Habitat fragmentation from ROW crossings through floodplains of large rivers;
- Habitat degradation from invasion of noxious species;
- Direct mortality of adults and juveniles by collisions with construction vehicles;
- Indirect mortality because of stress or avoidance of feeding due to exposure to construction and operations noise, and from increased human activity; and
- Loss of individuals and habitats due to exposure to toxic materials or crude oil releases (addressed in Section 3.13).

The following measure would result in avoidance of impacts on whooping cranes:

- If construction of the proposed pipeline occurs during either the spring or autumn migration and whooping cranes use areas within 1 mile of pipeline construction activities, construction activities would cease immediately and Keystone would notify the USFWS respective state field office, including the Nebraska Field Office (which maintains the Cooperative Whooping Crane Tracking Project for the United States), to determine when construction can continue.

This measure is recommended for implementation for the Keystone Project by USFWS (John Cochnar, USFWS, April 28, 2006). Construction of the Mainline Project and Cushing Extension may affect migrating or foraging whooping cranes and their habitats. Coordination with USFWS and state resource agencies should continue, with the goal of impact avoidance, minimization, or mitigation.

Connected Actions

Approximately 181 miles of new transmission lines and 22 miles of upgraded transmission lines would be required to power pumpstations along the Mainline, with about 12 miles of new lines for the Cushing Extension (see Section 2.14). New electrical power line segments would increase the collision potential for migrating and foraging whooping cranes. Factors influencing collision risk are related to the environment, and the configuration and location of lines (see Section 3.6.4). Power line-related factors influencing collision risk include the configuration and location of the line and line placement with respect to other structures or topography (APLIC and USFWS 2005).

Transmission lines supporting pump stations for the Keystone Project cross primarily cropland/pasture and cropland/grassland mosaic habitats (85 percent, 162.8 of 191.3 miles; see Table 3.5.5.5-1) in North Dakota, South Dakota, Nebraska, and Kansas. Whooping cranes may be attracted to croplands, pastures, and grasslands during spring and fall migrations—especially when the croplands are interspersed with riparian or emergent wetlands that provide roosting habitats. Transmission lines would cross approximately 3.7 miles of emergent and riparian wetlands (see Table 3.4.3.1-1).

Collision and electrocution impacts on birds resulting from construction of transmission lines would be reduced by provider implementation of the following mitigation measures:

- Standard, safe designs, as outlined in Suggested Practice for Avian Protection on Power Lines (APLIC 2006), into the design of electrical distribution lines in areas of identified avian concern.
- Marking techniques to increase transmission line visibility, using balls or flappers.
- A minimum 60-inch separation between conductors and/or grounded hardware and recommended use of insulation materials and other applicable measures, depending on line configuration.

Electrical service providers and RUS, where applicable, would coordinate with the appropriate state and federal resource agencies to identify specific locations for flight deterrents or other avoidance or minimization measures.

Federally Protected Mammals

Potential impacts on protected mammal species generally would be as described for wildlife in Section 3.6.5. Table 3.8.1-2 lists federally and state-protected mammals. The Mainline Project and the Cushing Extension could affect protected mammals by:

- Habitat loss, alteration, and fragmentation;
- Loss of breeding success from exposure to construction and operations noise, and from increased human activity;
- Reduced survival or reproduction due to decreased abundance of forage species;
- Direct mortality from project construction and operation;
- Indirect mortality because of stress or avoidance of feeding due to exposure to construction and operations noise, and from increased human activity; and
- Loss of individuals and habitats by exposure to toxic materials or crude oil releases (addressed in Section 3.13).

In addition to these general impacts, specific impacts and mitigation measures have been identified for the species described below.

Gray Bat

Currently, Keystone has no plans to complete surveys for gray bats in Missouri or Illinois as a result of consultations with federal and state resource agencies, although Keystone committed to implementing the following measures in its CMR Plan (Appendix B) to protect gray bats:

- Prior to surface disturbance activities in karst terrain, a geological investigation would be completed to determine the presence and type of karst features. The investigation would identify the location, distribution, and dimensions of rock cavities in the potential influence zone of construction.
- A qualified biologist would conduct surveys for exposed caves that may contain bat roosts within 0.25 mile from surface disturbance activities.
- In the event that cave features or bat roosts are identified, USFWS or appropriate state wildlife agency would be contacted and applicable mitigation measures would be developed.

Karst topography potentially would be crossed by the Mainline Project at the following locations within the range of the gray bat:

- Caldwell County, Missouri – MP 790 to 814;
- Lincoln County, Missouri – MP 954 to 981;
- St. Charles County, Missouri – MP 981 to 1021; and
- Madison County, Illinois – MP 1022 to 1025.

Blasting may coincide with karst topography in Caldwell and Lincoln Counties in Missouri. To avoid habitat alteration or loss or disturbance to this species, Keystone would conduct a search for this species prior to any activity that would affect caves in Madison County, Illinois or in Lincoln County, Missouri.

Construction of the Mainline Project may affect, but is not likely to adversely affect, gray bats or their habitats. Because the Cushing Extension is west of the current distribution of gray bats, construction of this pipeline would not affect this species. Coordination with USFWS and state resource agencies should continue, with the goal of impact avoidance, minimization, or mitigation.

Connected Actions

Approximately 0.3 mile of new or converted transmission lines would be necessary to power pump stations along the pipeline ROW (see Sections 2.1.1.2 and 2.1.2.2) within the range of the gray bat in Missouri and Illinois. New electrical power line segments would increase the collision potential for habitat and collision impacts for the gray bat. Factors influencing collision risk are related to the environment and to the configuration and location of lines (see Section 3.6.4). Power line-related factors influencing collision risk include the configuration and location of the line and line placement with respect to other structures or topography (APLIC and USFWS 2005).

Transmission lines supporting pump stations for the Keystone that would be located within the areas identified as potentially containing gray bats include:

- MP 982 Mainline PS-36 in Lincoln County, Missouri (<0.1 mile); and
- MP 1027 Mainline PS-37 in Madison County, Illinois (0.3 mile).

Because neither of these transmission lines would cross forested floodplains or other riparian lands (see Table 3.4.3.1-1) likely to be used by the gray bat for foraging, no effect to this species is expected from construction or operation of these transmission lines. Electrical service providers and RUS, where applicable, would coordinate with the appropriate state and federal resource agencies to identify specific locations for flight deterrents or other avoidance or minimization measures if necessary.

Indiana Bat

Indiana bats are assumed present from April 1 to September 30 in all Missouri and Illinois counties. An Indiana bat was captured in Randolph County, Missouri in May 2007 during mist-net surveys for the collocated REX-West pipeline. This bat was equipped with a radio transmitter, and subsequent surveys indicated that the bat was not using roost sites within 5 miles of the capture location. Known occurrences in Illinois include captures of two adult lactating females and three juvenile Indiana bats in 1986, and two adult lactating female Indiana bats in 1987 in Bond County. One or two maternity colonies of Indiana bats also are thought to occur in the Carlyle Lake WMA.

The Keystone Project would affect a total of 713 acres of upland and riparian forests, 63 acres of riverine or open water, and 94 acres of emergent or scrub-shrub wetlands that could provide habitat for Indiana bats in Missouri and Illinois. Habitat suitability evaluations for the Keystone Project were completed in Missouri and Illinois during August, September, and December 2006 and in February 2007 to identify potentially affected summer Indiana bat habitats within 331 forest crossings greater than 200 feet in length (BHE 2006a, 2006b, 2007a, 2007b). Habitat suitability was assessed by densities of less than 14 potential roost trees (greater than or equal to 22 centimeters diameter at breast height and 3 meters height, no overarching canopy, no understory canopy within 2 meters of the trunk, greater than or equal to 25 percent of the tree covered by exfoliating bark, and the bole of tree free of obstructing vines) per hectare. Of the 331 woodlots initially identified for assessment, 195 woodlots were assessed during field investigations. Of these, 90 woodlots (51 in Missouri and 39 in Illinois) were identified as containing suitable habitat for Indiana bats (Table 3.8.1-10). The dominant roost tree species were shagbark hickory, oaks, and American elm.

TABLE 3.8.1-10 Indiana Bat Habitats Potentially Affected by the Keystone Project Route				
Milepost	State, County	Total Area[a] (acres)	Forest Cover within 3.5 km (%)	Comments[b]
760.4–760.9	Missouri, Buchanan	6.0	31	4 potential roost trees (3 hickory, l unknown), habitat suitability = 0.7
61.5–761.6	Missouri, Buchanan	1.5	29	11 potential roost trees (1 black walnut, 4 elm, 1 red oak, 4 unknown dead), habitat suitability = 0.7
762.9–760.3	Missouri, Buchanan	2.0	22	1 potential roost tree (elm), habitat suitability = 0.7
765.8–763.1	Missouri, Buchanan	1.6	15	7 potential roost trees (2 honey locust, 1 basswood, 4 unknown), habitat suitability = 1.0
775.3–775.4	Missouri, Clinton	0.9	15	6 potential roost trees (1 box elder, 1 silver maple, 4 cottonwoods), habitat suitability = 1.0
775.7–776.0	Missouri, Clinton	3.7	14	3 potential roost trees (1 black walnut, 1 ash, 1 unknown), habitat suitability = 1.0
784.1–784.2	Missouri, Clinton	2.1	17	16 potential roost trees (16 shagbark hickory), habitat suitability = 0.7
788.1–788.5	Missouri, Clinton	6.7	19	42 potential roost trees (22 elm, 20 shagbark hickory), habitat suitability = 0.6
789.4–789.5	Missouri, Clinton	1.5	16	2 potential roost trees (2 elm), habitat suitability = 1.0
789.6–789.7	Missouri, Clinton	1.2	16	2 potential roost trees (1 hawthorn, 1 black walnut), habitat suitability = 0.6
790.8–790.9	Missouri, Clinton	1.1	16	3 potential roost trees (1 unknown snag, 2 honey locust), habitat suitability = 1.0
793.8–793.9	Missouri, Caldwell	0.5	18	2 potential roost trees (1 elm, 1 shingle oak), habitat suitability = 1.0
796.9–797.1	Missouri, Caldwell	2.7	21	2 potential roost trees (1 post oak, 1 shagbark hickory), habitat suitability = 0.7
799.1–799.2	Missouri, Caldwell	0.8	22	1 potential roost tree (1 elm), habitat suitability = 0.7
799.2–799.2	Missouri, Caldwell	1.7	22	1 potential roost tree (1 shagbark hickory), habitat suitability = 0.7
800.8–800.9	Missouri, Caldwell	0.5	18	2 potential roost trees (2 dead hackberry), habitat suitability = 1.0
801.5–801.6	Missouri, Caldwell	2.5	14	2 potential roost trees (2 elm), habitat suitability = 0.7
801.7–801.8	Missouri, Caldwell	0.8	15	1 potential roost tree (1 elm snag), habitat suitability = 0.7
810.3–810.5	Missouri, Caldwell	2.5	19	3 potential roost trees (1 shagbark hickory, 1 elm, 1 unknown), habitat suitability = 1.0
810.5–810.7	Missouri, Caldwell	1.6	20	2 potential roost trees (1 honey locust, 1 oak), habitat suitability = 0.7

TABLE 3.8.1-10 (Continued)				
Milepost	State, County	Total Area[a] (acres)	Forest Cover within 3.5 km (%)	Comments[b]
810.8–810.9	Missouri, Caldwell	3.5	21	2 potential roost trees (2 shagbark hickory), habitat suitability = 0.7
818.1–818.2	Missouri, Carroll	2.0	23	1 potential roost tree (1 elm), habitat suitability = 0.7
818.4–818.8	Missouri, Carroll	3.9	21	3 potential roost trees (2 elm, 1 black walnut), habitat suitability = 1.0
823.1–823.2	Missouri, Carroll	0.8	27	4 potential roost trees (4 elm), habitat suitability = 1.0
824.3–824.6	Missouri, Carroll	4.0	40	14 potential roost trees (4 shagbark hickory, 7 oak, 2 black walnut, 1 elm), habitat suitability = 1.0
824.7–824.9	Missouri, Carroll	2.4	41	9 potential roost trees (5 shagbark hickory, 2 bitternut hickory, 2 unknown), habitat suitability = 1.0
825.4–825.7	Missouri, Carroll	4.0	41	15 potential roost trees (7 shagbark hickory, 5 white oak, 3 oak), habitat suitability = 1.0
825.8–825.9	Missouri, Carroll	1.2	40	3 potential roost trees (2 white oak, 1 elm), habitat suitability = 1.0
825.9–826.3	Missouri, Carroll	4.8	40	15 potential roost trees (6 shagbark hickory, 6 oak, 3 honey locust), habitat suitability = 1.0
827.4–827.6	Missouri, Carroll	1.9	33	6 potential roost trees (4 shagbark hickory, 2 elm), habitat suitability = 1.0
828.6–828.8	Missouri, Carroll	1.7	25	1 potential roost tree (1 shagbark hickory), habitat suitability = 0.7
828.7–828.8	Missouri, Carroll	0.9	24	4 potential roost trees (1 osage-orange, 3 shagbark hickory), habitat suitability = 0.9
843.1–843.2	Missouri, Carroll	2.5	14	3 potential roost trees (1 elm, 1 silver maple, 1 pecan), habitat suitability = 1.0
879.8–880.1	Missouri, Randolph	3.5	25	111 potential roost trees (106 shagbark hickory, 4 oak, 1 unknown snag), habitat suitability = 1.0
882.5–882.6	Missouri, Randolph	1.2	37	1 potential roost tree (1 elm), habitat suitability = 0.7
882.7–882.8	Missouri, Randolph	1.9	37	7 potential roost trees (6 shagbark hickory, 1 white oak), habitat suitability = 1.0
883.2–883.3	Missouri, Randolph	2.0	37	3 potential roost trees (1 elm, 2 shag-bark hickory), habitat suitability = 1.0
883.5–883.6	Missouri, Randolph	0.9	38	4 potential roost trees (3 shagbark hickory, 1 elm snag), habitat suitability = 0.8
918.2–918.4	Missouri, Audrain	1.5	14	2 potential roost trees (2 oak), habitat suitability = 1.0
945.9–946.8	Missouri, Montgomery	10.5	19	9 potential roost trees (6 oak, 3 shagbark hickory), habitat suitability = 1.0

TABLE 3.8.1-10 (Continued)				
Milepost	State, County	Total Area[a] (acres)	Forest Cover within 3.5 km (%)	Comments[b]
954.1–954.2	Missouri, Montgomery	2.7	22	18 potential roost trees (15 shagbark hickory, 2 honey locust, 1 silver maple), habitat suitability = 0.7
954.4–954.6	Missouri, Montgomery	2.0	22	30 potential roost trees (30 shagbark hickory), habitat suitability = 1.0
955.5–955.9	Missouri, Montgomery	4.1	34	17 potential roost trees (15 shagbark hickory, 2 elm), habitat suitability = 1.0
960.2–960.8	Missouri, Lincoln	8.5	54	7 potential roost trees (3 oak, 2 shagbark hickory, 1 elm, 1 cherry), habitat suitability = 1.0
961.0–961.7	Missouri, Lincoln	8.8	57	8 potential roost trees (7 white oak, 1 sugar maple), habitat suitability = 1.0
962.0–963.2	Missouri, Lincoln	14.9	54	17 potential roost trees (8 white oak, 6 shagbark hickory, 3 white ash), habitat suitability = 1.0
963.7–961.0	Missouri, Lincoln	4.8	55	10 potential roost trees (7 white oak, 2 elm, 1 shagbark hickory), habitat suitability = 1.0
965.0–966.3	Missouri, Lincoln	16.8	45	15 potential roost trees (14 oak, 1 elm), habitat suitability = 1.0
967.1–967.9	Missouri, Lincoln	10.2	33	15 potential roost trees (10 shagbark hickory, 5 white oak), habitat suitability = 1.0
968.6–968.8	Missouri, Lincoln	1.8	33	20+ potential roost trees (20+ shagbark hickory), habitat suitability = 1.0
969.5–969.6	Missouri, Lincoln	2.0	33	20+ potential roost trees (20+ shagbark hickory), habitat suitability = 1.0
1032.2–1032.6	Illinois, Madison	5.2	32	4 potential roost trees (oak), habitat suitability = medium
1032.8–1032.0	Illinois, Madison	3.7	35	1 potential roost tree (red oak), habitat suitability = medium
1033.1–1033.3	Illinois, Madison	4.1	35	7 potential roost trees (6 oak, 1 sycamore), habitat suitability = medium
1033.8–1033.9	Illinois, Madison	1.5	36	3 potential roost trees (2 oak, 1 cottonwood), habitat suitability = medium
1033.9–1034.1	Illinois, Madison	2.4	37	1 potential roost tree (1 oak), habitat suitability = medium
1035.1–1035.2	Illinois, Madison	1.5	34	1 potential roost tree (1 American elm), habitat suitability = medium
1035.4–1036.3	Illinois, Madison	12.4	30	9 potential roost trees (4 black walnut, 2 oak, 1 box elder, 2 cottonwood), habitat suitability = medium
1036.7–1037.1	Illinois, Madison	5.3	22	29 potential roost trees (19 unknown snags, 6 honey locust, 4 shagbark hickory), habitat suitability = medium

TABLE 3.8.1-10 (Continued)				
Milepost	State, County	Total Area[a] (acres)	Forest Cover within 3.5 km (%)	Comments[b]
1037.4–1037.6	Illinois, Madison	1.7	17	1 potential roost tree (unknown snag), habitat suitability = medium
1040.4–1040.8	Illinois, Madison	5.9	15	5 potential roost trees (2 elm, 3 silver maple), habitat suitability = medium
1044.1–1044.1	Illinois, Madison	0.4	8	2 potential roost trees (1 black willow, 1 hackberry), habitat suitability = medium
1044.9–1044.9	Illinois, Madison	0.4	13	1 potential roost tree (1 shingle oak), habitat suitability = medium
1049.3–1049.4	Illinois, Madison	0.5	15	8 potential roost trees (1 shagbark hickory, 3 red oak, 1 cherry, 2 elm, 1 honey locust), habitat suitability = high
1049.7–1049.9	Illinois, Madison	2.9	17	11 potential roost trees (2 unknown snags, 9 shagbark hickory), habitat suitability = medium
1050.0–1050.1	Illinois, Madison	3.5	17	13 potential roost trees (13 shagbark hickory), habitat suitability = medium
1050.1–1050.2	Illinois, Madison	2.0	17	20 potential roost trees (18 shagbark hickory, 2 unknown snags), habitat suitability = high
1050.5–1050.6	Illinois, Madison	1.6	17	22 potential roost trees (22 shagbark hickory), habitat suitability = high
1050.9–1051.1	Illinois, Madison	3.3	15	2 potential roost trees (2 unknown snags), habitat suitability = medium
1052.9–1052.9	Illinois, Madison	0.4	3	2 potential roost trees (1 elm, 1 white oak), habitat suitability = medium
1057.1–1057.4	Illinois, Bond	4.4	22	14 potential roost trees (9 shagbark hickory, 2 box elder, 2 oak, 1 elm), habitat suitability = medium
1057.8–1057.9	Illinois, Bond	1.2	25	3 potential roost trees (1 box elder, 2 elm), habitat suitability = medium
1060.0–1060.1	Illinois, Bond	0.5	16	1 potential roost tree (1 oak), habitat suitability = medium
1062.5–1062.6	Illinois, Bond	1.9	14	2 potential roost trees (2 shagbark hickory), habitat suitability = medium
1062.6–1062.7	Illinois, Bond	0.4	15	1 potential roost tree (1 shagbark hickory), habitat suitability = medium
1063.0–1063.5	Illinois, Bond	6.9	17	21 potential roost trees (11 hickory, 2 hackberry, 2 cherry, 2 black locust, 2 oak, 2 unknown snag), habitat suitability = medium
1063.8–1064.0	Illinois, Bond	2.4	19	1 potential roost tree (1 red oak), habitat suitability = medium
1064.1–1064.3	Illinois, Bond	3.5	19	7 potential roost trees (2 shagbark hickory, 2 elm, 3 red oak), habitat suitability = medium
1064.5–1064.8	Illinois, Bond	3.5	18	13 potential roost trees (13 shagbark hickory), habitat suitability = high
1064.8–1064.9	Illinois, Bond	1.5	17	1 potential roost tree (1 elm), habitat suitability = medium

TABLE 3.8.1-10 (Continued)				
Milepost	State, County	Total Area[a] (acres)	Forest Cover within 3.5 km (%)	Comments[b]
1065.4–1065.4	Illinois, Bond	0.5	13	1 potential roost tree (black oak), habitat suitability = medium
1069.8–1069.8	Illinois, Bond	0.1	3	1 potential roost tree (oak), habitat suitability = high
1072.5–1072.6	Illinois, Fayette	0.2	16	1 potential roost tree (shingle oak), habitat suitability = high
1073.2–1073.5	Illinois, Fayette	4.8	19	5 potential roost trees (1 box elder, 2 black walnut, 2 honey locust), habitat suitability = medium
1073.9–1074.1	Illinois, Fayette	2.1	22	1 potential roost tree (1 black willow), habitat suitability = medium
1075.0–1075.2	Illinois, Fayette	2.5	24	1 potential roost tree (black willow), habitat suitability = medium
1075.4–1075.4	Illinois, Fayette	0.8	25	1 potential roost tree (black willow), habitat suitability = medium
1075.6–1075.6	Illinois, Fayette	1.9	25	1 potential roost tree (pin oak), habitat suitability = medium
1075.8–1075.9	Illinois, Fayette	0.8	24	2 potential roost trees (2 maple), habitat suitability = medium
1080.8–1081.0	Illinois, Marion	2.9	14	5 potential roost trees (4 elm, 1 black cherry), habitat suitability = medium

a Area calculated as distance crossed (BHE 2007d, e) and a 110-foot right-of-way width.

b Habitat suitability – 0 = not suitable, 1 = highly suitable. Values between 0 and 1 indicate a range of suitability of habitat for the species in question. For Illinois habitat suitability was rated as high or medium. Table includes only those surveyed habitats rated as ≥ 0.6, medium or high. Readers need to refer to the cited references to see how these evaluations were derived.

Sources: BHE 2007d, e, f.

Construction of the Keystone pipeline and associated extra work pads and access roads would affect these identified suitable Indiana bat habitats. Identified potential roost trees would be removed and would not be allowed to regenerate within the maintained ROW. An estimated 275 acres of surveyed forested habitats and 338 acres of surveyed and estimated habitats suitable for Indiana bats would be lost due to construction of the Mainline Project (Table 3.8.1-11). No Indiana bat habitat has been identified along the Cushing Extension. Removal of roosting habitats would result in disruption of foraging patterns and loss of travel corridors, and would add to energetic costs as bats would need to search for new roost sites. An estimated 570 potential roost trees would be removed; of these a landscape-scale assessment indicates that the Keystone Project may remove a maximum estimated 19 primary maternity roosts (ENSR 2007i).

Use of pesticides historically has led to decline of the species. Use of pesticides during ROW maintenance activities for the life of the Keystone Project could result in poisoning of bats due to direct exposure through ingestion, inhalation, or dermal absorption; or due to indirect exposure through consumption of contaminated insect prey. Indiana bats also would be indirectly affected by pesticides through reduced insect abundance, which reduces the amount of forage available to the species. The scale of potential impacts would depend on the type of pesticide, proposed use, and identification and implementation of BMPs.

TABLE 3.8.1-11 Summary of Estimated Indiana Bat Habitats Potentially Affected by the Keystone Project								
	Habitat Area (acres)							
State, County	High HSI[a]	Medium HSI	Total Survey Suitable Habitat	Total Habitat Surveyed	Proportion Suitable (%)	Remaining Survey Area	Estimated Remaining Suitable Habitat	Estimated Total Suitable Habitat
Missouri, Buchanan	11.1		11.1	78.7	14			11.1
Missouri, Clinton	9.3	7.9	17.2	34.4	50	2.0	1.0	18.2
Missouri, Caldwell	17.1		17.1	38.4	45	3.2	1.4	18.5
Missouri, Carroll	30.1		30.1	43.9	69			30.1
Missouri, Chariton				29.2	0	5.6	0.0	0.0
Missouri, Randolph	9.5		9.5	44.8	21			9.5
Missouri, Audrain	1.5		1.5	4.9	30			1.5
Missouri, Montgomery	19.3		19.3	69.1	28	15.8	4.4	23.7
Missouri, Lincoln	67.8		67.8	147.9	46	58.7	26.9	94.7
Missouri, St. Charles						17.9	6.3	6.3
Missouri totals	*165.7*	*7.9*	*173.6*	*491.3*	*35*	*103.2*	*40.1*	*213.7*
Illinois, Madison	4.1	54.6	58.7	89.3	66	38.8	25.5	84.2
Illinois, Bond	3.6	23.2	26.8	61.7	43	3.5	1.5	28.3
Illinois, Fayette	0.2	12.9	13.1	33.2	39	0.3	0.1	13.2
Illinois, Marion		2.9	2.9	5.0	58			2.9
Illinois totals	*7.9*	*93.6*	*101.5*	*189.1*	*54*	*42.5*	*22.8*	*124.3*
Keystone Project totals	**173.6**	**101.5**	**275.1**	**680.4**	**40**	**145.7**	**62.9**	**338.0**

a HSI = Habitat suitability index. Habitat suitability: High ≥ 0.7, Medium = 0.6. Area calculated as distance crossed (BHE 2007a, b) and 110-foot right-of-way width.

Sources: BHE 2007d, e.

Two confirmed winter hibernacula are more than 5 miles south of the Mainline Project in Boone County, Missouri. USFWS also indicated a hibernaculum in St. Louis County, Missouri, approximately 15 miles south of the Mainline Project. Karst topography would potentially be crossed by the Mainline Project at the following locations within the range for the Indiana bat:

- Caldwell County, Missouri – MP 790 to 814;
- Lincoln County, Missouri – MP 954 to 981;

- St. Charles County, Missouri – MP 981 to 1021; and
- Madison County, Illinois – MP 1022 to 1025.

Blasting may coincide with karst topography in Caldwell and Lincoln Counties in Missouri. IDNR has indicated that no known winter cave hibernacula are located near the Keystone Project in Illinois (Rick Pietruszka, IDNR, February 6, 2007). The nearest known winter hibernaculum in Illinois is more than 10 miles northeast of the Mainline Project in Jersey County.

Keystone has committed to implementing the following measures in its CMR Plan (Appendix B) to protect Indiana bats:

- Occurrence surveys would be completed during 2007 in coordination with USFWS, if the surveys are necessary.
- Prior to surface disturbance activities within karst terrain, a geological investigation would be completed to determine the presence and type of karst features. The investigation would identify the location, distribution, and dimensions of rock cavities within the potential influence zone of construction (John Cochnar, USFWS, April 28, 2006).
- A qualified biologist would conduct surveys for exposed caves that may be suitable as winter hibernacula for Indiana bats within 0.25 mile from surface disturbance activities.
- In the event that cave features suitable as winter hibernacula for Indiana bats are identified, USFWS or appropriate state wildlife agency would be contacted and applicable mitigation measures will be developed.

To avoid impacts on the Indiana bat, Keystone will also:

- Schedule cutting of identified potential roost trees in sites with a habitat suitability index of 0.6 or more in Missouri, in moderate or high-quality sites in Illinois, and in sites where habitat quality has not been assessed for Indiana bats in Missouri and Illinois during October 1 to March 31, when the species is not present..
- If any Indiana bat maternity roost trees are located, applicable mitigation would be developed in consultation with USFWS and state wildlife agency personnel.
- Implement conservation measures to address the loss of Indiana bat summer habitat by working with USFWS, Missouri Department of Conservation, and Missouri Department of Natural Resources, IDNR, and other potential cooperators in development of conservation measures to potentially include onsite/offsite, and in-kind/out-of-kind measures based on acres of habitat impacts at a 2:1 ratio for conservation lands giving consideration to actual habitat assessments and losses.
- Identify pesticides potentially proposed for use and any BMPs that would be implemented to minimize the impacts of pesticide use to maintain the pipeline ROW.

USFWS recommends that these additional measures be adopted as conditions for all federal permits issued for construction of the Keystone Project. Construction of the Mainline Project may affect Indiana bats and their habitats. A maximum total of 338 acres of surveyed and estimated forested habitats suitable for Indiana bats, as calculated above, would be lost due to construction of the Keystone Project—encompassing a maximum total of 19 primary maternity roosts (ENSR 2007i). Coordination with federal and state resource agencies should continue, with the goal of impact avoidance, minimization, or mitigation. The Keystone Project may affect, but is not likely to adversely affect, the Indiana bat because of the inclusion of seasonal potential roost tree cutting and establishment of conservation lands at a ratio of 2 acres of conservation lands to 1 acre of habitat impact.

Connected Actions

Approximately 181 miles of new transmission lines and 22 miles of upgraded transmission lines would be required to power pumpstations along the Mainline, with about 12 miles of new lines for the Cushing Extension (see Section 2.14). New electrical power line segments would increase the collision potential for the Indiana bat and would potentially remove additional forested roosting habitat. Factors influencing collision risk are related to the environment, and the configuration and location of lines (see Section 3.6.4). Power line-related factors influencing collision risk include the configuration and location of the line and line placement with respect to other structures or topography (APLIC and USFWS 2005).

Transmission lines supporting pump stations for the Keystone that would be located within the range of the Indiana bat in Missouri and Illinois include:

- MP 982 Mainline PS-36 in Lincoln County, Missouri;
- MP 1027 Mainline PS-37 in Madison County, Illinois; and
- MP 1053 Mainline PS-38 in Madison/Bond County, Illinois.

None of these transmission lines would cross forested floodplains or other riparian lands (see Table 3.4.3.1-1) likely to be used by the gray bat for foraging; therefore, impacts to this species are unlikely to occur. Electrical service providers and RUS, where applicable, would coordinate with the appropriate state and federal resource agencies to identify specific locations for flight deterrents or other avoidance or minimization measures, if necessary.

Gray Wolf

The gray wolf is an occasional visitor to the Keystone Project area in North Dakota. The Mainline Project could affect gray wolves by interrupting foraging activities due to exposure to construction and operations noise, and from increased human activity.

To avoid construction-related disturbance impacts, if gray wolves are observed during construction Keystone will immediately contact USFWS to determine whether additional protection are required.

Construction of the Mainline Project is not likely to affect gray wolves or their habitats, as they are unlikely to occur regularly within the Project area. In addition, the gray wolf has been de-listed where they are most likely to occur within the Keystone Project area in North Dakota.

Federally Protected Reptiles and Insects

Potential impacts on protected reptiles and insects generally would be as described for wildlife in Section 3.6.5. Table 3.8.1-3 lists federally and state-protected reptiles and insects. The Mainline Project and the Cushing Extension could affect protected reptiles and insects by:

- Habitat loss, alteration, and fragmentation;
- Loss of breeding success from exposure to construction and operations noise, and from increased human activity;
- Reduced survival or reproduction due to decreased abundance of forage species;

- Direct mortality from project construction and operation; and
- Loss of individuals and habitats by exposure to pesticides, toxic materials or crude oil releases (addressed in Section 3.13).

In addition to these general impacts, specific impacts and mitigation measures have been identified for the species described below.

Massasauga

Massasauga (c.f. eastern or western) accounts have been recorded in the Keystone Project area within Chariton, Randolph, and St. Charles Counties in Missouri; and Bond, Fayette, and Madison Counties in Illinois. Habitats likely to support the massasauga in Missouri and Illinois were identified by reviewing maps and aerial photography; 134 of 144 identified sites have been evaluated during field surveys (BHE 2007d, 2007e). Of the 134 wetlands evaluated for habitat suitability, 34 sites totaling 5.2 miles were identified as containing habitats likely to support the massasauga in Missouri (Table 3.8.1-12), and 16 sites totaling 5.1 miles were identified as containing habitats likely to support the massasauga in Illinois (BHE 2006c). Most of the Missouri sites were surveyed for massasauga presence during April 2007 (BHE 2007f). No massasauga, Kirtland's, or fox snakes were located, although numerous frogs, turtles, other snakes, and lizards were documented, as indicated in Table 3.8.1-12 (BHE 2007f). The massasauga population at Carlyle Lake may be an endemic population, and possibly the most significant population in the Midwest (Chris Phillips, Illinois Natural History Survey, February 6, 2007).

Crossing occupied habitats during winter hibernation likely would lead to death of individual massasaugas, and crossing during breeding would cause interruption of the breeding cycle. Due to the low biological replacement rate for this species, small increases in adult mortality can cause irreversible declines.

To avoid construction-related impacts to the massassauga, Keystone will develop a mitigation plan and apply for an Incidental Take Authorization (ITA) for the massasauga in Illinois, with guidance from IDNR and the Illinois Natural History Survey. Keystone will also place biological monitors would be placed in areas of appropriate habitats to locate and remove snakes ahead of construction in order to prevent injury or destruction of the massasauga.

Construction of the Mainline Project may affect the eastern massasauga in Missouri and Illinois. Coordination with state and federal resource agencies should continue, with the goal of impact avoidance, minimization, or mitigation.

TABLE 3.8.1-12 Massasauga, Kirtland's, and Fox Snake Habitats Potentially Affected by the Keystone Mainline Project Route			
Approximate Milepost	**State, County**	**Total Miles**	**Description of Habitat – Occurrence Survey Results[a]**
752.1–752.3	Missouri, Buchanan	0.2	Wetland in agricultural field, crayfish burrows – not Surveyed
754.7–755.0	Missouri, Buchanan	0.3	Wetland in agricultural field, numerous crayfish burrows – none
755.0–755.2	Missouri, Buchanan	0.2	Wetland in woodlot, surrounded by agricultural field, crayfish burrows – snake
759.2–759.3	Missouri, Buchanan	0.1	Pond and associated wetland surrounded by pasture, crayfish burrows – frogs, turtle
763.8	Missouri, Buchanan	<0.1	Wooded ditch surrounded by agricultural field, crayfish burrows – frogs
765.4–765.5	Missouri, Buchanan	0.1	Wetland surrounded by agricultural field, crayfish burrows – frogs
765.5–765.6	Missouri, Buchanan	0.1	Emergent/forested wetland surrounded by agricultural field, crayfish – frogs
765.9	Missouri, Buchanan	<0.1	Emergent/forested wetland surrounded by agricultural field and pasture, crayfish burrows. – frogs, snake, lizard
767.4–767.5	Missouri, Buchanan	0.1	Wooded wetland surrounded by agricultural field, crayfish burrows – frog, snake, lizard
767.9–768.0	Missouri, Buchanan	0.1	Grassy wetland next to pond surrounded by agricultural field, crayfish burrows – frogs, snakes, turtles
768.8	Missouri, Buchanan	<0.1	Wetland next to pond surrounded by agricultural field, crayfish burrows – frogs, snake
822.1–822.2	Missouri, Carroll	0.1	Wetland surrounded by agricultural field, crayfish burrows – snake
823.5–823.6	Missouri, Carroll	0.1	Grassy waterway in agricultural field, crayfish burrows – not surveyed
832.5–832.7	Missouri, Carroll	0.2	Wooded wetland, crayfish burrows –frog
837.1–837.2	Missouri, Carroll	0.1	Wetland in a field surrounded by patches of trees, crayfish burrows – none
843.1–843.2	Missouri, Carroll	0.1	Wooded wetland crossed by two seasonal streams, crayfish burrows – frog, snake
843.8–843.9	Missouri, Chariton	0.1	Emergent wetland next to stream, crayfish burrows – none
843.9–844.0	Missouri, Chariton	0.1	Emergent wetland next to stream by levee, crayfish burrows – frog, snakes
844.3–844.4	Missouri, Chariton	0.1	Wetland through agricultural field, emergent vegetation, crayfish burrows – frogs
844.3–844.4	Missouri, Chariton	0.1	Wetland through agricultural field, emergent vegetation, crayfish burrows – frogs
845.2–845.6	Missouri, Chariton	0.4	Wetland through agricultural field, emergent vegetation, crayfish burrows – frog, snake
845.7	Missouri, Chariton	<0.1	Emergent scrub-shrub wetland near stream, surrounded by woodlot, crayfish burrows – frog
849.7–849.8	Missouri, Chariton	0.1	Riparian wetland/woodland surrounded by pasture, crayfish burrows – frog
860.4–860.5	Missouri, Chariton	0.1	Emergent wetland surrounding stream, crayfish burrows – frog

TABLE 3.8.1-12 (Continued)			
Approximate Milepost	State, County	Total Miles	Description of Habitat with Occurrence Survey Results[a]
861.3	Missouri, Chariton	<0.1	Farm pond in woodlot surrounded by pasture, crayfish burrows – frog
864.3	Missouri, Chariton	<0.1	Wet area next to agricultural fields, crayfish burrows – frog, snakes
864.3–864.5	Missouri, Chariton	0.2	Wetland next to agricultural field, crayfish burrows – frog, snakes
874.8–874.9	Missouri, Chariton	0.1	Pond and wetland next to levee, crayfish burrows – frogs, toad, snake, turtles
876.5	Missouri, Chariton	<0.1	Pond next to woodlot, crayfish burrows – not surveyed
988.7–989.4	Missouri, St. Charles	0.7	Series of ponds and forested wetlands, crayfish burrows – not surveyed
992.5–992.8	Missouri, St. Charles	0.3	Pond, emergent wetland surrounded by forest and agricultural field, crayfish burrows – not surveyed
993.1	Missouri, St. Charles	<0.1	Emergent wetland surrounded by agricultural field, crayfish burrows – frog, turtle
1006.7–1006.8	Missouri, St. Charles	0.1	Wetland through agricultural field, crayfish burrows – turtle
1024.6–1024.8	Missouri, St. Charles	0.2	Emergent wetland next to levee, crayfish burrows – not surveyed
1040.6–1041.0	Illinois, Madison	0.4	Wetland in agricultural field, crayfish burrows.
1041.7–1041.8	Illinois, Madison	0.1	Wetland adjacent to stream, crayfish burrows.
1044.8–1044.9	Illinois, Madison	0.1	Wetland adjacent to stream, crayfish burrows.
1046.5–1046.7	Illinois, Madison	0.2	Wetland adjacent to stream, crayfish burrows.
1049.9–1051.0	Illinois, Madison	1.1	Wetland adjacent to lake, crayfish burrows.
1060.6	Illinois, Bond	<0.1	Wetland adjacent to agricultural field, crayfish burrows.
1060.9–1061.1	Illinois, Bond	0.2	Wetland between two agricultural fields, crayfish burrows.
1061.2–1061.3	Illinois, Bond	0.1	Wetland adjacent to stream, crayfish burrows.
1062.5–1062.6	Illinois, Bond	0.1	Lowland next to road with pond, crayfish burrows.
1063.2–1063.4	Illinois, Bond	0.2	Woodlot next to agricultural field with stream, crayfish burrows.
1069.3–1069.6	Illinois, Bond	0.3	Wetland, stream bed, woodlot, crayfish burrows.
1072.1–1072.3	Illinois, Fayette	0.2	Pond next to agricultural field, crayfish burrows.
1074.7–1076.0	Illinois, Fayette	1.3	Wetland along river and ROW, crayfish burrows.
1076.1–1076.5	Illinois, Fayette	0.4	Wetland along ROW, crayfish burrows.
1077.5–1077.7	Illinois, Fayette	0.2	Wetland in pasture, crayfish burrows.
1078.3	Illinois, Fayette	<0.1	Wetland next to stream in woodlot, crayfish burrows.

[a] Includes sites with habitats evaluated as likely to support massasauga, Kirtland’s, or fox snakes. Occurrence survey results (Missouri only) by herpetological group (frog, turtle, snake, lizard) with singular indicating one species found and plural indicating more than one species found. No massasauga, Kirtland’s, or fox snakes were found during occurrence surveys.

Sources: BHE 2007d, e, f.

Dakota Skipper

Table 3.8.1-13 lists specific locations where suitable habitat for the Dakota Skipper potentially would be affected by the Mainline Project route. Threats to Dakota skipper habitat include burning; haying;

grazing; pesticide use; and invasion by non-native plants, including exotic pasture grasses. Pipeline construction reduces native grassland areas by destroying the prairie sod. Once disturbed, this sod is extremely slow (over 100 years) to redevelop. Disturbing soil along the construction ROW encourages the establishment of exotic pasture grasses, especially smooth brome, and the establishment of noxious weeds.

TABLE 3.8.1-13
Dakota Skipper Habitats Potentially Affected along the Keystone Mainline Project Route

Milepost	State	County	Habitat Quality	Summary
127.2–127.5	North Dakota	Barnes	High	High-quality native prairie, un-grazed site with mix of over 40 native forb species.
258.3–258.4	South Dakota	Day	High	High-quality native prairie, many native grasses and over 30 native forb species. No Dakota skippers found.
266.0–267.1	South Dakota	Day	High	High-quality native prairie, numerous native forbs. Two female Dakota skippers found.
392.1–393.0	South Dakota	Hutchinson	High	High-quality native prairie, rolling hills near Wolf Creek. May be outside of Dakota skipper range.
422.3–422.7	South Dakota	Yankton	High	High-quality native prairie, abundance of native forbs. May be outside of Dakota skipper range.
423.8–424.1	South Dakota	Yankton	High	High-quality native prairie, near James River. May be outside of Dakota skipper range.

Source: ENSR 2006e.

A total of 3.0 miles (0.3 mile in North Dakota and 2.7 miles in South Dakota) of high-quality Dakota skipper habitats would be affected by construction of the Mainline Project. Successful restoration of destroyed (e.g., plowed) or severely degraded Dakota skipper native prairie habitats has not been demonstrated (USFWS 2005). Keystone completed Dakota skipper occurrence surveys during June 29, 2007, at two locations in Day County, South Dakota (Table 3.8.1-13). No Dakota skippers were found at one site, and two female Dakota skippers were found at one site (Table 3.8.1-13).

Keystone has committed to implementing the following measures in its CMR Plan (Appendix B) to protect Dakota skippers and their habitats:

- Keystone has contracted qualified biologists to conduct surveys of sensitive species associated with native tall-grass prairie. Locations of sensitive species found were documented; sensitive species were identified in the ROW and Keystone would continue to work with the relevant regulatory authorities to determine whether any additional protection measures are required.

- Disturbance native prairie would be reclaimed to native prairie species using native seed mixes specified by applicable state and federal agencies, with an objective of no-net-loss of native prairie habitat.

- Where avoidance of native tall-grass prairie by the pipeline ROW is not feasible, appropriate surveys were implemented to ensure that populations of Dakota skippers would not be affected.

- Keystone would restrict workspaces where the ROW crosses native prairie habitat.

- Keystone would salvage and segregate topsoil in native prairie to maintain the native seed sources for revegetation of the ROW in native prairie.

- Keystone would encourage landowners to revegetate native prairie with native seed sources.

- Keystone would reseed native prairie with applicable native seed mixes.

- Keystone would control noxious and invasive plant species as addressed in Keystone's Noxious Weed Management Plan (see Section 3.5.4)

To avoid impacts on Dakota skippers and their habitats, Keystone should encourage landowners to follow these BMPs and Keystone is encouraged to implement these BMPs in vegetation management on the ROW:

- Vegetation maintenance plans should include measures that encourage or enhance a healthy native prairie, such as (John Cochnar, USFWS, March 6, 2007; USFWS 2005):
  - Alternate-year late-summer haying after mid-August, with at least 8 inches of stubble remaining (to reduce woody vegetation encroachment).
  - Limited grazing – both in duration and intensity (to preserve nectar sources and vegetation for egg deposition and larval food).
  - Prescribed burning – schedule before May 1; allow at least 3 to 4 years between burns; do not burn entire habitat area in any single year; allow patchy burn pattern; consider other rare, prairie-dependent species.
  - Control weeds and invasive species – avoid broadcast applications of pesticides or herbicides, train field crews to recognize target weeds in order to avoid adverse effects to native species.
  - Manage vegetation to minimize the likelihood of invasion by weeds.

Construction of the Mainline Project may affect the Dakota skipper at one location and 3.0 miles of suitable native prairie habitats in North Dakota and South Dakota. Coordination with federal and state resource agencies should continue, with the goal of impact avoidance, minimization, or mitigation.

Federally Protected Fish and Mollusks

Declines in big river fishes have been caused primarily by habitat alteration for navigation, channelization, and bank stabilization; and hydropower generation projects that have caused loss of the dynamic habitats once common in the Missouri and Mississippi Rivers. Dams have blocked spawning migrations, isolated populations, destroyed rearing and spawning habitats, and altered food supply, as well as changed flow, turbidity, and temperature regimes. Declines in intermediate- and small-stream fishes are attributable to stream modifications, sediment deposition, pollution, overgrazing, and predation by introduced fish.

Declines in mussels along the Mississippi and Missouri Rivers are primarily caused by habitat loss and degradation. These losses have been documented since the mid-19th century; causes include impoundment, channelization, chemical contamination, dredging, and sedimentation. Mussel habitat loss and degradation due to gravel dredging and stream channelization destabilize stream substrates and alter water flows. Most of the remaining populations of mussels are small and isolated, making them more susceptible to expiration from a catastrophic event. Isolated populations also decrease the gene flow through each species, leading to inbreeding depression within populations. Spread of the exotic zebra mussel (*Dreissena polymorpha*) is a threat to native freshwater mussels. Zebra mussels attach themselves to native mussels and restrict feeding and reproductive activities of the native mussels. They quickly out-compete native species, sometimes leading to their suffocation.

Table 3.8.1-14 lists waters affected by the Keystone Project that potentially contain protected fish or mollusks, or their federally or state-designated critical habitats.

Potential impacts on protected fish and mollusk species generally would be as described for fisheries in Section 3.7.3. Table 3.8.1-4 lists federally and state-protected fish and mollusks. The Mainline Project and the Cushing Extension pipelines could adversely affect these protected fish and mollusks by:

- Impacts associated with stream crossings;
- Sedimentation due to trenching, backfilling, and streambank erosion;
- Loss of bank cover and habitats;
- Entrainment of small fish and forage species, altered water temperatures and water quality, and increased erosion and scour from withdrawal or discharge of water for hydrostatic testing; and
- Loss of individuals and habitats due to exposure to toxic materials or crude oil releases (addressed in Section 3.13).

Proposed construction mitigation measures for water body crossings are described in Sections 3.7.3 and 3.3.2. In general, HDD crossing methods would be preferred to avoid construction-related damage to protected aquatic species habitats. The HDD does carry a risk of "frac-out" (the escape of drilling fluid) that could result in short-term sediment transport, water quality impacts, and bottom disturbance at or near the crossing location. For various reasons, including protected species habitat, Keystone has committed to using HDD at 13 crossings along the Mainline Project route (Pembina River, Missouri River [two crossings], South Branch Park River, Platte River, Chariton River, Cuivre River [two crossings], Elkhorn River, Kaskaskia River, Silver Creek, Hurricane Creek, and Mississippi River); and four crossings along the Cushing Extension route (one each on the Republican, Arkansas, Salt Fork Arkansas, and Cimarron Rivers). See section 3.3 for details regarding HDD decision making process.

TABLE 3.8.1-14
Water Body Crossings Containing Protected Fish or Mollusks along the Keystone Project Route

Approx. Milepost	County	State	Water Body (Type – Crossing[a]) Use	Species, Habitat – Occurence Survey Results
Mainline Project				
300.0	Clark	South Dakota	North Fork Foster Creek (R4 – Dry)	Topeka shiner, suitable habitat – no Topeka shiners
300.2	Clark	South Dakota	South Fork Foster Creek (R4 – Dry)	Topeka shiner, marginal habitat – no Topeka shiners
306.8	Clark	South Dakota	Tributary of Shue Creek (PEM – 1)	Topeka shiner, unsuitable habitat – no fish survey
310.7	Beadle	South Dakota	Tributary of Shue Creek (R4 – OC)	Topeka shiner, unsuitable habitat – no fish survey
314.3	Beadle	South Dakota	Shue Creek (R4 – OC)	Topeka shiner, unsuitable habitat – no fish survey
319.0	Beadle	South Dakota	Middle Pearl Creek (R4 – Dry)	Topeka shiner, unsuitable habitat – no fish survey
327.6	Kingsbury	South Dakota	South Fork Pearl Creek (PEM – 2)	Topeka shiner, marginal habitat – no Topeka shiners
336.4	Kingsbury	South Dakota	Redstone Creek (R4 – OC)	Topeka shiner, unsuitable habitat – no fish survey
338.7	Kingsbury	South Dakota	West Redstone Creek (R4 – Dry)	Topeka shiner, unsuitable habitat – no fish survey
344.4	Miner	South Dakota	Redstone Creek (R4 – Dry) hydrostatic test water source	Topeka shiner, suitable habitat – 6 Topeka shiners
363.6	Miner	South Dakota	Rock Creek (R4 – Dry)	Topeka shiner, suitable habitat – no Topeka shiners
377.2	Hansen	South Dakota	Wolf Creek (R2 – OC) hydrostatic test water source	Topeka shiner, marginal habitat – no fish survey
385.7	McCook	South Dakota	Wolf Creek (R2 – Dry)	Topeka shiner, suitable habitat – no Topeka shiners
392.8	Hutchinson	South Dakota	Wolf Creek (R2 – OC)	Topeka shiner, marginal habitat – no fish survey
393.2	Hutchinson	South Dakota	Tributary of Wolf Creek (R2 – OC)	Topeka shiner, poor habitat – no fish survey
396.6	Hutchinson	South Dakota	Tributary of Wolf Creek (R4 – OC)	Topeka shiner, poor habitat – no fish survey
419.7	Yankton	South Dakota	Tributary of James River (R4 – OC)	Topeka shiner, poor habitat – no fish survey
423.9	Yankton	South Dakota	James River (R2 – OC) hydrostatic test water source	Topeka shiner, poor habitat – no fish survey
425.7	Yankton	South Dakota	Tributary of James River (R4 – OC)	Topeka shiner, poor habitat – no fish survey
430.1	Yankton	South Dakota	Beaver Creek (R2 – OC)	Topeka shiner, poor habitat – no fish survey

TABLE 3.8.1-14 (Continued)				
Approximate Milepost	**County**	**State**	**Water Body (Type – Crossing[a]) Use**	**Species, Habitat – Occurence Survey Results**
Mainline Project (continued)				
437.6	Yankton, Cedar	South Dakota, Nebraska	Missouri River (R2 – HDD) hydrostatic test water source, HDD water source	Topeka shiner, poor habitat – no fish survey pallid sturgeon, lake sturgeon, sturgeon chub, sicklefin chub, blacknose shiner, northern redbelly dace, finescale dace, Higgins' eye pearly mussel, scaleshell mussel – no mussel surveys
544.2	Colfax	Nebraska	Platte River (R2 – HDD) hydrostatic test water source, HDD water source	Pallid sturgeon, sturgeon chub, sicklefin chub, suitable habitat – no fish survey
661.2	Marshall	Kansas	North Elm Creek (R2 – OC)	Topeka shiner (SCH), suitable habitat – no fish survey
662.0	Marshall	Kansas	Tributary of North Elm Creek (R4 – OC)	Topeka shiner, marginal habitat – no Topeka shiners
664.6	Marshall	Kansas	North Elm Creek (R2 – Dry)	Topeka shiner (SCH), suitable habitat – 142 Topeka shiners
667.1	Marshall	Kansas	Tributary of North Elm Creek (R4 – OC)	Topeka shiner (SCH), no access
691.9	Nemaha	Kansas	South Fork Big Nemaha River (R2 – OC)	Western silvery minnow (SCH), flathead chub (SCH), no fish survey
750.8	Doniphan, Buchanan	Kansas, Missouri	Missouri River (R2 – HDD) hydrostatic test water source, HDD water source	Pallid sturgeon, sturgeon chub, sicklefin chub, chestnut lamprey, no fish surveys
775.3	Clinton	Missouri	Castile Creek (R2 – OC)	Topeka shiner, marginal habitat – no Topeka shiners
783.3	Clinton	Missouri	Little Platte River (R2 – OC)	Topeka shiner, suitable habitat – no Topeka shiners
784.3	Clinton	Missouri	Tributary of Little Platte River (R2 – OC)	Topeka shiner, suitable habitat – no Topeka shiners
788.2	Clinton	Missouri	Shoal Creek (R2 – OC)	Topeka shiner, suitable habitat – no Topeka shiners
788.9	Clinton	Missouri	Little Shoal Creek (R2 – OC)	Topeka shiner, poor habitat – dry
797.0	Caldwell	Missouri	Log Creek (R2 – Dry)	Topeka shiner, poor habitat – dry
798.8	Caldwell	Missouri	Tributary of Log Creek (R2 – OC)	Topeka shiner, poor habitat – no Topeka shiners
798.9	Caldwell	Missouri	Tributary of Log Creek (perennial – OC)	Topeka shiner, poor habitat – no Topeka shiners
803.8	Caldwell	Missouri	Brush Creek (R2 – Dry)	Topeka shiner, poor habitat – no Topeka shiners
804.3	Caldwell	Missouri	Tributary of Brush Creek (R2 – OC)	Topeka shiner, poor habitat – dry
806.2	Caldwell	Missouri	Tributary of Crabapple Creek (R4 – OC)	Topeka shiner, poor habitat – dry
807.1	Caldwell	Missouri	Crabapple Creek (R2 – OC)	Topeka shiner, poor habitat – no Topeka shiners

TABLE 3.8.1-14 (Continued)				
Approximate Milepost	County	State	Water Body (Type – Crossing[a]) Use	Species, Habitat – Occurence Survey Results
Mainline Project (continued)				
874.7	Chariton	Missouri	East Fork Chariton River (R2 – OC)	Topeka shiner, poor habitat – no Topeka shiners
875.2	Chariton	Missouri	Tributary to East Fork Chariton River (R4 – OC)	Topeka shiner, poor habitat – dry
1024.7	St. Charles, Madison	Missouri, Illinois	Mississippi River (R2 – HDD) hydrostatic test water source, HDD water source	Pallid sturgeon, no fish survey Higgins' eye pearly mussel – no mussel surveys
1075.9	Fayette	Illinois	Kaskaskia River (R2 – HDD) hydrostatic test water source, HDD water source	Western sand darter, no fish survey
Cushing Extension				
51.2	Clay	Kansas	Republican River (R2 – HDD) hydrostatic test water source, HDD water source	Arkansas River shiner, silver chub, speckled chub, no fish survey
85	Dickinson	Kansas	Carry Creek (R4 – OC) hydrostatic test water source	Topeka shiner (SCH), suitable habitat – no Topeka shiners
87.0	Dickinson	Kansas	Carry Creek (R2 – OC) hydrostatic test water source	Topeka shiner (SCH), suitable habitat– no Topeka shiners
91.0	Dickinson	Kansas	Tributary of W. Branch Lyon's Creek (R4 – OC)	Topeka shiner (SCH), suitable habitat– no Topeka shiners
92.0	Dickinson	Kansas	West Branch Lyon's Creek (R2 – Dry)	Topeka shiner (SCH), poor habitat– no Topeka shiners
96.3	Dickinson	Kansas	Tributary of Lyon's Creek (R4 – OC)	Topeka shiner, suitable habitat– no Topeka shiners
96.8	Dickinson	Kansas	Tributary of Lyon's Creek (R4 – OC)	Topeka shiner, suitable habitat– no Topeka shiners
97.1	Dickinson	Kansas	Lyon's Creek (R2 – OC)	Topeka shiner, suitable habitat – no Topeka shiners
98.8	Dickinson	Kansas	Tributary of Lyon's Creek (R2 – OC)	Topeka shiner, suitable habitat– no Topeka shiners
103.2	Marion	Kansas	Tributary of Mud Creek (R4 – OC)	Topeka shiner (SCH), poor habitat– dry
105.2	Marion	Kansas	Tributary of Mud Creek (R4 – OC)	Topeka shiner (SCH), suitable habitat– no Topeka shiners
106.3	Marion	Kansas	Tributary of Mud Creek (R4 – OC)	Topeka shiner (SCH), suitable habitat– no Topeka shiners
108.7	Marion	Kansas	Tributary of Mud Creek (R4 – OC)	Topeka shiner (SCH), suitable habitat– no Topeka shiners

TABLE 3.8.1-14 (Continued)				
Approximate Milepost	County	State	Water Body (Type – Crossing[a]) Use	Species, Habitat – Occurence Survey Results
Cushing Extension (continued)				
117.1	Marion	Kansas	Cottonwood River (R2 – OC)	Neosho madtom, poor habitat – no Neosho madtoms fawnsfoot, creeper mussel, suitable habitat – no live or fresh dead fawnsfoot or creeper mussels – other live mussels found
205.7	Cowley	Kansas	Arkansas River (R2 – HDD) hydrostatic test water source, HDD water source	Arkansas River shiner (SCH), silver chub (SCH), Arkansas River speckled chub (SCH), suitable habitat – no target species observed
206.3	Cowley	Kansas	Spring Creek (R2 – OC)	Arkansas darter, suitable habitat – no Arkansas darters
288.5	Payne	Oklahoma	Cimarron River (R2 – HDD) hydrostatic test water source, HDD water source	Arkansas River shiner (SCH), suitable habitat– no Arkansas river shiners

FCH = Federally designated critical habitat.

SCH = State-designated critical habitat.

[a] Water body types: PEM = Palustrine emergent wetland, R2 = Perennial stream, R4 = Intermittent stream. Crossing techniques: OC = Open-cut construction techniques; Dry = Dry crossing techniques (flume or dam-and-pump methods); HDD = Horizontal directional drill method, as described in Keystone's Construction Mitigation and Reclamation Plan (CMR Plan); 1 = Soils within the wetland are anticipated to be dry at the time of construction, and mainline construction techniques will be implemented as described in the Project's CMR Plan (Appendix B).

Sources: TransCanada 2007b, d; ENSR 2006f, g; ENSR 2007d, e; f, g.

Keystone also has committed to implementing the following measures in its CMR Plan (Appendix B) to protect fish and mollusks:

- Keystone would coordinate water withdrawal with the appropriate USFWS Environmental Services field office when federally listed species inhabit or use the aquatic system.
- Throughout construction, contractors shall maintain adequate flow rates, such that small streams are not dewatered, to protect aquatic life and to prevent the interruption of existing downstream uses.
- Contractors shall locate all extra work areas (such as staging areas and additional spoil storage areas) at least 10 feet from the water's edge, if practicable.
- Prior to clearing, contractors shall flag the construction ROW at least 10 feet from the banks and ensure that riparian cover is maintained where practicable during construction.
- Temporary equipment crossings would be used, including portable bridges, bridges made from timber or mats, flumes, culverts, sand bags, subsoil, or coarse granular material and riprap.
- Contractors shall ensure that culverts and flumes of sufficient diameter are sized and installed to accommodate the existing flow of water and those that potentially may be created by sudden runoffs.

- Clearing and grubbing for temporary vehicle access and equipment crossings shall be carefully controlled to minimize sediment entering the water body from the construction ROW.
- Clearing and grading shall be performed on both sides of the water body prior to initiating any trenching work. All trees shall be felled away from watercourses.
- Plant debris or soil inadvertently deposited within the high water mark shall be promptly removed in a manner that minimizes disturbance of the water body bed and bank. Excess floatable debris shall be removed above the high water mark from areas immediately above crossings.
- Vegetation adjacent to water bodies that would be crossed by HDD wouldl not be disturbed, except by hand clearing as necessary for drilling operations.
- The contractor shall install sediment barriers immediately after any initial disturbance of the water body or adjacent upland.
- Streambank contours shall be reestablished. All debris shall be removed from the streambed and banks.
- Streambanks would be stabilized to prevent erosion using rock riprap, gabions, stabilizing cribs, or bio-stabilization measures to protect backfill prior to reestablishing vegetation cover.
- Any water obtained or discharges for hydrostatic testing would comply with permit notice requirements. Withdrawal rates may be limited as stated by permit.
- The contractor shall locate hydrostatic test manifolds 100 feet outside wetlands and riparian areas to the maximum extent practicable.
- Staging/work areas for filling pipeline with water shall be located a minimum of 50 feet from the water body or a wetland boundary.
- The contractor shall install temporary sediment filter devices adjacent to all streams where runoff may enter.
- Contractors shall screen the intake hose to prevent the entrainment of fish or debris. The hose shall be kept off the bottom of the water body.
- Contractors shall not use chemicals in the test water and shall not discharge any water containing oil or other substances that are in sufficient amounts to create a visible color film or sheen on the surface of the receiving water.
- Contractors shall not discharge into water bodies that provide habitat for federally listed threatened or endangered species unless appropriate federal, state, and local permitting agencies grant written permission.

Specific impacts and mitigation measures have been identified and developed for the species discussed separately below.

Pallid Sturgeon

River habitats used by the pallid sturgeon are not likely to be adversely affected by construction of the Keystone Project because Keystone plans to use HDD crossings at all major river crossings where pallid sturgeon may occur (Section 3.3). HDD does carry a risk of the escape of drilling fluids into rivers at the crossings, which could result in short-term sediment transport and water quality impacts that could adversely affect the pallid sturgeon. The use of significant amounts of surface waters for hydrostatic testing of the pipeline that would diminish Platte River flows could adversely affect pallid sturgeon in the lower Platte River. In addition, water withdrawal for HDD and hydrostatic testing from the Missouri

River at the Nebraska/South Dakota border, the Platte River in Nebraska, and the Mississippi River at the Missouri/Illinois border could entrain larval fish and uptake eggs of the pallid sturgeon.

To avoid impacts on pallid sturgeon, Keystone would:

- Consult with individual states and acquire all necessary permits needed for water withdrawal from the Lower Platte River drainage.
- Periodically check screened intake ends of water pumps for entrainment of fish. Withdrawal rates would be low, with velocities at the intake of less than 15 centimeters per second (cm/s), which would further reduce the potential for entrainment or entrapment. If a pallid sturgeon should become entrained, Keystone would immediately stop operations and contact USFWS to determine whether additional protection measures are required.
- Complete hydrostatic testing after August 1, when water use would be from water sources containing sensitive aquatic species.
- Return water used for hydrostatic testing back to its source within a 30-day period; this temporary water use would not be considered a "depletion" by USFWS.

The critical period for water withdrawal in the Lower Platte region (Columbus, Nebraska to the Missouri River) is February 1 through July 31 (Carey Grell, NGPC, February 5, 2007). Thus Keystone should avoid water withdrawals during February 1 through July 31 in the Lower Platte region (Columbus, Nebraska to the Missouri River) (John Cochnar, USFWS, February 5, 2007).

Construction of the Mainline Project and Cushing Extension may affect, but would not likely adversely affect the pallid sturgeon. Coordination with state resource agencies should continue concerning potential water withdrawal from the Lower Platte River drainage, with the goal of habitat impact avoidance, minimization, or mitigation.

Arkansas Darter

The distribution of the Arkansas darter is south and west of the Mainline Project, so construction of the Mainline Project would have no affect this species. The Cushing Extension crosses one tributary of the Arkansas River where the Arkansas darter has been identified in Kansas. Surveys for the Arkansas darter at this location indicated that the habitat was poorly suited for the species, and no Arkansas darters were captured.

To avoid impacts on the Arkansas darter, Keystone would:

- Not conduct construction activities, if suitable habitat exists within the ROW, during the Arkansas darter spawning period March 1 to May 31 at the Arkansas River or the unnamed tributary of the Arkansas River unless dry crossing or HDD methods are used.
- Implement erosion control measures and monitor the measures daily during construction to ensure effectiveness, particularly after storm events.
- Restore beds and banks of streams, as described in Keystone's CMR Plan (Appendix B).

Construction of the Mainline Project would not affect the Arkansas darter. Construction of the Cushing Extension would not likely affect the Arkansas darter at the stream crossing discussed above.

Coordination with state and federal resource agencies should continue concerning the potential to affect the Arkansas darter and its habitat at this crossing, with the goal of habitat impact avoidance, minimization, or mitigation.

Arkansas River Shiner

The distribution of the Arkansas River shiner is generally found south and west of the Mainline Project, so construction of the Mainline Project would not affect this species. The Cushing Extension crosses the Republican River, the Arkansas River and the Cimarron River where the Arkansas River shiner has been identified in Kansas and Oklahoma. The Arkansas River is designated critical habitat for this species. Habitat surveys were completed during August 2007 at the Arkansas River and Cimarron River crossing locations of the Cushing Extension. Habitat was considered suitable for this species at both of these locations, although no Arkansas River shiners were captured at either location.

Designated critical habitat in the Arkansas and Cimarron Rivers would be crossed using HDD. Water withdrawal for HDD and hydrostatic testing are planned at both of these rivers. Although intake ends would be screened, the pelagic eggs or young larvae of the Arkansas River shiner drifting in these rivers could be entrained and destroyed during water withdrawal for HDD, which may occur during the Arkansas River shiner's spawning period. Water withdrawal for hydrostatic testing would require much larger volumes but generally would be completed after August 1, unless specific approval is obtained in advance from the appropriate resource agencies.

To avoid impacts on the Arkansas River shiner and its critical habitats, Keystone would:

- Not conduct construction activities for HDD crossings described above, which constitute suitable habitat, during the Arkansas River shiner spawning period from March 1 to May 31.
- Periodically check screened intake ends of HDD water pumps for entrainment of fish. Withdrawal rates and total water consumption would be low, with uptake velocities of less than 15 cm/s, which would further reduce the potential for entrainment or entrapment.
- Periodically check screened intake ends of hydrostatic testing water pumps for entrainment of fish. Because withdrawal rates and total water use for hydrostatic testing are greater than those for HDD, hydrostatic testing generally would occur after August 1 in waterbodies where sensitive species are located in order to avoid entrainment of larval fish and eggs.

Construction of the Mainline Project would not affect the Arkansas River shiner. Construction of the Cushing Extension would not likely adversely affect the Arkansas River shiner or its designated critical habitat in the Arkansas and Cimarron Rivers, because these crossings would be completed using HDD with additional planned mitigation. Coordination with state and federal resource agencies should continue concerning the potential to affect the Arkansas River shiner and its habitats at these crossings, with the goal of impact avoidance, minimization, or mitigation.

Topeka Shiner

Keystone completed habitat assessment surveys at each pipeline stream crossing in areas designated by USFWS-South Dakota, SDGFP, KDWP, and MDC for the Mainline Project and the Cushing Extension. The Mainline Project surveys assessed suitability of these habitats based on the current understanding of life history requirements for Topeka shiners (Table 3.8.1-14). Presence/absence surveys then were conducted to determine the relative abundance of fish species, with emphasis on determining whether Topeka shiner populations were present (Table 3.8.1-14). Topeka shiner habitat was assessed at 51 stream crossings: 39 stream crossings of the Mainline Project and 12 stream crossings of the Cushing

Extension (Table 3.8.1-14). Occurrence surveys were completed at 28 crossings with habitat suitable for supporting Topeka shiners: 17 Mainline Project crossings and 11 Cushing Extension crossings. Topeka shiners were found at two Mainline Project crossings: Redstone Creek in Miner County, South Dakota and North Elm Creek in Marshall County, Kansas (Table 3.8.1-14). Crossings at both of these locations would be completed using dry open-cut crossing methods, as described in Keystone's CMR Plan. Additional crossings potentially containing Topeka shiners along the Mainline Project that have been identified for dry open-cut crossings include North Fork and South Fork Foster Creek (Clark County), West Redstone Creek and Rock Creek (Minor County), Wolf Creek (McCook County), and Wolf Creek (Hutchinson County) in South Dakota; North Elm Creek (one of two crossings) (Marshall County) in Kansas; and Log Creek and Brush Creek (Caldwell County) in Missouri (Table 3.8.1-14). No Topeka shiners were found at the stream crossings for the Cushing Extension (Table 3.8.1-14). The West Branch Lyon's Creek (Dickson County) in Kansas along the Cushing Extension also has been identified for a dry open-cut crossing method (Table 3.8.1-14).

Topeka shiners can be affected by direct habitat impacts, such as channel degradation or water quality impacts from increased sedimentation, which also can include riparian vegetation impacts. Topeka shiners also may be affected by water withdrawal during hydrostatic testing at identified water sources in South Dakota on Redstone Creek (Miner County), Wolf Creek (Hansen County), and James River (Yankton County) for the Mainline Project; and in Kansas on Carry Creek (Dickinson County) for the Cushing Extension.

To avoid impacts on the Topeka shiner, Keystone would:

- To protect the Topeka shiner from significant impacts associated with the Project, prohibit all work within the bed or banks of identified Topeka shiner streams annually during the species' spawning season of May 15 through July 31.
- Conduct salvage and relocation efforts at all crossings outside of the spawning season. For this work the following provisions would be implemented by a qualified biologist who has obtained the necessary state and federal collecting permits:
    - The salvage and relocation efforts would occur within 2 weeks prior to commencing work within the bed and banks of each identified stream. Repeated salvage and relocation efforts would be completed if high-water events delay construction activities more than 2 weeks following the initial salvage and relocation efforts.
    - Salvage efforts would occur in all pools of affected streams that contain suitable habitat for the Topeka shiner within the ROW.
    - Extensive effort would be made to collect all individuals of the species, including multiple seine attempts within pools upstream and downstream.
    - Temporary cofferdams would be used to block off the work area in which salvage operations occur.
    - Relocation activities would occur during ambient weather conditions suitable to ensure survivorship during relocation. Collection and relocation efforts would be performed in the early daytime hours to avoid ambient air temperatures that exceed 80 ºF.
    - Individual Topeka shiners would be held in proper transfer containers that ensure suitable water quality conditions. This includes using aeration equipment and ensuring that water temperatures in transfer containers do not exceed ambient water temperatures. Ambient water temperature would be collected at a depth no more than 60 percent of maximum pool depth from the pools in which salvage efforts are attempted.

- Salvage and relocation efforts would be implemented rapidly to avoid excessive holding time prior to relocation.
- The relocation site would be upstream (if feasible) and include pool(s) of similar size and depth as pools from which Topeka shiners are collected. No significant differences in habitat conditions (including riparian canopy cover) or water quality would occur between the salvage pools and the relocation pools.

- Implement erosion control measures as described in Keystone's CMR Plan. Erosion and sediment controls would be monitored daily during construction to ensure effectiveness, particularly after storm events.
- Restore banks and streambeds using erosion control and revegetation measures as described in Keystone's CMR Plan.
- Withdraw no more than 10 percent of the ambient stream flow and maintain adequate flow rates in the waterbody to protect aquatic life and provide for downstream uses.
- Avoid water withdrawal for hydrostatic tests until after August 1, unless specific approval is obtained in advance from the appropriate regulatory or resource agency.
- During operation of the pipeline and during routine inspection and maintenance, ensure that crews are aware of the location of populations of Topeka shiners within the ROW and clearly mark locations on maps and in described in maintenance orders.

The Mainline Project would cross state-designated critical habitats at North Elm Creek in two locations and at a tributary to North Elm Creek in Marshall County, Kansas (Table 3.8.1-14). Based on the accumulated site information, construction of the Mainline Project would not result in any foreseeable negative effects on the Topeka shiner at the stream crossings surveyed in Missouri (Table 3.8.1-14). The Cushing Extension would cross state-designated critical habitats at Carry Creek (two crossings), West Branch Lyon's Creek, and a tributary to West Branch Lyon's Creek in Dickson County, Kansas; and Mud Creek (including four Mud Creek tributary crossings) in Marion County, Kansas.

Construction of the Mainline Project may affect, but is not likely to adversely affect state-designated critical habitat in Kansas; the Topeka shiner in Missouri; and the Topeka shiner at the two stream crossings where they occur: Redstone Creek (Miner County) in South Dakota and North Elm Creek (Marshall County) in Kansas. Construction of the Cushing Extension may affect, but is not likely to adversely affect state-designated critical habitat for the Topeka shiner in Kansas. Coordination with federal and state resource agencies should continue concerning the documented occurrences and the state-designated critical habitats for the Topeka shiner, with the goal of habitat impact avoidance, minimization, or mitigation.

Neosho Madtom

The distribution of the Neosho madtom is generally found south of the Mainline Project; therefore, construction of the Mainline Project would not affect this species. The Cushing Extension would cross the Cottonwood River where the Neosho madtom has been identified in Kansas. The mainstem Cottonwood River is state-designated as critical habitat for this species, from where it enters Chase County downstream to its confluence with the Neosho River. The crossing of the Cushing Extension in Marion County would be upstream from the state-designated critical habitat for this species. No federal critical habitat has been designated for the Neosho madtom. The Cottonwood River would be crossed using wet open-cut methods, as described in Keystone's CMR Plan (Appendix B). The Cottonwood River was not identified as a potential water source for hydrostatic testing.

Keystone completed a habitat assessment at the Cottonwood River crossing for the Cushing Extension and found that the habitat was poorly suited for the Neosho madtom. Occurrence surveys were completed and no Neosho madtoms were collected at or near the crossing location (ENSR 2007f).

Construction of the Mainline Project would not affect the Neosho madtom. Construction of the Cushing Extension would not affect the Neosho madtom or potential habitat in the Cottonwood River because this species was not found to occur at this location.

Higgins' Eye Pearlymussel and Scaleshell Mussel

These large river mollusks may occur at the following crossing locations on the Mainline Project:

- Yankton, South Dakota – MP 437.6 – Missouri River;
- Doniphan, Kansas – MP 750.8 – Missouri River; and
- St. Charles, Missouri – MP 1024.7 – Mississippi River.

Construction of the Keystone pipeline across the Missouri and Mississippi Rivers would use the HDD method; therefore, benthic habitats for these mussels would not be affected by pipeline construction. Hydrostatic test waters would be returned to the same location from which it was withdrawn. All equipment used to pump water would be thoroughly cleaned between locations where water would be withdrawn for HDD and hydrostatic testing to prevent any movements of zebra mussels. Because the mussels are not expected at any other river or stream crossings, no effects on these species are anticipated from construction of the Mainline Project or Cushing Extension pipelines.

Federally Protected Plants

Potential construction- and operations-related impacts on special-status plant species generally would be the same as those described for vegetation communities in Section 3.5.5, including:

- Temporary and permanent modification of vegetation community composition and structure from clearing and operational maintenance;
- Increased risk of soil erosion from lack of vegetative cover;
- Expansion of invasive and noxious weed populations along the pipeline ROW as a result of construction and operational vegetation maintenance;
- Loss of plant species and habitats as a result of construction clearing and grading;
- Soil and sod disturbance (mixing of topsoil with subsoil with altered biological activities and chemical conditions that could affect reestablishment and natural recruitment of listed plant species after restoration);
- Compaction and rutting of soils from movement of heavy machinery and transport of pipe sections, altering natural hydrologic patterns, inhibiting seed germination, or increasing siltation; and
- Alteration in vegetation productivity and phenology because of increased subsurface soil temperatures associated with heat loss from the pipeline.

Keystone has committed to implement the following measures in its CMR Plan (Appendix B) for native prairie species:

- Contracting a qualified biologist to conduct a survey of sensitive species associated with native tall-grass prairie.
- Working with regulatory authorities if sensitive species are identified in the construction ROW, to determine whether any additional protection measures would be required.
- Once construction is complete, disturbance in native prairie would be reclaimed to native prairie species using native seed mixes specified by applicable state and federal agencies with the intent there will be no net loss of native prairie habitat.
- To minimize impacts to native prairie, no permanent developments, such as access roads or pump stations, would be constructed in native prairie tracts if feasible.

In addition to these general impacts and mitigation measures, specific impacts and mitigation measures have been identified for the species described below.

Decurrent False Aster

In the Keystone Project area, the decurrent false aster is known to occur in the floodplains of the Missouri and Mississippi Rivers. A number of populations are known from the Missouri River and Mississippi River floodplains in St. Charles County, Missouri and in Madison County, Illinois. Surveys for the decurrent false aster in the Mississippi River floodplain in Confluence State Park, St. Charles County Missouri identified no decurrent false asters within the Keystone Project ROW.

The Missouri Department of Conservation has developed Best Management Practices (BMPs) for projects in areas where the decurrent false aster is likely to occur. USFWS recommends that Keystone follows these BMPs to minimize potential impacts to the decurrent false aster. These BMPs are voluntary and include:

- Survey for the presence of decurrent false aster during the August-to-October flowering period.
- Maintain open, moist, early successional habitat that receives periodic inundation from Mississippi River floodwater. Established populations need newly disturbed areas in which to spread.
- Avoid general application of non-specific herbicides. Monocot-specific herbicides can be spot-applied with minimal threat to decurrent false aster.
- Resurvey following significant flooding, as decurrent false aster populations are frequently redistributed by flood waters.
- Use cutting, prescribed burns, or herbicides to reduce colonization of sites by cottonwoods, willows, and other wetland woody species.
- Low, wet areas of agricultural fields occupied by decurrent false aster should be cultivated only with adequate frequency to prevent succession to heavy shade-producing species, perhaps every third year.
- Avoid any changes to drainage patterns that would lessen accessibility of sites to Mississippi River flood waters.
- Avoid mowing of decurrent false aster populations during the May-through-October growing period.

Keystone has developed a small route variation in consultation with USFWS and the Missouri Department of Natural Resources through the Confluence State Park to avoid an area of recently planted hardwood trees and an area where decurrent false asters are located. To avoid impacts on the decurrent false aster, Keystone would:

- Conduct surveys prior to construction within suitable habitat during the flowering period.
- Reduce the width of the construction ROW in areas where populations have been identified, to the extent possible.
- Appropriately salvage and segregate topsoil where populations have been identified to preserve native seed sources in the soil for use in re-vegetation efforts.
- Restore habitat by using an approved seed mix provided by the NRCS or appropriate state agency.
- Collect seed to repopulate the ROW or an appropriate offsite location, or for creation of a nursery population until viable natural populations have established themselves.
- Avoid the population by rerouting around plants or boring under plants.
- Monitor populations for two years after construction to identify and remove exotic weed, grass, or legume species that could hinder the re-establishment of the decurrent false aster.

Construction of the Mainline Project in the Missouri River floodplain in St. Charles County, Missouri; and in the Mississippi River floodplain in Madison County, Illinois may affect, but is not likely to adversely affect the decurrent false aster with implementation of the measures listed above. Surveys for this species would aid in avoidance of the species, but suitable habitat areas may be crossed and altered by construction activities. Adopting conservation measures such as those recommended by the MDC could aid in minimizing effects on the decurrent false aster. Coordination with state and federal resource agencies should continue concerning the potential to affect the decurrent false aster and its habitats, with the goal of habitat impact avoidance, minimization, or mitigation.

Western Prairie Fringed Orchid

Surveys along the proposed pipeline ROW for western prairie fringed orchid habitat were completed in September 2006 and May 2007. Occurrence surveys were completed in June and July 2007. An area was categorized as suitable for the western prairie fringed orchid if: (1) it was possible for the grassland to be sub-irrigated (sub-irrigation was evaluated by the proximity of wetlands to the grassland site); (2) the wetland area had upland inclusions; and (3) the site was in the range of where this orchid potentially could occur.

The surveys identified suitable habitats for the western prairie fringed orchid that would be affected by the Mainline Project at seven sites in South Dakota, and five sites in Nebraska (Table 3.8.1-15).

TABLE 3.8.1-15
Western Prairie Fringed Orchid Habitats Potentially Affected along the Keystone Project Route

Milepost	State	County	Habitat Quality and Occurrence	Summary
258.2–258.4	South Dakota	Day	High – no WPFO	Abundance of native grasses, sedges, and over 30 native forbs
278.0–278.8	South Dakota	Clark	Medium – no WPFO	Mosaic of pasture/wetland and grassland
279.4–280.0	South Dakota	Clark	Medium – no WPFO	Mosaic of pasture/wetland and grassland
385.3–385.8	South Dakota	McCook	Medium to high – no WPFO	Smooth brome pasture with wetlands and native grassland on hills
392.1–392.9	South Dakota	Hutchinson	High – no WPFO	By Wolf Creek, rolling, native prairie hills
422.3–422.7	South Dakota	Yankton	High – no WPFO	Scattered little blue stem and abundance of native forbs
392.1–392.9	South Dakota	Yankton	High – no WPFO	Near James River, native prairie ridges between tree lined ravines
439.8–440.2	Nebraska	Cedar	Medium to high – no WPFO	Rolling hills with mix of native grasses
505.8–506.9	Nebraska	Stanton	High – no WPFO	High-quality native sandy prairie near Elkhorn River
542.9–543.3	Nebraska	Colfax	Medium to low – no WPFO	Native sedges in sandy oxbow are of Platt River, scattered native forbs
624.3–624.4	Nebraska	Jefferson	High – No WPFO	No access – mixed-grass native prairie site
639.1–640.4	Nebraska	Jefferson	Medium to high – No WPFO	Large tracts of native grasses and forbs

WPFO = Western prairie fringed orchid.

Source: ENSR 2007h.

The Missouri Department of Conservation has developed Best Management Practices (BMPs) for projects in areas where the western prairie fringed orchid is likely to occur. These BMPs are voluntary and include:

- Survey high-quality prairies during the flowering period to determine whether the orchid is present.
- At known occurrences or sites where presence is expected, avoid herbicide use during the growing season unless spot spraying is used on target species.
- Do not mow during the orchid's growing season.
- Maintain or promote hydrologic conditions fostering prairie swales and bottomland prairies.
- Avoid any pesticide use at prairie sites that might affect the species' pollinators.

To avoid impacts on identified populations of the western prairie fringed orchid, Keystone would:

- Conduct preconstruction surveys within suitable habitat if construction activities were to occur during the flowering period.
- Reduce the width of the construction ROW in areas where populations have been identified, to the extent possible.
- Salvage and segregate topsoil where populations have been identified to preserve native seed sources in the soil for use in re-vegetation efforts.
- Restore habitat by using an approved seed mix provided by the NRCS or appropriate state agency.
- Collect seed to repopulate the ROW or an appropriate offsite location, or for creation of a nursery population until viable natural populations have established themselves.
- Avoid the population by rerouting around plants or boring under plants.
- Monitor populations for two years after construction to identify and remove exotic weed, grass or legume species that could hinder the re-establishment of the western prairie fringed orchid.

Construction of the Mainline Project in native wet prairie habitats in North Dakota, South Dakota, and Nebraska may affect, but is not likely to adversely affect the western prairie fringed orchid. Surveys for this species would aid in avoidance of the species, but suitable habitat areas may be crossed and altered by construction activities. Adopting conservation measures such as those recommended by MDC could aid in minimizing effects on the western prairie fringed orchid. Coordination with federal and state resource agencies should continue concerning the potential to affect the western prairie fringed orchid or suitable habitats, with the goal of impact avoidance, minimization, or mitigation.

Connected Actions

Approximately 181 miles of new transmission lines and 22 miles of upgraded transmission lines would be required to power pumpstations along the Mainline, with about 12 miles of new lines for the Cushing Extension (see Section 2.14). New electrical power line segments would potentially cross native grassland habitats where the western prairie fringed orchid may occur. Construction and vegetation maintenance for transmission lines could impact the western prairie fringed orchid if the species occurs within the transmission line ROW. Transmission lines supporting 16 Mainline Project pump stations and two Cushing Extension pump stations would be located within the range of the western prairie fringed orchid in North Dakota, South Dakota, Kansas, and Nebraska. Approximately 182 miles of transmission lines would affect approximately 22 acres of emergent wetland habitats in North Dakota, South Dakota, and Nebraska where the western prairie fringed orchid could occur (see Table 3.4.3.1-1).

In the modification or construction of transmission lines, servicing electric cooperatives or their contractors would locate The ROW to avoid sensitive vegetation conditions including wetlands where practical. If the wetlands are linear they would cross them at the least sensitive feasible point.

Electrical service providers and RUS, where applicable, would coordinate with the appropriate state and federal resource agencies to identify specific locations where avoidance or minimization measures for the western prairie fringed orchid would be necessary.

Running Buffalo Clover

In the Keystone Project area, running buffalo clover is known to occur on the floodplain of the Cuivre River in Cuivre River State Park in Lincoln County, Missouri. The plant also may occur within the floodplains of the Missouri, Grand, Chariton, Middle Fork Chariton, East Fork Chariton, West Fork Cuivre, Cuivre, and Missouri/Mississippi Rivers. Potential suitable habitats for running buffalo clover within the floodplains of the West Fork Cuivre River and the Cuivre River in Missouri would be surveyed prior to construction. If these surveys identify running buffalo clover, Keystone would consult with USFWS to determine appropriate mitigation measures.

MDC has developed BMPs for projects in areas where running buffalo clover is likely to occur. USFWS recommends that Keystone follow these BMPs to minimize potential impacts to running buffalo clover. These BMPs are voluntary and include:

- Project activity in the vicinity of known running buffalo clover sites should be consistent with the maintenance of open woodland habitat. Moderate disturbances such as prescribed fire and grazing should be allowed to continue in order to maintain suitable habitat.
- Do not use herbicides at running buffalo clover sites unless all of the clover plants are located and spot spraying can be conducted without contacting the clover.
- Selective harvest of timber is acceptable if clover plants are protected from physical destruction and a partial tree canopy is maintained.
- Do not mow or otherwise disrupt plants during the period of sexual reproduction (April through August).

If required to avoid impacts on running buffalo clover, Keystone would:

- Reduce the width of the construction ROW in areas where populations have been identified, to the extent possible.
- Salvage and segregate topsoil appropriately where populations have been identified to preserve native seed sources in the soil for use in re-vegetation efforts in the ROW.
- Restore habitat by using an approved seed mix provided by the NRCS or appropriate state agency.
- Collect seed to repopulate the ROW or an appropriate offsite location, or for creation of a nursery population until viable natural populations have established themselves.
- Avoid the population by rerouting around plants or boring under plants.
- Implement procedures in the ROW maintenance plan that would not allow mowing or disruption of the plants during the period of sexual reproduction (April through August).

Construction of the Mainline Project in open woodland habitats in Missouri may affect, but is not likely to adversely affect running buffalo clover. Surveys for this species would aid in avoidance of this species, but suitable habitat areas may be crossed and altered by construction activities. Adopting conservation measures such as those recommended by MDC—along with any mitigation measures developed during continued consultation, if this species is identified within the Keystone ROW—would minimize any effects on running buffalo clover. Coordination with federal and state resource agencies should continue concerning the potential to affect running buffalo clover or suitable habitats, with the goal of impact avoidance, minimization, or mitigation.

Platte River Basin Water Depletions

In addition to the effects described above for the federally protected species, water depletions to the Platte River system in Nebraska may affect the federally protected piping plover, interior least tern, pallid sturgeon, bald eagle, and western prairie fringed orchid. Depletions include evaporative losses and consumptive use, which often is characterized as diversions from the Platte River or its tributaries, less return flows. Facilities and activities that could be associated with depletions to the Platte River system include, but are not limited to, ponds (detention, recreation, irrigation storage, stock watering), lakes (recreation, irrigation storage, municipal storage, power generation), reservoirs (recreation, irrigation storage, municipal storage, power generation), created or enhanced wetlands, hydrostatic testing of pipelines, wells, diversion structures, dust abatement, and water treatment facilities. Any actions that may result in a water depletion to the Platte River system should be identified. Overall, if specific proposed project activities result in the consumptive use of Platte River system water, these activities would need to be identified and the amount and timing of the depletion calculated and provided to the USFWS.

Since 1978, USFWS has concluded in all of its ESA Section 7 consultations on water projects in the Platte River basin in Nebraska that the Platte River ecosystem is in a state of jeopardy, and that any federal action resulting in further water depletion to the Platte River system will further or continue deterioration of the stressed habitat conditions. Due to the cumulative effect of many water depletion projects in the Platte River basin, USFWS considers any depletion of flows (direct or indirect) from the Platte River system to be significant. Consequently, USFWS has adopted a jeopardy standard for all Section 7 consultation on federal actions that result in water depletions to the Platte River system in Nebraska, Colorado, and Wyoming. USFWS considers the Platte River and its associated wetland habitats to be resources of national and international importance.

The Keystone Project potentially would use water from the Lower Platte River basin, including the Elkhorn River (MP 505), and the Platte River (MP 543) for hydrostatic testing, which could result in an instream flow depletion to the lower Platte River. Such depletion would adversely affect federally listed species, as described above. USFWS's primary concern is the potential effects of hydrostatic testing on the Platte River system during the February-through-July period. Keystone anticipates that testing and discharge would occur during spring, summer, and fall months. For water bodies that contain sensitive species, Keystone will generally avoid withdrawal of hydrostatic test water until after August 1, unless specific approval is obtained in advance from the appropriate regulatory or resource agency(ies).

Keystone is responsible for acquiring all permits required by federal, state, and local agencies for procurement of water and for discharge of water used in the hydrostatic testing operation. Keystone anticipates that the pipeline would be hydrostatically tested in approximately 30-mile sections (maximum of 50-mile sections). This process includes filling the line with water, pressurizing the section to at least 1.25 times the maximum allowable operating pressure, and maintaining that pressure for a period of 8 hours. Water used for the testing then would be transferred to another pipe section for subsequent hydrostatic testing. Once testing is completed, the water would be returned to the drainage (discharged).

Assuming a 30-mile average test section length, the Mainline Project would require approximately 36 test sections. The volume of water required to test one 30-mile section of 30-inch-diameter pipeline is about 18 acre-feet. Assuming that test water could be reused in three test sections, 12 withdrawals would be required (36/3), and a total volume of approximately 216 acre-feet of water would be required for testing the entire Mainline Project. Assuming that approximately 150 miles of the Mainline Project through Nebraska would be hydrostatically tested using water from the Lower Platte River Basin; approximately 36 acre feet (five 30-mile test sections, and reuse of water to test three sections) would be required for a one-time use. Keystone has agreed that water withdrawn from the Lower Platte River basin for hydrostatic testing activities would be returned to the same location during a 30-day period.

Average monthly flow rates for potential water sources including the Elkhorn River, and the Platte River during 2000 to 2006 are presented in Table 3.8.1-16. The total volume required for testing this section of the Mainline Project as calculated above (36 acre-feet) represents between 6 and 11 percent of the average monthly flow as acre-feet/day for the Elkhorn River (Figure 3.8.1-1), and between 2 and 15 percent of the average flow for the Platte River (Figure 3.8.1-1) from August through January. Keystone's Draft Hydrostatic Test Plan (Appendix B), however, indicates estimated volumes of 26.6 acre-feet for the Elkhorn River and 1.1 acre-feet for the Platte River—or 8 percent and 1 percent, respectively, of the lowest daily flow rates for these water sources during August (Table 3.1.1-16).

For hydrostatic test withdrawal and discharge activities associated with the Platte River, Keystone would notify USFWS and the Nebraska Department of Natural Resources during construction of the anticipated hydrostatic test and withdrawal period. To avoid impacts on federally protected species in the Lower Platte River basin, Keystone would:

- Provide a detailed hydrostatic test plan that describes the specific test sections; quantities of water required by water source; location, timing, and duration of withdrawals; and location, timing, and duration of discharges including:
    - An estimate of the amount and timing of average annual water use (both historical and new uses) and the methods of arriving at such estimates;
    - The location of where water use or diversion occurs, as specifically as possible;
    - If and when the water would be returned to the system; and
    - For what purpose the water is being used.
- Maintain adequate flow rates in water bodies used for water withdrawal for HDD and hydrostatic testing by limiting withdrawal to not more than 10 percent of the ambient stream flow to protect aquatic life, provide for all water body uses, and provide for downstream withdrawals of water by existing users, in compliance with regulatory and permit requirements.
- Avoid water withdrawal from February 1 through July 31 in the Lower Platte region.
- Ensure that hydrostatic test water is withdrawn and discharged in the same watershed and that no chemicals are added to the hydrostatic test water.
- Ensure that no discharge of any water occurs that contains oil or other substances in a sufficient amount to create a visible color film or sheen on the surface of the receiving water.
- Ensure that the pipeline is cleaned prior to the hydrostatic testing.

TABLE 3.8.1-16
Average Monthly Stream Flows for Potential Hydrostatic Test Water Sources in the Lower Platte River Basin along the Keystone Project Route

	Elkhorn River at Norfolk, Nebraska (USGS 06799000)			Platte River near Duncan, Nebraska (USGS 06774000)		
	cfs	ac-ft/ day	ac-ft/ mo	cfs	ac-ft/ day	ac-ft/ mo
January	295	585	17554	1,040	2,063	61,884
February	**362**	**718**	**21,540**	**1,140**	**2,261**	**67,835**
March	**536**	**1,063**	**31,894**	**1,310**	**2,598**	**77,950**
April	**985**	**1,954**	**58,612**	**1,110**	**2,202**	**66,050**
May	**772**	**1,531**	**45,937**	**1,130**	**2,241**	**67,240**
June	**645**	**1,279**	**38,380**	**550**	**1,091**	**32,727**
July	**259**	**514**	**15,412**	**153**	**303**	**9,104**
August	165	327	9,818	120	238	7,140
September	173	343	10,294	205	407	12,198
October	208	413	12,377	387	768	23,028
November	280	555	16,661	606	1,202	36,060
December	306	607	18,208	944	1,872	56,172

cfs = Cubic feet per second.
ac-ft/day = Acre-feet per day.
ac-ft/mo = Acre-feet per month.

Notes:

Values are monthly averages during the 6-year period from September 2000 to September 2006.

Boldface text indicates months of particular concern for water withdrawal (John Cochnar, USFWS, May 27, 2007)

Sources: USGS Surface-Water Monthly Statistics for the Nation. Data accessed online at <http://waterdata.usgs.gov/nwis> on May 31, 2007. Potential source waters identified by USFWS (John Cochnar, USFWS, May 27, 2007).

3.8.2 State-Listed Threatened and Endangered Species

In addition to the federally protected species described above, six of the seven states crossed by the Keystone Project maintain state statutes and lists of endangered and threatened animals and plants. The following sections describe species identified during consultation with state agencies as potentially occurring within the Keystone Project area that could be affected by Project construction and that are protected by the states as endangered or threatened species.

Keystone coordinated development of species surveys and avoidance, minimization, and mitigation measures with the following state wildlife agencies that have state statutes related to endangered and threatened animals or plants:

- South Dakota Game, Fish and Parks (SDGFP);
- Nebraska Game and Parks Commission (NGPC);
- Kansas Department of Wildlife and Parks (KDWP);

- Missouri Department of Conservation (MDC);
- Illinois Department of Natural Resources (IDNR); and
- Oklahoma Department of Wildlife Conservation (OKDWC).

Keystone coordinated development of species surveys and avoidance, minimization, and mitigation measures with North Dakota Game and Fish Department (NDGFD) for federally listed species occurring within North Dakota, which are described in the preceding section.

3.8.2.1 State-Protected Birds

State-listed threatened and endangered birds include waterbirds (king rail, least bittern, and yellow-crowned night heron) raptors (northern harrier, osprey, and barn owl), loggerhead shrike, Henslow's sparrow, and greater prairie-chicken (Table 3.8.1-1). Habitat preferences, distribution, and lifecycles for these species are discussed below.

Waterbirds – King Rail, Least Bittern, and Yellow-Crowned Night Heron

The king rail, least bittern, and yellow-crowned night heron are state listed as threatened or endangered in Illinois or Missouri. King rails have been documented in Seward County, Nebraska; and suitable habitat for this species occurs along the ROW in Buchanan, Carroll, Chariton, Lincoln, and St. Charles Counties is Missouri. Least bittern have been documented in Buchanan, Chariton, Lincoln, and St. Charles Counties in Missouri, and in Madison and Fayette Counties in Illinois. Yellow-crowned night herons have been recorded within 5 miles of the pipeline ROW in Fayette County, Illinois; and a rookery is located in Pontoon Beach (ENSR 2006a).

Bitterns, and rails nest in wetland habitats with dense stands of emergent vegetation. King rails prefer extensive wetlands with abundant grasses, sedges, rushes, and cattails. Nest sites are in herbaceous cover over shallow water in river floodplains. Adult king rails molt completely after nesting and are flightless for nearly a month after breeding between April and June. Least bittern nest from May to July. The yellow-crowned night heron nests in trees, either singly or colonially. Nesting colony sites are used year after year.

Raptors – Northern Harrier, Osprey, and Barn Owl

The northern harrier is state listed as endangered in Missouri and Illinois, the osprey is state listed as threatened in South Dakota and as endangered in Illinois, and the barn owl is state listed as endangered in Missouri and Illinois. Raptor surveys along the Keystone Project ROW identified northern harriers in South Dakota. These birds are ground nesters; they use marshes, meadows, grasslands, and cultivated fields for nest sites. Harriers may perch on the ground, or on stumps or fence posts. Nests are commonly found near low shrubs, in tall weeds or reeds, and sometimes in bogs, on top of low shrubs above the water, or on knolls or shrubby ground near water.

Ospreys build large nests in living or dead trees, but will also use artificial structures such as telephone poles or microwave towers. No ospreys were identified by state resource agencies as occurring within the Keystone Project ROW. They are most likely to occur along the ROW as migrants, although there are two hack sites for the purpose of re-establishing this species at the Missouri River crossing of the Mainline Project ROW in Yankton County, South Dakota. Raptor surveys along the Mainline Project and Cushing Extension ROWs did not identify any natural osprey nests.

Barn owls nest in cavities, cliff crevices, cut bank burrows, or barns. They have been observed in the Carlyle Lake area of the Keystone ROW. The breeding season for barn owls is late winter, spring, and early summer. Barn owls feed primarily on rodents.

Loggerhead Shrike

The loggerhead shrike is state listed as threatened in Illinois and is a species of conservation concern in Missouri. Loggerhead shrikes have been reported from Buchanan County in Missouri and Bond, Fayette, and Marion Counties in Illinois. Loggerhead shrikes may nest in the Carlyle Lake WMA, and Keystone plans to complete pre-construction surveys for this species at this location (ENSR 2006c).

The loggerhead shrike nests in open habitats with mixed shrublands and hedgerows with scattered thorny trees. Nesting peaks in late April in Missouri and in Illinois, with a second peak in late May in Missouri. Grasshoppers comprise a large portion of their diet and they are susceptible to pesticides—both through actions on their prey and through bioaccumulation.

Henslow's Sparrow

The Henslow's sparrow is state listed as endangered in Illinois and is a species of conservation concern in Kansas and Missouri. The sparrow nests in tall-grass prairie habitats and has been reported from Butler, Dickinson, and Nemaha Counties in Kansas; Randolph and Clinton Counties in Missouri; and Marion County in Illinois. No large grassland habitats suitable for Henslow's sparrows would be crossed by the Keystone Project in Illinois, and Keystone does not plan to complete pre-construction surveys specific to this species. However, the species likely would be documented during general nesting surveys that would be required if construction occurred during the breeding season. Meadows, open grasslands, abandoned fields with wet areas, dense grass-forb mosaics, and scattered small woody shrubs appear are essential habitat for Henslow's sparrows. Nesting occurs from April to July.

Greater Prairie-Chicken

The greater prairie-chicken is state listed as endangered in Missouri and is a species of conservation concern in North Dakota. Along the Keystone ROW, greater prairie-chickens have been reported from Sargent County in North Dakota and Audrain County in Missouri. Greater prairie-chickens nest in mixed-grass and tall-grass prairies bordered by oak forests and croplands; they are non-migratory. Prairie-chickens form leks during mating, with hens establishing nests in the vicinity of displaying males. This concentration of nesting and traditional use of habitats makes identification and preservation of lek habitats a priority in preservation of the species.

Summer diets are primarily insects, especially grasshoppers. At other times of the year prairie-chickens eat grains, fruit, leaves, flowers, shoots, and seeds. Population declines are attributed primarily to loss and fragmentation of tall-grass prairie, and competition from introduced ringneck pheasants.

3.8.2.2 State-Protected Mammals

The river otter is the only state-listed threatened and endangered mammal identified as potentially affected by the Keystone Project (Table 3.8.1-2). Habitat preferences, distribution, and lifecycle are discussed below.

River Otter

The river otter is state listed as threatened in Nebraska and recently was removed from listing in Illinois. For the Keystone Project, river otters have been documented at the Elkhorn and Platte River crossings in Stanton and Colfax Counties in Nebraska. They are also known to occur within 5 miles of the ROW in Illinois.

River otters use rivers, streams, lakes, ponds, marshes, and beaver ponds—especially near water bodies with wooded shorelines or nearby wetlands. When resting or bearing young, river otters use hollow logs, spaces under roots, logs, or overhangs; abandoned beaver lodges; and dense thickets near water or burrows of other animals. Although otters are generally highly mobile, during the denning season (March to September), they are tied to a particular den site. In Nebraska, otter pups are born between March 1 and May 31 and do not leave the den for 2 months after birth. The pups may remain near the den site for a month after leaving the den. Otters may use dens built by beavers or other animals. Brush piles, root areas under large trees, and similar sites also may be used as temporary homes. The presence of beavers, existing dens, and the ponds they create provide ideal otter habitat.

3.8.2.3 State-Protected Amphibians and Reptiles

State-listed threatened and endangered amphibians and reptiles are shown in Table 3.8.1-3; these include the Illinois chorus frog, massasauga, Kirtland's snake, western fox snake, and false map turtle. The distribution, habitat preferences, and lifecycles for these species are discussed below.

Illinois Chorus Frog

The Illinois chorus frog is state listed as threatened in Illinois and is found in sand prairies, sandy agricultural fields, and waste areas. Chorus frogs have been recorded within 5 miles of the ROW in Madison County, Illinois.

Chorus frogs burrow in the sand and emerge after heavy, early spring rains to breed in nearby flooded fields, ditches, and other vernal ponds. Chorus frogs may breed in other soil types and require ephemeral pools for breeding, which are often located at the edges of sand units. Breeding occurs between February and May but most often occurs in March and April in association with heavy (greater than 2.5 centimeter) rainfalls (ENSR 2006c).

Massasauga

The massasauga rattlesnake is state listed as threatened in Nebraska. Nebraska lists the massasauga at a species level, using the common name for the western subspecies. Massasauga accounts have been recorded in the Keystone Project area within Jefferson and Gage Counties in Nebraska. See Section 3.8.1.3 for additional information presented for the eastern massasauga.

Kirtland's Snake

The Kirtland's snake is state listed as threatened in Illinois and as a species of possible occurrence in Missouri based on a single recorded occurrence from 1964. Its distribution is limited to a few states, including Illinois and Missouri, and it may be found in the Keystone Project area. This species also has been recorded within 5 miles of the ROW in Fayette County, Illinois. Currently, the USFWS Endangered Species Office is assessing the population viability throughout the range.

The Kirtland's snake is a small, slender snake, characterized by a reddish belly with conspicuous dark spots and two lines of dark spots along each side of the body. It is a reclusive species—spending long periods under objects or underground, making its detection difficult. The snake commonly uses crayfish burrows for cover and underground passageways; this exposes them to less severe temperature extremes and provides food sources, such as earthworms and slugs.

The Kirtland's snake typically inhabits moist grassy areas close to water bodies. This includes prairie fens, wet meadows, wet prairies associated with lake plains, open and wooded wetlands, seasonal marshes, open swamps, sparsely wooded hillsides, and the vicinities of ponds and sluggish creeks. The snake also has been found in vacant lots of urban settings among debris in damp habitats.

Mating has been reported throughout the year, with females giving birth in summer or early autumn. Peak activity occurs in April and October. During winter, the snake often hibernates in crayfish burrows; it emerges in early spring, when mating has been observed.

Due to the loss of prairie wetland habitat, the Kirtland's snake is confined to the north-central Midwest. Its home range appears to be relatively small because of separation barriers, such as highways, bodies of water, and densely urbanized areas dominated by buildings and pavement. Although this species is difficult to survey and its range appears to be continuous, populations are isolated to remaining patches of suitable habitat. Many previous populations are considered extant from habitat loss and degradation.

Western Fox Snake

The western fox snake is state listed as endangered in Missouri, primarily because of habitat loss. The species has been found in northwestern Indiana, Illinois, Iowa, western Michigan, Minnesota, Missouri, Nebraska, South Dakota, and Wisconsin. In the Keystone Project area, western fox snakes have been recorded in Lincoln and Buchanan Counties in Missouri.

The western fox snake prefers the open forests, prairies, and croplands located near water sources. Although the fox snake is an exceptional climber, it spends the majority of its time on the ground or in burrows hunting rodents and amphibians. The home range of this species is relatively unknown; however, snakes in this family have been known to move several kilometers between suitable habitat sites. Peak activity occurs between late April and October. During the winter months, small mammal burrows are commonly used for hibernation dens. Mating occurs in April, with females laying eggs in May or June and hatchlings appearing in August or September.

False Map Turtle

The false map turtle is state listed as threatened in South Dakota. The geographic range of the false map turtle extends from the eastern half of the United States and into Canada. In the United States, the turtles populate areas of the Mississippi and Missouri Rivers and their basins in Illinois, Kansas, Missouri, Nebraska, North Dakota, and South Dakota. Relative to the Keystone Project area, this species occurs near the Missouri River crossing in Yankton County, South Dakota. It also has been documented near Gavin's Point along the Missouri River.

The false map turtle is named from the web pattern covering their entire carapace, similar in appearance to a road map across the shell. The reptiles are particularly fond of large rivers and backwaters, but also may reside in bayous, oxbows, lakes, ponds, sloughs, drowned forests, and occasionally marshes. They prefer fresh water with slow currents, places to bask, and abundant aquatic vegetation. Oxbows and backwaters with emergent vegetation are important habitats for young-of-year turtles. Movement may be restricted by barriers such as highways or topography, and their limitation to aquatic or wetland habitats.

Mating occurs twice a year—once in April and again in October and November. Erosion along the Missouri River has removed sloping banks and sandy beach habitats that these animals prefer for nest sites. The turtles cannot climb up the steep or stabilized banks that remain.

Missouri and South Dakota have reported declining natural populations attributable to water pollution, river channelization, reduction in suitable nesting sites, siltation, and unlawful shooting. Populations also have been decimated due to the pet trade. For several river miles below Kansas City and St. Louis, Missouri, the false map turtle has become uncommon or extirpated.

3.8.2.4 State-Protected Fish and Mollusks

State-listed endangered or threatened fish and mollusks that could be affected by the Keystone Project are listed in Table 3.8.1-4. The following sections describe the distribution, habitat, and lifecycles of these species.

Chestnut Lamprey

The chestnut lamprey is state listed as threatened in Kansas. Chestnut lampreys live in certain large streams and small rivers of the Red, St. Croix, and lower Mississippi River systems. Surveys have not been completed to determine whether these lampreys would be found in the Keystone Project area. Adults can be found in nearly any habitat in these streams, where they are often are found attached to the sides of their prey. Spawning occurs in smaller tributary streams in swift shallow riffles where the gravel is clean. Eggs are laid in a nest during spring or summer. The larvae bury themselves in soft silt and muck in areas of quiet water with some aquatic vegetation. Only active at night, during the day they hide from the light under rocks or under the cover of river banks. Areas suitable for spawning have diminished because of siltation and pollution. The deterioration of river environments threatens their food supply, and toxic chemicals can cause mortality. Eutrophication can cause mortality in the young.

Lake Sturgeon

The lake sturgeon is state listed as endangered in Missouri and Illinois, and as threatened in Nebraska. This species is generally bottom-dwelling and found in large rivers and shallow areas of large lakes. Surveys have not been completed to determine whether these fish would be found in the Keystone Project area.

The habitats most commonly associated with the species are silt-free deep-run and pool habitats of rivers—generally lacking aquatic vegetation. Over-fishing, habitat alteration, and pollution have turned this species from one of the most abundant large fishes into one of the rarest. Poor water quality and migration barriers (locks and dams) continue to prevent recovery in the lower Mississippi River.

The spawning season for lake sturgeon spans the months of April, May, and sometimes June. Males do not reach sexual maturity until they are 20 years old, and females are usually 25 years old before they spawn for the first time. Females spawn only every 4 to 6 years, while the males usually spawn every other year. Lake sturgeon generally migrate long distances to reach suitable spawning habitat. Dams and other navigation devices can interfere with this migration and force sturgeon to spawn in unsuitable areas. Spawning occurs in gravelly tributary streams of rivers and lakes, although rocky, wave-swept areas near islands can serve as alternative locations.

Flathead Chub

The flathead chub is state listed as threatened in Kansas and as endangered in Missouri. It is found in large schools over shallow, sandy bars in smaller tributary streams. This fish can survive quite well in turbid water, which historically characterized the Missouri River. Currently, it is commonly found in pools and riffles in the river. In the Keystone Project area, the flathead chub is known to occur in the Missouri and South Fork Nemaha Rivers in Kansas.

The greatest threats to the flathead chub are non-point source pollution and mainstem impoundments affecting natural flow regimes. Other threats across its range include dewatering of rivers from irrigation and degradation of riparian areas.

This species relies on flood flows to spawn successfully. Spawning occurs from June 1 to August 15, after water levels have subsided from peak flows and when water temperatures are warmer and the substrate is more stable.

Silver Chub

The silver chub is state listed as endangered in Kansas as of 2005 and as a species of conservation concern in Missouri. Its entire range is from Lake Erie south throughout the Mississippi, Ohio, and Alabama River drainage basins. In the Keystone Project area, silver chubs have been reported in streams in Cowley County, Kansas, and in Chariton County, Missouri. Once common in the Kansas River, there have been no records or their presence since 1980. Large reservoirs, predators, and competition have contributed to the decline of the silver chub.

The silver chub is considered a big river chub because it lives in large, sandy rivers. Little is known about the reproductive biology of this species, but it is believed to spawn from late May through June in open water areas of large streams and lakes.

Sturgeon Chub

The sturgeon chub is state listed as threatened in South Dakota and Kansas, endangered in Nebraska, and as a species of conservation concern in Missouri. Sturgeon chubs have been reported from the Platte and Missouri Rivers in South Dakota, Nebraska, Kansas, and Missouri; they may occur in the Keystone Project area. The species once inhabited the Yellowstone and Missouri Rivers, the Mississippi River downstream from the mouth of the Missouri, and many of the large tributaries of the Yellowstone and Missouri Rivers. This distribution has been greatly reduced because of changes in the flow regime and turbidity, and non-point source pollution.

The sturgeon chub prefers large turbid sandy rivers over a substrate of small gravel and coarse sand. It is often found in areas swept by currents—especially at heads of islands or exposed sandbars. This chub is relatively short lived (4 years) and does not reproduce until it reaches its second year. The spawning period is from late spring to midsummer.

Sicklefin Chub

The sicklefin chub is state listed as endangered in South Dakota and Kansas, and as a species of conservation concern in Nebraska and Missouri. In the Keystone Project area, these fish are found in South Dakota, Nebraska, Kansas, and Missouri in the Platte and Missouri Rivers. The populations have been on a serious decline from changes in impoundments, channelization, and regulated flow. Although the species has been sampled in shallow water and rocky substrate, there seems to be a general preference for deeper, turbid water and sandy substrate. It is often found in association with the sturgeon chub.

The sicklefin chub reaches a maximum age of 4 years and generally becomes sexually mature in its second year. Spawning occurs in main channel areas of the large turbid rivers that they inhabit. The spawning period is in summer and probably occurs over a wide time span—similar to other big river species.

Arkansas River Speckled Chub

The Arkansas River speckled chub is listed as endangered in Kansas. The species prefers shallow channels of perennial streams with clean fine sand. Speckled chubs avoid calm waters and silted stream bottoms. In the Keystone Project area, the chub is found in the lower Arkansas River and its major tributaries. Speckled chubs are broadcast spawners, producing nonadhesive, semibuoyant eggs that drift downstream. Spawning occurs during May 15 to August 31 after a sharp rise in stream flow, when water temperatures are above 70° F. Eggs drift downstream with the strong current.

Western Silvery Minnow

The western silvery minnow is listed as threatened in Kansas and as a species of conservation concern in Missouri. Historically, the species' range in the United States extended from Montana to Ohio, and southward to the Gulf States. Today, it is common only in the Missouri River and adjacent creeks and backwaters, where the minnow is often found behind wing dikes, revetments, and other protected shoreline habitats. Western silvery minnows are known to occur in the Missouri and South Fork Big Nemaha Rivers in Kansas and in the Missouri River in Missouri; they may be found in the Keystone Project area.

The western silvery minnow prefers relatively deep, quiet waters with sluggish flow and bottoms of silt or sand in large, turbid rivers and prairie streams. In streams, they are typically found in water less than 1 foot deep and shallow shore water heavily vegetated with emergent grasses and reeds. In protected areas of large rivers, they move in large schools of 50 to 100 individuals along the bottom in deep, quiet water. The greatest threats to the western silvery minnow are non-point source pollution, water depletion from irrigation, degradation of riparian areas, and mainstem impoundments affecting natural flow regimes.

Western silvery minnows spawn from June 1 to August 15. Prior to spawning, adults migrate to well-vegetated lagoons or slow-moving lower reaches of tributary streams. The eggs probably are scattered on silt substrate in the quiet waters.

Silverband Shiner

The silverband shiner is state listed as threatened in Kansas, where it has been documented in the Missouri River. The silverband shiner is found in the slow-flowing pools of large, turbid rivers, such as the Missouri and lower Mississippi Rivers. Surveys have not been completed to determine whether these fish would be found in the Keystone Project area.

Habitat changes that occurred after large rivers were dammed and channelized have been detrimental to the population of the silverband shiner and several other large river fish species.

This fish can tolerate extremely turbid conditions and is usually found in moderate to swift current near sandy or gravelly bars. It also may be found in schools with several other minnow species. Little information is known regarding its reproductive biology, but it probably spawns in late spring or summer.

3.8.2.5 State-Protected Plants

Table 3.8.1-5 provides the state-listed plant species potentially occurring in the Keystone Project area, including the small white lady's slipper, royal catchfly, prairie spiderwort, and spring ladies' tresses. The distribution, habitat preferences, and lifecycles for these species are discussed below.

Small White Lady's Slipper

The small white lady's slipper is state listed as threatened in Nebraska. This species is found in wet prairie habitats, mesic blacksoil prairie, wet blacksoil prairie, glacial till prairie hillsides, sedge meadows, calcareous fens, and glades. Known distributions of small white lady's slipper include wetland areas in the Keystone Project area in Nebraska. The plant is generally associated with calcareous soils and flowers from May to June.

Royal Catchfly

Royal catchfly is state listed as endangered in Illinois and has been recorded within 5 miles of the Keystone ROW in Madison County, Illinois. The royal catchfly is a large (2 to 5 feet) perennial herb that grows from a fleshy taproot. They produce scarlet-crimson flowers during late-May through October and primarily are pollinated by the ruby-throated hummingbird. The royal catchfly is found in mesic black soil prairies, openings in upland forests, savannas, scrubby barrens, and open areas along roadsides and railroads. This plant is endemic of tall-grass prairie habitats, with only a few, scattered remnant populations. Many of the remaining population remnants are found along roadsides, where they are vulnerable to construction and management of roadside vegetation.

Prairie Spiderwort

The prairie spiderwort is state listed as threatened in Illinois and has been recorded within 5 miles of the Keystone ROW in Madison County, Illinois. This plant is a perennial forb from 2 to 3 feet tall that prefers sandy soils and appears to be most abundant where grazing is light to moderate. The plant is found primarily in tall-grass prairie biome, generally in western Illinois and further west. Prairie spiderworts, typical of dry prairies and dry sand prairies, produce multiple 1- to 2-inch, three-petaled purple flowers from May 1 to June 1.

Spring Ladies' Tresses

Spring ladies' tresses are state listed as endangered in Illinois. This plant is a small (2 to 5 inches) perennial orchid that is typically found in upland dry to mesic forests, dry to mesic prairies, or cultivated fields. It produces white flowers in a spiraling pattern on upright bracts during June through August. Spring ladies' tresses have been documented within 5 miles of the Keystone ROW in Madison County, Illinois.

3.8.2.6 Potential Impacts and Mitigation for State-Protected Species

State-Protected Birds

Impacts on state-listed birds (Table 3.8.1-1) and their habitats related to construction of the Keystone Project would be similar to the general impacts described for federally listed bird species (see Section 3.8.1.6). Any specific impacts or mitigation measures that have been identified for state-listed species are discussed below.

Waterbirds – King Rail, Least Bittern, and Yellow-Crowned Night Heron

Table 3.8.2-1 describes four functionally intact or extensive wetland complexes based on wetland survey data along the Mainline Project ROW in Chariton, and Lincoln Counties, Missouri. Habitats were assessed for structural complexity with open water and vegetation dominated by sedges and cattails that may provide suitable habitat for the king rail; three of the four sites were surveyed for king rail occurrence.

TABLE 3.8.2-1
King Rail, Least Bittern, and Yellow-Crowned Night-Heron Suitable Habitats Potentially Affected by the Keystone Project Route

Milepost	State, County	Wetland Description (Species)	Comments
841.1	Missouri, Chariton	Open water and emergent wetland – sedge (king rail)	Floodplain along the Grand River – no king rails found
841.7	Missouri, Chariton	Forested wetland transitions to emergent wetland – sedge (king rail)	Floodplain along the Grand River – no king rails found
842.0	Missouri, Chariton	Intermittent stream, emergent wetland – sedge (king-rail)	Floodplain along the Grand River – no king rails found
973.8	Missouri, Lincoln	Emergent wetland – rice cutgrass and bushy seedbox, pond (king rail)	Good habitat, open water and emergent vegetation – no survey
1073.4–1077.4	Illinois, Fayette	No wetland description available - (loggerhead shrike, least bittern, yellow-crowned night heron)	Carlyle Lake Wildlife Management Area – 70.4 acres Desktop survey only

Sources: ENSR 2007b, k.

MDC has developed BMPs for projects in areas where the king rail is likely to occur. Applicable BMPs are voluntary and include:

- Avoid altering natural swales and other topographic features that are potential habitat for king rails.
- No work should be allowed below the high bank of streams or below water levels in wetlands between April 1 and July 15 to prevent disrupting breeding activities.
- Revegetate disrupted areas with native wetland species.
- Erosion and sediment controls should be implemented, maintained, and monitored for the duration of the project.

To reduce impacts to state-protected waterbirds, Keystone would:

- Restrict construction activities within a 0.25-mile buffer of an active nest during the appropriate breeding season.
- Conduct follow up surveys prior to resuming construction within 0.25 mile of an active nest site, to verify that the nest site is no longer active.
- Restore habitat to pre-construction conditions.

The following additional measures could further reduce impacts to state-protected waterbird species:

- Conducting surveys at the four sites identified in Table 3.8.2-1 for the presence of king rails during the first week of May or after April 20. Observers should be able to distinguish king rails from other rail species by sight and sound (Andrew Forbes, MDC, February 15, 2007).
- To prevent disrupting breeding activities, prohibiting construction between April 1 and July 15 if king rails are identified at the sites described above.
- Conducting surveys for least bittern and yellow-crowned night herons at Carlyle Lake in Fayette County, Illinois, as these species are known to occur at Carlyle Lake (Joe Smothers, COE, February 6, 2007).
- Avoiding construction in areas with documented nest sites until after young of these species have fledged (John Cochnar, USFWS, April 28, 2006).

Construction of the Mainline Project in Missouri and Illinois may affect, but is not likely to adversely affect nesting, brood-rearing, and foraging waterbirds and their habitats in the floodplain of the Grand River in Chariton County, Missouri and at the Carlyle Lake WMA in Fayette County, Illinois. Coordination with USFWS and state agency wildlife biologists should continue, with the goal of impact avoidance, minimization, or mitigation.

Raptors – Northern Harrier, Osprey, and Barn Owl

Table 3.8.2-2 provides locations of raptor nests and breeding territories identified during aerial surveys of the floodplains of major rivers that potentially would be affected by the Keystone Project. A pair of barn owls is known to nest at the north end of Carlyle Lake, in the Carlyle Lake WMA in Fayette County, Illinois.

Keystone completed an aerial survey prior to leaf out in spring 2007 along the entire Keystone Project route to locate active and inactive raptor nest sites in deciduous trees and breeding territories within the Project ROW. No additional northern harriers, osprey, or barn owls were recorded during these surveys; however, survey design was not ideal for identification of ground- and cavity-nesting species such as the northern harrier and barn owl. In addition, pre-construction bird surveys would be conducted in tracts of grasslands, marshes, or other open grassy habitats for the presence of adult birds, young, or nests between May and July, if pipeline construction occurs during the breeding season.

TABLE 3.8.2-2 Raptor Nests and Breeding Territories Potentially Affected by the Keystone Project Route				
Milepost	**State, County**	**Species**	**Activity**	**Summary**
271.6	South Dakota, Day	Northern harrier	Probable occupied territory	Female flushed from cattails, high probability of nest in area
286.9	South Dakota, Clark	Northern harrier	Unknown	Female flushed from meadow, no nest observed
435.5	South Dakota, Yankton	Osprey	Hack site	450 feet from ROW
435.5	South Dakota, Yankton	Osprey	Hack site	750 feet from ROW

Sources: ENSR 2006a, 2007a.

MDC has developed BMPs for projects in areas where the northern harrier is likely to occur. Applicable BMPs are voluntary and include:

- Prairies and native grass plantings should be maintained whenever possible.
- Open areas such as pastures, cropland, native grass plantings, and marshes where harriers nest should not be destroyed.
- Mowing earlier than August 1 should be avoided to lessen destruction of nests.
- Use of insecticides and rodenticides in nesting areas should be minimized. Harriers can act as a natural, biological control of unwanted insects and rodents.

MDC also developed BMPs for projects in areas where the barn owl is likely to occur. All of the BMPs developed for the northern harrier, except for mowing dates, apply to the barn owl. In addition:

- If available nesting structures must be removed, barn owl nest boxes should be placed in other areas to provide alternative nesting sites.

To avoid impacts to the northern harrier and barn owl, Keystone will conduct surveys for these birds within 330 feet of the ROW if construction were to proceed during the nesting season.

Construction of the Mainline Project in Missouri and Illinois may affect, but is not likely to adversely affect nesting, brood-rearing, and foraging northern harriers, osprey, and barn owls and their habitats. Coordination with USFWS and state agency wildlife biologists should continue, with the goal of impact avoidance, minimization, or mitigation.

Loggerhead Shrike and Henslow's Sparrow

The loggerhead shrike was identified as a species that potentially nests within the Keystone Project ROW in the Carlyle Lake WMA (Table 3.8.2-1). Keystone plans to complete occurrence surveys within the ROW in the Carlyle Lake WMA during the nesting season (from March through June) 2007. Additional pre-construction surveys in 2008 would not be required if construction occurred outside of the breeding season.

Because no large grassland habitats suitable for Henslow's sparrows would be crossed by the Keystone Project in Illinois, there would be little chance of effects to this species during construction.

To avoid impacts on the loggerhead shrike, Keystone would:

- Complete pre-construction nest surveys in the Carlyle Lake WMA, Fayette County, Illinois during the appropriate breeding season (March 1 through June 15).
- If nesting birds are found, restrict construction activities within a 0.25-mile area around an active nest during the appropriate breeding season.
- Conduct follow-up surveys prior to resuming construction within the 0.25-mile area around an active nest to verify that the nest site was no longer active.
- Restore habitat to pre-construction conditions.

Construction of the Mainline Project in Illinois may affect, but is not likely to adversely affect nesting, brood-rearing, and foraging loggerhead shrike if construction takes place during the nesting season. Removal of trees may affect habitats used by the loggerhead shrike in the Carlyle Lake WMA. Coordination with USFWS and state agency wildlife biologists should continue, with the goal of impact avoidance, minimization, or mitigation.

Greater Prairie-Chicken

Keystone consulted with MDC concerning an appropriate approach to address Project impacts on the greater prairie-chicken. Keystone completed a telephone survey of landowners in Audrain County, Missouri, for 21 tracts of land that were identified with potentially suitable greater prairie-chicken habitat based on agency correspondence, aerial habitat surveys, wetland field surveys, USGS Land Use Land Cover Data, and aerial photography (Table 3.8.2-3).

After review of the results of the telephone survey, MDC determined that construction of the Mainline Project would not likely affect the greater prairie-chicken (Doyle Brown, MDC, February 6, 2007).

Construction of the Mainline Project in Audrain County, Missouri is not likely to affect nesting, brood-rearing, or foraging greater prairie-chickens, as this species is not likely to occur within the project ROW. If the species is observed within the project ROW during construction, coordination with state agency wildlife biologists should continue, with the goal of impact avoidance, minimization, or mitigation.

TABLE 3.8.2-3
Potentially Suitable Greater Prairie-Chicken Habitats in Audrain County, Missouri along the Keystone Project Route

Milepost	Miles	GPC Observed	Summary
904.3		No	Landowner familiar with greater prairie-chickens, no greater prairie-chickens or sign observed
908.3	0.5	No	Landowner unfamiliar with greater prairie-chickens, no greater prairie-chickens or sign observed
908.9	0.3	No	Landowner familiar with greater prairie-chickens, nests on property 6 to 7 years ago, no greater prairie-chickens or sign observed since then

TABLE 3.8.2-3 Potentially Suitable Greater Prairie-Chicken Habitats in Audrain County, Missouri along the Keystone Project Route			
Milepost	**Miles**	**GPC Observed**	**Summary**
913.9	0.7	No	Landowner familiar with greater prairie-chickens, no greater prairie-chickens or sign observed
914.7		No	Landowner unfamiliar with greater prairie-chickens, no greater prairie-chickens or sign observed
914.8		No	Landowner familiar with greater prairie-chickens, no greater prairie-chickens or sign observed
914.9	0.2	No	Landowner familiar with greater prairie-chickens, no greater prairie-chickens or sign observed
915.2	0.3	No	Landowner familiar with greater prairie-chickens, no greater prairie-chickens or sign observed
915.7	0.3	No	Landowner familiar with greater prairie-chickens, no greater prairie-chickens or sign observed
917.0	0.3	No	Landowner familiar with greater prairie-chickens, no greater prairie-chickens or sign observed
917.6	0.8	No	Landowner familiar with greater prairie-chickens, no greater prairie-chickens or sign observed
918.4	0.1	No	Landowner unfamiliar with greater prairie-chickens, no greater prairie-chickens or sign observed
918.8	0.3	No	Landowner familiar with greater prairie-chickens, no greater prairie-chickens or sign observed
919.1	0.3	No	Landowner familiar with greater prairie-chickens, no greater prairie-chickens or sign observed
919.4	0.1	No	Landowner familiar with greater prairie-chickens, no greater prairie-chickens or sign observed

GPC = Greater prairie-chicken.

Source: ENSR 2007c.

Connected Actions

Approximately 181 miles of new transmission lines and 22 miles of upgraded transmission lines would be required to power pumpstations along the Mainline, with about 12 miles of new lines for the Cushing Extension (see Section 2.14). Newly constructed power lines would cross habitats that would potentially be used by state-protected birds. The primary impacts on birds would be habitat loss due to removal of vegetation within the construction work area, collision and electrocution mortality, reduction in habitat quality due to habitat fragmentation and potential invasion by noxious weeds, and reduced productivity for ground-nesting birds due to increased depredation.

New transmission lines would potentially coincide with the occurrence of state-protected bird species at the following locations:

- MP 263 Mainline PS-20: Day County, South Dakota – about 10 miles from northern harrier sighting.
- MP 310 Mainline PS-31: Clark County, South Dakota – about 22 miles from northern harrier sighting.

- MP 454 Mainline PS-34: Yankton County, South Dakota – about 18 miles from osprey hack sites.
- MP 867 Mainline PS-33: Chariton County, Missouri – line runs parallel to an existing transmission line – about 26 miles from king rail habitat sites.
- MP 982 Mainline PS-36: Lincoln County, Missouri – about 10 miles from king rail habitat site.
- MP 1053 Mainline PS-38: Fayette County, Illinois – about 20 miles from loggerhead shrike, least bittern, and yellow-crowned nigh heron habitats at Carlyle Lake WMA.

New electrical power line segments would also increase the collision potential for migrating and foraging birds. Factors influencing collision risk are related to the avian species, the environment, and the configuration and location of lines. Transmission line poles would be used as vantage perches by raptors facilitating predation on ground-nesting birds. Location of poles across grassland habitats reduces habitat suitability for ground-nesting birds.

Collision and electrocution impacts on birds resulting from the construction of transmission lines would be reduced by provider implementation of the following mitigation measures:

- Standard, safe designs, as outlined in Suggested Practice for Avian Protection on Power Lines (APLIC 2006), into the design of electrical distribution lines in areas of identified avian concern.
- Marking techniques to increase transmission line visibility, using balls or flappers.
- A minimum 60-inch separation between conductors and/or grounded hardware and recommended use of insulation materials and other applicable measures, depending on line configuration.
- Standard raptor-proof designs, as outlined in Avian Protection Plan Guidelines (APLIC and USFWS 2005), into the design of the electrical distribution lines to prevent collision by foraging and migrating raptors in the Keystone Project area.

Electrical service providers and RUS, where applicable, would coordinate with the appropriate state and federal resource agencies to identify specific locations for flight deterrents or other avoidance or minimization measures.

State-Protected Mammals

General impacts on state-listed mammals related to construction of the Keystone Project would be similar to those described for federally listed mammal species (see Section 3.8.1.6). Specific impacts and mitigation measures identified for the state-listed species are discussed below.

River Otter

The river otter may be affected by habitat alteration, primarily at river crossings where this species occurs. The buried river crossings have the potential to destroy dens along the shorelines that are used by river otters. Destruction of dens with otter young likely would result in their death. Disturbance near den sites may lead to abandonment of young, lost productivity, and displacement from preferred habitats. Increased sedimentation due to runoff from construction sites near rivers would increase turbidity, reducing foraging effectiveness by affecting the otter's ability to see underwater. River otters have been reported to occur at several rivers crossed by the Keystone Project. Habitats identified during consultations with state agencies were surveyed for the presence of river otters during the denning season between March and September 2007. No signs of river otters was found along the Platte River or Elkhorn River crossings (ENSR 2007l). These areas would be surveyed again in 2008 if construction would occur during the denning season, within 0.25 mile upstream and downstream on both banks at each of the river crossings:

- Colfax County, Nebraska – MP 542, Platte River crossing (HDD); and
- Stanton County, Nebraska – MP 502, Elkhorn River crossing (open cut).

Construction of the Mainline Project in Nebraska may affect, but is not likely to adversely affect denning river otters. If river otters or signs of river otter activity (such as dens, slides, and feeding stations) are observed at the crossing locations identified above, coordination with state resource agencies should continue, with the goal of impact avoidance, minimization, or mitigation.

State-Protected Reptiles and Amphibians

Illinois Chorus Frog

Even though chorus frogs have been recorded within 5 miles of the ROW, no individuals were identified during a survey of the ROW through Illinois (ENSR 2006c). No documented populations would be affected by Keystone Project construction.

Massasauga

Massasauga accounts have been recorded in the Keystone Project area within Jefferson and Gage Counties in Nebraska. No surveys for this species were required or completed in Nebraska. Crossing occupied habitats during winter hibernation would likely lead to death of individual massasaugas, and crossing during breeding would cause interruption of the breeding cycle. Due to the low biological replacement rate for this species, small increases in adult mortality can cause irreversible declines.

To avoid construction-related impacts to the massasauga in Nebraska, Keystone would:

- Place biological monitors in areas of appropriate native prairie/wet prairie habitats to locate and remove snakes ahead of construction to prevent injury or destruction.
- Provide results of the survey to the NGPC to determine whether specific actions are needed to avoid impacts to the massasauga.

Construction of the Mainline Project may affect the massasauga in Nebraska. Coordination with state resource agencies should continue, with the goal of impact avoidance, minimization, or mitigation.

Western Fox Snake

Approximately 5.2 miles of suitable western fox snake habitats occur in the Mainline Project survey corridor in Buchanan, Carroll, Chariton, and St. Charles Counties in Missouri (Table 3.8.1-11). Most of these habitats were evaluated for the presence of the western fox snake during spring hibernation emergence (BHE 2007f). No western fox snakes were found during this survey (BHE 2007f).

MDC has developed voluntary BMPs for projects in areas where the western fox snake is likely to occur, including:

- Avoid removing or destroying unique habitat features, such as downed trees, logs and brush piles, that provide habitat for the western fox snake or their prey.
- Avoid draining or destroying wetland habitat that is used by the snake.

- Avoid altering water levels in wetlands where western fox snakes are present.

Construction of the Mainline Project in Missouri may affect, but is not likely to adversely affect the western fox snake and its habitats. No western fox snakes were observed during hibernation emergence surveys at the habitats identified in Table 3.8.1-11, coordination with state resource agencies should continue, with the goal of impact avoidance, minimization, or mitigation.

Kirtland's Snake

The proposed Keystone Project would affect 5.1 miles of suitable habitat for the Kirtland's snake in Madison, Bond, and Fayette Counties in Illinois (Table 3.8.1-11). Kirtland's snake is known to occur in the Carlyle Lake WMA. To avoid construction-related impacts to the Kirtland's snake, Keystone would develop a conservation plan and ITA for Kirtland's snake in Illinois, with guidance from IDNR and the Illinois Natural History Survey.

Construction of the Mainline Project in Illinois may affect the Kirtland's snake and its habitats. Coordination with state resource agencies should continue, with the goal of impact avoidance, minimization, or mitigation.

False Map Turtle

The proposed Keystone pipeline would potentially affect approximately 0.2 mile of false map turtle habitat in Yankton County, South Dakota (MP 431.9–432.3). False map turtles would be affected by the Keystone Project if nesting areas (sandy beaches with gently sloping shorelines) were destroyed along the Missouri River. Because the crossing of the Missouri River at Yankton would use the HDD methods, false map turtles would not be affected by pipeline construction.

State-Protected Fish and Mollusks

General impacts on state-listed fish and mollusks related to construction of the Keystone Project would be similar to those described for federally listed fish and mollusk species (see Section 3.8.1.6). Specific impacts and mitigation measures have been identified for the state-listed species discussed below.

Chestnut Lamprey

The Mainline Project would cross state-designated critical habitat for the chestnut lamprey at the Missouri River crossing in Doniphan County, Kansas. Because this river would be crossed using HDD, no river channel habitat impacts are expected. Hoses used for water withdrawal for HDD and hydrostatic testing would be placed in the water column and would not affect larval lampreys living in the sediments. HDD does carry a risk of the escape of drilling fluids, which would potentially be harmful to the chestnut lamprey. However, construction would not likely affect the chestnut lamprey.

Lake Sturgeon

Impacts on lake sturgeon from construction of the Keystone Project are not likely because Keystone plans to use HDD crossings at the Missouri and Mississippi River crossings where lake sturgeon may occur (Section 3.3). HDD does carry a risk of the escape of drilling fluids into rivers at the crossings. This could result in short-term sediment transport and water quality impacts that could adversely affect the lake sturgeon. Water withdrawal for HDD (generally during spring) and hydrostatic testing (generally after August 1 in habitats with sensitive species) could affect the lake sturgeon, if spawning grounds are located near the withdrawal locations in the Missouri (two locations) and Mississippi Rivers. Protections for aquatic life during water withdrawal for HDD and hydrostatic testing that would be implemented at the Missouri and Mississippi River crossings would be as described for the federally-protected pallid sturgeon. Keystone pipeline construction across the Missouri and Mississippi River crossings, with the implemented measures, would not likely adversely affect the lake sturgeon.

Flathead Chub

The Mainline Project would cross state-designated critical habitat for the flathead chub at the South Fork Big Nemaha River in Kansas (Nate Davis, KDWP, February 12, 2007). Crossing this river by the proposed wet open-cut method would degrade the designated critical habitat and negatively affect the flathead chub.

To avoid impacts on flathead chubs and state-designated critical habitat, Keystone will:

- Not conduct instream construction activities during the flathead chub spawning period from July 1 to August 15 within the South Fork Big Nemaha River channel or at other stream crossings where this species is found unless HDD methods are used.
- Outside the spawning season, if construction would disturb streams with pool depths of 3 feet or greater, seine the pools at least 1 week prior to construction, and relocate fish upstream to a pool or location of similar depth (see Topeka shiner description of salvage relocation for condition requirements and fish handling). If a streambed is dry, or only shallow pools (less than 3 feet in depth) exist, no sampling is required.
- As part of any request for fish habitat permit authorizations, describe and implement erosion control measures. Monitor erosion and sediment controls daily during construction to ensure effectiveness, particularly after storm events, and continue to use only the most effective techniques.
- Restore banks and streams beds to pre-construction conditions, as outlined in Keystone's CMR Plan (Appendix B).

Construction of the Cushing Extension in Kansas may affect, but is not likely to adversely affect the flathead chub and state-designated critical habitat in the South Fork Big Nemaha River, with implementation of the described mitigation measures. Coordination with state resource agencies should continue, with the goal of impact avoidance, minimization, or mitigation.

Silver Chub

The Cushing Extension would cross state-designated critical habitat for the silver chub in the South Fork Big Nemaha River and the Arkansas River in Kansas. The South Fork Big Nemaha River would be crossed using the wet open-cut method, and the Arkansas River would be crossed using HDD. Habitat and sampling surveys for this species were attempted in summer 2007 at the Arkansas River crossing, but water levels were too high for seining. The Arkansas River would be used as a water source for HDD and hydrostatic testing. Protections for aquatic life during water withdrawal for HDD and hydrostatic testing that would be implemented at the Arkansas River crossing would be as described for the Arkansas River shiner.

To avoid impacts on state-designated critical habitat for silver chubs, Keystone has committed to the measures listed above for the flathead chub at the South Fork Big Nemaha River and the measures specified for the Arkansas River shiner.

Construction of the Cushing Extension in Kansas may affect, but is not likely to adversely affect the silver chub or designated critical habitat in the South Fork Big Nemaha River and the Arkansas River, with implementation of the measures described for the flathead chub and the Arkansas River shiner. Coordination with state resource agencies should continue, with the goal of impact avoidance, minimization, or mitigation.

Sturgeon Chub

Because the Platte and Missouri Rivers, where sturgeon chubs have been observed, would be crossed using HDD methods, pipeline construction would not affect sturgeon chubs. Use of water for HDD and hydrostatic testing may alter habitats in the Platte River used by sturgeon chub. Protections for aquatic life during water withdrawal for HDD and hydrostatic testing that would be implemented at the Platte and Missouri River crossings would be as described for the pallid sturgeon.

To avoid impacts on sturgeon chub Keystone would consult with individual states concerning potential water withdrawals from the Platte River drainage and avoid water withdrawals during February 1 through July 31 in the Lower Platte region.

Construction of the Mainline Project may affect, but is not likely to adversely affect the sturgeon cub. Coordination with state resource agencies should continue concerning potential water withdrawal from the Lower Platte River drainage, with the goal of habitat impact avoidance, minimization, or mitigation.

Sicklefin Chub

Sicklefin chubs have been reported from the Platte and Missouri Rivers in South Dakota, Nebraska, Kansas, and Missouri. Because crossings of these rivers would use HDD methods, pipeline construction would not affect sicklefin chubs. Use of water for hydrostatic testing may alter habitats in the Platte River used by sicklefin chub. Protections for aquatic life during water withdrawal for HDD and hydrostatic testing that would be implemented at the Platte and Missouri River crossings would be as described for the pallid sturgeon. To avoid impacts on sicklefin chub, Keystone would implement the measures identified above for the sturgeon chub.

Construction of the Mainline Project may affect, but is not likely to adversely affect the sicklefin chub. Coordination with state resource agencies should continue concerning potential water withdrawal from the Lower Platte River drainage, with the goal of habitat impact avoidance, minimization, or mitigation.

Arkansas River Speckled Chub

The Cushing Extension would cross designated critical habitat for the Arkansas River speckled chub in the Arkansas River in Kansas. This crossing would use the HDD method, and no river channel habitat impacts are expected. Water withdrawal for HDD and hydrostatic testing from the Arkansas River would follow protections for aquatic life described for the Arkansas River shiner.

Construction of the Cushing Extension in Kansas may affect, but is not likely to adversely affect the Arkansas River speckled chub or its designated critical habitat in the Arkansas River. Coordination with state resource agencies should continue, with the goal of impact avoidance, minimization, or mitigation.

Western Silvery Minnow

The Mainline Project would cross state-designated critical habitat for the western silvery minnow at the South Fork Big Nemaha River in Kansas. The proposed wet open-cut crossing method would degrade this state-designated critical habitat and would negatively affect the western silvery minnow.

To avoid impacts on the western silvery minnow and state-designated critical habitat in the South Fork Big Nemaha River, Keystone would:

- Not conduct in-stream construction during the western silvery minnow spawning period from June 1 to August 15 within the South Fork Big Nemaha River channel or at other stream crossings where this species is found, unless HDD methods are used.
- Outside the spawning season, if construction would disturb streams with pool depths of 3 feet or greater, seine the pools at least 1 week prior to construction, and relocate fish upstream to a pool or location of similar depth (see Topeka shiner description of salvage relocation for condition requirements and fish handling). If a streambed is dry, or only shallow pools (less than 3 feet in depth) exist, no sampling is required.
- As part of any request for fish habitat permit authorizations, describe and implement erosion control measures. Monitor erosion and sediment controls daily during construction to ensure effectiveness, particularly after storm events, and continue to use only the most effective techniques.
- Restore banks and streams beds to pre-construction conditions, as outlined in Keystone's CMR Plan (Appendix B).

Construction of the Cushing Extension in Kansas may affect, but is not likely to adversely affect the western silvery minnow or state-designated critical habitat in the South Fork Big Nemaha River, with implementation of the described protection measures. Coordination with state resource agencies should continue, with the goal of impact avoidance, minimization, or mitigation.

Silverband Shiner

The Mainline Project would cross designated critical habitat for the silverband shiner at the Missouri River crossing in Doniphan County, Kansas. Because this river would be crossed using HDD, no river channel habitat impacts are expected. Water use for HDD and hydrostatic testing would follow the protection measures described for the pallid sturgeon, which would be protective for the silverband shiner. Construction of the Mainline Project may affect, but is not likely to adversely affect the silverband shiner.

Plants

General impacts on state-listed plants related to construction of the Keystone Project would be similar to those described for federally listed plant species (see Section 3.8.1.6). Specific areas of impact have been identified for the state-listed species discussed below. All of the potential areas of occurrence are on privately owned lands; consequently, the regulatory authority for the states of Nebraska and Illinois to protect state-listed plants on private lands is unclear. As discussed above for federally protected plants, plants are considered to be the property of the landowner.

Small White Lady's Slipper

The locations of potential habitats suitable for the small white lady's slipper that could be affected by the Keystone Project are shown in Table 3.8.2-4.

TABLE 3.8.2-4
Small White Lady's Slipper Habitats Potentially Affected along the Keystone Project Route

Milepost	State	County	Habitat Quality	Summary
436.0–436.1	Nebraska	Cedar	Not evaluated	Potential native grassland – small white lady's slipper habitat
503.4–503.5	Nebraska	Stanton	Not evaluated	Potential native grassland – small white lady's slipper habitat
540.9–541.2	Nebraska	Colfax	Not evaluated	Potential native grassland – small white lady's slipper habitat
548.1–548.2	Nebraska	Butler	Not evaluated	Potential native grassland – small white lady's slipper habitat
564.4–564.7	Nebraska	Butler	Not evaluated	Potential native grassland – small white lady's slipper habitat
594.8–595.1	Nebraska	Saline	Not evaluated	Potential native grassland – small white lady's slipper habitat
606.4–606.5	Nebraska	Saline	Not evaluated	Potential native grassland – small white lady's slipper habitat
622.2–622.4	Nebraska	Jefferson	Not evaluated	Potential native grassland – small white lady's slipper habitat
635.1–636.8	Nebraska	Jefferson	Not evaluated	Potential native grassland – small white lady's slipper habitat
637.0–637.4	Nebraska	Jefferson	Not evaluated	Potential native grassland – small white lady's slipper habitat

Source: ENSR 2006e.

Construction of the Mainline Project in Nebraska may affect the small white lady's slipper if this species is present along the project ROW. Specific mitigation measures for the species would be developed if the plant is found to occur in the Keystone ROW within the habitats identified in Table 3.8.2-4, if this species is identified on state or federally owned lands.

Royal Catchfly, Prairie Spiderwort, and Spring Ladies' Tresses

Keystone would conduct surveys for these state-listed plants prior to construction within suitable habitats crossed by the Mainline Project, if it is found that the IDNR has the authority to protect state-listed plants on private lands.

Twenty-three areas totaling 14.4 miles of Mainline Project ROW were determined appropriate to survey for one or more of these plants in Madison County, Illinois during 2007 (Charles Johnson, Keystone Pipeline Project Proposed Survey Schedule for Illinois, January 17, 2007):

- Keystone MP 1022.0 to 1022.3, royal catchfly;
- Keystone MP 1022.1 to 1022.7, prairie spiderwort;
- Keystone MP 1022.7, royal catchfly;
- Keystone MP 1023.2 to 1024.2, spring ladies' tresses;
- Keystone MP 1023.8 to 1024.1, prairie spiderwort and royal catchfly;

- Keystone MP 1024.9 to 1027.9, spring ladies' tresses;
- Keystone MP 1025.3 to 1025.6, prairie spiderwort and royal catchfly;
- Keystone MP 1026.5 to 1027.0, prairie spiderwort;
- Keystone MP 1026.5 to 1027.4, royal catchfly;
- Keystone MP 1028.0 to 1033.1, royal catchfly;
- Keystone MP 1029.0 to 1033.1, prairie spiderwort and spring ladies' tresses;
- Keystone MP 1034.2 to 1034.3, prairie spiderwort, royal catchfly and spring ladies' tresses;
- Keystone MP 1036.7 to 1037.1, royal catchfly;
- Keystone MP 1037.8 to 1037.9, royal catchfly;
- Keystone MP 1040.6 to 1041.1, royal catchfly;
- Keystone MP 1040.7, prairie spiderwort;
- Keystone MP 1040.7 to 1041.2, spring ladies' tresses;
- Keystone MP 1042.5 to 1042.8, royal catchfly;
- Keystone MP 1042.8 to 1043.0, spring ladies' tresses;
- Keystone MP 1045.2 to 1048.0, spring ladies' tresses;
- Keystone MP 1045.5 to 1047.0, royal catchfly;
- Keystone MP 1049.0, royal catchfly; and
- Keystone MP 1049.0 to 1049.1, spring ladies' tresses.

Occurrence surveys would be completed, if required, by qualified botanists within appropriate habitats, including sandy areas along roadsides and gravel prairies for royal catchfly; disturbed areas near roads or railroad ballasts in sandy or gravelly soil for prairie spiderwort; and mesic and dry upland prairies, and roadsides through prairies for spring ladies' tresses. Surveys would be completed during the appropriate flowering period for each species, prior to construction during 2008. If any of these plants are found during the 2008 surveys, appropriate mitigation measures would be developed.

Construction of the Mainline Project in Illinois may affect the royal catchfly, prairie spiderwort, or spring ladies' tresses if these plants are present along the project ROW. Specific mitigation measures for these plants would be developed if they are found to occur in the Keystone ROW within the habitats identified above, if it is found that the state of Illinois has the authority to protect state-listed plants on privately owned property.

3.8.3 Species of Conservation Concern

Mammal, amphibian, reptiles, and invertebrate species of conservation concern along the Keystone Project ROW are described in Table 3.8.3-1. Many of these species are tied to woodland, wetland, or prairie habitats —habitats that historically have been converted to agricultural use throughout the Keystone Project area. These animals have been designated by state wildlife management agencies or state natural heritage organizations charged with conservation as being of conservation concern after review of abundance, population trends, distribution, number of protected sites, degree of threat to survival, suitable habitat trends, degree of knowledge about the species, and its life history. These designations do not constitute legal authority but are intended to assist with conservation planning and maintenance of the state's natural heritage.

Many resident and migratory birds are identified as species of conservation concern, primarily due to habitat loss, degradation, fragmentation, and associated declining population trends. Birds associated with native prairie habitats and wetlands that have been extensively altered by agriculture are included, as are birds that rely on forested floodplain habitats (Table 3.8.3-2).

3.8.3.1 Potential Impacts and Mitigation for Species of Conservation Concern

The pipeline ROW would cross habitats set aside for wildlife, as described in Table 3.6.5-1. The Mainline Project and Cushing Extension pipelines primarily would affect wildlife species of conservation concern by:

- Habitat loss, alteration, and fragmentation;
- Loss of breeding success from exposure to construction and operations noise, and from increased human activity;
- Direct mortality from Keystone Project construction and operation;
- Direct mortality due to collision with or electrocution by power lines; and
- Loss of individuals and habitats due to exposure to toxic materials or crude oil releases (addressed in Section 3.13, Safety and Reliability).

The magnitude and mechanisms for impacts to wildlife species are discussed in additional detail in Section 3.6.5. Potential impacts on small game animals include nest or burrow destruction and abandonment and loss of eggs or young, foraging, and cover habitat. Losses of active waterfowl nests, incubating adults, eggs, or young also could occur. Habitat loss and fragmentation would occur until vegetation is reestablished; then the habitat may be degraded due to the spread of noxious and invasive species. For species that use tree and shrub habitats for cover, forage, and nesting, these losses would be long term because the permanent ROW would be maintained free of trees and large shrubs. Displacement or attraction of small game animals from disturbance areas would be short term, as animals would be expected to return following completion of construction and reclamation activities.

TABLE 3.8.3-1
Mammals, Amphibians, Reptiles, and Invertebrates of Conservation Concern along the Keystone Project Route

Species	Status[a]	Occurrence by State[b]							Habitat
		ND	SD	NE	KS	MO	IL	OK	
Mammals									
Long-tailed weasel (*Mustela frenata*)	MO-SC OK-SC					Randolph and Carroll Counties			Commonly found in woodlands, field edges, riparian grasslands, swamps, and marshes with preferred habitats in Missouri of woodlands and thickets near water. Dens are abandoned mammal burrows, rock crevices, brush piles, stump hollows, or spaces among tree roots. Breeding period is July–August, with litters born in April–May.
Southern flying squirrel (*Glaucomys volans*)	KS-SC				Doniphan County				Found in the eastern third of Kansas, restricted to thick stands of deciduous forest. Pine and hardwood trees provide suitable foraging and nesting habitats, with snags important for nesting. Breeding period is February–March and June–July, with a 40-day gestation and pups weaned at 5 weeks.
Southern bog lemming (*Synaptomys cooperi*)	KS-SC				Nemaha and Brown Counties				Two subspecies occur in Kansas. Lives in communities of thick matted ground cover with high overhead vegetation in forest and grassland, but not restricted to bogs. Favored habitats include vegetation surrounding springs, damp to wet grasslands, and marshes. Upland grasslands near wetland and riparian areas also are used. Breeds year-round, with peaks in April–September.
Amphibians									
Great Plains toad (*Bufo cognatus*)	MO-SC					Buchanan and Carroll Counties			Found in grasslands, semi-desert shrublands, open floodplains, and agricultural areas—typically in stream valleys. Burrows underground when inactive. Breeds after heavy warm rains in spring or summer.

TABLE 3.8.3-1 (Continued)									
		Occurrence by State[b]							
Species	Status[a]	ND	SD	NE	KS	MO	IL	OK	Habitat
Amphibians (continued)									
Northern cricket frog (*Acris crepitans*)	SD-SC		Hanson, Hutchinson, and Yankton Counties						Inhabits the edges of sunny marshes, marshy ponds, and small slow-moving streams in open country. May periodically range into adjacent non-wetland habitats. Eggs lain late spring–early summer. Hibernation sites underground on land near water; may hibernate communally.
Northern crawfish frog (*Rana areolata circulosa*)	MO-SC					Lincoln County			Generally found in grasslands, prairies, and woodlands near small creeks or marshes. Often in crayfish burrows or other animal burrows. Breeds February–April in early spring after heavy rains.
Reptiles									
Blanding's turtle (*Emydoidea blandingii*)	SD-SC, MO-SC		Yankton County			St. Charles County			Found in productive, clean, shallow waters with abundant aquatic vegetation and soft muddy bottoms over firm substrates. Found in ponds, marshes, swamps, bogs, wet prairies, river backwaters, sloughs, slow-moving rivers, protected coves, and lake shallows and inlets. Extensive marshes bordering rivers provide excellent habitat.
Spiny softshell (*Apalone spinifera*)	SD-SC		Yankton County						Found in large rivers, impoundments, lakes, ponds along rivers, pools, along intermittent streams, and oxbows. Usually in areas with open sandy or mud banks and soft bottom. Basks on shores or on partially submerged logs. Burrows in bottom of pools during winter inactivity. Eggs are laid June–July in nests dug in open areas in sand, gravel, or soft soil near water. Eggs hatch September–October.

TABLE 3.8.3-1
(Continued)

Species	Status[a]	Occurrence by State[b] ND	SD	NE	KS	MO	IL	OK	Habitat
Reptiles (continued)									
Smooth softshell (*Apalone mutica*)	SD-SC		James River and Yankton County						Found in large rivers and streams with moderate to fast currents. Very infrequently found in lakes, impoundments, and shallow bogs. Prefers waterways with sandy bottoms and a few rocks or aquatic plants. Sandbars important for basking and egg-laying sites. They seem to prefer large rivers and live along certain portions in colonies.
Northern prairie skink (*Eumeces septentrionalis*)	ND-SC	Barnes, Ransom, and Sargent Counties							Found in open sandy areas of pine barrens and bracken grassland, grassy dunes, sandy banks of creeks and rivers and along roadsides, open grass-covered rocky hillsides near streams, and forest edges and woodland. Eggs are laid in shallow nests dug in loose moist soil under logs, boards, rocks, or other objects. Usually hatches in 1–2 months (mid- to late-July).
Eastern hognose snake (*Heterodon platirhinos*)	KS-SC				Doniphan County				Found in areas with sandy soil near water, wooded upland hillsides, fields, woodland meadows, prairie, forest-grassland ecotone, river valleys, and stream courses. Burrows into soil; overwinters in burrows. Eggs laid in May–August; hatches in 39–65 days.
Timber rattlesnake (*Crotalus horridus*)	KS-SC, NE-SC			Marshall and Doniphan Counties					In central midwest, optimum habitat is high, dry ridges with oak-hickory forest interspersed with open areas and deciduous forest, especially along hilltop rock outcrops in thick woods. Also may be found in swampy areas and floodplains. Mating season is early spring when emerging from hibernation. Young born from August to October.

TABLE 3.8.3-1
(Continued)

Species	Status[a]	Occurrence by State[b] ND	SD	NE	KS	MO	IL	OK	Habitat
Reptiles (continued)									
Ringneck snake (*Diadophis punctatus*)	SD-SC		Yankton County						Prefers moist habitats in prairie areas of the midwest. Occurs both in patches of woods and prairies. Found in open grassland, pasture, and prairie to forested areas—usually hardwoods but also in wooded areas. Prefers south- or west-facing hillsides and generally found under rocks or on rocky hillsides in forested areas. Requires rocks, logs, stumps, fallen bark; habitats are usually moist. Sometimes found in moist caves.
Fox snake (*Elaphe vulpine*)	SD-SC		Yankton County						Prefers moist areas, such as river valleys, marsh borders, river bottom forests, upland hardwoods, pine barrens, open prairies, scrub areas, and hedgerows. Rarely far from rivers or streams. May be abundant in heavily farmed prairie areas; frequently found in alfalfa fields and bromegrass.
Invertebrates									
Ottoe skipper (*Hesperia ottoe*)	SD-SC		Day County						Mixed- to tall-grass undisturbed prairies on the Great Plains. Strictly prairie habitat species. Nectar feeder—needs abundant sources to maintain a population. Adult males emerge before females in late June and July; females may be found as late as early August in some years.
Powesheik skipperling (*Oarisma powesheik*)	SD-SC		Marshall and Day Counties						Obligate resident of undisturbed tall-grass prairies. Primary habitat is virgin prairie, but also occurs in fens and grassy lakeshores. One brood between June and August.

**TABLE 3.8.3-1
(Continued)**

Species	Status[a]	Occurrence by State ND	SD	NE	KS	MO	IL	OK	Habitat
Invertebrates (continued)									
Regal fritillary (*Speyeria idalia*)	ND-SC, MO-SC	Sargent and Ransom Counties				Buchanan, Randolph, and Caldwell Counties			Tall-grass prairie and other open sites, including damp meadows, marshes, wet fields, and pastures. Larvae are obligate feeders on Violets. One brood from mid-June to mid-August; most eggs are laid in August. Violets, including bird's foot violet are only suitable larval hosts.
Prairie mound ant (*Formica montana*)	MO-SC					Chariton County			Found in tall-grass prairies but occasionally also may occur in open oak or pine-dominated woodlands.
Wallace's deepwater mayfly (*Raptoheptagenia cruentata*)	KS-SC				Doniphan County				Microhabitat not documented.

[a] SC = State species of conservation concern.

Source: ENSR 2006a.

TABLE 3.8.3-2
Birds of Conservation Concern along the Keystone Project Route

Species	Status [a]	Residence [b]							Habitat
		ND	SD	NE	KS	MO	IL	OK	
Red-necked grebe	SD-SC	N	N						Herbaceous wetlands, lakes, and rivers
Pied-billed grebe	MO-SC	N	N	N	N	N/W	N/W	N/W	Herbaceous wetlands, ponds, lakes, and rivers
American white pelican	PIF	N	N	M	M	M		M	Rivers, lakes, and reservoirs
American bittern	BCC	N	N	NE	M/N	N	N	M	Herbaceous wetlands, lake and pond edges, and riparian
Little blue heron	BCC	V	V	M	M	M	M	M	Wetlands and riparian
Great egret	MO-SC	M	M	M	M/N	N	M/N	M/N	Riparian woodlands, forested wetlands, and herbaceous wetlands
Northern harrier	BCC	N	N	N	N	N	N	N/W	Herbaceous wetlands, fens, meadows, grasslands, and croplands
Mississippi kite	BCC				N	N	N	N	Riparian woodlands, shelterbelts, forested wetlands, and grasslands
Broad-winged hawk	SD-SC	M/N	M/N	M/N	M/N	N	N	M/N	Deciduous and mixed forests, wetlands, forest edge, and woodland roads
Cooper's hawk	MO-SC	N	N	N	N	N	N	N	Forests
Ferruginous hawk	BCC	--	N	--	--	--	--	--	Grasslands, cliffs, forested riparian, shrub steppe, and croplands
Red-shouldered hawk	MO-SC								Riparian woodlands and wetlands
Swainson's hawk	BCC, PIF	--	N	--	N	--	--	--	Grasslands, riparian, croplands, and shelterbelts
Peregrine falcon	BCC		--	N	--	--	N	--	Herbaceous wetlands, riparian, and woodlands
Greater prairie-chicken	PIF	N	N	N	N	N	N		Tall-grass prairie, croplands, and shelterbelts
Lesser prairie-chicken	BCC, PIF			E	--			--	Sand sagebrush and mixed grass-shrublands
Black rail	BCC, PIF			--	--	--	--		Herbaceous wetlands, lake and pond edges, and wet meadows
Sora	MO-SC	N	N	N	M/N	M/N	M/N	M	Herbaceous wetlands, fens, wet meadows, and flooded fields
Yellow rail	BCC, PIF	--	--				E		Herbaceous wetlands, fen, riparian, and wet meadows
Mountain plover	BCC	E	E	--	--			--	Short-grass prairie, croplands, and shelterbelts

TABLE 3.8.3-2
(Continued)

Species	Status [a]	Residence [b] ND	SD	NE	KS	MO	IL	OK	Habitat
American golden plover	BCC	M	M	M	M	M	M	M	Short-grass prairie, pastures, flooded croplands, and riparian
Snowy plover	BCC				--			--	Salt flats, sand dunes, and riparian
Piping plover	PIF	N	N	N	--			--	Sand dunes, river islands, beaches, and riparian
Greater yellowlegs	BCC	M	M	M	M	M	M	M	Herbaceous wetlands, fens, riparian, bar habitats, and grasslands
Upland sandpiper	BCC	--	N	N	N	M/N	M/N	M/N	Short-grass prairie, pastures, and hayfields
Buff-breasted sandpiper	BCC	M	M	M	M	M	M	M	Short-grass prairie, croplands, and riparian
Solitary sandpiper	BCC	M	M	M	M	M	M	M	Herbaceous wetlands, riparian, croplands, and woodlands
Stilt sandpiper	BCC	M	M	M	M	M	M	M	Herbaceous wetlands, riparian, and flooded croplands
Willet	BCC	N	N	N					Herbaceous wetlands, short-grass prairie, pastures, and riparian
Long-billed curlew	BCC, PIF	--	--	--	--		E	--	Herbaceous wetlands, grasslands, and riparian
Hudsonian godwit	BCC		M	M	M			M	Herbaceous wetlands, grasslands, fens, and flooded croplands
Marbled godwit	BCC, PIF	N	N	M	M	M	M	M	Grasslands, herbaceous wetlands, riparian, and hayfields
Sanderling	BCC	M	M	M	M	M	M	M	Sand dunes, riparian, and lake shorelines
White-rumped sandpiper	BCC	M	M	M	M	M	M	M	Herbaceous wetlands, grasslands, riparian, and flooded croplands
Short-billed dowitcher	BCC	M	M	M	M	M	M	M	Herbaceous wetlands, fens, grasslands, riparian, and flooded croplands
Wilson’s phalarope	BCC	N	N	N	M	M	M	M	Herbaceous wetlands, grasslands, fens, and croplands
Black tern	ND-SC, SD-SC, KS-SC	N	N	M/N	M/N	M	M	M	Herbaceous wetlands with open water, fens, wet meadows, and flooded fields
Common tern	BCC, SD-SC	--	M	M	M	M	--	M	Herbaceous wetlands, riparian, and river bars
Black-billed cuckoo	BCC, PIF	N	N	N	N	N	N	N	Woodlands, riparian, scrub/shrub, and shelterbelts
Short-eared owl	BCC, KS-SC, MO-SC	N	N	--	--	N	N	W	Grassland, herbaceous wetland, fens, croplands, and shelterbelts

TABLE 3.8.3-2
(Continued)

Species	Status [a]	Residence [b] ND	SD	NE	KS	MO	IL	OK	Habitat
Burrowing owl	BCC	N	N	N	N			N	Open grasslands, prairie, and savanna
Red-headed woodpecker	BCC	N	N	N	N	N	N	N	Open woodlands, orchards, and riparian forest
Pileated woodpecker	ND-SC	N			N	N	N	N	Dense deciduous, coniferous, and mixed forests and open woodland
Chuck-will's-widow	BCC		--	N	N	N	N	N	Forests, woodlands, scrub/shrub, and pastures
Whip-poor-will	BCC, KS-SC	--	--	--	N	N	N	N	Forests and woodlands
Eastern wood-pewee	PIF	N	N	N	N	N	N	N	Forests, woodlands, orchards, and riparian
Acadian flycatcher	BCC			N	N	N	N	N	Forested wetlands, riparian, and woodlands
Scissor-tailed flycatcher	BCC, PIF	V	V	N	N	N	V	N	Grasslands, savanna, shrublands, croplands, and pastures
Loggerhead shrike	BCC, PIF	--	--	N	N	N	N	--	Short-grass prairie, grasslands, pastures, shelterbelts, and croplands
Bell's vireo	BCC, PIF		N	--	N	--	N	--	Riparian, shrub-scrub, and woodlands
Bewick's wren	BCC				N	--	--	N	Riparian, shrub-scrub, and woodlands
Sedge wren	PIF	N	N	N	M/N	N	N	M/N	Grasslands, herbaceous wetlands, fens, riparian, croplands, and shelterbelts
Wood thrush	BCC	N	--	M/N	M/N	M/N	N	N	Forested wetlands, riparian, woodlands, orchards, and shrub thickets
Sprague's pipit	BCC, PIF, ND-SC	--	--	M	M	M			Short- grass and mixed-grass prairies, wet meadow, croplands, and shelterbelts
Cerulean warbler	BCC, PIF, KS-SC		--	--	--	--	--	--	Forested wetlands, riparian, and woodlands
Prothonotary warbler	BCC			--	N	N	N	N	Old-growth forested wetlands, riparian, and woodlands
Blue-winged warbler	BCC		N	N	N	N	N	N	Forested wetlands, riparian, fen, shrublands, and woodlands
Swainson's warbler	BCC					--	--		Forested wetland, riparian, and woodlands
Kentucky warbler	BCC			N	N	N	N	N	Forested wetland, riparian, woodlands, and shrublands
Worm-eating warbler	BCC	V	V		N	N	N		Forests, shrublands, and woodlands
Louisiana waterthrush	BCC			--	N	N	N	N	Forested wetlands, riparian, and woodlands
Dickcissel	BCC, PIF	N	N	N	N	N	N	N	Grasslands, meadows, croplands, and shelterbelts

TABLE 3.8.3-2
(Continued)

Species	Status [a]	Residence [b] ND	SD	NE	KS	MO	IL	OK	Habitat
Cassin's sparrow	BCC			--	--			--	West of Keystone Project area
Field sparrow	BCC, PIF	N	N	N	N	N/W	N/W	N/W	Shrublands, pastures, woodlands, and shelterbelts
Baird's sparrow	BCC, PIF, ND-SC	--	--						Mixed-grass and tall-grass prairies and wet meadows
Nelson's sharp-tailed sparrow	BCC, PIF	N	--	M	M	M	M	M	Herbaceous wetlands, grasslands, fens, and flooded croplands
Grasshopper sparrow	BCC	N	N	N	N	N	N	N	Grasslands and pasture
Le Conte's sparrow	BCC, PIF	--	N	M	M	M/W	E	M/W	Herbaceous wetlands, fen, riparian, grasslands, and pastures
Henslow's sparrow	BCC, PIF		--		N	N	N	--	Grasslands, tall-grass prairie, meadows, shrub-scub, and pastures
Painted bunting	BCC, PIF				N			N	Shrublands, riparian, pastures, woodlands, and shelterbelts
Harris's sparrow	BCC, PIF	M	M/W	M/W	W	M/W	M	W	Riparian, scrub-shrub, forested wetlands, and shelterbelts
Swamp sparrow	ND-SC	M/N	M/N	M/N	M/N	N	N	M/N	Herbaceous wetlands, and scrub-shrub wetlands
Chestnut-collared longspur	BCC	N	N	--	M/W			M/W	Mixed-grass and short-grass prairies, pastures, and croplands
Smith's longspur	BCC, PIF	M	M	M	M/W	W	M/W	W	Grasslands, croplands, and pastures
McCrown's longspur	BCC, PIF	--	--	--					West of Keystone Project area
Bobolink	PIF, KS-SC	N	N	N	--	--	N/M	M	Tall-grass prairie, herbaceous wetlands, and croplands
Rusty blackbird	BCC	M	M	M/W	W	W	W	W	Forested wetlands, riparian, scrub-shrub, and croplands
Yellow-headed blackbird	MO-SC	N	N	N	M/N	M	M	M	Herbaceous wetlands and prairie wetlands
Orchard oriole	BCC	N	N	N	N	N	N	N	Riparian, croplands, shelterbelts, and orchards

[a] BCC = Birds of conservation concern (USFWS 2002), PIF = Partners in Flight Physiographic Area Plans (Rich et al. 2004), SC = State species of conservation concern.

[b] Based on range mapping from http://www.natureserve.org (Natureserve 2006).
-- = Species occurs in state; however, range does not include Keystone Project right-of-way.
E = Extirpated. M = Passage migration. N = Breeding (nesting) resident. W = Winter resident.

Sources: USFWS 2002, Rich et al. 2004, ENSR 2006a, NaturServe 2006.

All migratory birds are protected by the MBTA, as discussed in Section 2.6.4. As noted, golden eagles and their nests are further protected by the Bald and Golden Eagle Protection Act (16 USC 688-688d [a and b]). The destruction or disturbance of a migratory bird nest that results in the loss of eggs or young is a violation of the MBTA. Disturbance to bald or golden eagles is prohibited under the BGEPA and the MBTA.

Pipeline construction would be conducted in accordance with any required permits. Keystone has committed to implementing the following measures in its CMR Plan (Appendix B) to protect wildlife species of conservation concern:

- Bevel shavings produced during pipe bevel operation would be removed immediately to ensure that livestock and wildlife do not ingest this material.
- Litter and garbage that could attract wildlife would be collected and removed from the construction site at the end of the day's activities.
- Feeding or harassment of livestock or wildlife is prohibited.
- Construction personnel would not be permitted to have firearms or pets on the construction ROW.
- All food and wastes would be stored and secured in vehicles and/or appropriate facilities.
- Areas of disturbance in native range would be seeded with a native seed mix after topsoil replacement.
- Keystone would contract a qualified biologist to conduct a survey of species of conservation concern associated with native tall-grass prairie. Locations of species of conservation concern found would be documented; if species of conservation concern are identified in the ROW, Keystone would work with the relevant regulatory authorities to determine whether any additional protection measures would be required.
- Disturbance in native prairie would be reclaimed to native prairie species using native seed mixes specified by applicable state and federal agencies, to ensure no net loss of native prairie habitat.
- Where avoidance of native tall-grass prairie by the pipeline ROW is infeasible, appropriate surveys would be implemented to ensure that populations of species of conservation concern are not affected.
- Keystone would contract a qualified biologist to conduct a survey of breeding bird habitat within 330 feet of proposed surface disturbance activities that would occur during the breeding season. The biologist will document active nests, bird species, and other evidence of nesting (e.g., mated pairs, territorial defense, and birds carrying nesting material or transporting food). If the biologist documents an active nest for a species that is designated as a USFWS Birds of Conservation Concern, a Partners in Flight Priority Bird Species, a State Species of Conservation Concern (Table 3.8.3-2), or a State Threatened or Endangered Species during the survey, Keystone would work with USFWS and state agency wildlife biologists to determine whether any additional protection measures would be required.
- Immediately prior to construction activities during the raptor breeding season (February 1–July 31), breeding raptor surveys would be conducted by a qualified biologist through areas of suitable nesting habitat to identify any potentially active nest sites in the Keystone Project area. If raptors are identified within 0.5 mile of the construction ROW, Keystone would work with USFWS and state agency wildlife biologists to develop mitigation measures. These measures

would be implemented on a site-specific and species-specific basis, in coordination with USFWS and state agency wildlife biologists.

Total habitat loss due to pipeline construction would be small in the context of total available habitat, because of the linear nature of the Keystone Project and because restoration would follow pipeline construction. However, if disturbance involved important remnant habitats, such as prairie-chicken leks or cricket frog marshes, habitat loss would significantly affect local populations. Normal operation of the pipelines would result in negligible effects on terrestrial wildlife. Direct impacts from maintenance activities, such as physical pipe inspections or ROW repair, would be the same as those for construction. Keystone would consult with appropriate state wildlife agencies prior to initiation of maintenance activities beyond standard inspection procedures.

To avoid impacts on wildlife species of conservation concern, Keystone would work with USFWS to identify measures to comply with the MBTA and the BGEPA and will work with both USFWS and state agency wildlife biologists to determine whether additional mitigation is needed for wildlife species of conservation concern.

Connected Actions

Approximately 181 miles of new transmission lines and 22 miles of upgraded transmission lines would be required to power pumpstations along the Mainline, with about 12 miles of new lines for the Cushing Extension (see Section 2.14). Wildlife habitats affected by construction and operation of transmission lines and wildlife collision potential applicable to species of conservation concern are described in Section 3.6.4. In modifying or constructing transmission line substations to support the Keystone Project, Western would implement the following mitigation measures for species of conservation concern:

Collision and electrocution impacts on birds resulting from construction of transmission lines would be reduced by provider implementation of the following mitigation measures:

- Standard, safe designs, as outlined in Suggested Practice for Avian Protection on Power Lines (APLIC 2006), into the design of electrical distribution lines in areas of identified avian concern.
- Marking techniques to increase transmission line visibility, using balls or flappers.
- A minimum 60-inch separation between conductors and/or grounded hardware and recommended use of insulation materials and other applicable measures, depending on line configuration.
- Standard raptor-proof designs, as outlined in Avian Protection Plan Guidelines (APLIC and USFWS 2005), into the design of the electrical distribution lines to prevent collision by foraging and migrating raptors in the Keystone Project area.

Electrical service providers and RUS, where applicable, would coordinate with the appropriate state and federal resource agencies to identify specific locations for flight deterrents or other avoidance or minimization measures.

3.8.4 References

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3.9 LAND USE, RECREATION AND SPECIAL INTEREST AREAS, AND VISUAL RESOURCES

Construction, operation, and maintenance of the pipeline facilities and access routes for the Keystone Project would cause temporary and permanent impacts on various types of land uses, such as agriculture, rangeland, wetlands, waterbodies, industrial/commercial land, residential land, and recreational and other special interest areas (e.g., public lands). The potential impacts and mitigation measures identified in the following sections apply to both the Mainline Project and the Cushing Extension routes, except as noted.

As shown in Tables 3.9.3-3 and 3.9.4-3 (in the respective sections), the largest amount of acreage that would be affected by the Keystone Project would be agricultural land (72 percent and 58 percent for the Mainline Project and the Cushing Extension, respectively), followed by rangeland (17 and 35 percent, respectively). Impacts to these and other various land uses, as well as visual resources, are discussed below and are separated for the Mainline Project and the Cushing Extension routes. Wetlands and forested areas are discussed in greater detail in Sections 3.4 and 3.5, respectively.

3.9.1 Right-of-Way Acquisition Process

Pipeline facilities would predominantly affect privately owned land. Private land comprises approximately 99.6 percent of lands that would be crossed by the Mainline Project and 98.8 percent that would be crossed by Cushing Extension. Of the affected privately owned areas, land use is primarily agricultural.

Keystone requires a negotiated easement from all ROW landowners. Easements would consist of two types: permanent easements that would allow Keystone to construct, operate, and maintain the pipeline in the permanent ROW; and temporary easements to allow for additional construction workspace and storage areas. In return, the company compensates the landowner for use of the land. The easement agreement between the company and landowner typically specifies compensation for loss of use during construction, loss of non-renewable or other resources, damage to property during construction, and allowable uses of the permanent ROW after construction. Because the easement acquisition process is conducted with the landowner, it is possible that tenants or lessees could be adversely affected, although it is not known whether any instances of such impacts would occur in conjunction with the components of the Keystone Project.

The potential effect of a pipeline easement on private property values or property income is an issue that would be negotiated between the parties during the easement acquisition process, a process designed to compensate a landowner for the right to use the property for pipeline construction and operation. The impact a pipeline may have on the value of a tract of land depends on many factors, including the size of the tract, the values of adjacent properties, the presence of other utilities, the current value of the land, and the current land use. Construction of the proposed Keystone Project would not change the general use of the land (except for permanent aboveground facilities and forest land) but would preclude construction of aboveground structures on the permanent ROW, restrict excavation or alteration of ground elevation, and restrict impoundment of water above the permanent ROW. The easement would allow Keystone the right to cut and clear trees, brush, and shrubbery and to remove structures and other obstacles from the permanent ROW. Construction and operation of the pipeline might interfere with other current uses on a short-term or long-term basis, or contribute to the loss of non-renewable resources or destruction of site improvements such as fences.

Keystone would monetarily compensate landowners in return for granting easements. Compensation would be for loss of use during construction, crop loss, loss of non-renewable or other resources, and restoration of any unavoidable damage to personal property during construction. In the event that an easement cannot be negotiated with a landowner, Keystone would utilize state eminent domain laws to obtain easements needed for pipeline construction, maintenance, and operation. State laws dictate under what circumstances eminent domain may be used and define the eminent domain process for each state, as applicable. Keystone would still be required to compensate the landowner for the ROW and damages incurred during construction. However, the level of compensation would be determined by a court according to applicable state or federal law. In either case, Keystone would compensate landowners for use of the land. Eminent domain does not apply to lands under federal ownership.

Compensation for crop loss would be determined on a case-by-case basis. Keystone would obtain from the USDA current information regarding commodity prices and yields; these data would be supplemented by property-specific yield and price data supplied by the landowner. Landowners would be compensated at 100 percent for the year of construction, with diminishing percentages over the next 2 years.

Keystone also would acquire a number of sites for the construction, operation, and maintenance of pump stations and other permanent aboveground facilities. These would be negotiated with and purchased from landowners.

3.9.2 Data and Methodology

The Keystone Pipeline Project Environmental Report (ENSR 2006a) was the primary source of data for this analysis of land use, recreation and special interest areas, and visual resources. The Environmental Report originally was submitted in April 2006 and was updated through 10 subsequent filings, with the final filing submitted in November 2007. Land use classifications provided in the Environmental Report were established by developing Project-specific land cover categories based on analysis of high-resolution aerial photography (TransCanada 2007c). Keystone subsequently has updated its land use data several times: the December 2006 realignment of the Cushing Extension route; the January 24, 2007 supplemental filing to DOS (TransCanada 2007a); the January 29, 2007 Data Request #1 filing (TransCanada 2007b), the April 4, 2007 Data Request #2 filing (TransCanada 2007c), and the September 9, 2007 supplemental filing to DOS (TransCanada 2007d). Keystone's CMR Plan (Appendix B) was instrumental in determining the adequacy of mitigations and impact significance. In addition, aerial strip maps were analyzed to verify land use categories and identify structures on or close to the construction ROW.

On January 26, 2007, a meeting was held between DOS and FSA; on February 1, 2007, a similar meeting between DOS and NRCS was held to discuss potentially affected conservation easements, compensatory mitigation for impacts to agricultural wetlands, and appropriate mitigation and revegetation measures for agricultural lands. Subsequent meetings to discuss agricultural issues were held with FSA on March 15, 2007, and with Keystone on April 9, 2007. Review of the Keystone Project shapefiles indicates that the route as originally proposed in the application would cross three NRCS easements: one each in South Dakota, Missouri, and Oklahoma. Keystone will avoid all but the Missouri easement. For this easement, Keystone determined that potential impacts would be greater to re-route the Project than to cross the easement. NRCS has agreed to this finding with caveats, described fully in the agricultural land use subsection.

3.9.3 MAINLINE PROJECT

3.9.3.1 General Land Use

As proposed, the 1,082-mile Mainline Project would disturb a total of 17,607 acres of land while traversing the states of North Dakota, South Dakota, Nebraska, Kansas, Missouri, and Illinois. Of this total, approximately 6,667 acres would be retained as the permanent ROW. Approximately 109 acres are to be set aside for permanent aboveground facilities, including pump stations, MLVs, delivery facilities and permanent access roads. All other disturbed acreage (including pipe and contractor yards, additional temporary facilities, and the construction ROW) would revert to previous uses following the construction process.

Approximately 377 miles (43 percent) of the Mainline Project pipeline would be within an approximately 300-foot-wide corridor of existing pipeline, utility, or road ROWs. The remaining 705 miles would require a new ROW (TransCanada 2007c). Table 3.9.3-1 shows the number of acres that would be affected during construction and operation of the Mainline Project.

TABLE 3.9.3-1
Land Requirements for the Keystone Mainline Project

State	Land Affected during Construction (acres)	Permanent Right-of-Way (acres)
North Dakota	3,440	1,342
South Dakota	3,377	1,349
Nebraska	3,335	1,323
Kansas	1,871	608
Missouri	4,675	1,687
Illinois	909	358
Mainline Project total	**17,607**	**6,667**

Sources: ENSR 2006a; TransCanada 2007c, d.

Keystone plans to construct 3.5 miles of permanent roads to access Project facilities (TransCanada 2007c). Existing roads would be used on a temporary basis during construction; and some of these roads may require improvements. A total of 142 new temporary roads or expanded existing roads are planned for the Mainline Project. These roads would range from 0.01 to 13.5 miles long, with the majority less than 0.5 mile long and crossing agricultural land. One access road at MP 1072.5 would be 13.5 miles long and would cross a wetland. Temporary access roads would occupy approximately 142 acres during construction. Access roads also are discussed in Section 2.1.1.3, Ancillary Facilities.

Additional Aboveground Facilities

The Mainline Project would include 23 new pump stations (and a possible 24th at Bond County, Illinois to support expansion) and 57 MLVs, two delivery sites (Wood River and Patoka Terminals), and pig launching and receiving facilities that would be located within pump stations. The Mainline Project would require construction of 24 new electric power lines to provide energy for pump stations. These would total approximately 181 miles in length (the longest spanning about 31 miles, with an average length of 7.5 miles). The power lines would be permitted and built by various utility providers but would be considered a connected activity under NEPA. Keystone assumes that the majority of required transmission lines would parallel existing county road ROWs and that no substation construction would be necessary to accommodate Keystone Project power requirements. Either steel or wooden poles would be used for power lines, with wire conductors installed through pulling or reeling, and insulators installed as needed. Poles would vary in height from 40 to 80 feet, depending on transmission line voltage. Additional power lines would be required for valve sites and would be supplied from distribution service drops from adjacent distribution power lines. Most of these service drops would require installation of one or two poles with a transformer and would typically be less than 200 feet in length (TransCanada 2007d).

Table 3.9.3-2 catalogues the number of acres required to accommodate aboveground facilities during construction and operation, as well as affected acreage for the pipeline ROWs, additional workspaces, temporary and permanent access roads, and contractor and pipe yards. Some facilities, including MLVs and pig launching and receiving sites, are located within the affected acreage of other facilities (e.g., pig launchers and receivers would be located within pump stations) or would be located entirely within the 50-foot-wide permanent ROW (MLVs). The state, county, and milepost location of each aboveground facility is provided in Table 2.1-6, in Section 2.1.1.3.

Turnouts and access roads from public roads would be installed to each aboveground facility. Drainage would be maintained by installing ditches or culverts, and the short access roads would be surfaced with crushed rock. The delivery facility sites would be enclosed with a chain-link security fence (TransCanada 2007c).

Land Use by State

The Mainline Project would primarily affect agriculture and grassland/rangeland land uses. Of lands that would be crossed by the Mainline Project, agriculture and rangeland account for 72 and 17 percent, respectively, of the total acres affected by the Mainline Project. Table 3.9.3-3 shows affected land use acreages by state for the Mainline Project.

On a state-by-state basis, agriculture is the predominant land use affected, generally followed by grassland/rangeland. Missouri differs in that a much larger percentage of land crossed by the pipeline is comprised of rangeland and forestland than for other states. In Missouri, 22 percent of affected land is rangeland and 13 percent is forestland. Missouri contains more affected forestland acreage than all other stretches of the pipeline combined. The Mainline Project in Kansas and Illinois also has a relatively higher percentage of forestland (6 percent) than in North Dakota, South Dakota, and Nebraska.

The Mainline Project alignment was rerouted to avoid affecting wetlands in several North Dakota and South Dakota sections. These included North Dakota reroutes in Nelson and Steele Counties, and in the Hecla Sandhills (Sargent County, North Dakota, and Marshall County, South Dakota). North Dakota contains the most affected wetland acres of all states on the Mainline Project route (191 acres, or approximately 5.5 percent of total acres in North Dakota). Wetland impacts are discussed in further detail in Section 3.4.3.

Developed land comprises between approximately 1.3 (Kansas) and 7.8 percent (Illinois) of affected acres along the Mainline Project. For the Mainline Project pipeline as a whole, developed land represents about 2.9 percent of the affected acres.

TABLE 3.9.3-2 Acres Affected during Construction and Operation of Pipeline Facilities for the Keystone Mainline Project		
Pipeline Facility	**Construction**	**Operation**
North Dakota		
Pipeline right-of-way (ROW)	2,892	1,320
Additional temporary workspaces	121	0
Pipe and contractor yards	440	0
Pump stations and delivery facilities	25	25
Permanent access roads	0.2	0.2
Temporary access roads	40	0
North Dakota subtotal	*3,440*	*1,342*
South Dakota		
Pipeline ROW	2,928	1,332
Additional temporary workspaces	129	0
Pipe and contractor yards	329	0
Pump stations and delivery facilities	19	19
Permanent access roads	0.3	0.3
Temporary access roads	20	0
South Dakota subtotal	*3,377*	*1,349*
Nebraska		
Pipeline ROW	2,861	1,301
Additional temporary workspaces	123	0
Pipe and contractor yards	322	0
Pump stations and delivery facilities	25	25
Permanent access roads	0	0
Temporary access roads	7	0
Nebraska subtotal	*3,335*	*1,323*
Kansas		
Pipeline ROW	1,314	598
Additional temporary workspaces	80	0
Pipe and contractor yards	458	0
Pump stations and delivery facilities	11	11
Permanent access roads	1	1
Temporary access roads	0	0
Kansas subtotal	*1,871*	*608*
Missouri		
Pipeline ROW	3,646	1,660
Additional temporary workspaces	280	0
Pipe and contractor yards	800	0
Pump stations and delivery facilities	13	13
Permanent access roads	2	2
Temporary access roads	36	0
Missouri subtotal	*4,675*	*1,687*

TABLE 3.9.3-2 (Continued)		
Pipeline Facility	**Construction**	**Operation**
Illinois		
Pipeline ROW	655	345
Additional temporary workspaces	34	0
Pipe and contractor yards	175	0
Pump stations and delivery facilities (includes the Bond County pump station (PS-38) potentially needed for expansion)	13	13
Permanent access roads	0	0
Temporary access roads	39	0
Illinois subtotal	*909*	*358*
Mainline Project		
Total pipeline ROW	14,296	6,556
Total additional temporary workspaces	767	0
Total pipe and contractor yards	2,524	0
Total pump stations and delivery facilities	106	106
Total permanent access roads	4	4
Total temporary access roads	146	0
Mainline Project total	**17,607**	**6,667**

Notes:

Discrepancies between acreages for individual features and totals and subtotals are attributable to rounding.

Affected acreage for densitometer sites and mainline valves is effectively included within the 50-foot-wide permanent ROW of the pipeline and therefore is not listed separately here.

All pig launching and receiving facilities would be located within pump stations and would not require any additional acreage.

Affected lands components total acreage is quantified by component and does not account for overlap between components. Therefore, the total acreage of affected lands per state will not be the same as the sum of the individual components.

Sources: ENSR 2006a; TransCanada 2007c, d.

TABLE 3.9.3-3
Acres Affected during Construction by Land Use Type for the Keystone Mainline Project

Land Use Type	ND	SD	NE	KS	MO	IL	Total	Percent of Total (%)
Agriculture/cropland	2,649	2,504	2,751	1,348	2,754	581	12,587	71.5
Grassland/rangeland	450	679	447	349	1,014	112	3,051	17.3
Forestland	48	2	44	115	600	58	867	4.9
Wetlands/riparian	191	98	25	18	76	73	481	2.7
Developed	90	88	50	25	182	71	506	2.9
Water	12	6	18	16	49	14	115	<1
Total	**3,440**	**3,377**	**3,335**	**1,871**	**4,675**	**909**	**17,607**	

Notes:

Agriculture includes cultivated crops, flood or pivot irrigation crops, and fallow cropland.

Rangeland includes tall grass prairie, mid-grass prairie, short grass prairie, sand prairie, non-native grassland, deciduous shrubland, mixed native and non-native grasslands and mixed prairie, improved and unimproved pasture, and lands that appear to be used for cattle or other livestock grazing—with or without a shrub component.

Forestland includes upland and wetland forested areas.

Wetlands include palustrine forested wetlands and palustrine emergent/scrub-shrub wetlands.

Developed land includes both industrial/commercial and residential uses. Industrial/commercial includes electric power or gas utility stations, manufacturing or industrial plants, livestock feedlots, landfills, mines, quarries, commercial or retail facilities, and roads.

Residential includes residential yards, subdivisions, and planned new residential developments.

Sources: ENSR 2006a; TransCanada 2007c, d.

Ownership

Land along the Mainline Project is principally privately owned. In all states except Illinois, private ownership comprises more than 99 percent of lands that would be crossed by the Mainline Project (see Table 3.9.3-4). For Illinois, private ownership accounts for approximately 95 percent of land that would be crossed, with federal lands making up the remaining 5 percent. For the Mainline Project as a whole, private ownership accounts for approximately 99.6 percent of land crossed by the Project. This translates to approximately 66 acres of affected federal land in Illinois and 18 acres of affected state land in North Dakota, South Dakota, and Missouri (TransCanada 2007d) (see Table 3.9.3-5).

As noted earlier, temporary and permanent ROWs would be acquired via negotiation with private landowners on a case-by-case basis. Where the pipeline would traverse state land, all applicable state statutes would apply. The Mainline Project would cross approximately 1.3 miles of state-owned lands comprising 0.8 miles in North Dakota, and approximately 0.5 miles in Missouri (TransCanada 2007c).

Where the pipeline would traverse federal land, all applicable federal statutes would apply. In July 2007, Keystone applied for Right-of-Way Grants pursuant to the Mineral Leasing Act, which would authorize temporary construction use and long-term use of federal land for pipeline purposes. A Right-of-Way Grant is issued for a 30-year term and contains a right of renewal if the project continues to be used for its initial purpose. Each federal agency has its own easement procedure. The Mainline Project would cross about 3 miles of federally owned land in Illinois, comprising about 66 acres (TransCanada 2007c). The Mainline Project would not cross any other federal lands.

TABLE 3.9.3-4
Ownership of Land Crossed by the Keystone Mainline Project

Land Owner	Miles Crossed	Percent of Total (%)
North Dakota		
Federal	0.0	0.0
State	0.8	0.4
Private	217.0	99.6
North Dakota subtotal	*217.8*	
South Dakota		
Federal	0.0	0.0
State	0.0	0.0
Private	219.9	100.0
South Dakota subtotal	*219.9*	
Nebraska		
Federal	0.0	0.0
State	0.0	0.0
Private	214.6	100.0
Nebraska subtotal	*214.6*	
Kansas		
Federal	0.0	0.0
State	0.0	0.0
Private	98.7	100.0
Kansas subtotal	*98.7*	
Missouri		
Federal	0.0	0.0
State	0.5	0.2
Private (includes Nature Conservancy lands)	273.5	99.8
Missouri subtotal	*274.0*	
Illinois		
Federal	3.0	5.3
State	0.0	0.0
Private	53.9	94.7
Illinois subtotal	*56.9*	
MAINLINE PROJECT		
Federal	3.0	0.3
State	1.3	0.1
Private	1,077.6	99.6
Mainline Project total	**1,081.9**	

Note: Discrepancies between mileage for individual land owner type, totals, and subtotals are attributable to rounding.

Sources: ENSR 2006a; TransCanada 2007c, d.

TABLE 3.9.3-5 Ownership of Acres Affected during Construction by the Keystone Mainline Project				
Location	**Federal**	**State**	**Private**	**Total**
North Dakota	0	11	3,429	3,440
South Dakota	0	<1	3,377	3,377
Nebraska	0	0	3,335	3,335
Kansas	0	0	1,871	1,871
Missouri	0	7	4,668	4,675
Illinois	66	0	843	909
Mainline Project total	**66**	**18**	**17,523**	**17,607**

Sources: ENSR 2006a; TransCanada 2007c, d.

3.9.3.2 Agricultural Land

The Mainline Project primarily would cross cropland in private ownership. Construction and operation of the Mainline Project facilities would affect about 12,587 acres of agricultural land along approximately 1,082 miles of construction route. Of this, approximately 589 miles are considered prime farmland by the NRCS (including land considered potential prime farmland, if adequate protection from flooding and drainage was provided).

To determine the amount of agricultural land that potentially would be affected, Keystone reviewed aerial photographs and made general observations during reconnaissance activities. Further refinements to the assessment of various types of cover were completed during an August 2006 grassland survey. Based on the aerial photography evaluations and ground surveys, Keystone has indicated that no known orchards would be crossed by the Keystone Project.

Crops vary significantly along the pipeline route due to its length (ranging from the 49^{th} Parallel N at the U.S./Canadian border to the 43^{rd} Parallel N at Patoka, Illinois, and the 36^{th} Parallel N at Cushing, Oklahoma). Typical crops along the pipeline route include corn, soybeans, wheat, barley, rye, sorghum, sunflower, dry edible beans, flaxseed, canola, popcorn, alfalfa, hay, sugar beets, and oats. Certain crops are more common in the southern states of the pipeline route, including cotton, fruits and nuts, rice, vegetables, flowers, and tomatoes.

Numerous tracts of land are enrolled in USDA programs managed through NRCS and FSA. The NRCS negotiates easements with landowners for a variety of land and habitat conservation priorities. Some NRCS programs include the Wetland Reserve Program (WRP), the Farm and Ranchland Protection Program (FRRP), and the Wildlife Habitat Incentives Program (WHIP). FSA does not negotiate easements but enters into a contract with landowners for certain conservation practices. Some FSA programs include the Conservation Reserve Program (CRP), the Conservation Reserve Enhancement Program (CREP), the Farmable Wetlands Program (FWP), and the Emergency Conservation Program (ECP). The Grassland Reserve Program is implemented by both the FSA and NRCS and provides rental and easement options. Both easements and rental contracts for these programs are available for a variety of durations, and some easements can be made in perpetuity.

The CRP is the largest of these programs. Landowners with CRP contracts can receive annual rental payments and cost-share assistance to establish long-term resource-conserving covers on eligible farmland. CRP protects millions of acres of topsoil from erosion and is designed to safeguard natural resources. The program encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filter strips[1], or riparian buffers. Participants enroll in CRP contracts for 10 to 15 years (FSA 2007a).

Potential Impacts and Mitigation

Construction-related activities such as grading, trenching, stringing, welding, backfilling, and restoring could impact agricultural lands by leading to soil erosion, interference with and damage to agricultural surface and subsurface drainage and irrigation systems, mixing or loss of fertile topsoil and subsoil, and soil compaction. All of these impacts could result in reduced productivity of agricultural lands or direct crop loss.

During the scoping period for the Keystone Project, several members of the public expressed concerns regarding impacts on agricultural activities that could result in crop losses, including:

- Soil compaction due to heavy construction equipment;
- Construction schedule and duration during which agricultural activities could not be conducted;
- Impact to center pivot irrigation systems;
- Surface and subsurface drainage, ponds, waterlines, and drainage ditches;
- Access to farmland, particularly in areas where large amounts of wetland surround the farmland;
- Effect of wetland impacts on farmers eligible for payments associated with protection of wetlands on farmland (FSA programs);
- Impacts on landowners with CRP lands; and
- Compensation for affected crop production.

To address impacts on agricultural lands, Keystone has proposed a number of mitigation measures that are detailed in the CMR Plan (Appendix B). Keystone proposes to restore all disturbed areas associated with construction of the Keystone Project, in accordance with its CMR Plan and all other applicable federal, state, and local permit requirements. Keystone intends to repair or restore drain tiles, fences, and land productivity as these may be damaged during the construction process. Following construction, agricultural land can revert to its previous use, except for about 109 acres of land that would be set aside for permanent aboveground facilities (consisting of about 106 acres for pump stations and 3.5 acres for permanent access roads) and that Keystone would directly purchase from landowners. At this time, it is unclear what percentage of these acres to be devoted to permanent aboveground facilities would be located in agricultural land use areas; however, agriculture is the predominant land use, and these facilities are likely to displace agricultural land use acreage. When construction and cleanup have been completed, affected land along the temporary and permanent ROWs could be returned to agricultural production, although the magnitude of construction and operational impacts could include changes in agricultural use or even conversion to a non-agricultural use at a landowner's request.

Keystone's CMR Plan includes typical measures such as avoiding or minimizing topsoil/subsoil mixing and ensuring that compaction and other construction-related effects are rectified. See Section 3.2.2.1 for a detailed discussion of topsoil segregation. In addition, several of Keystone's proposed mitigation

[1] Filter strips are vegetated areas planted adjacent to crops that are designed to filter runoff and improve water quality. They are frequently used near streams, ponds, lakes, sinkholes, and agricultural drainage wells. Filter strips are typically planted with very close-growing vegetation, to better trap sediments, nutrients, and chemicals.

measures directly address the comments raised by landowners and other stakeholders affected by the Keystone Project:

- Only use machinery with low ground pressure;
- Avoid or restrict construction activities in excessively wet soil conditions to minimize soil compaction and rutting;
- Restore all temporary and permanent ROWs and additional workspaces to pre-construction levels of soil compaction through ripping and discing subsoil prior to salvaged topsoil replacement;
- Provide a minimum of 24 hours notice to a landowner before accessing his/her property for construction purposes;
- Supply Keystone contact information to affected landowners prior to construction;
- Reach a mutually acceptable agreement between Keystone and a landowner on the access route for entering and exiting the pipeline construction ROW, should access not be possible from adjacent pipeline construction ROW segments or from a public access road;
- Establish with a landowner an acceptable amount of time that an irrigation system (pivot, spray, or flow) may be out of service due to pipeline construction and reasonably compensate a landowner for any losses incurred due to irrigation disruption, both on and off the temporary and permanent ROWs;
- Implement measures to allow for irrigation to continue during pipeline construction when feasible and mutually agreeable to Keystone and the landowner;
- Not disrupt irrigation ditch water flows, except for the amount of time required to install the pipeline (typically 1 day or less), unless otherwise directed;
- Reestablish all original contours and drainage patterns following construction;
- Limit disruption to the surface drain network near the ROW;
- Leave gaps in trenches and strung pipeline to facilitate drainage;
- Discharge trench water in a manner that avoids damage to adjacent agricultural land, crops, and pasture;
- Install trench breakers on slopes where required to minimize potential water movement down the ditch and subsequent erosion;
- Minimize the duration of construction-related disturbance within wetlands to the extent possible; and
- Repair and restore land productivity to pre-construction levels.

Keystone would compensate agricultural landowners for actual crop losses resulting from removal of standing crops, disruption of planned seeding activity, disruption of general farming activities, or other losses resulting from construction of the pipeline—as negotiated in individual easements with the landowners. This includes compensation for direct yield payments from FSA. Standard damage remedies included in Keystone's CMR Plan stipulate that Keystone would agree to pay the landowner for any physical damages that arise from Keystone's use of the easement. In addition, any crop reductions related to the pipeline construction, whether on or off the construction and permanent ROWs, would be compensated to the landowner. Keystone would conduct post-construction monitoring to examine the revegetation in affected agricultural areas. Restoration is considered successful in agricultural areas if crop yields are similar to adjacent undisturbed portions of the same field. Affected areas would be restored, and Keystone would compensate landowners for any verifiable losses or damages both on and off the ROW that may result from pipeline construction. As noted in Section 3.9.1, crop loss compensation would be determined on a case-by-case basis. Keystone would obtain from the USDA current information regarding commodity prices and yields; these data would be supplemented by property-specific yield and price data supplied by the landowner. Landowners would be compensated at 100 percent for the year of construction, with diminishing percentages over the next 2 years.

Construction impacts on general agricultural activities are expected to be temporary and minor. Operations impacts on general agricultural activities are expected to be permanent but minor, consisting of the conversion of a small amount of agricultural acreage to industrial use for permanent aboveground facilities.

Soil Compaction

Construction of the Mainline Project could affect agricultural lands through soil compaction and decreased soil productivity. As outlined in its CMR Plan, Keystone proposes to avoid some initial soil compaction impacts by only using vehicles with low ground weight or wide tracks. Keystone would set restrictions upon construction during excessively wet periods to prevent compaction and rutting. Top soil would be stripped and segregated from sub soil. All affected land would be returned to original levels of compaction through ripping and discing prior to replacement of top soil. The restored ROW would be tested at regular intervals along the construction ROW. In the event that a landowner disagrees with Keystone's restoration methods, Keystone would consult the appropriate county Soil and Water Conservation District. Construction-related soil compaction impacts are expected to be short term and minor. Operation of the pipeline would not affect soil compaction.

Construction Schedule

Public comments questioned how the construction schedule might affect agricultural activities. Keystone proposes to begin construction of the pipeline in April 2008, with the construction period continuing for approximately 18 months, and operation beginning by November 30, 2009. Construction of the Cushing Extension section would proceed after this initial period, in late 2009 or early 2010, beginning service by 2010. The pipeline would be constructed in 11 spreads, eight for the Mainline Project and three for the Cushing Extension, proceeding north to south. The Mainline Project spreads would be constructed concurrently, and the Cushing extension spread would commence construction thereafter.

As described in Section 2.2, the typical pipeline construction period would include surveying and staking; clearing and grading; trenching; pipe stringing, bending, and welding; lowering-in and backfilling; hydrostatic testing; pipe geometry inspection; final tie-in welding; commissioning; and cleanup and restoration. In some areas, special construction techniques may be used for rugged or steep terrain, waterbodies, wetlands, paved roads, and railroads. Typical construction at one point would last for only a few days.

Keystone has made several schedule commitments in its CMR Plan. Landowners would be provided a minimum of 24 hours notice that Keystone intends to access their land for construction purposes. Notice would be made via personal or telephone contact, or by mail or hand delivery if a landowner cannot be reached. During construction, Keystone would provide access across the ROW to landowners at locations requested by the landowners, if practicable. Any restricted activity would continue for the duration of construction activities on any particular parcel of land and is not expected to last for more than a few days**.** Construction activities are expected to cause temporary and minor impacts to landowners.

Center Pivot Irrigation

Pivot irrigation systems typically involve an overhead irrigation mechanism consisting of several segments of pipe mounted on wheeled towers, with a row of sprinklers attached. The system moves in a circular pattern and is fed with water from the pivot point at the center, with crops planted in a circle to conform to the system geometry. Center pivot equipment also can be configured to move in a straight line, where the water is pulled from a central ditch.

The proposed pipeline crosses primarily agricultural lands, some of which use pivot irrigation systems. During scoping, public comments indicated concerns regarding the potential for pipeline installation to disrupt ongoing pivot irrigation.

While disruption of irrigation may occur during construction due to the location of trenching activity in relation to the pivot/tower system, these impacts would be temporary, and operations would return to normal following final restoration of the ROW. Keystone proposes to work with landowners to allow pivot irrigation to continue, as feasible and mutually acceptable, across land on which a pipeline is being constructed. If use of the irrigation system must be disrupted for pipeline construction, Keystone would establish with a landowner the acceptable amount of time that the system can remain out of operation. If interrupted irrigation due to pipeline construction would adversely affect agricultural production, Keystone would reasonably compensate the landowner for damages both on and off the ROW. Construction impacts on irrigation systems are anticipated to be temporary and minor. Pipeline operation is not expected to affect irrigation systems of any type.

Surface and Subsurface Drainage, Ponds, Waterlines, and Drainage Ditches

During scoping, commentors sought clarification concerning impacts to subsurface drainage, ponds, waterlines, and drainage ditches. In its CMR Plan (Appendix B), Keystone proposes to avoid initial disruption of surface drainage and to reestablish all original contours and drainage patterns following construction. For subsurface drainage, a major concern is migration of water within the pipeline trench. This would be prevented by installation of trench breakers on slopes at regular intervals to prevent water movement and subsequent erosion.

During land acquisition and permitting, Keystone would identify the locations of potentially affected public and private waterlines. No water lines would be cut without the permission of the landowner or public agency. Waterlines would merit the same treatment as irrigation systems—Keystone would attempt to allow continued operation of waterlines during construction and would establish with the landowner an acceptable amount of time that the waterline could be out of service, in the event that operation must be temporarily interrupted. If interruption of waterline service were to lead to damages to agricultural resources, Keystone would provide reasonable compensation to the landowner for lost productivity. The pipeline would be installed beneath the waterline in most cases, leaving a minimum of 12 inches of clearance between the waterline and the Keystone pipeline. If there is sufficient depth of cover available, in some areas, the Keystone pipeline could cross above the waterline with 12 inches of clearance and the additional 4 feet of cover on the oil pipeline (TransCanada 2007c).

During construction, a small backhoe or hand excavation would be used to expose the waterline, which then would be left exposed and flagged. The pipeline section to be installed beneath the waterline would be welded and left adjacent to the exposed waterline for installation by the tie-in crew. During connection, the waterline would be supported across the trench to prevent it from breaking. During backfilling of the trench, native material would be used and care would be taken to prevent damage to the waterline (TransCanada 2007c).

Underground drainage tiles would be repaired by Keystone if damaged during construction, either through settlement with the landowner or the county (in the case that a drainage tile system is publicly owned), or by directly repairing the system. In the CMR Plan (Appendix B), Keystone has adopted a set of guidelines and procedures for managing impacts to drainage tile systems. Keystone intends to avoid interrupting irrigation ditch flows, except for the time required for trenching, lowering-in pipe, and backfilling (typically 1 day or less).

Keystone proposes to avoid agricultural ponds by adjusting the pipeline route as necessary. If it is not possible to avoid a pond, Keystone would work with the landowner to remove or lower the water level in the agricultural pond prior to construction, to allow dry terrain installation (TransCanada 2007c). Where dry installation is not practical or acceptable to the landowner, the open-cut wet crossing method would be used to cross the pond. This method entails trenching through the water body, depositing trench spoils at least 10 feet from the edge of the water, installing pipeline that was previously assembled next to the pond, and backfilling with native material. The pipe would be weighted with concrete to provide negative buoyancy, and the banks would be restored. For a full description of this construction method, see Section 2.2. Cleanup of the adjacent banks and restoration, which would include installing temporary erosion controls and re-seeding the banks, would be completed following construction (TransCanada 2007c).

Construction impacts related to drainage systems, ponds, ditches, and waterlines would be temporary and minor, and Keystone would fully compensate or remediate any resulting damages. Operation of the underground pipeline is not expected to affect surface or subsurface drainage, water delivery, or water storage systems. (See Section 3.3.1.2 for a discussion of impacts on surface waters in the project area.)

Conservation Reserve Program Lands

Several scoping comments requested information about impacts on lands in the CRP. In reviewing the proposed alignment, FSA determined that there are landownership tracts along the proposed corridor that total 16,648 acres that have some portion of the tract enrolled in the CRP program. The FSA is unable to determine based on existing information how many acres of actual CRP lands within these tracts are impacted by the proposed corridor. However, the actual potentially affected acreage of CRP land is likely to be a small percentage of the total acreage within these landownership tracts.[2] Those CRP acres that are directly crossed by the corridor could be required to exit the program, and in this case the landowner would be required to pay liquidated damages equal to 25 percent of the annual rental payment, in addition to the federal cost-shares received, all annual rental payments, and interest. Keystone and FSA would determine the actual amount of enrolled acres that would be affected by the ROW through site visits. These visits would document whether the ROW crosses CRP acreage and the site-specific impact based on the type of affected habitat. Keystone would work with landowners and local FSA and NRCS officials to develop restoration programs that would ensure that any affected enrolled CRP acreage would be eligible to continue participation in the program.

Certain CRP lands, such as grasslands (approximately 80 percent of the potentially affected acreage reported by FSA), that would be affected by the construction period would require up to 5 years to fully regenerate to pre-construction conditions. Nevertheless, these areas could be managed in the same manner and for the same priorities following restoration. Enrolled CRP land containing woody

[2] FSA is unable release the precise location of acreage enrolled in its programs. The analysis that generated the amount of 16,648 acres affected during construction and 6,595 acres affected during operation was created by calculating the acreage of tracts *on which enrolled CRP acreage exists* that would be intersected by the proposed ROW. The ROW could intersect tracts of land with enrolled acreage and still avoid intersecting the enrolled acreage.

vegetation and trees would be more intensively affected, because the permanent ROW would need to be cleared and maintained in an open condition for the life of the pipeline. The construction ROW also would be affected over the long-term in woodlands, due to the long regeneration times for these cleared areas. Tree conservation acres represented less than 1 percent of the potentially affected acres reported by FSA. Impacts on CRP would be long term but minimal and localized.

To mitigate the impacts of land disturbance in CRP and other FSA conservation program areas, Keystone has committed to the following mitigation measures, in addition to those included in the CMR Plan:

- Assisting all appropriate landowners with contacting their local FSA offices concerning construction across lands covered by CRP contracts, for all verified enrolled acreage in CRP and other FSA conservation program areas.
- Conferring with all appropriate FSA offices to ensure that these consultations meet FSA requirements.
- Complying with remediation and restoration requirements required by FSA.
- Utilizing the state-specific NRCS Field Office Technical Guide (Appendix M) for mitigation and revegetation of areas damaged by construction.
- Consulting with the local NRCS representatives to determine the adequacy of Keystone's CMR Plan and supplement the plan as needed during construction and reclamation.

In the event that a landowner with current CRP contracts would need to remove land from the program because of pipeline construction and operation, Keystone would be responsible for covering all agricultural losses incurred because of pipeline construction and operation, as described in its CMR Plan (Appendix B). Keystone would restore the ROW to its original condition following construction.

Farmable Wetland Program Lands and Other FSA Programs

Some scoping comments asked about potential impacts on farmers who are currently eligible for federal payments from FSA associated with protection of wetlands on their farmland. The FWP is a voluntary program improving the land's hydrology and vegetation on no more than 100,000 acres per state.. Eligible producers in all states can enroll eligible land in the FWP through the CRP. Eligible acreage includes farmed and prior converted wetlands that have been affected by farming activities. The maximum acreage for enrollment of wetlands and buffers is 40 acres per tract (FSA 2007b). Pipeline construction in these areas would follow Keystone's guidelines for wetlands construction (see Section 2.2.2.4 for more information).

As with CRP lands, impacts on enrolled FWP lands and all FSA programs would be determined by site-specific visits. The CRP mitigation listed above also would apply to these lands. Keystone would be responsible for any agricultural impact resulting from pipeline construction and would restore the ROW to its original condition following construction.

NRCS Programs

NRCS determined that the Mainline Project would affect one WRP easement in Missouri. The WRP is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. NRCS provides technical and financial support to help landowners with their wetland restoration efforts. The goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, establishing long-term conservation and wildlife practices and protection.

Keystone agreed to re-route the ROW to avoid an easement in South Dakota but determined that relocating the alignment at the Missouri site would result in greater potential impacts than crossing the easement. NRCS agreed with this rationale for crossing the easement. To minimize the potential impacts of crossing this WRP easement Keystone would utilize the state-specific NRCS Field Office Technical Guide (Appendix M) for mitigation and revegetation of areas damaged by construction. Keystone would mitigate impacts to NRCS WRP easement lands to the greatest extent possible, according to a subordination agreement and the accompanying site restoration plan developed by NRCS. Ecological site conditions (including vegetation and hydrology) would be reestablished to the "future with no action condition" for all affected areas outside of the area to be maintained. Restoration of the site may take up to 5 years. Maintenance of vegetation would be specified in the maintenance plan developed with NRCS over the full width of permanent ROW. Keystone would consult with the local NRCS representatives to determine the adequacy of Keystone's CMR Plan and supplement the plan as needed.

Implementation of this measure would reduce potential impacts to agriculture on the one NRCS easement that would be crossed by the Mainline Project. The effect of the crossing would be considered long term but minor, with revegetation requiring up to 5 years to reestablish itself to pre-construction conditions. Maintenance of vegetation would not be conducted over the full width of the permanent ROW in non-forested areas, and no permanent impacts would result in this instance. Keystone would compensate the affected landowner for construction or operations impacts that affect the easement's continued enrollment in the WRP.

Access to Farmland

During construction of the pipeline, landowners may be temporarily unable to access farmland for agricultural activities. Keystone proposes to inform landowners a minimum of 1 day in advance of accessing their lands for construction purposes. In addition, Keystone would provide access during construction across the ROW, at locations requested by the landowners, if practicable. Construction impacts on farmland access would be temporary and minor, and Keystone would compensate landowners for any damage due to construction-related restriction of access. Operation of the pipeline would not affect access, as full access to the ROW would be restored to landowners following the construction period.

During construction, Keystone anticipates that farmers would be able to access farmlands that are surrounded by wetlands because Keystone would coordinate with the landowner to maintain access using the existing access roads. Access would be maintained by leaving hard plugs or soft plugs, or by creating temporary bridges using mats or other bridging materials where needed (TransCanada 2007c).

Windbreaks, Shelterbelts, and Living Snow Fences

Windbreaks, shelterbelts, and living snow fences are important resources in the Plains states for preventing soil erosion, reducing evaporation from soils, increasing crop yields, and providing habitat and wind protection for livestock (Haugen et al. 2002). The Mainline Project would intersect many windbreaks planted on private lands. At these intersection points, Keystone would need to remove trees and brush to provide access for construction equipment. During the operational life of the Keystone Project, the ROW would be maintained in an open condition, and trees and brush would not be allowed to revegetate the permanent ROW. Keystone has pledged that the construction ROW would be reduced to the minimum necessary width to construct the pipeline when crossing a shelterbelt.

To ensure that impacts on windbreaks, shelterbelts, and living snow fences are minimized, Keystone would address mitigation, reclamation, and remediation measures, including the possible use of non-vegetative remediation, pertaining to impacts to windbreaks, shelterbelts, and living snow fences with individual landowners and would comply with any applicable state requirements.

Revegetation with trees or woody vegetation would not be possible within the permanent ROW for the life of the Keystone Project, and revegetation within the construction ROW would take many decades to mature. Construction and operation of the pipeline, even with implementation of preventive and remedial measures, would result in permanent, but localized impacts to vegetative windbreaks, shelterbelts, and living snow fences.

3.9.3.3 Rangeland

Construction of Mainline Project facilities would affect about 3,051 acres of rangeland/grassland, representing approximately 17 percent of the total acres affected by the Mainline Project.[3] Missouri has the highest percentage of affected rangeland/grassland acres of all states (22 percent), and Illinois has the lowest (about 12 percent). Affected rangeland acreage in other states along the Mainline Project alignment ranges between 13 and 20 percent (TransCanada 2007c).

Potential Impacts and Mitigation

Construction activities would displace or halt grazing activities and would disturb the surface of livestock foraging areas. In addition, construction activities such as trenching could put livestock at risk of falling or being trapped in open trenches.

During the scoping period, the public asked how cattle would be protected during construction. To reduce overall risks to livestock grazing in rangelands, Keystone has proposed to work with the individual landowners to reach mutually agreeable terms regarding exclusion of livestock from construction work areas. These measures may include installation of fencing or use of hard (short lengths of unexcavated trench) or soft trench plugs (areas where the trench is excavated and replaced with minimal compaction) at agreed-upon livestock crossing intervals. Soft plugs would be constructed with a ramp on each side to allow a means of exit for animals that fell into the trench. In addition, Keystone has agreed to install temporary gates for livestock fences that must be breached. The following rangeland-specific mitigation measures are outlined in Keystone's CMR Plan:

- Access across the ROW during construction shall be provided at locations requested by landowners, if practicable;
- Bevel shavings during pipe bevel operations shall be removed immediately to ensure that livestock and wildlife do not ingest this material;
- Litter and garbage shall be collected and removed from the construction site at the end of the day's activities;
- Temporary gates shall be installed at fence lines for access to the construction ROW; gates shall remain closed at all times and shall be removed and replaced with permanent fencing upon completion of construction;
- Feeding or harassment of livestock or wildlife is prohibited;

[3] Rangeland includes tall grass prairie, mid-grass prairie, short grass prairie, sand prairie, non-native grassland, deciduous shrubland, mixed native and non-native grasslands and mixed prairie, improved and unimproved pasture, and lands that appear to be used for cattle or other livestock grazing—with or without a shrub component.

- Construction personnel shall not be permitted to have firearms or pets on the construction ROW;
- All food and wastes shall be stored and secured in vehicles and/or appropriate facilities;
- Areas of disturbance in native rangelands shall be seeded with a native seed mix after top soil replacement; and
- Improved pasture shall be seeded with a seed mix approved by individual landowners after top soil replacement.

Keystone has proposed to avoid impacts to livestock and to restore disturbed areas according to its CMR Plan (Appendix B), which requires grading and revegetation in rangelands to be conducted in consultation with landowners and land managing agencies. Following restoration, affected rangelands would be restored and reseeded, and rangeland activities may resume. Implementation of the proposed rangeland-specific mitigation measures discussed above would reduce potential impacts to minimal levels. Although restoration activities would begin soon after the end of construction in rangeland areas, herbaceous grasslands may take up to 5 years to recover to the point where visual scarring is no longer evident. The magnitude of construction and operational impacts could include changes from native to non-native species at a landowner's request, which would result in conversion of the original resource to a different habitat type. Therefore, construction impacts to rangelands are expected to be long term, but minor.

For the Mainline Project, approximately 109 acres would be set aside for permanent aboveground facilities (such as for pump stations and permanent access roads). At this time, it is not possible to determine the percentage of this acreage that would be located within rangeland land use areas; however, rangeland is a widespread land use along the Project route, and displacement of some rangeland acreage for permanent facility construction is likely. Construction and operation of aboveground facilities on rangeland/grassland would result in permanent conversion of rangeland to industrial/commercial use. Rangeland affected by operation of the aboveground facilities would be purchased or leased from the current landowners. Keystone would attempt to locate facilities to be as unobtrusive as possible to ongoing agricultural activities, and to cause the least disturbance to adjacent agricultural operations. In addition, Keystone would attempt to locate aboveground facilities near public roads to allow year-round access and would construct short permanent access roads to these facilities within the permanent ROW only when necessary. Operations impacts from aboveground facilities are considered permanent but minor, as the amount of land to be converted from rangeland to industrial land uses is small in comparison to the amount of productive rangeland in the region. Other pipeline operational activities are not expected to affect rangeland.

3.9.3.4 Forestland

Construction and operation of the Mainline Project facilities would affect about 867 acres of forestland of both upland and wetland types. This represents about 5 percent of the total acres affected by the Mainline Project. The majority of affected forestland is located in Missouri (600 acres) and Kansas (115 acres). Forest vegetative types are discussed in Section 3.5. None of the forested land that would be crossed by the pipeline is used for timber or Christmas tree production (TransCanada 2007c).

Mainline construction would affect forested wetlands in Missouri. Forested wetlands were once a dominant component of Missouri's landscape but are now considered at risk (Missouri Department of Conservation 2007d). The Mainline Project would cross approximately 2.6 miles of this community in Missouri, and 4.1 miles of forested wetlands over its entire length (TransCanada 2007d). Table 3.4.3-1 details the numbers of acres of forested wetlands that would be affected during construction and operation of the pipeline.

Potential Impacts and Mitigation

Construction activities would remove trees and brush from forested areas. During operation, the permanent ROW would be maintained, and revegetation of these types of woody materials would be prevented. This would result in a permanent loss of tree growth within the permanent ROW.

Keystone has proposed to minimize impacts to affected forested areas in several ways, as outlined in its CMR Plan (Appendix B). Trees would be felled such that they fall toward the center of the ROW, to minimize disturbance and limb breakage outside of the ROW. Tree stumps would not be grubbed beyond 5 feet on either side of the trench line and only where necessary for grading a level surface for construction equipment to operate safely. All debris would be recovered and landowners would be given the option of salvaging any materials removed; all unsalvaged materials would be properly disposed of. Disposal may not take place in wooded areas along the ROW; however, chipped material may be spread and incorporated with mineral soil over the forest floor at a density that would not prevent grass revegetation. See Section 2.2.2.8 for a more thorough discussion of forest construction methods and mitigation measures.

These measures would reduce impacts on forested lands. However, areas within the permanent ROW would not be allowed to regenerate as forested land over the life of the Keystone Project, and cleared areas in the construction ROW would not regenerate for many decades. Therefore, pipeline construction in forested areas would cause a long-term but localized impact on forestland. Pipeline operations in forested areas would constitute a permanent but localized impact on forestland. Section 3.5 describes potential impacts on forests and applicable mitigation measures.

3.9.3.5 Residences and Planned Development

The Mainline Project would cross and affect residential land. Based on 2006 aerial photography and ground truthing surveys conducted during summer 2007, Keystone identified 465 potential residential structures within 500 feet of the proposed Mainline Project ROW. The majority of potential residential structures are in Missouri (284) and Nebraska (60). Most structures in Missouri are situated where the Mainline Project route would collocate with the existing Platte pipeline. Three public assembly places are within 500 feet of the Mainline Project ROW. Keystone identified 20 residential structures located within 25 feet of the Mainline Project construction ROW, 16 of which are located in Missouri (TransCanada 2007d). Keystone has provided site-specific construction plans for each of the residential structures within 50 feet of the construction workspace.

Potential Impacts and Mitigation

The principal measures proposed by Keystone to mitigate impacts in existing residential areas include ensuring that construction proceeds quickly through such areas and limiting the hours during which activities with high-decibel noise levels could be conducted. Landowners would be notified at least 24 hours prior to construction. As specified in its CMR Plan (Appendix B), Keystone has proposed several mitigation measures for construction in all residential areas:

- Develop site-specific construction plans to mitigate the impacts of construction on residential and commercial structures;
- Notify landowners prior to construction;
- Post warning signs as appropriate;

- Reduce the construction ROW width, if practicable, by eliminating the construction equipment passing lane, reducing the size of work crews, or utilizing "stove pipe" or "drag section" construction techniques (stove pipe construction consists of welding pipe sections together away from residences, with trenching, pipeline lower in, and backfilling proceeding quickly to minimize construction duration; drag section construction techniques consist of layout and pre-assembly of the pipeline, followed by pull back of the assembled pipe to its proper position);
- Remove fences, sheds, and other improvements as necessary for protection from construction activities;
- Preserve mature trees and landscaping to the extent possible, while ensuring safe operation of the construction equipment;
- Fence the edge of the construction work area adjacent to a residence for a distance of 100 feet on either side of the residence to ensure that construction equipment and materials, including the spoil pile, remain within the construction work area;
- Limit the hours during which construction activities with high-decibel noise levels can be conducted;
- Limit dust impacts through prearranged work hours and by implementing dust minimization techniques;
- Ensure that construction proceeds quickly through residential and developed areas;
- Maintain access and traffic flow during construction activities, particularly for emergency vehicles;
- Clean up construction trash and debris daily;
- Fence or plate open ditches during non-construction activities;
- Restore all lawn areas, shrubs, specialized landscaping, fences, and other structures consistent with its pre-construction appearance or the requirements of the landowner immediately after backfilling; and
- Ensure that the pipe is ready for installation if the pipeline centerline is within 25 feet of a residence prior to excavating the trench; backfill immediately following pipe installation.

Construction of the pipeline and aboveground facilities may cause minor interference with the use of residential properties and other uses near the ROW, mainly from increased noise, heavy vehicle traffic, and dust. The adverse effects would be short term, lasting 2 to 3 months on any particular property, depending on weather and terrain. Equipment would be required to have effective mufflers installed to minimize construction noise. Access, including emergency access, to residences would be maintained at all times during construction. Keystone has not yet developed site-specific plans for residential structures in proximity to the pipeline. The potential impacts in residential areas are accentuated on weekends, when individuals and families are more likely to be at the residence throughout the day. Keystone has indicated that construction must proceed on weekends and possibly on holidays. If an individual landowner is concerned with noise levels associated with weekend construction, mitigation of those concerns may be discussed with Keystone's land agents. Based on these measures, construction-related effects on residences would be temporary and minor.

Operation of the pipeline has the potential to interfere with the long-term use of residential property and may result in ongoing noise impacts. Refer to Section 3.12.2 for a discussion of potential noise impacts and mitigation. Dwellings and ancillary structures would not be permitted to be placed over the permanent ROW for the operational life of the proposed Project. Prohibiting placement of structures above the permanent ROW would be a substantial constraint on landowners' property usage in the vicinity of the 50-foot-wide permanent ROW. Therefore, operations impacts on residential land uses would be permanent and significant.

Keystone contacted planning and development departments in each of the counties that would be crossed by the proposed Mainline Project facilities to determine whether any residential or commercial development is planned within 0.25 mile of the proposed construction ROW. Planned development projects would include those that are permitted and not yet constructed and those with permit applications that have been filed but have not yet been approved. Keystone's initial consultations indicate that no known planned residential or commercial developments are within 0.25 mile of the proposed Mainline Project facilities; consequently, construction and operation of the Mainline Project would not affect planned development. Keystone would meet with landowners as part of the easement negotiations. Discussions would include whether residential and commercial developments are planned in close proximity to the ROW. Keystone then would determine whether minor property-specific adjustments to the route are feasible (TransCanada 2007c).

3.9.3.6 Commercial and Industrial Land

Construction of the Mainline Project facilities would affect about 506 acres of developed land. Table 3.9.3-6 provides a breakdown of developed land by state for the Keystone Mainline Project.

TABLE 3.9.3-6
Developed Land by State for the Keystone Mainline Project

State	Total Developed (acres)
North Dakota	90
South Dakota	88
Nebraska	50
Kansas	25
Missouri	182
Illinois	71
Mainline Project total	**506**

Source: TransCanada 2007d.

With the exception of Kansas on the low end and Missouri on the high end, affected developed acreage is distributed rather evenly among the states along the Mainline Project. For the Mainline Project route as a whole, developed land represents approximately 3 percent of the affected acres.

Potential Impacts and Mitigation

Ground surveys conducted by Keystone during summer 2007 indicate that the Mainline Project construction ROW would be within 25 feet of 22 outbuildings (19 in Missouri), four commercial, one industrial, and two other structures (TransCanada 2007d).

Construction of the Mainline Project could affect commercial and industrial land through restricted access and the presence of construction activity. Impacts on a specific commercial or industrial area are anticipated to last only for several days. Keystone has adopted mitigation measures for commercial and industrial land in its CMR Plan. Keystone would mitigate impacts on commercial and industrial landowners by:

- Notifying business owners prior to construction;
- Reducing the construction corridor width to 85 feet, if feasible;
- Removing fences and other improvements as necessary for construction activity;
- Fencing the construction work area adjacent to businesses for approximately 100 feet on either side of a building to keep construction equipment and materials in the work area;
- Preserving mature trees and landscaping to the extent possible, while ensuring safe operation of construction equipment;
- Limiting hours during which construction activities with high-decibel noise levels can be conducted;
- Limiting dust impacts through prearranged work hours and implementing dust minimizing techniques;
- Proceeding quickly with construction through commercial and industrial areas;
- Maintaining access and traffic flow during construction, particularly for emergency vehicles;
- Cleaning up daily after construction;
- Fencing or plating open ditches during non-construction periods;
- Restoring landscaping, fences, and other structures immediately after backfilling;
- Employing site restoration personnel familiar with local horticultural and turf establishment practices; and
- Prefabricating the pipe so it is ready for immediate lowering-in where the pipeline centerline is within 25 feet of a commercial or industrial building.

Given the mitigation procedures described above, construction of the Mainline Project would cause temporary minor impacts on any commercial and industrial land.

Buildings of any type, including commercial and industrial structures, would not be permitted within the permanent ROW for the life of the proposed Keystone Project. This would place a substantial constraint on the use of commercial and industrial property in the vicinity of the 50-foot-wide permanent ROW. Therefore, operations impacts on commercial and industrial land use would be permanent and significant. Keystone would compensate landowners for these impacts on a case-by-case basis (TransCanada 2007c).

Connected Actions

Power Lines and Substations. The Keystone Project will require construction of power lines to service pump stations and other ancillary facilities. These will be permitted and constructed by utility providers; however, this is considered a connected action under NEPA. Keystone assumes that the land required to construct new power lines will generally be within existing county ROWs. It will be the responsibility of utility providers to obtain any necessary easements for the construction process. Construction of power lines would consist of limited clearing, which may result in the removal of some trees to provide adequate clearance between the wire conductors and underlying vegetation. Maintenance would consist of trimming, in some cases, to avoid tree removal. Holes would be excavated for placement of power poles, which would also be anchored as necessary for stability. Temporary pulling or reeling areas may be needed for installation of the conductor wires; these areas could return to their original condition following construction. Construction and operations activities for power lines would be considered to have a minor impact on land use, because they will be constructed primarily within county road ROWs.

3.9.3.7 Recreation and Special Interest Areas

The proposed Mainline Project facilities would cross various recreation and special interest areas and other recreation areas, resulting in temporary construction impacts and potential permanent impacts. Table 3.9.3-7 details the recreation and special interests lands that would be intersected by the Mainline Project. No other national, state, or local parks or forests are located with 500 feet of the proposed Mainline Project centerline.

As shown in Table 3.9.3-7, the proposed Mainline Project would cross multiple conservation and wildlife reserve easements, the majority of which are privately owned. Several of the areas listed in the table are discussed in further detail below.

Tetrault Woods State Forest and Pembina River, North Dakota

Tetrault Woods is a 432-acre area located along the banks of the Pembina River, in Cavalier and Pembina Counties. It preserves some of the riparian forest typical of the Pembina River Valley, including specimens of oak, ash, birch, elm, and aspen. The forest contains hiking trails and a scenic overlook of the valley (NDFS 2007). Tetrault Woods is one of very few public forest areas in North Dakota. The Mainline Project would cross Tetrault Woods between MP 6.8 and 7.7, traversing 0.8 mile of forestland and the Pembina River. The Pembina River has been classified by the National Rivers Inventory as having outstanding resource values for scenery and geology, although it is not classified as a National Wild and Scenic River (http://www.rivers.gov/agencies.html) or a National Recreation River (NPS 2007b). The Pembina River is a popular paddling and canoeing destination (NDPRD 2007). Keystone proposes to cross the Pembina River using the HDD crossing method (see Section 2.2.3.3), also crossing a public hiking trail south of the river.

Game Production Area, South Dakota

The SDGFP manages game production areas around the state to create habitat for game species and provide hunting opportunities (SDGFP 2007). The Mainline Project would intersect a game production area at MP 358.0, traversing a distance of 0.1 mile.

Missouri National Recreational River

The section of the Missouri River south of Yankton, South Dakota is designated a National Recreational River by the NPS. Rivers selected for this designation are to be preserved for having remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values (NPS 2007a). The Mainline Project would intersect the Missouri River and surrounding recreation lands at MP 435.8, and would traverse approximately 2.3 miles in South Dakota and Nebraska.

Keystone proposes using HDD (see Section 2.2.2.3) to cross the Missouri River. This method is not expected to affect the bed, banks, or water quality of the Missouri River. Additionally, this method would not interrupt recreational activity on the river or on its banks.

TABLE 3.9.3-7
Special Interest Areas Crossed by the Keystone Mainline Project

Site Name	Milepost	Miles Crossed	Ownership
North Dakota			
Tetrault Woods State Forest	6.8–7.7	0.8	North Dakota Forest Service
South Dakota			
Game Production Area	358.0–358.1	0.1	South Dakota Game, Fish and Parks Department
Missouri National Recreational River	435.8–437.5	2.3	Privately owned Designated Wild and Scenic (National Park Service)
Nebraska			
None identified	NA	NA	NA
Kansas			
None identified	NA	NA	NA
Missouri			
Western Missouri River Alluvial Plain/Missouri River Loess Woodland Conservation Opportunity Area (COA)	750.9–755.2	4.1	Private and Missouri Department of Conservation
Jentell Brees Access	751.0–751.1	0.1	Missouri Department of Conservation
Pigeon Hill Conservation Area	760.9–761.3	0.4	Missouri Department of Conservation
Little Prairie River Woodland/Forest Scarped Hills COA	770.0–771.4	1.4	Private
Little Platte River Woodland/Forest Scarped Hills COA	773.5–775.0	1.0	Private
Cameron River Upland Prairie Plain COA	781.9–784.0	2.1	Private
Shoal Creek Prairie/Woodland Scarped Plain COA	825.8–829.2	1.3	Private
Lower Grand River Lowland Plains/Missouri Grand River Alluvial Plain COA	841.6–844.4	2.8	Private
Chariton River Alluvial Plains COA	870.6–871.8	1.3	Private
Chariton River Alluvial Plains COA	874.3–875.2	0.9	Private
West Fork Cuivre River	931.8	NA	NA
Veronica Baier – The Nature Conservancy	958.3–959.7	1.4	The Nature Conservancy
Cuivre River Woodland/Forest Hills COA	964.3–966.2	1.9	Private

TABLE 3.9.3-7 (Continued)			
Site Name	**Milepost**	**Miles Crossed**	**Ownership**
Missouri (continued)			
Cuivre River Woodland/Forest Hills COA	973.8–976.0	2.2	Private
St. Charles/Lincoln Alluvial Plain, Mairas Temp Clair Alluvial Plain, West Alton Alluvial Plain COA	987.7–1,024.9	37.2	Private
Edward “Ted” & Pat Jones–Confluence Point State Park	1,023.5–1,024.7	1.2	Missouri Department of Natural Resources
Illinois			
Carlyle Lake Wildlife Management Area	1,073.5–1,076.6	3.1	U.S. Army Corps of Engineers
Mainline Project total		**65.6**	

NA = Not available.

Sources: ENSR 2006a, TransCanada 2007d.

Keystone's preliminary HDD plan would avoid direct land disturbance within the NPS National Recreational River administrative boundary. The HDD entry point would be on City of Yankton land on the north shore, and the exit would be on privately owned land on the south shore. NPS administers land at the crossing location, but it does not own this land. Keystone conducted preliminary discussions with NPS and the City of Yankton in February 2006, and provided the proposed HDD procedure at a May 19, 2006 meeting in Yankton.

Jentell Brees Access, Missouri

The Jentell Brees Access is owned and managed by the MDC. The site consists mostly of fields and grasslands, and includes a boat ramp with access to the Missouri River (MDC 2007c). The Mainline Project would intersect this area at MP 751.0, traversing 0.1 mile.

Pigeon Hill Conservation Area, Missouri

The Pigeon Hill Conservation Area is owned and managed by the MDC. Pigeon Hill is a 424-acre conservation area with a shooting range and hunting and fishing opportunities. Most of the acreage is forested (MDC 2007d), consisting of 250 acres of upland forest that includes areas of improved and high-value forest stands. The Mainline Project would intersect this area at MP 760.9, traversing 0.4 mile.

Conservation Opportunity Areas, Missouri

The Mainline Project would cross numerous privately owned Conservation Opportunity Areas (COAs), including approximately 56 miles in 17 separate COAs located throughout Missouri. The MDC partners with stakeholders and landowners to identify places where partners can best apply technology, expertise, and resources for conservation efforts (MDC 2007a). See Table 3.9.3-7 for the specific locations and names of COAs in Missouri.

West Fork Cuivre River, Missouri

The National Rivers Inventory has classified the West Fork of the Cuivre River as having outstanding resource values for scenery, geology, and fish; however, it is not classified as a National Wild and Scenic River (http://www.rivers.gov/agencies.html). The West Fork can be navigated by canoe or small johnboat during normal flows (MDC 2007b). The Mainline Project would cross the West Fork of the Cuivre River at MP 938.1, using the HDD drilling method.

Edward and Pat Jones–Confluence Point State Park, Missouri

This state park is situated at the confluence of the Missouri and Mississippi Rivers; work is ongoing to restore the natural floodplain of the area. The restored 1,118-acre park will include native vegetation, natural wetlands, forests, prairies, and marshes. Visitors can engage in high-quality bird watching and native plant species viewing (MSPHS 2007). The Lewis and Clark National Historic Trail begins inside the park, with the site where the Lewis and Clark expedition originally disembarked up the Missouri River. Keystone's Mainline Project would intersect Jones–Confluence State Park at MP 1,023.5 and would traverse approximately 1.2 miles of the park. Several other utility corridors, including another pipeline, currently traverse the park. In addition, the pipeline ROW would traverse 37 miles of private COA land prior to entering state park lands.

Carlyle Lake Wildlife Management Area, Illinois

Carlyle Lake, managed by COE, is the largest reservoir in Illinois, with 26,000 surface acres of water and 11,000 acres of adjacent public land. It is a major recreation destination for residents in the St. Louis metropolitan area. Recreation activities include fishing, hunting, wildlife viewing, boating, swimming, camping, and golfing. The Carlyle Lake Wildlife Management Area (WMA) is located at the north end of the reservoir and is managed by the IDNR under a 25-year lease from COE. The WMA includes 2,000 acres of woodland, 5,800 acres of open water and wetlands, 200 acres of grassland, and 1,500 acres of cropland planted for wildlife food and cover (IDNR 2007). The Mainline Project would cross approximately 3 miles of the WMA between MP 1,073.5 and 1,076.6.

U.S. Fish and Wildlife Service Wetland Easements

The proposed Mainline Project route also would cross multiple USFWS easements in North Dakota and South Dakota. Table 3.9.3-8 shows the location of USFWS wetland easements. USFWS easements and wetlands of special concern or value are discussed in depth in Section 3.4.2. Wetland easements are signed agreements with private landowners to permanently protect valuable wetlands as waterfowl production areas. The landowner receives a one-time payment. Protected wetland basins cannot be drained, burned, filled, or leveled.

When these wetlands naturally dry up, they can be farmed, grazed, or hayed. The land remains in private ownership, remains on the tax rolls, and the landowner controls access (USFWS 2007b). USFWS wetland easements are important habitat areas for a variety of flora and fauna, and they serve as private hunting areas. The Mainline Project would cross approximately 30.7 miles of USFWS wetland easements (see Table 3.9.3-8).

Wildlife Management Areas and Hunting

Hunting occurs on publicly and privately owned lands along the proposed Mainline Project route. Most affected cover for game species would be located on private land that would require landowner permission for access; however, two public wildlife areas (Pigeon Hill Conservation Area, Missouri at MP 760.9 and Carlyle Lake WMA, Illinois at MP 1,073.5) would be crossed by the pipeline route. The Mainline Project also would cross a South Dakota game production area at MP 358 that is owned and managed by SDGFP. Hunting also is permitted in Tetrault Woods State Forest (North Dakota, MP 6.8).

Wilderness Areas

The proposed Mainline Project route would not cross any designated Wilderness Areas or Wilderness Study Areas.

TABLE 3.9.3-8
U.S. Fish and Wildlife Service Wetland Easements Crossed by the Keystone Mainline Project

North Dakota		South Dakota	
Milepost	**Miles Crossed**	**Milepost**	**Miles Crossed**
76.2–77.2	1.0	179.3–179.8	0.5
79.3–79.9	0.5	182.4–183.4	1.0
80.4–81.0	0.6	183.4–183.9	0.5
81.0–81.5	0.5	183.9–184.1	0.3
81.5–82.0	0.5	185.1–185.4	0.3
82.0–82.5	0.5	187.4–187.9	0.5
86.0–86.7	0.7	188.5–189.0	0.5
87.2–87.8	0.5	189.0–189.5	0.5
87.8–88.3	0.5	189.5–190.0	0.5
89.7–89.8	0.1	218.8–219.3	0.5
89.8–90.1	0.3	219.3–219.8	0.4
91.9–92.4	0.5	219.8–219.9	0.1
92.4–92.9	0.5	311.7–312.2	0.5
98.0–98.5	0.6	317.6–318.1	0.5
101.1–101.4	0.3	320.1–320.6	0.5
109.8–110.3	0.5	322.7–323.2	0.5
110.8–111.3	0.5	326.8–327.8	1.0
117.5–118.0	0.5	327.8–328.0	0.2
119.1–119.4	0.3	332.1–332.1	0.0
122.0–122.6	0.5	333.7–334.2	0.5
127.9–128.1	0.3	335.2–335.7	0.5
128.2–128.4	0.2	335.7–336.2	0.5
137.6–138.1	0.5	339.2–339.3	0.1
138.1–138.4	0.3	340.3–341.3	0.9
139.2–140.3	1.1	341.3–341.4	0.1
169.9–170.9	1.0	350.6–351.3	0.7
171.2–171.6	0.4	365.5–365.6	0.2
172.8–173.2	0.4	365.6–366.1	0.5
173.2–173.5	0.3	368.8–369.3	0.5
173.5–173.6	0.1	380.2–380.6	0.4
173.9–174.0	0.1	387.1–387.3	0.3
174.7–175.3	0.5	387.6–387.8	0.3
176.3–176.8	0.5	395.0–395.3	0.3
178.5–178.8	0.3		

Sources: ENSR 2006a, TransCanada 2007d.

Potential Impacts and Mitigation

General Recreation Activities

For recreation areas and special management areas, the Keystone Project is expected to cause temporary impacts to recreational traffic and use patterns during construction. Sightseers, hikers, wildlife viewers, and other recreationists would be displaced from the immediate area during construction. Keystone would continue to coordinate with agency managers to minimize conflicts between construction activities and recreational uses for which these special areas were established. Following construction, all affected recreational lands would return to previous uses; Keystone would restore any affected trails or bicycle routes that cross the construction and permanent ROWs, and pipeline operation would not be expected to impact recreational activities. Construction impacts on general recreation activities are considered temporary and minor. Pipeline operation is not expected to affect general recreation.

Missouri National Recreational River

The Mainline Project would cross the Missouri National Recreational River at Yankton, South Dakota. Approximately 2.3 miles of land would be affected by this crossing. Keystone has developed a site-specific crossing plan for the Missouri River, which details the HDD methods to be used (Drawing K-31-P-6001-A-1.06, ENSR 2006a). The site plan shows that the HDD entry and exit points would be set well back from the river banks (more than 500 feet, in each case), and that views from the river of the entry and exit points would be shielded by vegetation. In addition, the site plan specifies that the water quality of the Missouri would not be affected by hydrostatic test water or excess drilling mud, which may not be disposed of in the water body or in existing wetlands but must be deposited in upland erosion control structures or as directed under conditions of the permit to conduct the HDD. The HDD drilling process would have the potential to create frac-outs, or a rupture of drilling mud to the surface or riverbed, where it could affect water quality and recreation on the Missouri River. Keystone proposes to contain and collect any inadvertently released drilling mud to the extent possible, and to dispose of it in compliance with the drilling permit. Keystone has received a Special Use Permit to conduct geotechnical drilling near the banks of the Missouri River.

Construction activities are anticipated to cause only temporary impacts, such as noise and dust from drilling at the entry and exit points for the HDD. Pipeline operation is not expected to affect recreation on the Missouri River or its banks.

Wetland Easements

As mentioned above, the Mainline Project would intersect multiple USFWS wetland easements in North Dakota and South Dakota. Construction in wetland easements would proceed in the same manner as outlined for general wetland areas. All mitigation for pipeline construction in wetlands of all types would apply to wetlands easements. Keystone would use trench construction in wetland areas. Soil stability at the time of construction largely would determine which wetland crossing method would be used. Refer to Section 2.2.2.4 for more information on construction methods in wetlands.

USFWS wetland easements also have a financial component that is paid to the landowner in return for maintaining the wetland (although the land may be grazed, farmed, or hayed if the wetland dries up due to natural causes). USFWS wetlands easements are perpetual, and payment is made to a consenting landowner at one time as a lump sum. Given proposed mitigation measures, construction impacts on wetland easements are expected to be short term and minor. These temporary impacts would be associated with vegetation removal, grading, grubbing, trenching, and soil stockpiling; they would be minimized by following the mitigation measures described in Appendix B (TransCanada 2007c).

Pipeline operation is not anticipated to affect wetland easements. Maintenance of vegetation would not be conducted over the full width of the permanent ROW in these wetland areas. Therefore, no permanent impacts are anticipated from crossing wetlands on USFWS easements (TransCanada 2007c).

Groves and Tree Nurseries

Keystone's proposed mitigation measures would minimize impacts on groves and tree nurseries. For these special interest areas, trees in the path of the construction and permanent ROWs would be removed, and no trees would be allowed to regenerate above the permanent ROW for the life of the Keystone Project. Any construction ROW areas cleared of trees during the construction process would take many decades to regenerate, which would be a long-term, but localized impact. Operations impacts on groves and nurseries, given the need to maintain the permanent ROW in an open condition, would be permanent but localized. The same construction and operation impacts would apply to any Sargent County, North Dakota walnut tree groves or tree nurseries identified in the scoping comments. Review of aerial strip maps of the proposed Keystone Project route indicates that the proposed route may affect small, isolated tree groves and windbreaks, some of which may be walnut trees or nurseries. Based on a review of aerial photography, helicopter reconnaissance, and ground surveys, Keystone has determined that no vineyards, orchards, or hops plantations would be crossed by the proposed Keystone Project (TransCanada 2007c). Additional verification will be accomplished through case-by-case discussions with landowners.

Forests and Woodlands

Some state forestland (Tetrault Woods State Forest, North Dakota), state park land (Jones-Confluence Point State Park, Missouri), state conservation land (game production area, South Dakota; Pigeon Hill Conservation Area, Missouri; Carlyle Lake WMA, Illinois), and private woodlands (COAs in Missouri) would be crossed by the Mainline Project. Recreation activities such as hiking, fishing, and hunting in these areas would be temporarily interrupted during the pipeline construction period, and these activities could resume following construction. The quality of the recreational experience following construction likely would be diminished in some areas due to the permanent clearance of some types of vegetation in the permanent ROW, long-term clearance of some types of vegetation in the construction ROW, and permanent maintenance activities required to maintain the permanent ROW in an open condition. These activities would result in long-term impacts on vegetation and would induce habitat fragmentation, which would decrease enjoyment of private and public recreational resources. Specific impacts and mitigation for forests can be found in Section 3.5. Impacts and mitigation for woodland habitat are discussed in Section 3.6. Permanent clearance of forestland and woodlands would result in permanent but localized impacts on recreation resources.

Keystone has adopted construction, mitigation, and restoration measures for forested land in its CMR Plan (Appendix B) (see Section 2.2.2.8 for more details on construction procedures in forestland areas). To further decrease the impact of forest clearance on recreation, Keystone will consult with land managers on state and federal lands regarding any necessary construction and maintenance restrictions consistent with management and use of such lands. Damages from disruption of recreational uses of private lands will be the subject of compensation negotiations with individual landowners. Where the pipeline follows an existing ROW in forested areas, Keystone will attempt to route the pipeline as close as practical to the existing ROW.

Implementation of these measures would substantially reduce the potential impacts on recreation activities in forested areas; nevertheless, clearance of woodlands would cause a permanent but localized impact in forested areas that would remain throughout the operational life of the pipeline.

Privately Owned Conservation Areas

The Mainline Project would intersect multiple private conservation areas in Missouri. These privately owned conservation areas consist of woodlands, grasslands, and wetlands. The ROW would cross numerous designated COAs. Many COAs in the Missouri-Mississippi River confluence area are managed as hunting grounds for private duck clubs and as conservation land for wildlife habitat and flood control. For all of these areas, recreational activities would be temporarily interrupted during the pipeline construction process and could resume following restoration. As described for recreational resources in forests and woodlands, privately owned conservation areas could be adversely affected by a decline in the recreation experience and enjoyment of recreational resources due to habitat fragmentation, tree removal, and visible scarring from the construction and mechanical maintenance processes.

Impacts to private conservation areas would differ depending on the land use type. For grasslands and wetlands, proposed construction mitigation and restoration measures would reduce effects to minimal levels. Mitigation would include relieving compaction, rock removal, reseeding, erosion control, stream bank stabilization, and repair or replacement fencing (as outlined in Section 4.11 of the CMR Plan, see Appendix B). Even with mitigation, however, grasslands may take up to 5 years to mature to levels where the visible construction scars are no longer evident. Construction impacts on grassland and wetland conservation areas are expected to be long term but minor, while pipeline operation would not affect grassland and wetland conservation areas following restoration, because regular maintenance would not occur above the permanent ROW in these areas.

For wooded conservation areas, impacts associated with pipeline construction and operation would be the same as for forested areas. Construction and operation impacts on wooded conservation areas would be long term or permanent, respectively, but localized.

To mitigate potential impacts on recreational resources in privately owned conservation areas, Keystone would consult with the owners of private conservation areas regarding any concerns related to disruption of recreational uses of such areas. Damages from disruption of recreational uses of private lands would be the subject of compensation negotiations with individual landowners. Where the pipeline follows an existing ROW in privately owned conservation areas, Keystone would attempt to route the pipeline as close as practical to the existing ROW.

Implementation of these measures would reduce potential impacts on recreation resources at privately owned conservation areas; nevertheless, permanent impacts would remain, particularly for forested areas.

Edward and Pat Jones–Confluence Point State Park

A parking lot and kiosk for the Lewis and Clark National Historic Trail is located south of the western HDD site for the Mississippi River crossing. Visitors to the area would be exposed to dust, noise, limited access, and construction activity within the park during the construction period. These conditions would cease following construction and would be short term and minor. Construction and operation activities would impact vegetative communities in the park, which would affect both recreational enjoyment of the site and visual resources. Vegetation clearance within the construction and permanent ROW would result in both long-term and permanent impacts. For grasslands, wetlands, and marshes, plant communities would be allowed to regenerate over the full width of the ROW following construction; however, regeneration may take up to 5 years to occur and would result in long-term minor impacts. For woodlands and forests, trees and brush would be cleared for construction activities. In the construction ROW, regeneration could begin following the construction period, but regrowth of these vegetation types would take many decades, resulting in long-term localized impacts. For the permanent ROW, regeneration would not occur for the life of the project; therefore, impacts would be permanent but localized.

Keystone has re-routed the pipeline within Confluence State Park from an area of recently planted hardwood trees and an area where decurrent false aster were found (TransCanada 2007d). Keystone also has developed a site-specific crossing plan in conjunction with park managers. This document specifies that Keystone would use a road bore underneath the existing gravel road that traverses the park and provides visitor access. This bore would allow the road to remain open to visitors throughout the construction process. Construction vehicles would access the construction ROW from the gravel road but would be required to park and stow all materials within the construction zone, instead of the gravel access road. Fencing would be installed to ensure public safety and prevent access to the pipeline ROW during the construction period. The anticipated construction period within Confluence Point State Park for both conventional trenching and the HDD crossing of the Mississippi River would be from May 2009 through August 2009 (TransCanada 2007e).

Mitigation for wooded portions of Jones–Confluence Point State Park would be the same as for forests and woodlands, as described above. Adherence to the site-specific construction plan and consultation with park managers would minimize construction impacts.

Wildlife Management Areas and Hunting

The Mainline Project would intersect one public WMA (Carlyle Lake WMA, Illinois), a public conservation area (Pigeon Hill Conservation Area, Missouri), a public game production area (South Dakota), and a public state forest where hunting occurs (Tetrault Woods State Forest, North Dakota). Public access to these areas for hunting and wildlife viewing could be impeded during construction. In addition, the Mainline Project would intersect many private areas regularly used for hunting. The impacts of pipeline construction in any one of these areas would be of limited duration; however, construction during the fall hunting and migratory season, in particular, could create conflicts with hunters and wildlife viewers.

To decrease possible conflicts with hunting and other recreational activities in wildlife management and public conservation areas, Keystone would negotiate with individual land managers. Where the pipeline follows an existing ROW in privately owned conservation areas, Keystone would attempt to route the pipeline as close as practical to the existing ROW

Implementation of this measure would substantially reduce the potential for conflicts with hunting and other recreation activities; nevertheless, some degree of recreational impact would persist throughout the life of the pipeline due to habitat fragmentation and routine maintenance activities.

Pipeline construction and operation activities have the potential to substantially affect forested portions of WMAs, public conservation areas, public game production areas, and public forest lands. Trees would be removed from both the construction and permanent ROWs. Woody vegetation along the permanent ROW would be periodically cleared by mechanical mowing or cutting. Trees would not be allowed to regrow within the permanent ROW for the life of the Keystone Project, and revegetation within the construction ROW would require many decades. For these forested special interest areas, impacts related to construction activities would be long term but localized. Pipeline operation would result in a permanent but localized impact on forested parts of these public areas.

Carlyle Lake WMA (a COE property managed by the IDNR) is subject to the Land and Water Conservation Fund (LWCF) Act. These areas may be funding recipients of the LWCF, which was established to assist states and federal agencies in meeting present and future outdoor recreation demands.

Section 6.f.3 of the LWCF Act states that: “No property acquired or developed with assistance under this section shall, without the approval of the Secretary [of the Interior], be converted to other than public outdoor recreation uses” (16 USC §4601-8[f.3]). Land may be converted, however, if it is deemed that the change is in accordance with existing statewide outdoor recreation plans, and given that the land is substituted for other recreation properties of “at least equal fair market value and or reasonably equivalent usefulness and location.” Construction and operation of Keystone Project facilities would affect the recreational use of Carlyle Lake WMA by temporarily disturbing access and recreational activities during construction, and by affecting the overall recreational experience and enjoyment of individuals through habitat fragmentation and visible scarification of the landscape following construction and during operation. Woodlands, grasslands, and wetlands would be affected as described above, and the same mitigation measures would apply.

Off-Road Vehicles and Trespassing

Pipeline projects have the potential to create trespassing problems, particularly when off-road vehicles (ORVs) and snow mobiles use the restored ROW after construction. The construction process creates a cleared, graded route and opens up a potential pathway for ORV use. No designated ORV areas were noted in the vicinity of the proposed route; however, many states allow ORV riders to use rural roadways and road shoulders, which would provide access to points where the pipeline ROW would cross these routes. Snow mobiles also may be permitted to operate on road shoulders, and trespassers could access the pipeline ROW by foot, bicycle, cross-country skis, and snow shoes.

While ROWs would be restored relatively quickly in agricultural areas such as cropland, revegetation would require longer periods in some land use types. In forests, revegetation of trees would not be allowed above the permanent ROW. Grasslands may take up to 5 years for the visible scar from pipeline construction activities to disappear. In forested areas, Keystone has committed to using gates, boulders, or other barriers to minimize unauthorized access, if requested by landowners. Keystone would install and maintain these control measures, as detailed in Section 2.15 of its CMR Plan (Appendix B). Fencing is only likely to work as an access deterrent where fencing is already in existence and in forested areas. However, if requested by a landowner, Keystone would use fencing and gates to prevent unauthorized access to the ROW immediately following the start of construction activities.

Implementation of these mitigation measures would reduce potential trespassing and ORV impacts to minimal levels, and prevent them entirely in most cases. With mitigation, pipeline construction and operation would not create ORV or trespassing problems.

3.9.3.8 Visual Resources

General visual impacts associated with the construction ROW, additional temporary workspaces, and operation of the Cushing Extension pipeline include clearing and removal of existing vegetation; exposure of bare soils; earthwork and grading scars associated with heavy equipment tracks; trenching; rock formation alteration or removal; machinery and pipe storage; landform changes that introduce contrasts in visual scale, spatial characteristics, form, line, color, or texture; and new aboveground structures.

Potential Impacts and Mitigation

Agricultural Lands and Rangeland

Some of the proposed Mainline Project route would be located within or adjacent to existing ROWS for pipelines, utilities, or roads ROWs—or in previously disturbed agricultural lands and herbaceous rangeland. The majority of the route, however, would consist of new ROW. Visual impacts associated with pipeline construction in rangeland and agricultural areas along the route would be temporary and would result from the presence of construction equipment and post-construction visual scarring. In cultivated croplands, visual scarring would persist until the ROW is replanted with new crops. Once crops are replanted, only a minor visual impact from pipeline construction would be evident in cultivated croplands. However, visual scarring in herbaceous rangeland and previously disturbed areas may last for 5 or more years in the Keystone Project region.

Temporary minor impacts could result from the presence of construction equipment along the ROW, but the remote location and short duration of the construction sequence in a given area would minimize these potential visual impacts, and they would cease immediately following construction. As scarring in rangeland areas may continue for up to 5 years, visual impacts resulting from construction are expected to be long term but minor in these areas. Construction-based visual impacts on agricultural lands are anticipated to be short term and minor, with the visual ROW impacts fading with subsequent replanting of crops. Visual impacts from pipeline operation in agricultural and rangeland areas would be limited to the introduction of aboveground facilities, discussed below.

In many agricultural and rangeland areas, landowners plant trees or shrubs to act as windbreaks, shelterbelts, or living snow fences; these features reduce wind erosion, reduce evaporation from soils, increase crop yields, provide wildlife habitat and wind protection for livestock, and serve as visual screens. Keystone has proposed mitigation to minimize impacts to these features; however, any access of the pipeline ROW through a windbreak would result in a permanent segmentation of the visual feature (see Section 3.9.3.2 for a detailed discussion of windbreaks). Pipeline construction and operation are expected to result in permanent but minor visual impacts on windbreaks.

The proposed aboveground facilities that are not adjacent to existing crude oil or other industrial facilities could affect visual resources because they would be new permanent industrial facilities located in relatively flat open areas. However, these facilities would primarily be situated in rural herbaceous rangeland and agricultural areas that have not been designated as primary viewsheds or scenic corridors, with only nominal viewer traffic. Keystone proposes to provide a landscaped visual screen for aboveground facilities where appropriate. Construction-based visual impacts on rangeland and agricultural areas from these facilities would be temporary and minor, consisting of the presence of construction equipment and staging areas along the ROW. Aboveground facilities would be permanent landscape fixtures in agricultural and rangeland areas. To further reduce visual impacts from these facilities, Keystone would comply with standard industry painting practices with respect to aboveground facilities. Keystone would address any visual aesthetics issues with landowners in individual consultations.

With implementation of these measures, the operational visual impact of these facilities is expected to be permanent but minor, based on the generally remote location.

Forestland

The Mainline Project would affect approximately 867 acres of forestland (see Table 3.9.3-3); most of these acres are in Missouri and Kansas. Keystone construction standards for forested areas dictate that trees above the permanent ROW would be removed prior to trenching. Removal of additional trees and grubbing of tree stumps would occur along the construction ROW for the safe operation of construction vehicles. Keystone has proposed construction mitigation and restoration measures to reduce potential impacts to forested land to minimal levels; however, trees would not be allowed to regenerate within the permanent ROW for the life of the Keystone Project. In addition, trees likely would not regenerate within the construction ROW for many decades. Removal of trees along both the permanent and construction

ROWs would leave a highly visible deforestation line that would persist for the duration of pipeline operation. The visual impact related to the construction ROW would be long term but localized, while the visual impact related to the permanent ROW would be permanent but localized. No mitigation is feasible to reduce these impacts to lesser levels.

Connected Actions

Power Lines and Substations. The Keystone Project would require construction of power lines to service pump stations and other ancillary facilities. These would be permitted and constructed by utility providers; however, this is considered a connected action under NEPA. Some power lines would consist of service drops from existing distribution power lines and would include several poles and a transformer. For pump stations, larger power line projects are required. These would total approximately 181 miles for the Mainline Project. Power line facilities would cause a visual impact on the landscape, consisting of metal or wooden poles ranging from 40 to 80 feet in height (anchored as necessary to ensure stability), conductor wires, and insulators. Metal poles would result in a greater visual contrast with the landscape than wooden poles, as would taller structures. Although power lines would constitute permanent visual features within the landscape for the life of the project, their impact would be minimal, as they would be of relatively short length and, in many cases, would be connected to existing power lines.

Wood River Refinery Expansion. The Wood River Refinery would undergo numerous upgrades to achieve the capacity to refine the additional crude oil resources from the Project. These upgrades would become permanent visible fixtures within the landscape. Among these, vertical structures would be most visible, including a new water tower and coking flare. The flare also would constitute a visible source of light when it is in use. The upgrades also are likely to include additional facility lighting, which would constitute a permanent addition to the existing amount of light produced by the refinery.

The visual impact of new structures would be permanent but minor, as these new structures would be located near numerous existing industrial features. The visual impact of new lighting also would be permanent but minor, as it would contribute incrementally to an already substantial light source in an industrial setting.

3.9.4 CUSHING EXTENSION

3.9.4.1 General Land Use

As proposed, the approximately 296-mile Cushing Extension would disturb a total of 4,666 acres of land while traversing the states of Nebraska (approximately 3 miles), Kansas (210 miles), and Oklahoma (83 miles); 1,801 acres of this total would be retained as the permanent ROW. All disturbed acreage would revert to previous uses following construction, except for 18 acres to be retained as space for aboveground facilities, including pump stations, MLVs, and a delivery site. Permanent roads to access the construction ROW for the Cushing Extension are not planned (TransCanada 2007c). Existing roads would be used on a temporary basis during construction, and some of these roads may require improvements. Keystone would construct temporary access roads on approximately 22 acres (TransCanada 2007d). (See Section 2.1.2.3 for further discussion of access roads.) Approximately 48 miles of the Cushing Extension pipeline would be located within existing pipeline, utility, or road ROWs (TransCanada 2007d). Co-location with other ROWs would decrease the overall footprint of multiple projects. About 248 miles, or 84 percent, of the 296-mile Cushing Extension would require a new ROW. Table 3.9.4-1 shows the number of acres that would be affected during construction and operation of the Cushing Extension.

TABLE 3.9.4-1
Land Requirements for the Keystone Cushing Extension

State	Land Affected during Construction (acres)	Permanent Right-of-Way (acres)
Nebraska	37	15
Kansas	3,266	1,275
Oklahoma	1,363	502
Cushing Extension total	**4,666**	**1,801**

Note: Discrepancies between acreages for individual features and totals are attributable to rounding.

Sources: ENSR 2006a; TransCanada 2007c, d.

Additional Aboveground Facilities

The Cushing Extension would include three new pump stations, 15 MLVs, and one delivery site. Pigging facilities would be located at some pump stations and delivery sites. Table 3.9.4-2 catalogues the number of acres required to accommodate aboveground facilities during construction and operation, as well as affected acreage for the pipeline ROWs, additional workspaces, contractor and pipe yards, and temporary access roads. No permanent access roads would be required for the Cushing Extension. Some facilities would be located within the affected acreage of other facilities (e.g., all pig launchers and receivers would be located within delivery facilities or pumping stations) or would be located entirely within the 50-foot-wide permanent ROW (the location for all MLVs).

Turnouts and access roads from public roads would be installed for each aboveground facility. Drainage would be maintained by installing ditches or culverts, and the short access roads would be surfaced with crushed rock. The delivery facility sites would be enclosed with a chain-link security fence. (TransCanada 2007c.)

TABLE 3.9.4-2
Acres Affected by Construction and Operation of Pipeline Facilities for the Keystone Cushing Extension

Pipeline Facility	Construction	Operation
Nebraska		
Pipeline right-of-way (ROW)	34	15
Additional temporary workspaces	4	0
Pipe and contractor yards	0	0
Pump stations and delivery facilities	0	0
Temporary access roads	0	0
Nebraska subtotal	*38*	*15*
Kansas		
Pipeline ROW	2,803	1,275
Additional temporary workspaces	149	0
Pipe and contractor yards	339	0
Pump stations and delivery facilities	10	10
Temporary access roads	15	0
Kansas subtotal	*3,266*	*1,275*
Oklahoma		
Pipeline ROW	1,094	497
Additional temporary workspaces	52	0
Pipe and contractor yards	207	0
Pump stations and delivery facilities	8	8
Oklahoma subtotal	*1,363*	*502*
Cushing Extension		
Total pipeline ROW	3,931	1,787
Total additional temporary workspaces	205	0
Total pipe and contractor yards	546	0
Total pump stations and delivery facilities	18	18
Temporary access roads	7	0
Cushing Extension total	**4,666**	**1,801**

Notes:

Discrepancies between acreages for individual features and totals and subtotals are attributable to rounding.

Affected acreage for densitometer sites and mainline valves is effectively included within the 50-foot-wide permanent ROW of the pipeline and therefore is not listed separately here.

All pig launching and receiving facilities would be located within pump stations and would not require any additional acreage.

Permanent access road acreage calculations assume a 20-foot-wide roadway.

Some temporary access roads are previously existing roads and would not require new construction.

Sources: ENSR 2006a; TransCanada 2007c, d.

Connected Actions

Power Lines and Substations. The Cushing Extension Project would require construction of three electrical power lines to provide energy for pump stations. These would total approximately 11.5 miles in length (the longest spanning about 8 miles, with an average length of 3.8 miles). The power lines would be permitted and built by various utility providers, but would be considered a connected activity under NEPA. Keystone assumes that the majority of required transmission lines would parallel existing county road ROWs, and that no substation construction would be necessary to accommodate Keystone Project power requirements. Either steel or wooden poles would be used for power lines, with wire conductors installed through pulling or reeling, and insulators installed as needed. Poles would vary in height from 40 to 80 feet, depending on transmission line voltage. Additional power lines would be required for valve sites, and would be supplied from distribution service drops from adjacent distribution power lines. Most of these service drops would require installation of one or two poles with a transformer, and would typically be less than 200 feet in length.

Land Use

The Cushing Extension primarily would affect agriculture and grassland/rangeland land uses. Of lands crossed by the Cushing Extension, agriculture and rangeland account for 58 and 35 percent, respectively, of the acres affected by the Cushing Extension pipeline. Table 3.9.4-3 shows affected land use acreage by state for the Cushing Extension.

Rangeland/grassland is the predominant land use that would be affected in Oklahoma (42 percent of the acres affected in that state) and Nebraska (65 percent), while agriculture is the predominant land use that would be affected in Kansas (64 percent). A total of 97 acres (2 percent of the total affected acreage) would consist of developed land.

Ownership

Nearly 98 percent of lands that would be crossed by the pipeline along the Cushing Extension route are privately owned (see Tables 3.9.4-4 and 3.9.4-5). In Nebraska, land along the entire route is privately owned. In Kansas, less than 2 percent of the affected land is federally owned, and the remainder is privately owned. In Oklahoma, approximately 4 percent of the land that would be crossed is owned by the state and the remainder is privately held.

As noted, temporary and permanent ROWs would be acquired through negotiations with private landowners on a case-by-case basis. The Cushing Extension route would cross approximately 3.6 miles of state-owned land in Oklahoma; all applicable state statutes would apply. This land has been identified as state school land.

Where the pipeline would traverse federal land (approximately 3.6 miles in Kansas), all applicable federal statutes would apply. For the Cushing Extension ROW, Keystone would apply in July 2008 for Right-of-Way Grants pursuant to the Mineral Leasing Act, which provides for authorizations for temporary construction use and long-term use of federal land for pipeline purposes. A Right-of-Way Grant is issued for a 30-year term and contains a right of renewal if the project continues to be used for its initial purpose.

TABLE 3.9.4-3
Acres Affected during Construction by Land Use Type for the Keystone Cushing Extension

Land Use Type	Nebraska	Kansas	Oklahoma	Total	Percent of Total (%)
Agriculture/cropland	12	2,097	578	2,687	57.5
Grassland/rangeland	24	934	681	1,639	35.1
Forestland	0	124	39	163	3.5
Wetlands/riparian	0	24	10	34	0.7
Developed	<1	54	43	97	2.1
Water	1	33	12	46	1.0
Cushing Extension total	**37**	**3,266**	**1,363**	**4,666**	

Notes:

Agriculture includes cultivated crops, flood or pivot irrigation crops, and fallow cropland.

Rangeland includes tall grass prairie, mid-grass prairie, short grass prairie, sand prairie, non-native grassland, deciduous shrubland, mixed native and non-native grasslands and mixed prairie, improved and unimproved pasture, and lands that appear to be used for cattle or other livestock grazing—with or without a shrub component.

Forestland includes upland and wetland forested areas.

Wetlands include palustrine forested wetlands and palustrine emergent/scrub-shrub wetlands.

Developed land includes both industrial/commercial and residential uses. Industrial/commercial includes electric power or gas utility stations, manufacturing or industrial plants, livestock feedlots, landfills, mines, quarries, commercial or retail facilities, and roads. Residential includes residential yards, subdivisions, and planned new residential developments.

Sources: ENSR 2006a; TransCanada 2007c, d.

TABLE 3.9.4-4
Ownership of Land Crossed by the Keystone Cushing Extension

Land Owner	Miles Crossed	Percent of Total (%)
Nebraska		
Federal	0.0	0.0
State	0.0	0.0
Private	2.5	100.0
Nebraska subtotal	*2.5*	
Kansas		
Federal	3.6	1.7
State	0.0	0.0
Private	206.8	98.3
Kansas subtotal	*210.4*	
Oklahoma		
Federal	0.0	0.0
State	3.6	4.3
Private	79.5	95.7
Oklahoma subtotal	*83.1*	
Cushing Extension		
Federal	3.6	1.2
State	3.6	1.2
Private	288.8	97.6
Cushing Extension total	**296.0**	

Note: Discrepancies between acreages for individual features and totals and subtotals are attributable to rounding.

Sources: ENSR 2006a; TransCanada 2007b, c, d.

TABLE 3.9.4-5
Ownership of Acres Affected during Construction by the Keystone Cushing Extension

Location	Federal	State	Private	Total
Nebraska	0	0	37	37
Kansas	52	0	3,214	3,266
Oklahoma	0	53	1,310	1,363
Cushing Extension total	**52**	**53**	**4,561**	**4,666**

Sources: ENSR 2006a; TransCanada 2007b, c, d.

3.9.4.2 Agricultural Land

The principal land use that would be affected by the proposed pipeline would be agricultural. The Cushing Extension would cross a substantial amount of agricultural cropland that is presently in private ownership. Construction and operation of the Cushing facilities would affect about 2,687 acres of agricultural land, along approximately 296 miles of the pipeline route. Of this, approximately 214 miles is considered prime farmland by NRCS (this includes land considered potential prime farmland, if adequate protection from flooding and drainage are provided). Prime farmland accounts for 67 percent of the proposed Cushing Extension route mileage in Oklahoma and 75 percent of the route in Kansas. About 1.4 miles of prime farmland would be crossed in Nebraska.

To determine the amount of agricultural land that potentially would be affected, Keystone reviewed aerial photographs and made general observations during reconnaissance activities. Further refinements to the assessment of various types of cover were completed during an August 2006 grassland survey. Based on the aerial photography evaluations and ground surveys, Keystone has indicated that no known orchards would be crossed by the Keystone Project. One landowner indicated in scoping comments that pecan trees would be removed along the Cushing Extension. Further verification of agricultural uses would take place on a case-by-case basis with landowners.

Potential Impacts and Mitigation

Construction-related activities such as grading, trenching, stringing, welding, backfilling, and restoration could impact agricultural lands by leading to soil erosion, interference with and damage to agricultural surface and subsurface drainage and irrigation systems, mixing or loss of fertile topsoil and subsoil, and soil compaction. All of these impacts could result in reduced productivity of agricultural lands or direct crop loss.

During the scoping period for the Keystone Project, concerns were expressed over a number of agricultural issues, as discussed in Section 3.9.3.2. To address impacts on agricultural lands, Keystone has proposed mitigation measures that are discussed in detail in the CMR Plan (Appendix B). Keystone proposes to restore all areas disturbed during construction of the Keystone Project in accordance with the CMR Plan and all other applicable federal, state, and local permit requirements. In particular, Keystone intends to repair or restore drain tiles, fences, and land productivity as these may be affected during the construction process.

Following construction, all agricultural land affected by the Cushing Extension could revert to its previous use, except for 18 acres that would be set aside for permanent aboveground facilities (pump stations and delivery facilities); Keystone would purchase this acreage from landowners. A portion of these 18 acres would be permanently converted from agricultural to industrial land use. When construction and cleanup have been completed, all other affected land along the temporary and permanent ROWs could be returned to agricultural production. The magnitude of construction and operational impacts could include changes from agricultural to non-agricultural uses at the landowner's request, which would constitute a land use change.

Potential agricultural land use impacts and mitigation measures for the Cushing Extension are the same as those for the Mainline Project (see Section 3.9.3.2). Specific agricultural topics discussed in Section 3.9.3.2 include soil compaction; construction schedule; center pivot irrigation; surface and subsurface drainage, ponds, waterlines, and drainage ditches; CRP lands; FWP lands and other FSA programs; NRCS programs; access to farmland; and windbreaks, shelterbelts, and living snow fences. The additional mitigation for CRP lands; FWP lands; NRCS programs; and windbreaks, shelterbelts, and living snow fences would minimize impacts on these features associated with the Cushing Extension.

3.9.4.3 Rangeland

The Cushing Extension would cross substantial amounts of grassland and rangeland. Construction and operation of the Cushing Extension facilities would affect about 1,639 acres of rangeland/grassland along the approximately 296-mile route. Approximately 18 acres would be set aside for permanent aboveground facilities (such as pump stations and delivery facilities); and some percentage of this acreage could be located in rangeland areas. This acreage would be converted permanently from grassland to industrial land uses.

Affected rangeland acres represent about 35 percent of the total acres affected by the Cushing Extension. Grassland acreage represents 65 percent (24 acres) of affected areas of Nebraska, 50 percent (681 acres) in Oklahoma, and 29 percent (934 acres) in Kansas.

Potential Impacts and Mitigation

Construction activities would displace or halt grazing activities and would disturb the surface of livestock foraging areas. In addition, construction activities such as trenching could put livestock at risk of falling or being trapped in open trenches. Land that would be set aside for operation of aboveground facilities would be permanently converted from rangeland to industrial uses.

During the scoping period, commentors questioned how cattle would be protected during construction. To reduce overall risks to livestock grazing in rangelands, Keystone has proposed a number of construction guidelines and mitigation measures that are outlined in its CMR Plan (Appendix B). Potential impacts and mitigation measures related to rangeland for the Cushing Extension are the same as those for the Mainline Project (see Section 3.9.3.3).

3.9.4.4 Forestland

Construction and operation of the Cushing Extension facilities would affect about 163 acres of forestland along approximately 11 miles of the Cushing Extension route. This represents about 3.5 percent of the total acres that would be affected by the Cushing Extension. The majority of affected forestland is located in Kansas (124 acres). Section 3.5 includes a detailed discussion of forest vegetative types. None of the forested land along the Cushing Extension route is used for timber or Christmas tree production (TransCanada 2007c).

Potential Impacts and Mitigation

Construction activities would remove trees and brush from forested areas. For the life of pipeline operation, the ROW would be maintained in an open condition, and woody revegetation would be periodically removed. This would result in a permanent loss of tree growth in the permanent ROW. If any of the 18 acres of permanent aboveground facilities were constructed in forested areas, this would result in permanent conversion from forestland to industrial land uses. To reduce impacts on forestlands, Keystone has proposed a number of construction guidelines and mitigation measures that are outlined in its CMR Plan. Construction and operation impacts and mitigation measures related to forestland are the same for the Cushing Extension as discussed for the Mainline Project (see Section 3.9.3.4).

3.9.4.5 Residences and Planned Development

The Cushing Extension would cross and affect residential land. Based on 2006 aerial photography and ground truthing surveys conducted during summer 2007, Keystone identified 128 potential residential structures within 500 feet of the proposed Cushing Extension ROW. These residences are located in

Kansas (73) and Oklahoma (55), with none in Nebraska. There are no public assembly places identified within 500 feet of the ROW. Keystone identified two residences within 25 feet of the construction ROW in Oklahoma. Keystone has provided site-specific construction plans for each of the residential structures within 50 feet of the construction workplace (TransCanada 2007d).

Potential Impacts and Mitigation

The principal measure proposed by Keystone to mitigate impacts in existing residential areas is to ensure that construction proceeds quickly through such areas and that the hours during which activities with high-decibel noise levels would be conducted are limited. Landowners would be notified at least 24 hours prior to construction. As specified in the CMR Plan (Appendix B), Keystone has proposed mitigation measures for potential impacts on all residential land. These measures, along with potential impacts and additional mitigation, are the same as those discussed in Section 3.9.3.5 for the Mainline Project.

3.9.4.6 Commercial and Industrial Land

Construction and operation of the Cushing Extension facilities would affect about 97 acres of developed land (Table 3.9.4-6). This includes 54 acres in Kansas, 43 acres in Oklahoma, and less than 1 acre in Nebraska. For the Cushing Extension route as a whole, developed land represents approximately 2 percent of total acres affected by the Cushing Extension.

TABLE 3.9.4-6
Developed Land by State for the Keystone Cushing Extension

State	Total Developed (acres)
Nebraska	>1
Kansas	54
Oklahoma	43
Cushing Extension total	**97**

Source: TransCanada 2007d.

Ground surveys conducted by Keystone during summer 2007 indicated that the Cushing Extension construction ROW would be within 25 feet of 15 outbuildings (six in Kansas and nine in Oklahoma) and three industrial structures (in Oklahoma) (TransCanada 2007d).

Potential Impacts and Mitigation

Construction of the Cushing Extension could affect commercial and industrial land through restricted access and the presence of construction activity. Impacts to a specific commercial or industrial area are anticipated to last for only several days. Keystone has adopted mitigation measures for commercial and industrial land in its CMR Plan. Construction and operation impacts and mitigation related to commercial and industrial land is the same for the Cushing Extension as described for the Mainline Project (see Section 3.9.3.6).

Connected Actions

Power Lines and Substations. The Keystone Project would require construction of power lines to service pump stations and other ancillary facilities. These would be permitted and constructed by utility providers; however, this is considered a connected action under NEPA. The land required to construct new power lines will generally be within existing county ROWs. It would be the responsibility of utility providers to obtain any necessary easements for the construction process. Construction of power lines would consist of limited clearing, which may result in removal of some trees to provide adequate clearance between the wire conductors and underlying vegetation. Maintenance would consist of trimming, in some cases, to avoid tree removal. Holes would be excavated for placement of power poles, which also would be anchored as necessary for stability. Temporary pulling or reeling areas may be needed for installation of the conductor wires, which could return to their original condition following construction. Construction and operation activities for power lines would be considered to result in a minor impact on land use because they typically would be constructed within county road ROWs.

3.9.4.7 Recreation and Special Interest Areas

The proposed Cushing Extension facilities would cross only one special interest area, resulting in temporary construction impacts and possible permanent impacts. Table 3.9.4-7 details the recreational and special interests lands intersected by the Cushing Extension route; no other national, state, or local parks or forests are located within 500 feet of the proposed Cushing Extension centerline.

The proposed Cushing Extension would cross the Milford Wildlife Area in Kansas at four points (MPs 50.1, 52.3, 52.9, and 53.8), affecting a total of approximately 3.6 miles along the route (representing 52 affected acres). The Cushing Extension would not intersect any recreational or special interest areas in Nebraska or Oklahoma.

Milford Wildlife Area, Kansas

The Milford Wildlife Area consists of approximately 19,000 acres of public land surrounding the western and northern sides of Milford Reservoir. The Kansas Forestry, Fishing & Game Commission manages the wildlife area, which is owned by COE along with the adjacent Milford Reservoir. The area includes a public hunting area, a wildlife area, and a number of recently created wetlands along the Republican River between the reservoir and Clay Center, Kansas (KDWP 2007).

Wilderness Areas

The Cushing Extension would not cross any designated Wilderness Areas or Wilderness Study Areas.

Potential Impacts and Mitigation

Keystone is currently working with Milford Wildlife Area personnel to develop a site-specific crossing plan for the area. Creation and implementation of this plan with review and approval of Milford managers should alleviate many potential impacts to specific sensitive areas and to important wildlife or hunting seasons.

Construction activities would cause temporary impacts to recreational traffic and use patterns during construction. Sightseers, hikers, wildlife viewers, hunters, and other recreationists would be displaced from the immediate area during construction. Public hunting access to this area could be impeded during construction; disruption of seasonal hunting activities would be the subject of discussion between

Keystone and Milford Wildlife Area managers during development of the site-specific crossing plan. Although impacts of pipeline construction would be of limited duration, construction during the fall hunting and migration season, in particular, could create conflicts with hunters and wildlife viewers. Keystone would continue to coordinate with agency managers to minimize conflicts between construction activities and recreational uses for which these special areas were established. Other temporary and minor construction impacts may occur, including decreased access and closure of trails, parking, and wildlife viewing areas. Following construction, all affected recreational and special interest would return to their previous uses.

TABLE 3.9.4-7
Special Interest Areas Crossed by the Keystone Cushing Extension

Site Name	Milepost	Miles Crossed	Ownership
Nebraska			
None identified	NA	NA	NA
Kansas			
Milford Wildlife Area	50.1–51.9	1.8	U.S. Army Corps of Engineers (COE)
Milford Wildlife Area	52.3–52.8	0.5	COE
Milford Wildlife Area	52.9–53.5	0.6	COE
Milford Wildlife Area	53.8–54.5	0.7	COE
Oklahoma			
None identified	NA	NA	NA
Cushing Extension total		**3.6**	

NA = Not applicable.

Sources: ENSR 2006a, TransCanada 2007d.

Operation of the pipeline would not affect hunting in the Milford Wildlife Area. Milford is primarily a wetland restoration area. Given proposed wetland mitigation measures, construction impacts are expected to be long term but minor. These temporary impacts would be associated with vegetation removal, grading, grubbing, trenching, and soil stockpiling; they would be minimized by following the measures described in Keystone's CMR Plan (Appendix B) (TransCanada 2007c). The ROW may be visible for up to 5 years as wetland and grassland vegetation reestablishes, resulting in a long term, minor impact. Keystone would restore all of these areas following construction.

Maintenance of vegetation would not be conducted over the full width of the permanent ROW in wetland areas. Therefore, no permanent impacts are anticipated from crossing wetlands of the Milford Wildlife Area (TransCanada 2007c).

For the Milford Wildlife Area, the primary concerns would be limited access and conflicts with hunters during construction. Therefore, Keystone would develop a site-specific crossing plan for the Milford Wildlife Area that will address these issues.

As described in Section 3.3.7 for the Carlyle Lake WMA and Riverlands Environmental Demonstration Area, Milford Wildlife Area may be a funding recipient of the LWCF and could be subject to the requirements of Section 6.f.3 of the LWCF Act. Construction and operation of Keystone facilities would not change the recreational use of Milford Wildlife Area, although temporary and minor recreational impacts would be expected.

Other general impacts related to recreation and special interest areas and associated mitigation measures are the same for the Cushing Extension as discussed for the Mainline Project (see Section 3.9.3.7).

3.9.4.8 Visual Resources

General visual impacts associated with the construction ROW, additional temporary workspaces, and operation of the Cushing Extension pipeline include clearing and removal of existing vegetation; exposure of bare soils; earthwork and grading scars associated with heavy equipment tracks; trenching; rock formation alteration or removal; machinery and pipe storage; landform changes that introduce contrasts in visual scale, spatial characteristics, form, line, color, or texture; and new aboveground structures.

Potential Impacts and Mitigation

Impacts on visual resources and associated mitigation measures are the same for the Cushing Extension as described for the Mainline Project (see Section 3.9.3.8).

Connected Actions

Power Lines and Substations. The Keystone Project would require construction of power lines to service pump stations and other ancillary facilities. These would be permitted and constructed by utility providers; however, this is considered a connected action under NEPA. Some power lines would consist of service drops from existing distribution power lines and would include several poles and a transformer. For pump stations, larger power line projects are required. Power line facilities would result in a visual impact on the landscape, consisting of metal or wooden poles ranging from 40 to 80 feet in height (anchored as necessary to ensure stability), conductor wires, and insulators. Metal poles would cause a greater visual contrast with the landscape than wooden poles, as would taller structures. Although power lines would constitute permanent visual features within the landscape for the life of the project, their impact would be minimal, as they would be of relatively short length and, in many cases, would be connected to existing power lines.

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3.10 SOCIOECONOMICS

This section describes existing socioeconomic conditions that could be affected by the proposed Keystone Project and evaluates the potential socioeconomic impacts that may result from project implementation. The key resource topics addressed in this section include population; housing, including property values; local economic activity, as measured primarily by employment and income parameters; tax revenues; public services; transportation; and environmental justice.

Several key socioeconomic issues have been identified for the proposed Keystone Project. These include: (1) compensation to property owners for conveyance of temporary and permanent ROW easements, in addition to restrictions on land use and damage to property; (2) indirect economic effects from displacing agricultural land uses and related effects on federal farmland protection program payments; (3) construction worker demands on local infrastructure; (4) economic benefits from the purchase of goods and services during construction and operations; and (5) fiscal impacts associated with property, sales and other tax revenues, as well as public service costs generated by the proposed Keystone Project.

3.10.1 Environmental Setting

This section provides a general overview of the socioeconomic resources that could be affected by the Keystone Project and represents existing (or current) socioeconomic conditions in the project area. Further, it provides context to the analysis of socioeconomic impacts and establishes baseline conditions against which the potential socioeconomic impacts of the proposed Keystone Project were evaluated. The data used to establish baseline socioeconomic conditions are based on a variety of federal, state, and local sources. Both text and tables in this section are organized by Keystone Project segment, namely the Mainline Project and the Cushing Extension.

3.10.1.1 Region of Influence

The proposed Keystone Project, including the Cushing Extension, would consist of an approximately 1,378-mile interstate crude oil pipeline and associated ancillary facilities, as described in Section 2.0. From its point of origin in the United States, the Mainline Project route would cross 48 counties in six states (North Dakota, South Dakota, Nebraska, Kansas, Missouri, and Illinois); the Cushing Extension would span an additional nine counties in Nebraska, Kansas, and Oklahoma. Within each county, several local communities are expected to incur most of the direct socioeconomic impacts of the Keystone Project, both positive and negative. For the purposes of this analysis, these are communities located within 2 miles of new pipeline facilities or surface disturbance activities associated with pipeline refurbishment. Potentially affected states, counties, and communities are listed in Table 3.10.1-1, with the communities and counties representing the “region of influence” for this socioeconomic analysis. Table 3.10.1-1 organizes communities based on their general proximity to the pipeline and also reports community-level population figures, which are intended to supplement the population data presented in Section 3.10.1.2.

TABLE 3.10.1-1
Affected Counties and Communities along the Keystone Project Route

State/County	Community (2000 Population)	
	Within 0.5 Mile	**Within 2.0 Miles**
MAINLINE PROJECT		
North Dakota		
Cavalier	--	--
Pembina	--	Walhalla (1,057)
Walsh	Lankin (131)	--
Nelson	--	--
Steele	--	Sharon (109); Luverne (44)
Barnes	--	Sibley (46)
Ransom	--	Fort Ransom (70)
Sargent	--	--
Dickey	--	--
Grand Forks [a]	--	Niagara (57)
South Dakota		
Brown	--	--
Marshall	--	--
Day	--	--
Clark	Raymond (86)	--
Beadle	--	--
Kingsbury	Iroquois (278)	--
Miner	Roswell (21)	Carthage (187)
Hansen	--	Emery (439)
McCook	--	Spencer (157)
Hutchinson	--	--
Yankton	Yankton (13,528)	--
Nebraska		
Cedar	--	Randolph (955); Fordyce (182)
Wayne	Sholes (24)	Hoskins (283)
Stanton	--	Stanton (1,627)
Platte	--	--
Colfax	Leigh (442); Richland (89)	--
Butler	Garrison (67)	Bellwood (446)
Seward	--	Seward (6,319); Staplehurst (270)
Saline	--	Dorchester (615); Swanton (106)
Jefferson	--	Plymouth (477); Steele City (84); Harbine (56)
Gage	--	--
Kansas		
Marshall	--	Oketo (87)
Nehama	--	Seneca (2,122); Oneida (70)

TABLE 3.10.1-1 (Continued)		
State/County	Community (2000 Population)	
	Within 0.5 Mile	Within 2 Miles
MAINLINE PROJECT (CONTINUED)		
Kansas (continued)		
Brown	--	Fairview (271)
Doniphan	--	Denton (186); Severance (108)
Missouri		
Buchanan	Agency (599)	St. Joseph (73,990); Gower (1,399)
Clinton	--	Turney (155)
Caldwell	Cowgill (247)	Polo (582)
Carroll	--	Bosworth (382); Tina (193)
Chariton	Salisbury (1,726); Keytesville (533)	Triplett (64)
Randolph	Renick (221)	Moberly (11,945)
Audrain	--	Mexico (11,320)
Montgomery	--	--
Lincoln	Troy (6,737); Moscow Mills (1,742); Chain of Rocks (91)	Old Monroe (250); Fountain N' Lakes (129); Truxton (96); Cave (7)
St. Charles	West Alton (573)	St. Charles (60,321); St. Peters (51,381); St. Paul (1,634); Portage Des Sioux (351)
Illinois		
Madison	Edwardsville (21,491); Highland (8,438); South Roxana (1,888); Roxana (1,547) Hartford (1,545); Grantfork (254)	Granite City (31,301); Alton (30,496); Godfrey (16,286); Wood River (11,296); East Alton (6,830)
Bond	Pocahontas (727)	--
Fayette	--	--
Marion	Vernon (178)	Patoka (633)
CUSHING EXTENSION		
Nebraska		
Jefferson [b]	--	Steele City (84)
Kansas		
Washington	Greenleaf (357); Hollenberg (31)	Washington (1,223)
Clay	--	Wakefield (838); Green (147)
Dickinson	Chapman (1,241)	Hope (372)
Marion	--	Marion (2,110); Ramona (94)
Butler	Townda (1,338); Potwin (457)	Augusta (8,423); Douglass (1,813)
Cowley	--	Winfield (12,206); Arkansas City (11,963)

TABLE 3.10.1-1 (Continued)		
State/County	Community (2000 Population)	
	Within 0.5 Mile	Within 2 Miles
CUSHING EXTENSION (CONTINUED)		
Oklahoma		
Kay	Ponca City (25,919)	Newkirk (2,243)
Noble	--	Morrison (636); Marland (280)
Payne	Cushing (8,371)	--

Notes:

Affected communities include those where new pipeline facilities or surface disturbance activities associated with pipeline refurbishment are proposed.

States and counties are listed geographically from north to south as the proposed Keystone Project crosses the area.

[a] The proposed pipeline does not travel through Grand Forks County, although the community of Niagara is located within 2 miles of the pipeline route.

[b] Also addressed in the Mainline Project route.

Sources: U.S. Bureau of the Census 2000, ENSR 2006a.

Several types of socioeconomic effects could occur within the region of influence, as described in more detail in the impact analysis presented in Section 3.10.2. Temporary effects during construction of the proposed Keystone Project could include changes in population levels or local demographics, changes in the demand for housing and public services, disruption of local transportation corridors, increased employment opportunities and related labor income benefits, and increased government revenues associated with sales and payroll taxes. Isolated impacts on individual property owners and economic land use also could occur along the pipeline route. The primary socioeconomic impacts associated with long-term operation of the proposed Keystone Project likely would include employment and income benefits resulting from long-term staffing requirements and local operating expenditures, as well as an increased property tax base and associated tax revenues.

3.10.1.2 Population

Population-related characteristics in the region of socioeconomic influence are summarized in Table 3.10.1-2. (Population data at the community level is presented in Table 3.10.1-1.) The pipeline route is predominantly rural and sparsely populated, with the population tending to increase from north to south along the route. For the Mainline Project, the total population in the counties comprising the region of influence was nearly 1.3 million in 2005. The comparable figure for the Cushing Extension was approximately 279,200 people. In total, the population in 2005 across all counties was over 1.5 million; however, the average population density was only 34.3 people per square mile, demonstrating the rural nature of the pipeline route.

The least populated areas along the route are in North Dakota, including Steele County with a population of just over 2,000 and population density of 2.81 people per square mile. Relatively urban areas of the route include Buchanan County, Missouri, which contains the St. Joseph metropolitan area; Lincoln and St. Charles counties in Missouri and Madison County in Illinois, which correspond to the St. Louis metropolitan area; and Payne County, Oklahoma, which includes the Stillwater metropolitan area. The most populated county in the Keystone Project area is St. Charles County, Missouri, with nearly 330,000 people and a population density of 557 people per square mile. Similar population patterns are evident at the community level. Many of the potentially-affected communities along the northern portions of the route have populations less than 100, while the largest community of St. Joseph, Missouri has a population of almost 74,000.

The population in the region of influence has increased at a compound rate of 0.7 percent per year since 1990, rising from 1.37 million then to 1.57 million in 2005. As expected, this increase has been mainly in urban areas. Between 2000 and 2005, the highest growth rate occurred in Lincoln County, Missouri, 18.4 percent. Conversely, many rural counties, particularly those in North Dakota, South Dakota, and Kansas, have actually experienced population declines. In fact, three counties have experienced double-digit population declines since 2000—Pembina and Steele Counties in North Dakota and Miner County, South Dakota.

TABLE 3.10.1-2
Population Characteristics in Affected Counties along the Keystone Project Route

State/County	Population			Population Change (%)			Population Density (Population per Square Mile)
	1990 (April 1)	2000 (April 1)	2005 (July 1 Estimates)	1990–2005	1990–2000	2000–2005	
MAINLINE PROJECT							
North Dakota	**638,800**	**642,200**	**636,677**	**-0.16**	**0.70**	**-0.87**	**9.23**
Cavalier	6,064	4,831	4,330	-40.05	-25.52	-11.57	2.87
Pembina	9,238	8,585	8,038	-14.93	-7.61	-6.81	7.17
Walsh	13,840	12,389	11,607	-19.24	-11.71	-6.74	8.97
Nelson	4,410	3,715	3,424	-28.80	-18.71	-8.50	3.39
Steele	2,420	2,258	2,007	-20.58	-7.17	-12.51	2.81
Barnes	12,545	11,775	11,075	-13.27	-6.54	-6.32	7.32
Ransom	5,921	5,890	5,810	-1.91	-0.53	-1.38	6.72
Sargent	4,549	4,366	4,150	-9.61	-4.19	-5.20	4.79
Dickey	6,107	5,757	5,487	-11.30	-6.08	-4.92	4.81
South Dakota	**697,101**	**754,844**	**775,933**	**10.16**	**7.65**	**2.72**	**10.23**
Brown	35,580	35,460	34,706	-2.52	-0.34	-2.17	20.05
Marshall	4,844	4,576	4,418	-9.64	-5.86	-3.58	4.99
Day	6,978	6,267	5,757	-21.21	-11.35	-8.86	5.28
Clark	4,403	4,143	3,799	-15.90	-6.28	-9.06	3.93
Beadle	18,253	17,023	15,896	-14.83	-7.23	-7.09	12.57
Kingsbury	5,925	5,815	5,532	-7.10	-1.89	-5.12	6.41
Miner	3,272	2,884	2,584	-26.63	-13.45	-11.61	4.52
Hanson	2,994	3,139	3,747	20.10	4.62	16.23	8.60
McCook	5,688	5,832	5,930	4.08	2.47	1.65	10.27
Hutchinson	8,262	8,075	7,581	-8.98	-2.32	-6.52	9.31
Yankton	19,252	21,652	21,718	11.35	11.08	0.30	40.78
Nebraska	**1,581,660**	**1,711,263**	**1,758,787**	**10.07**	**7.57**	**2.70**	**22.88**
Cedar	10,131	9,615	9,066	-11.75	-5.37	-6.06	12.16
Wayne	9,364	9,851	9,211	-1.66	4.94	-6.95	20.77
Stanton	6,244	6,455	6,534	4.44	3.27	1.21	15.16
Platte	29,820	31,662	31,262	4.61	5.82	-1.28	45.37
Colfax	9,139	10,441	10,433	12.40	12.47	-0.08	24.92

TABLE 3.10.1-2 (Continued)

State/County	Population 1990 (April 1)	Population 2000 (April 1)	Population 2005 (July 1 Estimates)	Population Change (%) 1990–2005	Population Change (%) 1990–2000	Population Change (%) 2000–2005	Population Density (Population per Square Mile)
MAINLINE PROJECT (CONTINUED)							
Nebraska (continued)							
Butler	8,601	8,767	8,720	1.36	1.89	-0.54	14.92
Seward	15,450	16,496	16,739	7.70	6.34	1.45	29.07
Saline	12,715	13,843	14,195	10.43	8.15	2.48	24.64
Jefferson	8,759	8,333	7,925	-10.52	-5.11	-5.15	13.77
Gage	22,794	22,993	23,306	2.20	0.87	1.34	27.10
Kansas	**2,481,349**	**2,688,418**	**2,744,687**	**9.59**	**7.70**	**2.05**	**33.55**
Marshall	11,705	10,965	10,405	-12.49	-6.75	-5.38	11.51
Nemaha	10,446	10,717	10,443	-0.03	2.53	-2.62	14.52
Brown	11,128	10,724	10,239	-8.68	-3.77	-4.74	17.89
Doniphan	8,134	8,249	7,816	-4.07	1.39	-5.54	19.68
Missouri	**5,128,880**	**5,595,211**	**5,800,310**	**11.58**	**8.33**	**3.54**	**84.20**
Buchanan	83,083	85,998	84,904	2.14	3.39	-1.29	204.80
Clinton	16,595	18,979	20,715	19.89	12.56	8.38	48.92
Caldwell	8,380	8,969	9,307	9.96	6.57	3.63	21.66
Carroll	10,748	10,285	10,193	-5.44	-4.50	-0.90	14.51
Chariton	9,202	8,438	8,124	-13.27	-9.05	-3.87	10.57
Randolph	24,370	24,663	25,336	3.81	1.19	2.66	51.96
Audrain	23,599	25,853	25,759	8.39	8.72	-0.36	36.97
Montgomery	11,355	12,136	12,166	6.67	6.44	0.25	22.52
Lincoln	28,892	38,944	47,727	39.46	25.81	18.40	74.53
St. Charles	212,907	283,883	329,940	35.47	25.00	13.96	557.00
Illinois	**11,453,316**	**12,419,293**	**12,763,371**	**10.26**	**7.78**	**2.70**	**229.62**
Madison	249,238	258,941	264,309	5.70	3.75	2.03	357.01
Bond	14,991	17,633	18,027	16.84	14.98	2.19	47.11
Fayette	20,893	21,802	21,713	3.78	4.17	-0.41	29.93
Marion	41,561	41,691	40,144	-3.53	0.31	-3.85	69.73

TABLE 3.10.1-2
(Continued)

State/County	Population 1990 (April 1)	Population 2000 (April 1)	Population 2005 (July 1 Estimates)	Population Change (%) 1990–2005	Population Change (%) 1990–2000	Population Change (%) 2000–2005	Population Density (Population per Square Mile)
CUSHING EXTENSION							
Nebraska [a]	**1,581,660**	**1,711,263**	**1,758,787**	**10.07**	**7.57**	**2.70**	**22.88**
Jefferson	8,759	8,333	7,925	-10.52	-5.11	-5.15	13.77
Kansas	**2,481,349**	**2,688,418**	**2,744,687**	**9.59**	**7.70**	**2.05**	**33.55**
Washington	7,073	6,483	6,009	-17.71	-9.10	-7.89	6.69
Clay	9,158	8,822	8,629	-6.13	-3.81	-2.24	13.17
Dickinson	18,958	19,344	19,209	1.31	2.00	-0.70	22.54
Marion	12,888	13,361	12,952	0.49	3.54	-3.16	13.58
Butler	50,580	59,482	62,354	18.88	14.97	4.61	43.11
Cowley	36,915	36,291	35,298	-4.58	-1.72	-2.81	31.17
Oklahoma	**3,148,825**	**3,450,654**	**3,547,884**	**11.25**	**8.75**	**2.74**	**51.67**
Kay	48,056	48,080	46,480	-3.39	0.05	-3.44	49.18
Noble	11,045	11,411	11,211	1.48	3.21	-1.78	15.10
Payne	61,507	68,190	69,151	11.05	9.80	1.39	99.19
Mainline Project subtotal	**1,110,789**	**1,211,758**	**1,262,254**	**12.00**	**8.33**	**4.00**	**34.69**
Cushing Extension subtotal	**264,939**	**279,797**	**279,218**	**5.11**	**5.31**	**-0.21**	**31.38**
Keystone Project total	**1,366,969**	**1,483,222**	**1,533,547**	**10.86**	**7.84**	**3.28**	**34.30**

Notes:

Affected counties include those where new pipeline facilities or surface disturbance activities associated with pipeline refurbishment are proposed.

States and counties are listed geographically from north to south as the proposed Keystone Project crosses the area.

[a] Also addressed in the Mainline Project route.

Source: U.S. Bureau of the Census 2006.

3.10.1.3 Housing

Available housing to serve the Keystone Project is a function of the housing stock (mainly rental and short-term accommodations), recent economic and population growth, and demand for housing from other sources. An overview of the existing housing stock in the region of influence is presented in Table 3.10.1-3. The total number of housing units in the counties crossed by the Keystone Project was estimated at over 655,000 in 2004, with about 535,000 units and 124,000 units in those counties affected by the Mainline Project and the Cushing Extension, respectively. The greatest number of units is found in urban counties in Missouri and Illinois. Most of the existing housing stock is occupied single-family residences that would not be available for use by Keystone Project workers.

More pertinent to the analysis is the number of rental units and short-term accommodations, such as motel and hotel rooms and recreational vehicle (RV) parks, and related vacancy rates. The total number of rental units located across all affected counties was about 158,500 in 2000. Rental vacancy rates and available rental housing vary considerably across states and counties. The highest vacancy rates for rental units are in North Dakota, ranging from 7.9 to 17.8 percent in the affected counties, compared with a weighted average of nearly 13 percent across the state. The lowest vacancy rates are in Nebraska, with an average vacancy rate of just below 8 percent across affected counties. Based on these data, approximately 14,400 vacant rental units are available in the region of influence. At the county level, the number of available units is smallest in North Dakota and South Dakota counties and largest in counties throughout Missouri and Illinois. Across the entire region of influence, 23 of the 58 counties had less than 100 vacant rental units, and seven counties had less than 50 units vacant.

Alternatives to rental housing are temporary short-term accommodations in hotels/motels, RV and mobile home parks, and campgrounds. In some cases, recreational cabins and seasonal housing for migratory workers also may be available. Short-term accommodations are more flexible and likely would be the preferred form of housing for construction workers. It is estimated that approximately 445 hotels and 285 campgrounds (including RV parks) are located within a 50-mile corridor of the pipeline route (TransCanada 2007b). Based on the average number of accommodations (i.e., rooms or RV/campground spaces) by facility type, there are approximately 41,200 hotel/motel rooms and 35,600 RV and campground spaces throughout the region of influence. The total number of hotels/motels and campgrounds by county is presented in Table 3.10.1-4. The availability of short-term accommodations varies throughout the year and depends on a number of factors, including seasonal fluctuations and timing of local events. Based on national average hotel and RV campground occupancy rates, roughly 34,100 vacant rooms and/or RV and campground spaces are available in the region of influence at any one time.

3.10.1.4 Economic Base

The economic base of an area reflects its major industries. Along the pipeline route, the predominant land use is agriculture, particularly in the northern reaches of the alignment; thus, agricultural production and agricultural support industries represent a major component of the economic base in the region of influence. In addition, local government is typically a substantial economic driver in many rural areas, generating jobs and income for local residents. In more urban areas, such as those larger communities and counties in the region of influence, service, manufacturing, and trade industries tend to generate the most economic activity.

TABLE 3.10.1-3
Housing Stock in Affected Counties along the Keystone Project Route

State/County	Total Housing Units (July 2004 Estimated)	Building Permits (2005)	Total Rental Units (2000)	Rental Vacancy Rate (2000)	Estimated Vacant Rental Units (2000)
MAINLINE PROJECT					
North Dakota	**300,815**	**4,038**	**--**	**--**	**--**
Cavalier	2,748	2	454	17.8	81
Pembina	4,100	1	902	15.3	138
Walsh	5,747	6	1,331	12.5	166
Nelson	2,028	2	373	13.7	51
Steele	1,240	11	228	7.9	18
Barnes	5,657	50	1,574	10.5	165
Ransom	2,740	5	641	9.5	61
Sargent	2,049	26	415	13.0	54
Dickey	2,677	1	779	16.4	128
North Dakota subtotal	*28,986*	*104*	*6,697*	*12.9* [a]	*862*
South Dakota	**342,620**	**5,685**	**--**	**--**	**--**
Brown	16,239	130	5,423	9.0	488
Marshall	2,626	26	482	15.1	73
Day	3,689	30	725	14.5	105
Clark	1,888	15	356	11.5	41
Beadle	8,279	57	2,731	15.1	412
Kingsbury	2,796	19	651	10.0	65
Miner	1,425	9	308	8.1	25
Hanson	1,249	6	243	4.1	10
McCook	2,507	30	512	9.4	48
Hutchinson	3,562	11	724	6.5	47
Yankton	9,147	135	2,798	9.7	271
South Dakota subtotal	*53,407*	*468*	*14,953*	*10.6* [a]	*1,586*
Nebraska	**757,743**	**9,929**	**--**	**--**	**--**
Cedar	4,288	19	811	13.4	109
Wayne	3,724	12	1,278	5.5	70
Stanton	2,491	22	483	5.0	24
Platte	13,167	69	3,538	8.8	311
Colfax	4,126	19	999	8.6	86
Butler	4,122	13	917	9.7	89
Seward	6,685	81	1,793	6.2	111
Saline	5,709	47	1,598	4.8	77

TABLE 3.10.1-3 (Continued)					
State/County	**Total Housing Units (July 2004 Estimated)**	**Building Permits (2005)**	**Total Rental Units (2000)**	**Rental Vacancy Rate (2000)**	**Estimated Vacant Rental Units (2000)**
MAINLINE PROJECT (CONTINUED)					
Nebraska (continued)					
Jefferson	3,975	20	932	9.4	88
Gage	10,441	47	2,941	8.7	256
Nebraska subtotal	*58,728*	*349*	*15,290*	*8.0* [a]	*1,221*
Kansas	**1,185,114**	**14,048**	--	--	--
Marshall	5,074	9	1,047	12.7	133
Nemaha	4,445	25	821	7.6	62
Brown	4,914	6	1,342	8.0	107
Doniphan	3,540	15	886	8.8	78
Kansas subtotal	*17,973*	*55*	*4,096*	*9.3* [a]	*381*
Missouri	**2,564,340**	**33,114**	--	--	--
Buchanan	37,292	204	11,745	7.4	869
Clinton	8,550	206	1,627	7.4	120
Caldwell	4,607	206	853	6.3	54
Carroll	4,984	36	1,215	10.8	131
Chariton	4,384	0	817	17.7	145
Randolph	10,997	34	3,141	18.3	575
Audrain	11,087	34	2,849	10.5	299
Montgomery	6,021	65	1,147	10.5	120
Lincoln	16,704	65	3,010	11.2	337
St. Charles	122,829	4,112	19,489	6.1	1,189
Missouri subtotal	*227,455*	*4,962*	*45,893*	*8.4* [a]	*3,839*
Illinois	**5,094,186**	**66,942**	--	--	--
Madison	113,914	1,519	29,223	8.6	2,513
Bond	6,973	112	1,342	7.1	95
Fayette	9,274	13	1,805	8.7	157
Marion	18,405	45	4,195	7.4	310
Illinois subtotal	***148,566***	***1,689***	***36,566***	***8.4*** [a]	***3,076***
CUSHING EXTENSION					
Nebraska [b]	**757,743**	**9,929**	--	--	--
Jefferson	3,975	20	932	9.4	88
Nebraska subtotal	*3,975*	*20*	*932*	*9.4* [a]	*88*

TABLE 3.10.1-3 (Continued)					
State/County	Total Housing Units (July 2004 Estimated)	Building Permits (2005)	Total Rental Units (2000)	Rental Vacancy Rate (2000)	Estimated Vacant Rental Units (2000)
CUSHING EXTENSION (CONTINUED)					
Kansas	**1,185,114**	**14,048**	**--**	**--**	**--**
Washington	3,204	0	631	13.0	82
Clay	4,150	14,048	973	13.6	132
Dickinson	8,841	58	2,214	9.9	219
Marion	6,049	50	1,153	10.9	126
Butler	24,844	50	5,327	9.8	522
Cowley	16,081	79	4,689	12.6	591
Kansas subtotal	*63,169*	*14,285*	*14,987*	*11.2* [a]	*1,672*
Oklahoma	**1,572,756**	**18,362**	**--**	**--**	**--**
Kay	21,955	12	6,117	11.4	697
Noble	5,157	8	1,268	12.2	155
Payne	30,283	338	12,680	7.3	926
Oklahoma subtotal	*57,395*	*358*	*20,065*	*8.93* [a]	*1,778*
Mainline Project total	**535,115**	**7,627**	**123,496**	**8.9** [a]	**10,965**
Cushing Extension total	**124,539**	**14,663**	**35,984**	**9.8** [a]	**3,537**
Keystone Project total	**655,679**	**22,270**	**158,548**	**9.1** [a]	**14,415**

Notes:

Affected counties include those where new pipeline facilities or surface disturbance activities associated with pipeline refurbishment are proposed.

States and counties are listed geographically from north to south as the proposed Keystone Project crosses the area.

[a] Average.

[b] Also addressed in the Mainline Project route.

Sources: U.S. Bureau of the Census 2000, 2006.

TABLE 3.10.1-4 Number of Hotels/Motels and Campgrounds by County along the Keystone Project Route		
County	**Hotels/Motels**	**Campgrounds**
MAINLINE PROJECT		
North Dakota		
Pembina	4	4
Cavalier	4	1
Walsh	5	4
Nelson	3	1
Grand Forks	1	3
Traill	1	1
Ramsey	0	2
Griggs	4	1
Barnes	6	5
Cass	0	2
Ransom	5	3
Lemoure	1	1
Sargent	2	2
Dickey	4	3
South Dakota		
Marshall	4	2
Brown	7	1
Day	5	0
Clark	2	1
Spink	2	0
Hamlin	1	0
Kingsbury	5	2
Beadle	8	1
Sanborn	1	0
Miner	1	0
Davison	11	7
McCook	7	2
Hutchinson	3	0
Clay	1	0
Bon Homme	1	0
Yankton	8	9
Clay	3	0
Nebraska		
Knox	3	1
Cedar	4	1
Pierce	2	2
Wayne	3	1
Madison	16	1
Cuming	2	0
Colfax	2	0
Platte	13	2
Butler	2	0
Polk	1	0
Seward	4	1
York	0	2
Lancaster	9	7

TABLE 3.10.1-4
(Continued)

County	Hotels/Motels	Campgrounds
MAINLINE PROJECT (continued)		
Nebraska (continued)		
Saline	6	0
Gage	8	2
Jefferson	2	0
Pawnee	1	2
Richardson	2	1
Kansas		
Marshall	6	0
Nemaha	3	1
Brown	7	5
Jackson	3	0
Atchison	5	1
Doniphan	1	1
Missouri		
Atchison	1	2
Holt	0	2
Buchanan	7	1
Andrew	0	2
Platte	4	1
Clay	3	3
Clinton	2	3
Dekalb	5	1
Ray	1	2
Livingston	2	1
Carroll	6	0
Saline	3	1
Linn	6	1
Howard	2	0
Chariton	1	0
Macon	0	1
Randolf	4	2
Boone	14	2
Callaway	5	1
Monroe	0	2
Audrain	7	0
Ralls	2	2
Montgomery	7	4
Gasconade	1	0
Pike	3	1
Warren	4	2
Lincoln	4	2
St. Charles	16	5
St. Louis	10	2

TABLE 3.10.1-4
(Continued)

County	Hotels/Motels	Campgrounds
MAINLINE PROJECT (continued)		
Illinois		
Calhoun	1	0
Jersey	5	0
Madison	31	13
Macoupin	1	2
Bond	9	2
Clinton	3	10
Fayette	4	3
Marian	5	1
CUSHING EXTENSION		
Kansas		
Washington	2	2
Clay	4	1
Riley	1	3
Geary	11	4
Dickinson	9	3
Marion	5	0
Harvey	6	2
Butler	12	3
Sedgwick	16	4
Sumner	4	4
Cowley	12	5
Oklahoma		
Kay	16	10
Osage	1	0
Noble	6	2
Pawnee	2	0
Payne	13	5
Logan	1	0
Creek	1	2
Lincoln	6	3

Source: TransCanada 2007c.

Employment and income patterns also provide insight into local economic conditions, including the strength of the local economy and well being of its residents. Summary statistics covering these economic parameters are shown in Table 3.10.1-5. Average income levels vary throughout the region. In 2004, per-capita income ranged from approximately $22,900 in Steele County, North Dakota to $36,200 in Sargent County, North Dakota; this variation within the same state shows the diversity in socioeconomic conditions along the pipeline route. At the household level, median income levels varied from $30,600 in Miner County, South Dakota to nearly $63,200 in St. Charles County, Missouri.

The civilian labor force within the region of influence totals about 815,600 individuals, and unemployment in the region ranged from about 2 to 7 percent in 2005. The lowest unemployment rates, about 2.7 percent, were in Sargent and Dickey Counties in North Dakota and Cedar County, Nebraska. Conversely, the highest unemployment rates, about 6.5 percent, were in Fayette and Marion Counties in Illinois and Pembina County, North Dakota. Based on the size of the labor force and unemployment rates, it is estimated that about 38,100 unemployed people reside in the region of influence.

3.10.1.5 Tax Revenue

The proposed Keystone Project would generate varied tax revenues for local and state jurisdictions, as well as the federal government. The major incremental tax revenue at the state and local levels would be property taxes, which are based on the assessed value of Keystone Project facilities and applicable tax rates. Generally, states assess the value of pipelines in order to facilitate consistent valuation among counties crossed within the state. Table 3.10.1-6 reports the total government revenue, property tax mill levy values, and effective[1] property tax rates for all of the counties within the region of influence.

Effective property tax rates in the region of influence for the Mainline Project range from 0 percent in Illinois to between 3 and 4 percent in Kansas. The highest rate is in Marshall County, Kansas, at 4.08 percent. Property tax rates in North Dakota, South Dakota, Nebraska, and Missouri range between approximately 1.50 and 2.25 percent. On the Cushing Extension, property tax rates are relatively higher. Rates in Kansas vary between 3.85 and 4.70 percent, which are higher than most jurisdictions along the Mainline Project. In Oklahoma, the effective rate is 2.40 percent in all affected counties.

Other fiscal revenues that may be generated by the proposed Keystone Project include sales and use taxes, which are based on the value of goods and materials purchased for the Keystone Project and by construction workers, as well as income taxes levied on labor earnings. In addition, federal agencies assess fees for use of public lands for activities such as pipelines and transmission ROWs. Applicable sales and income tax rates vary across counties.

[1] The effective property tax rate is defined as the percentage of total assessed value that is levied as a property tax.

TABLE 3.10.1-5 Existing Income and Employment Conditions in Affected Counties and States along the Keystone Project Route				
State/County	**Per Capita Personal Income ($) (2004)**	**Median Household Income ($) (2003)**	**Labor Force (2005)**	**Unemployment Rate (%) (2005)**
MAINLINE PROJECT				
North Dakota	**29,494**	**38,223**	**358,960**	**3.4**
Cavalier	30,334	36,869	2,179	3.8
Pembina	27,294	39,001	4,220	6.5
Walsh	26,792	35,833	5,977	4.9
Nelson	23,837	32,365	1,723	4.1
Steele	22,879	44,213	1,168	2.8
Barnes	27,683	36,372	6,134	3.5
Ransom	28,455	42,103	3,139	3.1
Sargent	36,217	42,570	2,477	2.7
Dickey	29,592	33,951	2,994	2.7
South Dakota	**30,209**	**38,008**	**432,032**	**3.9**
Brown	34,640	39,863	20,964	3.4
Marshall	28,515	32,393	2,130	4.8
Day	27,958	31,998	3,043	6.1
Clark	28,721	30,968	1,881	5.1
Beadle	30,995	33,631	8,892	4.5
Kingsbury	30,924	34,312	3,109	3.9
Miner	25,608	30,627	1,221	5.0
Hanson	26,047	39,381	2,024	3.1
McCook	29,783	37,902	3,016	3.5
Hutchinson	30,216	33,329	4,489	4.0
Yankton	27,765	37,021	11,953	3.6
Nebraska	**32,341**	**41,984**	**986,296**	**3.8**
Cedar	31,981	38,865	5,108	2.7
Wayne	27,366	35,091	5,616	3.0
Stanton	26,175	39,195	3,771	3.0
Platte	28,325	41,425	17,336	3.7
Colfax	27,697	37,186	5,993	2.8
Butler	27,371	38,113	4,758	3.6
Seward	30,464	45,149	9,428	3.1
Saline	27,695	39,633	8,426	3.2
Jefferson	28,959	34,640	4,423	3.8
Gage	30,561	36,770	13,112	4.3
Kansas	**31,078**	**43,113**	**1,475,791**	**5.1**
Marshall	31,522	34,648	6,009	3.7
Nemaha	28,432	35,677	5,457	3.6
Brown	27,097	33,478	5,619	4.9
Doniphan	22,501	33,729	4,546	6.2

TABLE 3.10.1-5 Continued				
State/County	**Per Capita Personal Income ($) (2004)**	**Median Household Income (2003)**	**Labor Force (2005)**	**Unemployment Rate (%) (2005)**
MAINLINE PROJECT (CONTINUED)				
Missouri	**30,475**	**40,870**	**3,024,478**	**5.4**
Buchanan	27,368	35,344	46,008	5.9
Clinton	26,486	44,459	10,586	5.2
Caldwell	24,485	34,722	4,479	5.8
Carroll	24,124	32,352	4,964	5.5
Chariton	25,304	33,661	4,226	5.5
Randolph	23,462	32,154	12,707	5.3
Audrain	23,694	32,586	11,359	5.6
Montgomery	24,806	34,690	6,286	5.7
Lincoln	24,504	46,925	24,047	5.2
St. Charles	32,686	63,178	185,066	4.0
Illinois	**34,721**	**47,367**	**6,469,338**	**5.7**
Madison	29,979	43,747	137,300	5.4
Bond	25,990	38,358	8,605	5.8
Fayette	21,067	32,549	10,399	6.5
Marion	25,330	34,641	18,239	6.5
CUSHING EXTENSION				
Nebraska [a]	**32,341**	**41,984**	**986,296**	**3.8**
Jefferson	28,959	34,640	4,423	3.8
Kansas	**31,078**	**43,113**	**1,475,791**	**5.1**
Washington	24,309	30,564	3,504	3.7
Clay	29,018	35,015	4,911	4.1
Dickinson	25,724	37,097	10,595	4.5
Marion	23,095	35,106	6,843	4.1
Butler	29,503	48,096	31,832	5.6
Cowley	25,487	35,945	17,411	5.8
Oklahoma	**27,840**	**35,634**	**1,741,753**	**4.4**
Kay	26,865	33,032	21,877	5.5
Noble	23,371	23,227	5,637	3.8
Payne	23,399	30,898	36,339	3.7

Notes:

Affected counties include those where new pipeline facilities or surface disturbance activities associated with pipeline refurbishment are proposed.

States and counties are listed geographically from north to south as the proposed Keystone Project crosses the area.

[a] Also addressed in the Mainline Project route.

Source: U.S. Bureau of the Census 2006.

TABLE 3.10.1-6 Property Mill Levies and Tax Rates for the Keystone Project						
State/County	**Portion of Pipeline through State (%)**	**Government Revenue (Existing) ($)**	**Property Tax Mill Levy (mills)**	**Effective Property Tax Rate (%)**	**Tax Revenue per County ($)**	**Capital Cost of Project ($)**
MAINLINE PROJECT						
North Dakota (2006 Total Ad Valorem Property Taxes)						
Cavalier	0.43	6,295,726	324.33	1.620	19,457	1,199,826
Pembina	14.57	10,212,016	354.14	1.770	713,843	40,314,170
Walsh	11.34	12,382,781	395.51	1.980	620,070	31,355,466
Nelson	16.89	4,364,556	401.15	2.010	936,951	46,713,245
Steele	14.00	3,814,357	356.84	1.780	690,742	38,714,401
Barnes	19.90	13,006,449	370.65	1.850	1,019,881	55,032,042
Ransom	11.36	6,607,588	413.04	2.070	649,205	31,435,454
Sargent	11.51	6,040,508	406.01	2.030	646,274	31,835,396
South Dakota (2006 Total Revenue from All Sources)						
Marshall	11.07	1,806,615	21.50	2.150	719,444	33,462,489
Day	13.93	3,390,223	21.50	2.150	905,346	42,109,127
Clark	16.65	3,013,792	21.50	2.150	1,081,954	50,323,433
Beadle	7.18	7,188,817	21.50	2.150	466,616	21,703,062
Kingsbury	7.12	1,924,014	21.50	2.150	462,898	21,530,129
Miner	11.36	2,882,361	21.50	2.150	738,034	34,327,153
Hanson	6.24	1,807,719	21.50	2.150	405,268	18,849,671
McCook	5.21	2,663,670	21.50	2.150	338,343	15,736,881
Hutchinson	10.90	3,463,049	21.50	2.150	708,289	32,943,391
Yankton	10.33	28,120,617	21.50	2.150	671,109	31,214,363
Nebraska (Department of Revenue, Property Assessment and Taxation Department, Taxes Levied in 2006)						
Cedar	17.14	14,373,607	17.42	1.742	848,105	48,685,714
Wayne	8.72	12,999,096	18.66	1.866	461,839	24,756,851
Stanton	11.40	10,581,066	18.37	1.837	594,587	32,374,344
Platte	1.46	39,424,920	16.50	1.650	68,326	4,139,942
Colfax	10.67	14,080,472	17.90	1.790	542,448	30,304,373
Butler	11.08	15,539,120	17.43	1.743	548,347	31,463,557
Seward	11.84	23,915,026	17.73	1.773	596,017	33,616,327
Saline	11.57	19,624,429	19.82	1.982	651,342	32,817,137
Jefferson	12.42	13,079,964	19.62	1.962	692,043	35,272,303
Gage	3.70	27,964,647	19.32	1.932	203,148	10,515,452
Kansas (2006 Total All Property Tax Dollars)						
Marshall	29.34	11,772,795	123.49	4.080	1,395,178	34,236,909
Nemaha	25.55	9,482,614	116.84	3.860	1,149,747	29,819,243
Brown	25.11	10,209,742	118.30	3.900	1,143,945	29,303,849
Doniphan	20.00	7,299,226	103.64	3.420	798,217	23,340,000

TABLE 3.10.1-6 (Continued)						
State/County	Portion of Pipeline through State (%)	Government Revenue (Existing) ($)	Property Tax Mill Levy (mills)	Effective Property Tax Rate (%)	Tax Revenue per County ($)	Capital Cost of Project ($)
MAINLINE PROJECT (CONTINUED)						
Missouri (2006 Assessed Valuations)						
Buchanan	7.20	1,061,552,284	70.00	2.240	628,976	28,079,289
Clinton	7.88	227,936,441	70.00	2.240	688,689	30,745,044
Caldwell	9.00	94,313,724	70.00	2.240	786,220	35,099,111
Carroll	9.66	133,562,042	70.00	2.240	843,943	37,676,008
Chariton	11.62	115,832,051	70.00	2.240	1,015,120	45,317,840
Randolph	8.07	304,867,379	70.00	2.240	704,612	31,455,913
Audrian	14.10	271,818,136	70.00	2.240	1,232,077	55,003,418
Montgomery	7.72	168,475,439	70.00	2.240	674,756	30,123,035
Lincoln	9.98	558,363,794	70.00	2.240	871,809	38,920,027
St. Charles	14.76	6,609,549,616	70.00	2.240	1,289,799	57,580,314
Illinois (Most Recently Available/Published 2002 Equalized Assessed Values)						
Madison	49.51	2,404,001	0.00	0.000	0	49,262,786
Bond	34.39	108,000	0.00	0.000	0	34,213,275
Fayette	11.21	133,000	0.00	0.000	0	11,151,795
Marion	4.90	217,001	0.00	0.000	0	4,872,144
CUSHING EXTENSION						
Nebraska [a] (Department of Revenue, Property Assessment and Taxation Department, Taxes Levied in 2006)						
Jefferson	100.00	13,079,964	19.62	1.962	72,594	3,700,000
Kansas (2006 Total All Property Tax Dollars)						
Washington	14.46	8,435,597	142.43	4.700	2,096,285	44,600,000
Clay	14.37	9,041,595	140.63	4.640	2,060,555	44,400,000
Dickinson	17.43	16,579,757	116.80	3.850	2,073,703	53,800,000
Marion	17.34	13,669,639	125.70	4.150	2,219,216	53,500,000
Butler	20.40	65,397,029	135.28	4.460	2,808,048	62,900,000
Cowley	16.00	31,923,989	143.69	4.740	2,342,500	49,400,000
Oklahoma (Tax Revenue Information Provided by the Oklahoma Tax Commission, Ad Valorem Department)						
Kay	35.99	23,853,655	105.00	2.400	1,014,883	1,014,883
Noble	31.15	8,943,669	105.00	2.400	878,126	878,126
Payne	32.86	32,315,508	105.00	2.400	926,111	926,111

TABLE 3.10.1-6
(Continued)

Notes:

Affected counties include counties where new pipeline facilities or surface disturbance activities associated with pipeline refurbishment are proposed.

States and counties are listed geographically from north to south as the proposed Keystone Project crosses the area.

[a] Also addressed in the Mainline Project route.

Source: Information was based on discussions with the counties in January 2005 to obtain the current local tax rates and valuation methodology (from ENSR 2006a).

3.10.1.6 Public Services

The region of influence is served by a range of public services and service providers. Public services most pertinent to the proposed Keystone Project include police and fire protection and medical facilities.[2] Table 3.10.1-7 shows selected information for relevant public services in the region of influence. Generally, the extent of public service resources in a region is a function of its size, population, and number of established communities. Accordingly, public service infrastructure is typically not as developed in remote rural areas relative to urban areas.

There are multiple law enforcement service providers in the region of influence, including state patrols, county sheriff departments, local police departments, and special law enforcement agencies such as university police. In many cases, mutual aid or cooperative agreements allow one agency to provide support to other agencies in emergencies. On average, from one to 10 law enforcement agencies serve any one given county. In the region of influence, the exception is Madison County, Illinois, which is served by 24 law enforcement agencies.

A network of fire departments and districts provides fire protection and suppression services throughout the region of influence. Many of these organizations are staffed by volunteers, particularly in rural areas. In larger urban areas, fire protection staff typically is housed in fire stations. At the county level, the number of fire departments is approximately the same as the number of law enforcement agencies.

Table 3.10.1-7 also shows the nearest medical facilities to the proposed Keystone Project, specifically all critical access facilities that are located within 50 miles of the pipeline route. Non-federal, short-term, acute care facilities nearest the route are distinguished in the table based on their likelihood of serving Keystone Project-related medical needs. In every county along the pipeline route, there is at least one acute care facility within the county or nearby in a neighboring county. These facilities would provide emergency medical care and, in some cases, would serve as the base for local emergency medical response and transport services for construction accidents or operating concerns.

3.10.1.7 Transportation and Traffic

Mainline Project

Highways and Rural Roads

Many utility crossings (roadways, railroads, and other pipelines) would be required for the Keystone Project. The Mainline Project route would cross the following interstates and major U.S. highways:

- Interstate (I)-94 and U.S. Highway (US)-2 in North Dakota;
- I-90, US-12, US-212, US-14, US-81, and US-16 in South Dakota;
- I-80, US-20, US-275, US-30, US-34, US-6, and US-136 in Nebraska;
- US-35, US-77, US-75, US-73, and US-59 in Kansas;
- I-29, I-35, , US-59, US-169, US-69, US-65, US-24, US-63, US-54, and US-61 In Missouri; and
- I-55 and I-70 in Illinois.

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[2] Education facilities are not addressed in the section because most construction workers are not expected to relocate with school-aged children; therefore, impacts on schools would be negligible.

TABLE 3.10.1-7
Existing Public Service Facilities along the Keystone Project Route

State/County	Police/Sheriff Departments [a] (Number)	Fire Departments [b] (Number)	Nearest Medical Facilities [c]
MAINLINE PROJECT			
North Dakota			
Cavalier	2	4	Cavalier County Memorial Hospital (Langdon)
Pembina	5	8	Pembina County Memorial Hospital (Cavalier)
Walsh	3	10	First Care Health Center (Park River) Unity Medical Center & Grafton Family Clinic (Grafton) Mercy Hospital (Devils Lake)
Nelson	2	5	Nelson County Health Systems (McVile) Northwood Deaconess Health Center (Northwood) * Altru Hospital (Grand Forks)
Steele	1	2	Cooperstown Medical Center (Cooperstown) Union Hospital (Mayville) Hillsboro Medical Center (Hillsboro)
Barnes	3	8	Mercy Hospital (Valley City) Jamestown Hospital (Jamestown) * Dakota Clinic at Innovis Health (Fargo) * MeritCare Hospital (Fargo) * MeritCare South University (Fargo)
Ransom	2	3	Lisbon Area Health Services (Lisbon)
Sargent	4	4	Lisbon Area Health Services (Lisbon) Oaks Community Hospital (Oakes)
Dickey	2	5	Oakes Community Hospital (Oakes)
South Dakota			
Brown	3	10	* Avera Saint Lukes (Aberdeen) * Marshall County Healthcare Center / Avera Health (Britton) Coteau Des Prairies Hospital (Sisseton)
Marshall	1	5	* Marshall County Healthcare Center / Avera Health (Britton) * Avera Saint Lukes (Aberdeen) Coteau Des Prairies Hospital (Sisseton)
Day	4	5	Lake Area Hospital (Webster)

TABLE 3.10.1-7
(Continued)

State/County	Police/Sheriff Departments [a] (Number)	Fire Departments [b] (Number)	Nearest Medical Facilities [c]
MAINLINE PROJECT (CONTINUED)			
South Dakota (continued)			
Clark	2	3	* Prairie Lakes Healthcare Systems – Hospital (Watertown) Community Memorial Hospital (Redfield)
Beadle	3	4	* Huron Regional Medical Center (Huron)
Kingsbury	4	5	De Smet Memorial Hospital (De Smet) * Brookings Hospital (Brookings)
Miner	2	2	Madison Community Hospital (Madison) Avera Weskota Memorial Medical Center (Wessington Springs)
Hanson	1	2	* Avera Queen of Peace Hospital (Mitchell)
McCook	2	3	* Sioux Valley USD Medical Center (Sioux Falls) * Avera McKennan Hospital & University Health Center (Sioux Falls) Dell Area Health Center (Dell Rapids)
Hutchinson	6	4	Freeman Community Hospital & Nursing Home (Freeman) Avera Saint Benedict Health Center (Parkston) Douglas County Memorial Hospital (Armour) Pioneer Memorial Hospital (Viborg) Canton-Inwood Memorial Hospital (Canton)
Yankton	2	5	Landemann-Jungmann Memorial Hospital (Scotland) Saint Michael's Hospital & Nursing Home (Tyndall) * Avera Sacred Heart Hospital (Yankton) South Dakota Human Services Center (Yankton) * Sioux Valley Vermilion Medical Center (Vermilion) Wagner Community Memorial Hospital (Wagner)

TABLE 3.10.1-7 (Continued)			
State/County	Police/Sheriff Departments [a] (Number)	Fire Departments [b] (Number)	Nearest Medical Facilities [c]
MAINLINE PROJECT (CONTINUED)			
Nebraska			
Cedar	4	8	* Avera Sacred Heart Hospital (Yankton, SD) * Sioux Valley Vermilion Medical Center (Vermilion, SD) * Lundberg Memorial Hospital (Creighton) * Mercy Medical Center (Sioux City, IA) * Saint Luke's Regional Medical Center
Wayne	2	3	Providence Medical Center (Wayne) Plainview Public Hospital (Plainview) Osmond General Hospital (Osmond) Pender Community Hospital (Pender)
Stanton	2	2	* Faith Regional Health Services (Norfolk) Norfolk Regional Center (Norfolk) Saint Francis Memorial Hospital (West Point)
Platte	3	5	* Columbus Community Hospital (Columbus)
Colfax	5	3	Memorial Hospital (Schuyler) Saint Francis Memorial Hospital (West Point)
Butler	2	7	Annie Jeffrey Memorial County Health Center (Osceola) Butler County Health Care Center (David City)
Seward	3	5	* Bryan LGH Medical Center East/West (Lincoln) * Saint Elizabeth Regional Medical Center (Lincoln) Memorial Hospital (Seward) York General Hospital (York)
Saline	4	5	Warren Memorial Hospital (Friend) Crete Area Medical Center (Crete) Fillmore County Hospital (Geneva)
Jefferson	3	5	Jefferson Community Health Center (Fairbury) Thayer County Health Services (Hebron)
Gage	3	6	* Beatrice Community Hospital (Beatrice)

TABLE 3.10.1-7
(Continued)

State/County	Police/Sheriff Departments [a] (Number)	Fire Departments [b] (Number)	Nearest Medical Facilities [c]
MAINLINE PROJECT (CONTINUED)			
Kansas			
Marshall	6	6	Washington County Hospital (Washington) Community Memorial Healthcare, Inc. (Marysville)
Nemaha	3	5	Sabetha Community Hospital (Sabetha) Nemaha Valley Community Hospital (Seneca) * Community Hospital Onaga, Inc. (Onaga) Humboldt Health Care Inc. (Humboldt, NE) Pawnee County Medical Center (Pawnee City, NE)
Brown	4	5	Hiawatha Community Hospital (Hiawatha) Holton Community Hospital (Holton) Community Medical Center Inc. (Falls City, NE)
Doniphan	4	4	* Atchison Hospital (Atchison) Jefferson County Memorial Hospital (Winchester)
Missouri			
Buchanan	5	4	* Heartland Regional medical Center (St. Joseph) * Saint Francis Hospital & Health Services (Maryville) * Saint Luke's Hospital (Kansas City) * Truman Medical Center (Kansas City) * North Kansas City Hospital (North Kansas City) * Baptist-Lutheran Medical Center (Kansas City) * Saint Joseph Medical Center (Kansas City) Kindred Hospital (Kansas City)
Clinton	6	2	* Cameron Regional Medical Center (Cameron) * Saint Luke's Northland Hospital (Smithville) * Excelsior Springs Medical Center (Excelsior Springs) * Liberty Hospital (Liberty) * Independence Regional Health Center (Independence) * Medical Center of Independence (Independence)
Caldwell	6	4	* Hedrick Medical Center (Chillicothe) * Ray County Memorial Hospital (Richmond) Wright Memorial Hospital (Trenton)

TABLE 3.10.1-7
(Continued)

State/County	Police/Sheriff Departments [a] (Number)	Fire Departments [b] (Number)	Nearest Medical Facilities [c]
MAINLINE PROJECT (CONTINUED)			
Missouri (continued)			
Carroll	4	4	* Carroll County Memorial Hospital (Carrollton) * Fitzgibbon Hospital (Marshall) * Lafayette Regional Health Center (Lexington)
Chariton	4	6	Pershing Memorial Hospital (Brookfield)
Randolph	5	5	* Moberly Regional Medical Center (Moberly) * Cooper County Memorial Hospital (Boonville) Samaritan Hospital (Macon)
Audrain	4	5	* Audrain Medical Center (Mexico) * Boone Hospital Center (Columbia) * Columbia Regional Hospital (Columbia) * University of Missouri Hospital (Columbia)
Montgomery	6	8	Hermann Area District Hospital (Hermann)
Lincoln	9	6	Lincoln County Medical Center (Troy) * Pike County Memorial Hospital
St. Charles	8	11	* Saint Luke Hospital (Chesterfield) * Northwest Healthcare (Florissant) CenterPointe Hospital (St. Charles) * Barnes-Jewish Hospital (St. Louis) * Christian Hospital (St. Louis) * Des Peres Hospital (St. Louis) * Forest Park Hospital (St. Louis) * Missouri Baptist Medical Center (St. Louis) * Saint Alexius Hospital (St. Louis) * Saint Anthony Medical Center (St. Louis) * Saint John Mercy Hospital (St. Louis) * Saint Louis University Hospital (St. Louis) * SSM DePaul Health Center (St. Louis) * SSM Saint Joseph Health Center (St. Charles / Wentzville)

TABLE 3.10.1-7
(Continued)

State/County	Police/Sheriff Departments [a] (Number)	Fire Departments [b] (Number)	Nearest Medical Facilities [c]
MAINLINE PROJECT (CONTINUED)			
Missouri (continued)			
St. Charles (continued)	8	11	* SSM Saint Joseph Health Center (St. Louis / Lake St. Louis) * SSM Saint Mary Hospital (St. Charles) Kindred Hospital (St. Louis)
Illinois			
Madison	24	38	* Saint Anthony's Health Center (Alton) * Alton Memorial Hospital (Alton) * Memorial Hospital (Belleville) * Touchette Regional Hospital (Centreville) * Gateway Regional Medical Center (Granite City) * Jersey Community Hospital (Jerseyville) * Saint Elizabeth Hospital (Belleville) * Saint Joseph Hospital (Highland) * St. Francis Hospital (Litchfield) * Anderson Hospital (Maryville) Community Memorial Hospital (Staunton) Thomas H. Boyd Memorial Hospital (Carrollton) *Also see St. Charles County, Missouri (St. Louis)*
Bond	4	5	* Saint Joseph Hospital (Breese) Edward A. Utlaut Memorial Hospital (Greenville)
Fayette	6	6	* Fayette County Hospital (Vandalia) Hillsboro Area Hospital (Hillsboro) Washington County Hospital (Nashville)
Marion	9	8	* Saint Mary's Hospital (Centralia) * Good Samaritan Regional health Center (Mount Vernon) * Crossroads Community Hospital (Mount Vernon) * Clay County Hospital (Flora) * St. Anthony's Memorial Hospital (Effingham) Pana Community Hospital (Pana) Salem Township Hospital (Salem)

TABLE 3.10.1-7 (Continued)

State/County	Police/Sheriff Departments [a] (Number)	Fire Departments [b] (Number)	Nearest Medical Facilities [c]
CUSHING EXTENSION			
Nebraska			
Jefferson [d]	*See above*	*See above*	*See above*
Kansas			
Washington	2	10	Washington County Hospital (Washington) Community Memorial Healthcare, Inc. (Marysville) Republic County Hospital (Belleville)
Clay	4	3	Clay County Medical Center (Clay Center) * Mercy Regional Health Center (Manhattan)
Dickinson	6	8	* Morris County Hospital (Council Grove) * Salina Regional Health Center (Salina)
Marion	5	9	* Augusta Regional Medical Center (Augusta) * Mercy Hospital, Inc. (Moundridge) * Newman Regional Health (Emporia)
Butler	8	12	* Newton Medical Center (Newton) * Susan B. Allen Memorial Hospital (El Dorado) * Via Christie Riverside Medical Center (Wichita) * Wesley Medical Center (Wichita)
Cowley	6	7	* South Central Kansas Regional Medical Center (Arkansas City) * William Newton Memorial Hospital (Winfield) * Sumner Regional Medical Center (Wellington)
Oklahoma			
Kay	5	11	* Integris Blackwell Regional Hospital (Blackwell) * Via Christi Oklahoma Regional Medical Center (Ponca City)
Noble	3	5	* Integris Bass Baptist Health Center (Enid) * Perry Memorial Hospital (Perry) * Saint Mary's Regional Medical Center (Enid)

TABLE 3.10.1-7 (Continued)			
State/County	Police/Sheriff Departments [a] (Number)	Fire Departments [b] (Number)	Nearest Medical Facilities [c]
CUSHING EXTENSION (CONTINUED)			
Oklahoma (continued)			
Payne	7	5	* Cushing Regional Hospital (Cushing) * Bristow Medical Center (Bristow) * Hillcrest Medical Center (Tulsa) * Saint Francis Hospital (Tulsa) * Saint John Medical Center (Tulsa) * Stillwater Medical Center (Stillwater) * Tulsa Regional Medical Center (Tulsa) Saint John Sapulpa (Sapulpa) Prague Municipal Hospital (Prague) Logan Hospital & Medical Center (Guthrie) Cleveland Area Hospital (Cleveland) * Pawnee Municipal Hospital (Pawnee)

Note:

States and counties are listed geographically from north to south as the proposed Keystone Project crosses the area.

[a] Police/sheriff departments include special law enforcement units for universities.
[b] Fire departments include volunteer, district, city, and town fire departments.
[c] Medical facilities include critical access facilities within approximately 50 miles of the Project.
[d] Addressed in the Mainline Project route.
* Facilities marked with an asterisk (*) are non-federal, short-term, acute care facilities.

Sources: Capitol Impact 2006, American Hospital Directory 2006.

The rural road network is well developed across all the states that would be traversed by the pipeline. In addition to the major highways, numerous smaller state, county, and municipal roads and rural routes would be crossed by the pipeline or used by contractors during construction.

The proposed ROW for the Mainline Project would parallel or possibly share the ROW with highways and rural routes. In particular, the Mainline Project would parallel US-81 for a short distance near Yankton, South Dakota, as well as in Nebraska just past its border with South Dakota. The Mainline Project route also parallels I-70 near St Louis; the route also parallels and then crosses US-169 in western Missouri.

Railroads

The Burlington Northern Santa Fe (BNSF) railway has numerous main and branch tracks and smaller spur lines in the states affected by the Mainline Project route. The Twin Cities Division of BNSF has track concentrated in the eastern portion of North Dakota and South Dakota, and it is likely that the pipeline corridor would cross several main tracks of this division. The BNSF Kansas and Nebraska divisions have main, branch, and spur tracks in the vicinity of the Keystone pipeline ROW, and the Springfield division covers territory in Missouri and Illinois that coincides with the Keystone Project. For more information on BNSF divisions and routes, see <http://www.bnsf.com/tools/reference/division_maps/>.

The Union Pacific Railroad has main, branch, and spur track lines across Nebraska, Kansas, Missouri, and Illinois (<http://www.uprr.com/aboutup/maps/sysmap/index.shtml>). These lines connect many of the larger cities in these states, such as St. Louis in Missouri, Kansas City and Topeka in Kansas, and Omaha and North Platte in Nebraska, with Chicago to the east and California cities to the west. It is likely that the Mainline Project route would intersect track owned by the Union Pacific Railroad.

Several other railroad corporations operate in the vicinity of the Mainline Project ROW. CSX Railroad Corporation has a line connecting Salem and East St. Louis, Illinois that may run in the vicinity of the pipeline as the corridor nears the proposed terminals at Wood River and Patoka, Illinois (<http://www.csx.com/share/general/fastfacts/docs/ Ill_Fact_Sheets_0506-11-REF21841.pdf>). Amtrak has numerous regional routes running south and west from Chicago (<http://www.amtrak.com/servlet/ContentServer?pagename=Amtrak/Page/Browse_Routes_Page&c=Page&cid=1081256321432&ssid=133>). Many of these routes interconnect states that would be crossed by the Mainline Project route and could intersect the pipeline ROW.

Cushing Extension

Highways and Rural Roads

The Cushing Extension begins in lower Nebraska near the Nebraska/Kansas border, crosses into into Kansas, and then into Oklahoma. This route would intersect the following interstates and major US highways:

- I-70, I-35, US-35, US-24, US-56, US-50, US-54 US-160, and US-166 in Kansas; and
- US-64 and US-412 in Oklahoma.

The rural road network is also well developed in Kansas and Oklahoma. In addition to these major highways, numerous smaller state, county, and municipal roads and rural routes would be crossed by the ROW or used by contractors during construction. The Cushing Extension parallels and crosses US-77 in

Oklahoma in the vicinity of Ponca City; it also parallels that highway near the Oklahoma/Kansas border in the vicinity of Arkansas City, Kansas.

Railroads

The Kansas, Springfield, and Texas Divisions of BNSF all have mainline, branch, and spur tracks that could be affected by the pipeline crossings for the Cushing Extension (<http://www.bnsf.com/tools/reference/division_maps/>). The Union Pacific Railroad main, branch, and spur tracks cross Kansas and run south through Oklahoma to Texas (<http://www.uprr.com/aboutup/maps/sysmap/index.shtml>). The Cushing Extension may intersect track owned by the Union Pacific Railroad.

3.10.1.8 Environmental Justice

Other demographic characteristics of the local population are important to consider when evaluating potential environmental justice impacts of the Keystone Project. Environmental justice refers to the "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." An analysis of potential environmental justice effects is included in this section pursuant to EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (1994). Related guidance—Environmental Justice: Guidance under the National Environmental Policy Act (1997)—also has been prepared by the CEQ. The key socioeconomic data pertinent for environmental justice are the racial/ethnic composition and income status of affected communities, which are summarized in Table 3.10.1-8.

Minority Populations

In accordance with the CEQ Guidance, minority populations should be identified where either (a) the minority population in the affected area exceeds 50 percent; or (b) the minority population of the affected area is meaningfully greater than the minority population in the general population of the surrounding area. For the purposes of this analysis, the "affected area" is defined as local communities, the "general population" refers to the state within which the community is located, and "meaningfully greater" means at least 1.5 times the corresponding measure for the general population.

The 2000 Census shows that minority groups do not exceed 50 percent of the population in any community in the region. However, some minority populations are "meaningfully greater" than the corresponding minority population at the state level, which are identified with an asterisk (*) in the relevant racial/ethnic category columns of Table 3.10.1-8. Along the Mainline Project, the areas with a minority population that is meaningfully greater than the corresponding state population include three communities in South Dakota (Yankton, Iroquois, and Raymond); one community in Nebraska (Garrison); five communities in Missouri (Renick, Turney, Fountain N' Lakes, Truxton, and Triplett); and five communities in Illinois (South Roxana, Grantfork, Vernon, Granite City, and Alton). There are no affected communities in North Dakota or Kansas with minority populations that meet the environmental justice criteria outlined above. Of the 14 communities, eight are located within 0.5 mile of the proposed Keystone Project route and six are located within 0.5 to 2 miles. Along the Cushing Extension, six communities have notable minority populations. They are Potwin, Winfield, Arkansas City, Douglass, and Green in Kansas, and Marland in Oklahoma. Of these, only Potwin is located within 0.5 mile of the Keystone Project route.

TABLE 3.10.1-8
Environmental Justice Statistics in Affected Communities along the Keystone Project Route

State/County	Relative Proximity to Route (miles)	Racial/Ethnic Categories (as Percent of Total Population) – 2000							Families with Income below the Poverty Level (1999)
		White	Black	Native American or Alaskan Native	Asian or Pacific Islander	Other	Two or More Races	Hispanic or Latino	
MAINLINE PROJECT									
North Dakota	**--**	**92.4**	**0.6**	**4.9**	**0.6**	**0.4**	**1.2**	**1.2**	**8.3**
Lankin	0.5	96.9	0.0	2.3	0.0	0.0	0.8	0.0	0.0
Walhalla	2	89.8	0.0	6.0	0.0	0.1	4.2	0.9	9.7*
Sharon	2	94.5	0.0	1.8	0.0	0.0	3.7	0.0	0.0
Fort Ransom	2	100.0	0.0	0.0	0.0	0.0	0.0	0.0	11.8*
Niagara	2	94.7	0.0	1.8	0.0	0.0	3.5	0.0	0.0
Sibley	2	100.0	0.0	0.0	0.0	0.0	0.0	0.0	14.3*
Luverne	2	97.7	0.0	2.3	0.0	0.0	0.0	0.0	0.0
South Dakota	**--**	**88.7**	**0.6**	**8.3**	**0.6**	**0.5**	**1.3**	**1.4**	**9.3**
Yankton	0.5	94.4	1.6*	1.6	0.5	0.9	1.0	2.5*	6.2
Iroquois	0.5	95.7	0.0	0.4	0.4	1.4	2.2	2.5*	18.8*
Raymond	0.5	96.5	0.0	0.0	0.0	3.5	0.0	4.7*	13.6*
Roswell	0.5	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emery	2	100.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8
Carthage	2	98.9	0.0	0.0	0.0	0.0	1.1	0.0	13.2*
Spencer	2	98.7	0.0	0.6	0.6	0.0	0.0	0.0	7.0
Nebraska	**--**	**89.6**	**4.0**	**0.9**	**1.3**	**2.8**	**1.4**	**5.5**	**6.7**
Leigh	0.5	99.5	0.0	0.0	0.0	0.0	0.5	1.8	4.5
Richland	0.5	97.8	1.1	1.1	0.0	0.0	0.0	1.1	0.0
Garrison	0.5	95.5	0.0	4.5*	0.0	0.0	0.0	0.0	0.0
Sholes	0.5	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Seward	2	98.0	0.5	0.1	0.5	0.4	0.6	1.0	4.1
Stanton	2	97.2	0.2	0.6	0.3	1.1	0.7	2.4	5.8
Randolph	2	99.0	0.1	0.3	0.3	0.2	0.1	0.2	4.9

TABLE 3.10.1-8 (Continued)									
		Racial/Ethnic Categories (as percent of total population) – 2000							Families with Income below the Poverty Level (1999)
State/County	Relative Proximity to Route (miles)	White	Black	Native American or Alaskan Native	Asian or Pacific Islander	Other	Two or More Races	Hispanic or Latino	
MAINLINE PROJECT (CONTINUED)									
Nebraska (continued)									
Dorchester	2	97.2	0.0	0.0	0.0	2.6	0.2	4.1	4.1
Plymouth	2	99.4	0.0	0.0	0.0	0.4	0.2	0.8	1.5
Bellwood	2	100.0	0.0	0.0	0.0	0.0	0.0	0.4	1.6
Hoskins	2	99.6	0.0	0.0	0.0	0.0	0.4	0.4	5.3
Staplehurst	2	97.4	0.0	0.0	0.4	0.0	2.2	0.4	7.4*
Fordyce	2	100.0	0.0	0.0	0.0	0.0	0.0	4.9	2.4
Swanton	2	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Steele City	2	100.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3*
Harbine	2	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kansas	**--**	**86.1**	**5.7**	**0.9**	**1.7**	**3.4**	**2.1**	**7.0**	**6.7**
Seneca	2	98.8	0.4	0.0	0.0	0.0	0.6	0.7	4.4
Fairview	2	95.2	3.3	0.0	0.0	0.0	1.5	1.1	11.0*
Denton	2	99.58	0.0	0.0	0.0	0.0	0.5	0.5	0.0
Severance	2	100.0	0.0	0.0	0.0	0.0	0.0	0.0	21.4*
Oketo	2	95.4	0.0	0.0	0.0	0.0	4.6	0.0	8.7*
Oneida	2	94.1	2.9	0.0	0.0	0.0	0.0	0.0	0.0
Missouri	**--**	**84.9**	**11.2**	**0.4**	**1.2**	**0.8**	**1.5**	**2.1**	**8.6**
Troy	0.5	93.9	2.9	0.4	0.1	0.8	1.9	1.7	7.6
Moscow Mills	0.5	94.3	3.2	0.3	0.1	0.3	1.8	0.9	5.3
Salisbury	0.5	94.8	4.2	0.2	0.2	0.1	0.5	0.6	7.1
Agency	0.5	98.5	0.0	0.0	0.5	0.5	0.5	1.7	3.7
West Alton	0.5	99.1	0.0	0.2	0.2	0.5	0.0	0.5	4.5

TABLE 3.10.1-8
(Continued)

State/County	Relative Proximity to Route (miles)	Racial/Ethnic Categories (as percent of total population) – 2000 White	Black	Native American or Alaskan Native	Asian or Pacific Islander	Other	Two or More Races	Hispanic or Latino	Families with Income below the Poverty Level (1999)
MAINLINE PROJECT (CONTINUED)									
Missouri (continued)									
Keytseville	0.5	95.3	3.9	0.0	0.0	0.2	0.6	0.2	10.9*
Cowgill	0.5	97.6	0.4	0.0	0.0	1.2	0.8	0.0	21.2*
Renick	0.5	95.5	0.0	0.9*	0.0	0.0	3.6*	0.0	10.0*
Chain of Rocks	0.5	100.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1
St. Joseph	2	91.9	5.0	0.5	0.5	0.7	1.4	2.6	9.1*
St. Charles	2	93.3	3.5	0.3	1.0	0.7	1.2	2.0	4.6
St. Peters	2	94.3	2.8	0.2	1.2	0.4	1.1	1.5	1.5
Moberly	2	90.5	6.7	0.4	0.6	0.4	0.3	1.7	11.1*
Mexico	2	88.8	9.2	0.3	0.5	0.3	0.9	0.9	10.0*
St. Paul	2	99.0	0.1	0.1	0.0	0.2	0.7	1.3	1.1
Gower	2	99.4	0.1	0.1	0.0	0.0	0.4	0.8	2.4
Polo	2	99.5	0.0	0.0	0.0	0.2	0.3	1.4	5.2
Bosworth	2	100.0	0.0	0.0	0.0	0.0	0.0	0.0	11.7*
Portage Des Sioux	2	99.1	0.0	0.3	0.0	0.6	0.0	1.4	2.8
Old Monroe	2	98.4	0.0	0.0	0.0	0.8	0.8	2.8	0.0
Tina	2	99.5	0.0	0.0	0.0	0.0	0.5	0.0	5.4
Turney	2	95.5	0.6	1.3*	0.0	1.3	1.3	0.6	6.0
Fountain N' Lakes	2	99.2	0.0	0.8*	0.0	0.0	0.0	0.0	17.2*
Truxton	2	95.8	0.0	0.0	3.1*	0.0	1.0	1.0	4.5
Triplett	2	87.5	7.8	1.6*	1.6*	0.0	1.6	0.0	30.8*
Cave	2	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TABLE 3.10.1-8
(Continued)

State/County	Relative Proximity to Route (miles)	Racial/Ethnic Categories (as percent of total population) – 2000							Families with Income below the Poverty Level (1999)
		White	Black	Native American or Alaskan Native	Asian or Pacific Islander	Other	Two or More Races	Hispanic or Latino	
MAINLINE PROJECT (CONTINUED)									
Illinois	**--**	**73.5**	**15.1**	**0.2**	**3.4**	**5.8**	**1.9**	**12.3**	**7.8**
Edwardsville	0.5	87.7	8.7	0.3	1.7	0.3	1.4	1.0	5.0
Highland	0.5	98.6	0.1	0.1	0.5	0.3	0.5	1.3	3.6
South Roxana	0.5	97.7	0.3	0.4*	0.3	0.3	1.0	0.8	17.4*
Roxana	0.5	98.5	0.1	0.3	0.3	0.4	0.5	0.6	2.5
Hartford	0.5	98.4	0.1	0.2	0.4	0.3	0.5	0.7	10.3*
Pocahontas	0.5	98.6	0.1	0.3	0.3	0.0	0.7	0.0	12.5*
Grantfork	0.5	99.2	0.0	0.4*	0.0	0.0	0.4	0.4	3.1
Vernon	0.5	98.3	0.0	0.6*	0.0	0.0	1.1	1.7	17.9*
Granite City	2	94.7	2.0	0.5*	0.5	0.9	1.4	2.9	8.8*
Alton	2	72.3	24.7*	0.2	0.4	0.7	1.7	1.5	14.7*
Godfrey	2	94.1	4.0	0.3	0.7	0.2	0.7	1.0	3.2
Wood River	2	97.6	0.6	0.3	0.5	0.4	0.7	1.2	13.2*
East Alton	2	96.7	0.9	0.2	0.4	0.2	1.5	1.0	7.8
Patoka	2	98.9	0.0	0.0	0.2	0.0	0.9	1.3	11.6*
CUSHING EXTENSION									
Nebraska [a]									
Kansas	**--**	**86.1**	**5.7**	**0.9**	**1.7**	**3.4**	**2.1**	**7.0**	**6.7**
Towanda	0.5	96.8	0.4	0.4	0.2	0.2	2.0	0.7	5.1
Chapman	0.5	94.8	0.5	1.0	0.4	0.7	2.7	3.0	4.3
Potwin	0.5	95.4	0.0	1.5*	0.2	0.0	2.8	0.9	4.7
Greenleaf	0.5	99.4	0.0	0.0	0.0	0.3	0.3	0.8	8.3*
Hollenberg	0.5	96.8	0.0	0.0	0.0	3.2	0.0	3.2	0.0

TABLE 3.10.1-8
(Continued)

State/County	Relative Proximity to Route (miles)	Racial/Ethnic Categories (as percent of total population) – 2000							Families with Income below the Poverty Level (1999)
		White	Black	Native American or Alaskan Native	Asian or Pacific Islander	Other	Two or More Races	Hispanic or Latino	
Kansas (continued)									
Winfield	2	88.1	3.3	1.1	3.7*	1.7	2.1	4.7	8.9*
Arkansas City	2	87.2	4.5	2.7*	0.6	1.9	3.0	4.5	12.4*
Augusta	2	96.1	0.2	0.8	0.4	0.7	1.9	2.6	4.1
Marion	2	97.6	0.0	0.8	0.1	0.2	1.2	1.4	5.3
Douglass	2	96.2	0.3	1.6*	0.2	0.5	1.2	1.7	4.5
Washington	2	98.9	0.1	0.2	0.0	0.2	0.5	0.6	8.6*
Wakefield	2	95.9	0.8	1.1	0.1	0.6	1.4	1.2	4.2
Hope	2	98.1	0.8	0.5	0.3	0.0	0.3	0.3	4.8
Green	2	96.6	0.7	2.7*	0.0	0.0	0.0	1.4	5.3
Ramona	2	95.7	0.0	0.0	0.0	4.3	0.0	6.4	0.0
Oklahoma	**--**	**76.2**	**7.6**	**7.9**	**1.5**	**2.4**	**4.5**	**5.2**	**11.2**
Ponca City	0.5	84.2	3.0	6.3	0.7	2.1	3.8	4.4	12.7*
Cushing	0.5	79.7	7.0	8.0	0.1	0.9	4.3	2.7	15.1*
Newkirk	2	83.7	1.2	8.7	0.1	0.8	5.4	2.1	11.0
Morrison	2	89.2	0.3	2.8	0.5	2.7	4.6	4.2	13.5*
Marland	2	48.9	0.0	38.6*	0.0	3.2	9.3	10.0*	31.0*

Notes:

Affected areas are those where existing facilities exist or communities where new pipeline facilities or surface disturbance activities associated with pipeline refurbishment are proposed.

Communities are listed in order by state as the proposed Keystone Project crosses from north to south, proximity to the proposed Keystone Project centerline, and descending size based on year 2000 population.

Minority populations—defined as black, Native American or Alaskan Native, Asian or Pacific Islander, or Hispanic with percentages meaningfully greater than 1.5 times that of the minority population percentage in the general population of the surrounding area (i.e., corresponding state)—are identified with an asterisk (*).

TABLE 3.10.1-8
(Continued)

Notes (continued):

Persons of Hispanic origin may be of any race, and for census-gathering purposes, Hispanic is a self-identified category. In this table, individuals may have reported themselves as only Hispanic or in combination with one or more of the other races listed. This may result in the sum of percentages for all ethnic categories to be greater than 100 percent for any community.

The poverty threshold is defined as the average threshold for a family of three and is not adjusted for regional, state, or local variations in the cost of living.

The percent of families with income below the poverty threshold in 2000, as defined by the Bureau of the Census for federal statistical purposes, based on a family of three. Communities with a higher percent of the population below the poverty level than occurring in the respective state are identified with an asterisk (*).

[a] Addressed in the Mainline Project route.

Source: U.S. Bureau of the Census 2000.

Low-Income Populations

Low-income populations are defined as those individuals or groups living below the established poverty threshold. In 2000, the poverty threshold for a family of three was $13,290. Low-income populations in the region of influence were identified using income data and poverty statistics from the U.S. Census. For the purposes of this analysis, low-income populations were evaluated at the community level. If the percentage of population living below the threshold was greater in a local community relative to the state in which it is located, it was considered to be a low-income population; these communities are noted with an asterisk (*) in the far right column of Table 3.10.1-8.

Although the income characteristics of the communities along the proposed pipeline route vary, affected communities in every state have low-income populations as defined here. In total, 28 communities along the Mainline Project and eight communities along the Cushing Extension are classified as low-income populations along the Mainline Project and the Cushing Extension, respectively. Along the Mainline Project, these are Walhalla, Fort Ransom, and Sibley in North Dakota; Iroquois, Raymond, and Carthage in South Dakota; Staplehurst and Steele City in Nebraska; Fairview, Severance, Oketo, Keytesville, Cowgill, Renick, St. Joseph, Moberly, Mexico, Bosworth, Fountain N' Lakes, and Triplett in Missouri; and South Roxana, Hartford, Pocahontas, Vernon, Granite City, Alton, Wood River, and Patoka in Illinois. Additional low-income populations located along the Cushing Extension include Greenleaf, Winfield, Arkansas City, and Washington in Kansas, and Ponca City, Cushing, Morrison, and Marland in Oklahoma. The highest poverty rates are found in Triplett, Missouri (30.8 percent) and Marland, Oklahoma (31.0 percent).

3.10.2 Potential Impacts and Mitigation

The socioeconomic consequences of constructing and operating the proposed Keystone Project would vary in duration and magnitude. From a temporal perspective, impacts are characterized as temporary, short term, long term, or permanent. The significance of impacts is considered in the context of duration, magnitude (relative to baseline conditions), and any proposed measures or activities that Keystone would implement as part of the proposed Keystone Project. The following thresholds of significance for social and economic impacts were used in the analysis:

- Substantial disruption of local social or economic activities, including changes in employment and income levels, resulting from the proposed pipeline construction and operations.
- Overburdening of the local housing stock because of demand generated by the temporary and permanent workforce.
- Substantial changes in private property values.
- Substantial changes in fiscal revenues, including tax receipts, of local jurisdictions.
- Substantial burden on public service providers serving the Keystone Project area such that they would need to expand their service capacities in order to meet those demands.

Impacts are characterized as positive (beneficial) or negative (adverse) and, where possible, are evaluated relative to regional conditions to help assess the magnitude of socioeconomic effects and to determine the significance of identified impacts based on established significance criteria. The analysis of socioeconomic impacts is organized into two parts: Section 3.10.2.1 addresses the anticipated socioeconomic effects during Keystone Project construction, and Section 3.10.2.2 addresses operations-related impacts.

3.10.2.1 Construction Impacts

Keystone would construct the pipeline in 11 construction spreads or completed lengths, with eight spreads along the Mainline Project and three spreads along the Cushing Extension (see Section 2.2.4 and Table 3.10.2-1). Each spread would require 6 months to complete. Keystone proposes to initiate construction of the Mainline Project's aboveground facilities in April 2008. Construction of each pump station would require approximately 20 to 30 additional workers. Construction of pump stations would be completed in 18 months.

TABLE 3.10.2-1
Construction Spreads Associated with the Keystone Project

Spread Number	Location	Approximate Distance within Construction Spread (miles)
Mainline Project		
Spread 1	U.S./Canada Border to MP 129.9 in North Dakota	130
Spread 2	Through North Dakota into South Dakota to PS-20 at MP263.2	133
Spread 3	Through South Dakota to MP 403.8	141
Spread 4	Through South Dakota into Nebraska to MP 534.47	131
Spread 5	Through Nebraska into Kansas to MP 657.1	141
Spread 6	Through Kansas into Missouri to MP 779.6	105
Spread 7	Through Missouri to MP 905.9	126
Spread 8	Through Missouri into Illinois to end of line at Patoka IL (MP 1081.7)	176
Cushing Extension		
Spread 9	PS- 28 in Jefferson, Nebraska to Marion, Kansas at MP 107.6	108
Spread 10	Marion, Kansas to Crowley, Kansas at MP 211.9	105
Spread 11	Crowley, Kansas to Kansas/End of line at Cushing Oklahoma (MP 295.5)	83.3

Source: TransCanada 2007d.

Population

The number of residents within the region of influence would increase temporarily during construction with the influx of construction workers and Keystone Project staff. The construction workforce would consist of approximately 2,500 to 3,000 workers, including Keystone employees, contractor employees, and construction and environmental inspection staff. These workers would be distributed across the pipeline route by construction spread, with approximately 500 to 600 construction personnel allocated to each spread. Construction of the pump stations and delivery facilities would require additional staff; it is anticipated that an additional 20 workers per station would be required, for 150 to 200 additional workers during peak periods (because not all pump stations would be constructed simultaneously).

Population impacts in the region of influence would depend on the composition of the construction workforce in terms of local versus non-local workers. Keystone is expected to utilize temporary local construction labor where possible. It is estimated that 10 to 15 percent of the total construction workforce could be hired from local communities, with the remaining workers (85 to 90 percent) from outside the local area. It is anticipated that approximately 25 percent of non-local construction workers would temporarily reside in the Keystone Project area with their spouses; however, few non-local workers are expected to be accompanied by their children or other family members because of the mobile nature of the workforce along the pipeline route during construction. Based on these data and assumptions, it is estimated that 2,800 to 3,600 non-local residents would temporarily move into the region of influence, resulting in short-term population increases during the construction period. Overall, the estimated increase in population is less than 1 percent in the region of influence.

These workers would be distributed throughout the region of influence according to construction spread, thereby potentially affecting isolated communities along the pipeline route. At the local level, construction workers and their spouses would account for about 560 to 720 temporary new residents per construction spread. Construction workers would be working concurrently in multiple locations within each construction spread; however, they would work from a single contractor yard. Therefore, all 560 to 720 temporary residents could reside in any one community at a given point in time, although it is more likely that they would be dispersed across several communities. Depending on the size of the local community and duration of stay, these influxes of construction workers may result in a range of short-term socioeconomic effects. The significance of these potential temporary increases in local population levels is addressed in the analysis of related resource topics in this section, including housing and public services.

Housing

Non-local construction workers moving into the region of influence would require short-term accommodations. Because workers are not expected to relocate with their families and their stay in any one community would be temporary, it is expected that most workers would use temporary housing, such as hotels/motels, RV parks, and campgrounds. Most workers likely would prefer short-term accommodations, primarily hotels and motels, in the more populated, service-oriented communities located within a reasonable commuting distance from the work site. As local accommodations fill, workers would be forced to seek alternative accommodations, including RV parks and campgrounds, in smaller, more distant communities. Further, some employees may elect to utilize furnished apartments and rental homes due to the constrained availability of other accommodations, although this is expected to be limited based on extended-period lease requirements. Depending on location and available accommodations, workers may elect to temporarily reside in one location during the construction period or relocate within each spread as needed as construction proceeds along the pipeline route.

There could be a need for nearly 2,900 housing units throughout the region of influence, or 450 to 575 housing units within any one construction spread, assuming that each worker would require his/her own unit, which would be shared with a spouse accompanying the worker. The availability of short-term housing varies across the pipeline route. In total, there are approximately 14,400 rental units and 34,100 hotel/motel rooms and campground spaces available to serve the housing needs of the Keystone Project. The anticipated project-related demand for housing would account for about 6 percent of all available temporary housing in the region of influence. At a regional scale, therefore, it appears that the temporary housing available within the region of influence would be sufficient to meet the temporary and moderately increased demand for housing resulting from construction activities.

In the northern, more rural portions of the pipeline route, particularly North Dakota and most areas in South Dakota, Nebraska, and Kansas, it may be difficult to meet the local housing needs based on the limited amount of short-term accommodations in proximity to the Keystone Project. In these areas, it is more likely that construction workers would drive extended distances to find accommodations in small towns, or rely more extensively on RV parks and campgrounds. Conversely, in more urban areas, such as most of Missouri and Illinois, short-term housing is more abundant, particularly hotels and motels; therefore, it is more likely that the available housing stock in proximity to the Keystone Project would be sufficient to meet the increased housing demands generated by the Keystone Project.

Local Economic Activity

The proposed pipeline has the potential to generate substantial direct and indirect economic benefits, for local and regional economies along the pipeline route. During construction, these benefits are derived from the construction labor requirements of the Keystone Project and spending on construction goods and services. At the local level, these benefits would be in the form of employment of local labor as part of the construction workforce and related income benefits from wage earnings, construction expenditures made at local businesses, and construction worker spending in the local economy.

Construction of the proposed Keystone Project, including the pipeline and pump stations, would result in hiring approximately 2,650 to 3,200 workers over the 18-month construction period. As indicated above, Keystone expects that roughly 10 to 15 percent of the construction workforce would be hired from local labor markets, thus 265 to 480 local workers throughout the entire region of influence, or 50 to 100 local workers per construction spread. Related income benefits would be substantial. Keystone estimates that the total construction payroll for the Keystone Project would be between $280 and $320 million; at the local level, construction income benefits are expected to total $28 to $48 million.

In addition to payroll spending, construction would generate substantial expenditures on goods and services, both inside and outside of the region of influence. Typical construction spending includes expenditures on fuel supplies, hardware needs, and parts/equipment. In total, the cost of construction goods and services for the Keystone Project is estimated at $110 to $130 million. Of this amount, approximately 40 percent, or $44 to $52 million, would be spent locally in the region of influence, thereby providing economic benefits to local businesses and service providers—primarily equipment suppliers, aggregate and concrete suppliers, and industrial supply depots.

Construction also would generate indirect local economic benefits from secondary activity spurred by the direct effects described above. This includes spending by the non-local construction workforce within local economies during the construction period, including expenditures on food, clothing, lodging, gasoline, and entertainment. The extent of local spending by non-local workers would be tied to labor earnings and individual spending patterns. Construction worker spending, in conjunction with outlays for construction goods and services, also would generate indirect economic benefits as these monetary flows circulate throughout the economy based on economic linkages among industries. These “ripple” effects, commonly referred to as “multiplier effects,” result from businesses buying from other businesses and can generate additional economic benefits within the region of influence.

Labor and income benefits also would extend outside the region of influence based on the employment of non-local labor for the Project and expenditures on construction materials and services that would be imported into the area. Although these benefits would not be realized locally, they do represent a substantial positive economic impact at the national level.

Overall, construction of the proposed Keystone Project would result in a substantial positive impact on the local economies in the region of influence. While subsequent operation and maintenance of the project also would require some labor, most of the construction-related impacts would be temporary and would conclude with the end of construction in approximately 18 months.

Agriculture

Unlike the construction spending benefits to the local economy described above, Keystone Project construction has the potential to both temporarily and permanently displace land uses, primarily agriculture, and result in adverse economic impacts on the agricultural sector. For purposes of this analysis, agriculture consists of cropland, grassland/rangeland, and forestland—and includes activities associated with harvested crops, timber production, livestock grazing, and/or dairy production.

Agriculture is the predominant land use along the pipeline corridor, comprising about 94 percent of land crossed by the Keystone Project. Based on the size of the construction ROW, approximately 13,007 acres of agricultural land would be temporarily removed from production during portions of the 18-month construction period. This would result in lost agricultural production values and any related indirect economic activity that is associated with agricultural production. The direct effect of lost production values on individual landowners would be offset by compensation paid by Keystone for pipeline easements, which theoretically would reflect lost production values and agricultural income. Construction-related effects on displacement of most agricultural uses would be temporary, lasting only through the construction period. (Refer to Section 3.9 for a discussion of easement acquisition.)

Tax Revenue and Fiscal Resources

The fiscal benefits of the Keystone Project include short-term tax revenues generated during construction and long-term tax revenues associated with property tax payments. The proposed project is not expected to require substantial new government expenditures. The range of potential tax revenues during construction is described below.

In the short term, the predominant source of tax revenues would be sales/use and fuel taxes levied on goods and services purchased during the construction period. This includes, for example, construction materials and construction worker spending in the local economy for basic living expenses such as food, housing, gasoline, and entertainment. It is difficult to quantify these short-term tax benefits because tax rates and their applicability vary by region and jurisdiction.

For construction-related purchases, tax benefits would be dependent on construction spending levels and the ability of local businesses to meet the demand for required materials and services. The total cost of construction goods and services is estimated at between $110 and $130 million, of which about 40 percent (or $44 to $52 million) would be spent locally in the region of influence. To the extent that these expenditures are taxed, local governments would benefit.

For employee-generated purchases, tax revenues would depend on the proportion of the workforce that is local, the behavior of individual workers, and the duration of their stay. The magnitude of these tax benefits would be related to the construction worker payroll, which is estimated at between $280 and $320 million. Some portion of the construction payroll would be retained and spent within the region of influence by the construction workforce over the approximate 18-month construction period. The resulting tax revenues generated by this spending represent additional fiscal benefits of the proposed Keystone Project.

Short-term fiscal benefits also may be derived from fees assessed by federal agencies for the use of public land for pipeline and transmission ROWs, as well as from local, state, and federal income taxes paid by corporations and employees serving the Project. These taxes and fees vary by region and have not been quantified for this analysis.

Some increases in spending by local jurisdictions may be associated with increases in public service levels. However, these expenditures are expected to be minor due to the temporary nature of construction activities.

Public Services

Various types of emergency events may occur during construction, such as worker accidents requiring medical attention. As a result, the proposed Keystone Project could temporarily increase the demand for emergency response, medical, police, and fire protection services during the construction period. Table 3.10.1-7 lists the public service providers located in the region of influence. Emergency response in more urban areas likely would be quick, based on the proximity of public service facilities to the pipeline. However, in more rural sections of the proposed route, particularly North Dakota and most of South Dakota, emergency response times may be long based on communication, dispatch, and travel time constraints. It is the intent of Keystone to work with local law enforcement, fire departments, and emergency services providers, including medical aid facilities, to establish appropriate measures that would ensure effective emergency response and provision of related services; this information would be included in the ERP developed as part of the Keystone Project (Appendix C). With implementation of applicable measures in the ERP, construction-related impacts on public services are expected to be minor.

The influx of construction workers, and possibly spouses, in local communities also has the potential to generate additional demands on local public services. The magnitude of public service impacts would vary by community, depending on the size of the non-local workforce and their accompanying families, the size of the community, and duration of stay. However, as noted above, few non-local workers are expected to be accompanied by family members because of the short construction period and transient nature of the work. Therefore, potential public service impacts associated with temporary increases in population would be short term and minor.

Transportation and Traffic

Construction activities could result in short-term impacts on the transportation infrastructure. These impacts could include disruption to traffic flow due to the movement of construction equipment, materials, and crew members; closure of existing roads and railways during construction of pipeline crossings; and damage to local roads from movement of heavy construction equipment and materials. In general, impacts on local traffic levels would be of short duration and would be located in rural areas. Pipeline construction schedules typically begin and end outside of peak commuting hours. Any temporary impacts would include damage to local unpaved roadways and disruption of traffic flow, particularly during the initial staging that requires transport of bulk construction equipment and materials to the respective spread areas, as well as closures and disruption of roads during open-cut pipeline installation.

Prior to beginning construction work, Keystone would obtain permits and approvals for all road and railroad crossings. Construction across paved roads, highways, and railroads would be in accordance with the requirements of these permits. In general, all major paved highways and state roads and all railroads would be crossed by boring beneath the road or railroad, thereby minimizing disturbance to the transportation corridor.

In several areas, the pipeline ROW parallels major highways such as I-70 and State Road 370, both in St. Charles County, Missouri. Boring techniques would result in minimal or no disruption to traffic at road, highway, or railroad crossings, but congestion could be increased in areas where the pipeline parallels existing major highways that experience heavy traffic during the morning and evening peak hours of travel. Keystone's construction contractors would work with state and local transportation authorities to ensure that construction in the parallel areas would not greatly affect traffic conditions. This likely would include conducting major pipeline work during the off-peak traffic hours. Completing each boring would require from 1 to 2 days for most roads and railroads, and up to 10 days for long crossings such as interstates or four-lane highways.

The open-cut method would be used to cross smaller rural routes, unpaved roads, and driveways, where permitted by local authorities or private owners. The open-cut method requires establishment of detours and temporary closure of the road to traffic. If a reasonable detour is not available, at least one lane of traffic would be kept open, except during brief periods during actual installation of the pipe. Most open-cut road crossings would be completed and the road resurfaced within 1 or 2 days. Safety measures would be implemented, such as posting signs at open-cut road crossings and the use of flagging personnel to indicate safe passage through construction areas. These measures also would help to minimize traffic disruptions.

Keystone would use public and preexisting private roads to provide access to most of the construction ROW. To minimize the effects of large machinery and transport trucks on local roads, traffic flows, and related services, major highways would be used as much as possible to transport slow-moving, heavy construction equipment to the spread areas. Keystone does not anticipate the need to improve and maintain many temporary roads to access the work areas. Paved roads are not likely to require improvement or maintenance prior to or during construction. Gravel roads and dirt roads may require maintenance during the construction period due to high use. Road improvements such as blading and filling would be restricted to the existing road footprint (i.e., the road would not be widened). Private roads and new temporary access roads would be used and maintained only with permission of the landowner or local land management agency.

Damage to existing roads also would be minimized by following permit requirements for maximum vehicle loads and width limits. Any soil remaining on the road surface from construction equipment and activities would be removed, and any damage to roads would be repaired by Keystone to preexisting conditions or better, following construction. Public safety on the roads would be provided by construction personnel while equipment is being moved. Police assistance would be requested only when necessary. Transportation planning conducted for the Keystone Project as necessary to support state and local permitting would identify possible routes to be used during construction. In addition, Keystone would conduct more detailed traffic studies in more populated areas, in conjunction with state and local permitting processes.

Property Damages and Values

Land use patterns along the pipeline route vary, as described in Section 3.9. The predominant land use, however, is agricultural, particularly in the northern portions of the route. Keystone would acquire permanent pipeline ROW easements along the pipeline route. Keystone would implement its CMR Plan to minimize adverse effects on agricultural and other activities. Measures include, among others, allowing for irrigation to continue during construction when feasible and mutually agreeable to Keystone and landowners, avoiding disruption of surface drainage, installing trench breakers on slopes at regular intervals to prevent water movement and erosion, and allowing for continued operation of water lines during construction.

All land disturbed by the construction project would be restored to the best extent possible. Keystone would repair or restore drain tiles, fences, and land productivity if these are damaged or adversely affected during construction. All agricultural land disturbed during construction, other than that required for permanent aboveground facilities, would be returned to pre-construction levels of productivity. Only the agricultural production on the land on which aboveground facilities are located would be permanently reduced, and landowners would be compensated for this loss in production. If interruption of water line services during construction leads to agricultural resource damage, Keystone would provide reasonable compensation to landowners for lost productivity.

Keystone would be responsible for reclaiming all lands as nearly as practicable to an equivalent level of capability. In addition, Keystone would compensate landowners for actual crop losses resulting from removal of standing crops, disruption of planned seeding activity, disruption of general farming activities, or other losses resulting from construction. Compensation would be negotiated between Keystone and private landowners based on fair market values. (Refer to Section 3.9 for a discussion of easement acquisition). If repair or replacement is not possible, Keystone would compensate landowners for property damage.

The net economic impact of construction-related Keystone Project activities on individual landowners would be negligible. Lost revenue from existing land uses and property damage would be offset by monetary compensation such that the economic status of landowners would be similar to existing conditions. As such, potential construction-related economic effects on landowners would be negligible.

The value of agricultural land should not be adversely affected by the pipeline Project because Keystone would restore the land to its pre-project productivity. Keystone would also compensate landowners for any crop or other losses they sustain during the construction period.

In addition, the pipeline is unlikely to have adverse impacts on property values. Anstine[3] notes that diminution in property value, when present, is typically associated with facilities which emit noticeable byproducts such as odors, vapor plumes, or noise. Similarly, RESI[4] notes in its literature review that some industrial facilities may increase surrounding property values, while others may decrease values. In the latter case, however, the reductions were associated with such factors as industrial activities, visual alterations to the landscape, and perceived risks to human health. Because the Keystone Pipeline will not emit odors, vapors, or noise, nor adversely affect viewscapes, there is little potential for reduced property values attributable strictly to the pipeline.

Environmental Justice

The analysis of environmental justice effects is presented in Section 3.10.2.2.

3.10.2.2 Operations Impacts

Population

During operation, Keystone estimates that the proposed Keystone Project would require approximately 26 permanent employees, including 20 field staff and 6 head office staff. If all employees moved into the region along with their families, the population in the region of influence could increase by about 65 people. Because the new population would be dispersed across the region of influence based on the location of facilities, long-term population effects at the community level would not be expected to alter local demographic characteristics and are considered negligible.

Housing

Housing demand for the approximately 26 permanent positions generated by operation of the proposed Keystone Project would represent a permanent, yet negligible, increase in housing demand in selected

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[3] Anstine, Jeff, 2003, "Property Values in a Low Populated Area When Dual Noxious Facilities Are Present," Growth and Change, 34:345-358.
[4] RESI Research and Consulting, 2004, "The Proposed Catoctin Project: Literature Review & Case Study Analysis," Towson University, Towson, Maryland.

areas along the pipeline route. It is expected that existing available housing resources in these areas could accommodate this demand; therefore, this impact is considered minor.

Local Economic Activity

During operation, the proposed Keystone Project would generate a demand for goods and services, including power, which would result in economic benefits to the region. The cost of operational goods and services is estimated at $1.3 million per year, plus an additional $46.5 million for power (TransCanada 2007b). It is further estimated that approximately 90 percent of this total, or about $43.0 million, would be spent in the project area. In addition to the 26 permanent jobs directly attributed to operations and the associated $5.5 million annual payroll, these expenditures would support additional jobs and related income benefits in the region.

Agriculture

Once construction is complete, most agricultural land uses would not be prohibited within the permanent pipeline ROW, and agricultural production would return to near pre-construction levels. However, some agricultural practices, such as forest production and permanent orchards, would not be allowed within the permanent pipeline ROW. Areas that historically were in forest or orchard production would remain fallow or would shift to an alternative agricultural use. In addition, construction and operation of ancillary aboveground facilities on agricultural lands would permanently remove this land from agricultural production. It is estimated that approximately 62 acres of agricultural land would be permanently displaced by aboveground facilities. Accordingly, long-run agricultural production is expected to decline with implementation of the Keystone Project. As described in Section 3.9, potential adverse economic effects on individual landowners would be compensated by easement acquisition, and no economic impact would be expected to occur at the individual or farm level. However, there could be adverse indirect effects on the related support industries that serve crops that would be prohibited or displaced within the permanent ROW. Given the small amount of land potentially affected relative to the total amount of land dedicated to agricultural production in the region of influence, impacts to the agricultural sector are considered minor.

Because of current legal constraints regarding the publication of site-specific CRP contract information and data, the following analysis was completed based on a “worst-case” scenario approach, as identified below:

- We assumed that all acres affected by the Project within a county would touch, dissect, or cross a portion of a CRP contract(s) within that county.
- Because the exact location is not known of where, if at all, the pipeline would affect a CRP contract, we assumed that all acreage of the CRP contract affected by the pipeline would be removed from the program. Consequently, all annual monetary and environmental benefits would be lost. The worst-case approach was used because of potential disclosure problems under the Freedom of Information Act. In particular, because participation in and compensation paid by FSA to individual farmers are confidential, no information on particular parcels potentially affected by the Keystone Project can be revealed.
- The CRP practices in the counties affected by the pipeline are grasses, wetlands, and trees. For this analysis, the land use types considered for the affected counties included agriculture, cropland, grassland, rangeland, and wetland acres.

The results of this worst-case analysis are shown in Table 3-10.2-2.

TABLE 3.10.2-2
Worst-Case Scenario for Conservation Reserve Program Acres and Loss of Program Benefits by State Attributable to the Mainline Project

State	CRP Acres	Continuous CRP Acres [a]	CREP Acres	Annual Rent	Grass Acres (CP 1, 2, 4, and 10)	Wetland Acres (CP 9 and 23)	Wildlife Habitat Acres (CP 4, 12, and 25)	Tree Acres (CP 3, 11)
Illinois	335.5	79.4	0.0	$30,088	250.3	7.7	12.6	1.3
Kansas	3,516.8	251.8	0.0	$198,935	2647.7	0.0	617.3	0.0
Missouri	7,643.5	182.2	5.2	$516,789	7307.3	66.3	143.2	9.8
Nebraska	3,027.3	145.6	63.7	$230,527	2723.1	20.1	340.3	9.0
North Dakota	11,407.2	241.2	0.0	$493,203	7781.4	3,378.3	3,496.7	0.0
South Dakota	2,066.1	232.5	0.0	$102,235	1338.5	465.9	198.4	7.5
Total	**27,996.4**	**1,132.7**	**68.9**	**$1,571,776**	**22,048.3**	**3,938.3**	**4,808.5**	**27.6**

	Total Acres Affected during Construction [b]	Total Acres Affected by Permanent Right-of-Way [b]	CRP Acres	Worst-Case Percent of Affected CRP Acres during Construction	Worst-Case Percent of Affected CRP Acres from Permanent Right-of-Way	Agriculture, Cropland, Grassland Rangeland, and Wetland Acres Affected during Construction [b]	Worst-Case Percent of Affected CRP Acres Based on Land Use Type	Annual Rent[c]	Loss of Annual Rent Based on % Change[c]
Illinois	909	358	336	100	100.0	693	100	$30,100	$30,100
Kansas	1,871	608	3,517	53	17	1,697	48	$199,000	$95,500
Missouri	4,675	1,687	7,644	61	22	3,768	49	$516,800	$253,200
Nebraska	3,335	1,323	3,027	100	44	3,198	100	$230,500	$230,500
North Dakota	3,440	1,342	11,407	30	12	3,099	27	$493,200	$133,100
South Dakota	3,377	1,349	2,066	100	65	3,183	100	$102,200	$102,200
Total	**17,607**	**6,667**	**27,996**	**63**	**24**	**15,638**	**56**	**$1,572,000**	**$847,000**

TABLE 3.10.2-2
Continued

Notes:

CP = Conservation Practice. Numbers refer to specific practices. For example, CP1 is the new introduction of grasses and legumes. See Farm Service Agency. 2007. Conservation Reserve Program, Summary and Enrollment Statistics, FY 2006. Washington, DC. May.
CREP = Conservation Reserve Enhancement Program.
CRP = Conservation Reserve Program.

[a] Includes CREP acres
[b] Data from TransCanada 2007d
[c] Rounded to nearest $100
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Under the worst-case scenario (worst case assumes that all landowner tract acreage is impacted even though only some small percentage of that acreage is actually included in the CRP program, an obviously highly conservative assumption), the pipeline could affect 17,607 acres, 15,638 acres of which are either agricultural, cropland, or wetland acreage in those counties affected by the Mainline Project. Removal of all of the affected CRP acreage in those counties would result in a loss of about $802,000 in annual rental income payments to those participants who remove their land. As shown in Table 3-10.2-2 and as discussed above, all landowner rents were assumed lost on land, regardless of the percentage of that land enrolled in FSA programs. Consequently, for Illinois, Nebraska, and South Dakota, all rents were assumed lost under the worst-case scenario.[5]

The worst-case scenario is not probable, and the impact on FSA program participants, like those enrolled in the CRP and FWP programs, is expected to be minimal, temporary, and localized. Mitigation is recommended in Section 3.9 to prevent any adverse economic or environmental impact to FSA program participants (see Section 3.9.3.1).

Tax Revenue and Fiscal Resources

Once the Keystone Project is constructed, it would generate property tax revenues for the states and counties traversed by the pipeline, in accordance with applicable tax structures. Keystone has developed estimates of property taxes by state based on the value and/or length of pipe in the ground and quantity of aboveground facilities (see Table 3.10.2-3). Overall, an estimated $46.7 million in annual property tax revenues would be generated by the Keystone Project in the region of influence. Most of these revenues, about $30.2 million, are attributed to the Mainline Project. The Cushing Extension would generate the remaining $16.5 million. The incremental property tax revenues for the Mainline Project would be 0.24 percent of total current property taxes among all affected counties. The corresponding percent for the Cushing Extension would be 7.66 percent because of the lower current property taxes in the affected counties. Jurisdictions in Kansas would realize the greatest annual property tax benefits ($18.1 million). No property tax revenues would be generated in Illinois, where property taxes are not levied. Local counties would be the primary beneficiaries of estimated property tax benefits listed in Table 3.10.2-3. Based on the size of the existing tax base of affected jurisdictions, which varies substantially within the region of influence, these revenues may represent a minor to major fiscal benefit of the Keystone Project that would be realized over the long term.

Public Services

During operation, the approximate 26 permanent employees serving the Keystone Project and their associated family members would represent a long-term, yet minor, increase in the demand for the provision of public services. No decline in public service levels or need for facility expansions are anticipated. Further, any increase in demand for public services would be offset by increases in government revenues from property tax payments, which are often used to fund these services.

Transportation and Traffic

The proposed pipeline would be located underground and the aboveground ancillary facilities would be unmanned; consequently, pipeline operations would not affect local transportation systems. A negligible increase in vehicle trips would be associated with operations staff commuting to Keystone Project facilities.

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[5] Further, in the worst-case situation, producers would be required to pay 25 percent of the annual rental payment, plus federal cost shares received, plus all annual rental payments, plus interest. These data are not included in Table 3.10.2-2.

TABLE 3.10.2-3
Property Tax Revenue Generated by the Keystone Project

State/County	Current Total Ad Valorem Property Taxes (Unless Noted) ($)	Property Tax Revenue (Project) ($)	Percent of Existing Revenue (%)
MAINLINE PROJECT			
North Dakota			
Pembina	10,212,016	713,843	6.99
Cavalier	6,295,726	19,457	0.31
Walsh	12,382,781	620,070	5.01
Nelson	4,364,556	936,951	21.47
Steele	3,814,357	690,742	18.11
Barnes	13,006,449	1,019,881	7.84
Ransom	6,607,588	649,205	9.83
Sargent	6,040,508	646,274	10.70
North Dakota subtotal	*62,723,981*	*5,296,423*	*8.44*
South Dakota			
Marshall	1,574,320	719,444	39.82
Day	2,070,614	905,346	26.70
Clark	1,871,952	1,081,954	35.90
Beadle	3,506,097	466,616	6.49
Kingsbury	1,459,097	462,898	24.06
Miner	1,887,182	738,034	25.61
Hanson	1,168,129	405,268	22.42
McCook	2,242,276	338,343	12.70
Hutchinson	2,550,459	708,283	20.45
Yankton	18,725,119	671,109	2.39
South Dakota subtotal	*37,055,245*	*6,497,295*	*11.55*
Nebraska (Taxes Levied)			
Cedar	14,373,607	848,105	5.90
Wayne	12,999,096	461,839	3.55
Stanton	10,581,066	594,587	5.62
Platte	93,424,920	68,326	0.07
Colfax	14,080,472	542,448	3.85
Butler	15,539,120	548,347	3.53
Seward	23,915,026	596,017	2.49
Saline	19,624,429	651,342	3.32
Jefferson	13,079,964	692,043	5.29
Gage	27,964,647	203,148	0.73
Nebraska subtotal	*245,582,347*	*5,206,202*	*2.12*

TABLE 3.10.2-3 Continued			
State/County	Current Total Ad Valorem Property Taxes (Unless Noted)	Property Tax Revenue (Project)	Percent of Existing Revenue (%)
MAINLINE PROJECT (CONTINUED)			
Kansas			
Marshall	11,772,795	1,395,178	11.85
Nemaha	9,482,614	1,149,747	12.12
Brown	10,209,742	1,143,945	11.20
Doniphan	7,299,226	798,217	10.94
Kansas subtotal	*38,764,377*	*4,487,087*	*11.58*
Missouri			
Buchanan	1,061,552,284	628,976	0.06
Clinton	227,936,441	688,689	0.30
Caldwell	94,313,724	786,220	0.83
Carroll	133,562,042	843,943	0.63
Chariton	115,832,051	1,015,120	0.88
Randolph	304,867,379	704,612	0.23
Audrain	271,818,136	1,232,077	0.45
Montgomery	168,475,439	674,756	0.40
Lincoln	558,363,794	871,809	0.16
St. Charles	6,609,549,616	1,289,799	0.02
Missouri subtotal	*9,546,270,906*	*8,736,001*	*0.09*
Illinois			
Madison	2,404,500,000	0	0.00
Bond	108,000,000	0	0.00
Fayette	133,000,000	0	0.00
Marion	217,700,000	0	0.00
Illinois subtotal	*2,863,200,000*	*0*	*0.00*
CUSHING EXTENSION			
Nebraska (Taxes Levied)			
Jefferson	13,079,964	72,594	0.56
Kansas			
Washington	8,435,597	2,096,285	24.85
Clay	9,014,595	2,060,555	22.86
Dickinson	16,579,757	2,073,703	12.51
Marion	13,669,639	2,219,216	16.23

TABLE 3.10.2-3 Continued			
State/County	**Current Total Ad Valorem Property Taxes (Unless Noted)**	**Property Tax Revenue (Project)**	**Percent of Existing Revenue (%)**
CUSHING EXTENSION (CONTINUED)			
Kansas (continued)			
Butler	65,397,029	2,808,048	4.29
Cowley	31,923,989	2,342,500	7.34
Kansas subtotal	*145,020,606*	*13,600,307*	*9.38*
Oklahoma			
Kay	23,853,655	1,014,883	4.25
Noble	8,943,669	878,126	9.82
Payne	32,315,508	926,111	2.87
Oklahoma subtotal	*65,112,832*	*2,819,120*	*4.33*
Mainline Project subtotal	***12,793,596,856***	***30,223,013***	***0.24***
Cushing Extension subtotal	***223,213,402***	***16,492,019***	***7.66***
Keystone Project total	**13,016,810,258**	**46,715,032**	**0.36**

Sources: TransCanada 2007b, c.

As a part of its permanent aboveground facilities, Keystone would construct short, permanent access roads from public roads to the proposed pump stations, delivery facilities, and MLVs. The miles of new permanent access roads are included in the discussions of above ground facilities for the Mainline Project and the Cushing Extension (Section 2.1.1.3 and 2.1.2.3, respectively). Prior to construction, Keystone would finalize the location of permanent access roads, along with any additional temporary access roads. Impacts of the presence of the access roads on cultural, biological, and physical resources—and the required permits and approvals—are discussed in the respective resource sections. Future maintenance of newly created access roads would be the responsibility of Keystone.

Property Damages and Values

Potential adverse impacts on property values would be based on the encumbrances associated with a pipeline easement, responsibility for property taxes, effects on landowner insurance premiums, and lost economic uses of land. The impact of an oil pipeline project on the value of any land parcel depends on many factors, including the size, current value, and use of the parcel, and the value of other nearby properties.

Most of the lands that would be impacted by the proposed Keystone Project are agricultural. All but the land required for permanent location of aboveground facilities would be returned to pre-construction levels of productivity, and production from those lands would not be affected following construction. As part of the ROW procurement process, Keystone would negotiate with the affected landowners to obtain an easement within the permanent pipeline ROW, compensating for any losses. If a landowner demonstrates that installation of the pipeline negatively impacts a non-agricultural development opportunity, Keystone will negotiate with the landowner for compensation regarding the potential diminution in the value of that land during the easement acquisition process. (Refer to Section 3.9 for a discussion of easement acquisition.)

Property value effects at the community or regional scale likely would be negligible for two principal reasons. First, land uses on parcels adjacent to the pipeline would not be affected, and land could continue to be used in its highest and best use. Second, the proposed pipeline would be underground and therefore would not adversely affect the regional amenity values that contribute to property values. For these reasons, the proposed Keystone Project is not expected to adversely affect property values.

Environmental Justice

As described in Section 3.10-1.7 and shown in Table 3.10.1-8, minority and low-income populations in a number of communities within the region of influence are meaningfully higher than in the surrounding region. In addition, several Native American tribes are proximate to the pipeline route. The Keystone Project could generate substantial adverse environmental or economic or environmental justice effects in these communities. However, as described below, the Keystone Project and its associated mitigation measures are not expected to result in adverse impacts that would fall disproportionately on minority or low-income populations located along the pipeline route.

As described throughout this EIS, construction and operation of the proposed Keystone Project may generate a range of environmental impacts, but these would be minimized or mitigated, as applicable, based on mitigation proposed by Keystone and additional DOS-recommended mitigation measures. More pertinent to the environmental justice analysis are the related health and safety concerns based on the risk associated with a pipeline failure. Section 3.13 and Appendix L address the risks and associated impacts to public health and safety that would result from a pipeline crude oil release; they also describe how applicable safety regulations and standards would minimize the potential risk of such releases.

Because of the stringent safety and integrity measures Keystone has incorporated into the design, construction, and operation of the pipeline, as well as governing PHMSA pipeline safety regulations, the pipeline does not appear to pose a significant risk to residents along the route, whether in rural or urban areas. Further, there is no evidence that such risks would be disproportionately borne by any minority or low-income populations identified within potentially affected communities in proximity to the Keystone Project.

The proposed Keystone Project would result in negligible to minor and temporary adverse effects on certain socioeconomic resources in the region, such as housing availability and public services. Conversely, Project-related spending and tax revenues would result in substantial socioeconomic benefits in the region of influence, which may in turn positively affect low-income and minority populations and Native American tribes through increased employment opportunities (and income benefits) and improved public service levels.

It also should be noted that an extensive public outreach program has been implemented in conjunction with the Keystone Project to ensure that public input is received, including any potentially affected minority or low-income population and tribal interests. The public review and comment process that DOS has implemented in association with the environmental review under NEPA has provided an additional opportunity for public input. Further, Keystone has communicated directly with the property owners who would be affected by the proposed Keystone Project, irrespective of minority or income status, regarding the proposed route and the results of archaeological and environmental surveys of their property. Therefore, all groups have been provided appropriate opportunities to participate in the EIS process.

In summary, the Keystone Project is not expected to result in any adverse environmental justice impacts to minority or low-income populations or Native American tribes in the region of influence. These populations may benefit from the positive socioeconomic effects that the project is expected to generate.

3.10.2.3 Connected Actions

Wood River Refinery Expansion. Based on the anticipated investment and expansion of the Wood River Refinery, the region and the nation are expected to experience a range of socioeconomic impacts from this connected action. (Only limited economic effects are expected to be generated at other refineries because no substantial changes in capital investment or operations are anticipated.) Expansion of the Wood River Refinery is estimated to cost approximately $1 billion, which likely would include expenditures on capital equipment, other goods and materials, services, and labor. To the extent that these expenditures are made in the local region, for example Madison County, and industries are present to meet project demands, the project likely would result in substantial regional economic benefits. Within an input-output model framework, these benefits would include increases in direct, indirect, and induced economic output; value added (i.e., labor income, other property income, and indirect business taxes); and employment in the region that result from spending rippling through the economy via inter-industry linkages. This is referred to as the “multiplier” effect. During project implementation, most of these benefits likely would be concentrated directly in the construction sector, including a significant increase in construction jobs. In addition, construction-support businesses and local retailers serving the construction workforce would realize economic benefits. Although the proportion of total project-generated spending that would occur at the regional level is not known, regional economic benefits could be substantial based on the total value of the project. These construction-related benefits would be temporary, lasting through the construction period.

Based on the specialized nature of capital equipment and labor that likely would be required to construct the project, it is probable that a substantial proportion of project spending would occur outside the immediate region. The need to import goods and services to implement the project represents leakage from the regional economy to the national economy, thereby resulting in economic benefits in other parts of the country in the form of increases in output, value added income, and jobs. Similarly, these are short-term benefits coinciding with the construction period.

In the long term, expansion of the Wood River Refinery would result in greater refining capacity and increased production/output in the refined petroleum industry. Based on an estimated 340,000 bpd in increased crude oil shipments and an approximate crude oil contract price of $60 per barrel,[6] the estimated value of refinery inputs is $20.4 million per day, or $744.6 million annually. Depending on the refined product and associated value added at the refinery, the estimated value of refinery production resulting from oil delivered by the Keystone pipeline would be even higher. This would contribute to increases in gross domestic product at the local, state, and national levels. Such an expansion likely would generate an increase in operational expenditures for items such as industrial supplies and maintenance services, and would require a larger operations workforce. Similar to construction, if these operational expenditures and workers are based in the region, future operation of the Wood River Refinery would result in regional economic benefits, including higher levels of income and employment.

Other socioeconomic parameters that could be affected by expansion of the Wood River Refinery include increases in fiscal revenues and increased demands for public services and other local resources. The fiscal benefits of the project would be attributed to increased tax revenues, including sales, property, and

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[6] Energy Information Administration. 2007. Current prices reported in *This Week in Petroleum* on the internet. Available at: <http://tonto.eia.doe.gov/oog/info/twip/twip_crude.html>. Accessed May 17, 2007.

income taxes that would be realized at the local, state, and national level. Conversely, potentially adverse socioeconomic effects could occur—particularly during construction—as a result of increased demand for a range of public services, including law enforcement, fire protection, and medical aid. This could disproportionately affect lower income areas. Depending on the characteristics of the construction workforce, demands may increase for short-term housing in the region, such as hotels/motels and rental units, driving rents up and affecting lower income or minority populations. Other environmental justice concerns, such as disproportionate air and water quality impacts to communities, would not be expected. As described in Sections 3.3 and 3.12, the refinery expansion would be required to obtain and follow all standards and requirements of permits necessary under the CAA and CWA.

In summary, expansion of the Wood River Refinery in response to increased crude oil deliveries from the Keystone pipeline is expected to generate both positive and adverse socioeconomic effects. Because of limited information, the magnitude of these effects has not been quantified at this time; however, the estimated value of the project (approximately $1 billion) suggests that these effects could be substantial.

3.10.3 References

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3.11 CULTURAL RESOURCES

Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, requires the lead federal agency with jurisdiction over a federal undertaking (i.e., a project, activity, or program that is funded by a federal agency or that requires a federal permit, license, or approval) must consider impacts to historic properties before that undertaking occurs. A historic property is defined as any district, archeological site, building, structure, or object that is either listed, or eligible for listing, in the National Register of Historic Places (NRHP). Under this definition, other cultural resources may be present within a project's area of potential effect (APE) but are not historic properties if they do not meet the eligibility requirements for listing in the NRHP. To be considered eligible for the NRHP, a property generally must be greater than 50 years of age, although there are provisions for listing cultural resources of more recent origin if they are of "exceptional" importance. The intent of Section 106 is for federal agencies to take into account a proposed undertaking's effects on any historic properties situated within the APE; and to consult with the Advisory Council on Historic Preservation (ACHP), State Historic Preservation Officers (SHPOs), federally recognized Indian tribes, applicants for federal assistance, local governments, and any other interested parties regarding the proposed undertaking and its potential impacts on historic properties.

The implementing regulation of Section 106 is 36 CFR Part 800. This regulation establishes a process of identifying NRHP-eligible or listed historic properties that may be affected by the proposed undertaking; assessing the undertaking's effects on those resources; and engaging in consultation that seeks ways to avoid, reduce, or mitigate any impacts on NRHP-listed or -eligible properties. Impacts include, but are not limited to, destruction or alteration of all or part of a property; isolation from or alteration of its surrounding environment; introduction of visual, audible, or atmospheric elements that are out of character with the property or that alter its setting; transfer or sale of a federally owned property without adequate conditions or restrictions regarding preservation, maintenance, or use; and neglect of a property resulting in its deterioration or destruction (36 CFR 800.5).

36 CFR Part 800 specifies that certain parties must be consulted during the process. These parties include each SHPO whose state would physically include any portion of the APE. The SHPO is appointed by each state to protect the interests of its citizens with respect to issues of cultural heritage.
Section 101(b)(3) of the NHPA provides each SHPO a prominent role in advising the responsible federal agencies and ACHP in their efforts to carry out Section 106 requirements. The SHPO, as well as the federal agencies, have an obligation to work with state and local governments, private organizations, and individuals during the initial planning and development of the Section 106 process. Federal agencies usually consult with the SHPO when developing methodologies related to cultural resource investigations and are required to notify SHPO when making findings related to the establishment of an APE, NRHP-eligibility of identified cultural resources, project effects, and resolution of impacts. On non-tribal lands, the lead federal agency—in consultation with the SHPO and other consulting parties—assesses the need for cultural resources investigations in the project APE, generates and approves methodologies for undertaking such investigations within the state, and evaluates the preliminary NRHP status of any cultural resources located within the APE. The SHPO also assists the lead federal agency and ACHP to assess any potential impacts to historic properties and works with the project applicant, lead federal agency, ACHP, and Indian tribes to mitigate any negative impacts that could occur to historic properties.

Section 106 recognizes the importance of consulting with Indian tribes for federal undertakings that are proposed within tribal ancestral territories. Specifically, 36 CFR 800.2(c)(2)(ii) notes:
"Section 101(d)(6)(B) of the NHPA requires the agency official to consult with any Indian tribe or Native Hawaiian organization that attaches religious and cultural importance to historic properties that may be affected by an undertaking. This requirement applies regardless of the location of the historic property."

In addition, sub-part (B) of the same statute says the "Federal Government has a unique legal relationship with Indian tribes set forth in the Constitution of the United States, treaties, statutes, and court decisions. Consultation with Indian tribes should be conducted in a sensitive manner respectful of tribal sovereignty. Nothing in this part alters, amends, repeals, interprets or modifies tribal sovereignty, any treaty rights, or other rights of an Indian tribe, or preempts, modifies or limits the exercise of any such rights."

The proposed Project does not currently cross any federally recognized Indian tribal lands. In the event of its occurrence, the Section 106 responsibilities described above can be assumed by a Tribal Historic Preservation Officer (THPO) under Section 101(d)(2) of the NHPA. In this event, all consultations regarding the Project and its potential effect on historic properties within the relevant tribal lands would be through the THPO and would follow the procedures outlined in the Programmatic Agreement (PA) created for this undertaking. The state SHPO still must be consulted relative to non-tribal lands. In the event that the tribe has not assumed the SHPO functions on its lands, the lead federal agency is required to consult with both the SHPO and the tribe's designated representative for any impacts anticipated for historic properties situated on the tribal lands.

Section 106 regulations state that each SHPO (or THPO, if they have assumed the SHPO's role) generally is required to respond within 30 days of receiving a request to review a proposed action, or a request to review a federal agency's finding or determination regarding historic properties located within the project APE. In the event that the SHPO/THPO does not respond within this time frame, 36 CFR 800.3(c)(4) states that the lead agency can decide to (1) proceed to the next step in the application process based on any earlier findings or determinations that have been made up to that point; or (2) consult directly with the ACHP in lieu of the SHPO/THPO. If, after this step is followed, the SHPO or THPO decides to re-enter the Section 106 process, 36 CFR 800.3(c)(4) further states that the lead agency official may continue the consultation proceeding without being required to reconsider previous findings or determinations.

DOS has elected to primarily follow the assessment criteria for pipeline projects that have been developed by FERC, given their experience in these types of projects. For cultural resources, the relevant assessment schema is found in the "Guidelines for Reporting on Cultural Resources Investigations for Pipeline Projects," published by the FERC Office of Energy Projects in 2002. Unless otherwise stated, the statements made in this document to assess Section 106 compliance for the Keystone Project have used those guidelines in their determination. Keystone provided information, analyses, and recommendations to assist DOS in complying with NEPA and Section 106, in accordance with NHPA regulations.

As a whole, cultural resources are locations of human activity, occupation, or usage that contain materials, structures, or landscapes that were used, built, or modified by people. Cultural resources include spatially circumscribed areas of human activity, such as Pre-contact Native American archeological sites, American farmsteads or a district of historic buildings. Not all cultural resources are considered historic properties under Section 106. To be designated as a historic property, the cultural resource must be listed or eligible for listing in the NRHP. The criteria (36CFR 60.4 [a–d]) used to evaluate the significance of a cultural resource are as follows:

a. It is associated with events that have made a significant contribution to the broad patterns of American history; or

b. It is associated with the lives of past significant persons; or

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

d. It has yielded or may be likely to yield, information important in history or prehistory.

This analysis includes a summary of all cultural resources that have been reported to DOS for the Keystone Project. This includes cultural resources that are already listed on the NRHP, NRHP-eligible historic properties, cultural resources assessed as being NRHP-ineligible, and cultural resources for which NRHP eligibility has not been evaluated. The reported cultural resources are divided into three main temporal groupings: Pre-contact period, Historic period, and multi-component. Pre-contact resources are sites that contain material evidence of Native American activities before Europeans entered the project area. Examples of Pre-contact sites include, but are not limited to, rock art; camp or village sites; rock shelters; and scatters of stone, bone, or ceramic tool-making debris. Historic period resources can include recent Native American activity locations but generally reflect Euro-American activities of the last 250 years. These can include residential, government, or commercial structures; farmsteads; mining sites; roads or railways; and ceramic, metal, and glass artifact scatters. Multi-component resources are locations where both Historic period and Pre-contact cultural remains are present.

The category of historic properties can also include traditional cultural properties (TCPs) as well as sites of traditional religious and/or cultural importance that meet the above criteria of eligibility but that do not necessarily have physical evidence of human activity. Bulletin #38 of the National Register defines TCPs as locations that embody the "beliefs, customs, and practices of a living community of people that have been passed down through the generations, usually orally or through practice. The traditional cultural significance of a historic property, then, is significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices." No TCPs have been defined to date within the Keystone Project APE. DOS has requested in writing and through meetings that participating parties provide information on properties of religious or cultural significance so that potential impacts can be avoided or addressed. These requests were made to federally recognized Indian tribes, as described in Section 3.11.3. Requests for the identification of TCPs of significance to non-Indian tribal communities were made through open public meetings with local community members. To assist with the identification of TCPs, on November 8, 2007, DOS offered to fund TCP studies conducted by consulting Indian tribes. To date, only two tribes have agreed to participate in this effort. DOS also has included the identification and assessment of TCPs within the PA that has been developed for the Project (see Section 3.11.3 and Appendix R).

The PA is being used to conclude Section 106 review to ensure that an appropriate formal process is followed for the outstanding cultural resources surveys that result from Project adjustments or from current denial of survey permissions. This process is described under 36 CFR 800.4(b)(2), which states where "alternatives under consideration consist of corridors or large land areas, or where access to properties is restricted, the agency official may use a phased process to conduct identification and evaluation efforts. The agency official may also defer final identification and evaluation of historic properties if it is specifically provided for in a memorandum of agreement executed pursuant to § 800.6, a programmatic agreement executed pursuant to § 800.14 (b), or the documents used by an agency official to comply with the National Environmental Policy Act pursuant to §800.8."

3.11.1 Environmental Setting

The proposed Keystone Project includes the Mainline Project that crosses six states (North Dakota, South Dakota, Nebraska, Kansas, Missouri, and Illinois) and the proposed Cushing Extension that lies within three states (Nebraska, Kansas, and Oklahoma). The proposed Keystone pipeline does not traverse Indian tribal lands; therefore, no THPO assumed SHPO Section 106 duties. The legislation enacted for Section 106 of the NHPA declares for projects crossing state boundaries that the relevant SHPO offices may choose to designate one of their members as having Lead SHPO authority. This provision, 36 CFR

800.3(c)(2), would allow the Lead SHPO to take all actions necessary to conclude the Section 106 application process. The relevant SHPO offices did not elect to exercise the Lead SHPO option for this undertaking. The cultural resources sections of the EIS, therefore, summarize the cultural resources aspects of the Keystone Project in relation to each individual affected state.

Although the APE for the proposed Project varies from state to state, the Project corridor generally ranges between 200 and 300 feet wide and is centered on the Project centerline. Where the Keystone Project is collocated with an existing pipeline, the APE is adjusted from 40 to 60 feet on the collocated side and from 160 to 240 feet on the non-collocated side. The APE for the Project also includes Project access roads, additional temporary workspace, pipeline reroutes, and appurtenant facilities. Figures 2.1-10 to 2.1-17 provide the routes of the pipeline through the affected states. Table 3.11.1-1 also illustrates the APEs for each respective state.

3.11.1.1 North Dakota

The Keystone pipeline would enter North Dakota from Canada and would extend through the state for approximately 217.8 miles. The counties crossed include Cavalier, Pembina, Walsh, Nelson, Steele, Barnes, Ransom, Sargent, and Dickey. Metcalf Archaeological Consultants (Metcalf) was contracted on behalf of Keystone to perform the required cultural resources assessments within the state. Their draft survey report was submitted to the North Dakota SHPO in January 2007 (Bleier et al. 2007a). A supplemental report for fieldwork conducted from October 2006 to August 2007 was submitted to DOS and the SHPO in October (Stein et al. 2007).

Before beginning fieldwork, Metcalf undertook a Class I literature and file search of the proposed pipeline route in January 2006; this research was revised in September 2006 to incorporate projected changes to the then-preferred route. The searches collected cultural site and survey data that were housed at the State Historical Society of North Dakota. The information was reviewed in relation to a corridor that extended for the length of the proposed pipeline route and that was 1 mile wide, centered on the route's proposed centerline. The records search identified 119 cultural resources within this region. The resources included 18 Pre-contact sites, four Historic period sites, eight sites with both Historic period and Pre-contact cultural components, 26 locations represented by architectural remains, and nine locations limited to isolated cultural finds. The specific locations of these resources generally could be plotted in relation to the planned survey corridor. In contrast, most of the remaining 54 cultural resources could not be plotted on the Project maps, as precise geographic data were not available for these site "leads." The background research indicated that only one known cultural resource, a church structure, was located within the projected corridor.

Along with the literature review, Metcalf submitted its research design for cultural resources field studies to the North Dakota SHPO in January 2006. The purpose of the research design was to present the methods Metcalf would use to assess the Keystone pipeline and identify historic properties. It was based on the results of the site file research and results of previous surveys. The design incorporated a sampling strategy that assessed the route in terms of high and low probabilities for containing Section 106-defined historic properties (excluding TCPs); this sampling strategy follows procedures generally accepted by the SHPO and FERC for pipeline projects and is permissible under 36 CFR 800.4(b)(1). It was developed in part through discussions with the North Dakota SHPO. The submitted research design used the preliminary pipeline route as its basis; subsequent alterations to the route did not require submission of a new research design but involved implementation of the general procedures outlined in the research design. This process also is considered acceptable by the SHPO, FERC, and DOS. The procedures used to identify TCPs and historic properties of cultural or religious importance to Indian tribes is outlined in the discussion of the consultation process (see Section 3.11.4).

TABLE 3.11.1-1 Area of Potential Effect for the Keystone Project by State		
State	**Counties**	**Corridor Area of Potential Effect**
North Dakota	Cavalier, Pembina, Walsh, Nelson, Steele, Barnes, Ransom, Sargent, Dickey	300-foot-wide corridor, centered on Project centerline
South Dakota	Brown, Marshall, Day, Clark, Beadle, Kingsbury, Miner, Hanson, McCook, Hutchinson, Yankton	300-foot-wide corridor, centered on Project centerline
Nebraska	Cedar, Wayne, Stanton, Platte, Colfax, Butler, Seward, Saline, Jefferson, Gage	300-foot-wide corridor centered on Project centerline; for collocated pipeline, 60 feet on collocated side and 240 feet on non-collocated side
Kansas	Marshall, Nemaha, Brown, Doniphan, (Washington, Clay, Dickinson, Marion, Butler, and Cowley)	200-foot-wide corridor centered on Project centerline (300-foot-wide corridor for Cushing Extension)
Missouri	Buchanan, Clinton, Caldwell, Carroll, Chariton, Randolph, Audrain, Montgomery, Lincoln, and St. Charles	200-foot-wide corridor centered on centerline used for Rockies Express Western Phase Project survey
Illinois	Madison, Bond, Fayette, Marion	200-foot-wide corridor; for areas with collocated pipeline, 40 feet on collocated side and 160 feet on non-collocated side; 300-foot-wide corridor centered on centerline in greenfield areas
Oklahoma	Kay, Noble, Payne	300-foot-wide corridor centered on Project centerline

The research design proposed that a cultural resources pedestrian field effort (labeled a Class III survey in North Dakota) be conducted along 49.5 miles of the proposed pipeline, using a 300-foot-wide survey corridor that was centered on the proposed Project centerline. The excavation of shovel probes was proposed at high-potential landforms with low surface visibility. The sampling strategy focused on landform types that were derived from the known site database and the results of previous surveys. The pedestrian survey was to use survey transects spaced no more than 65.6 feet (20 meters) apart and to use 15.7-inch- (40-centimeter-) diameter shovel probes at locations with poor surface visibility or where cultural materials within 3.3 feet (1 meter) of the ground surface were suspected. The research design further proposed Class II vehicular reconnaissance of the entire pipeline route by geomorphologists to ascertain locations where deeply buried cultural deposits were possible and at 41 miles of the route for archaeologists to field-assess additional Class III survey locations. The SHPO accepted the proposed research plan in a letter dated February 23, 2006.

Metcalf conducted the initial cultural resources field survey of the proposed Keystone pipeline route between May and August 2006. The 2006 surveys examined a 300-foot-wide corridor that field-assessed 67.4 miles; it included 47.7 miles of the original planned route and 19.7 miles of proposed reroutes (Bleier et al. 2007a). Additional surveys were conducted by Metcalf in 2007 for proposed reroutes and Project items. The surveys conducted to August 2007 were reported by Stein et al. (2007) and included 28.53 miles of additional pipeline route, 55.1 acres of proposed pump stations, and 10 roads totaling 2.5 miles in length with a 50-foot-wide assessment corridor being used for the latter Project items. While no federally owned land is bisected within the North Dakota corridor, the above areas included properties with easements that were assessed at the request of USFWS.

The applicant has abandoned portions of the originally proposed route due to landowner concerns, the presence of wetland or biological concerns, or for cultural resources that are potential historic properties. Table 3.11.1-2 displays the cultural resources survey status of the currently designed pipeline route. It excludes proposed routes that were surveyed for cultural resources but subsequently removed from the APE through abandonment by Keystone (and to avoid confusion from duplicated, changed, and overlapping mileposts). Access was denied to Metcalf along 8.04 miles of the planned survey areas; therefore, the cultural resources inventory of the proposed 30-inch-diameter Keystone pipeline is incomplete at this time. The cultural resources surveys for Project access roads, additional temporary workspace outside of the surveyed corridor, pipeline reroutes, and appurtenant facilities are ongoing. Further survey reports must be submitted and reviewed by consulting parties prior to land-altering activities occurring within these areas, using the process outlined in the PA.

3.11.1.2 South Dakota

The Keystone pipeline would enter South Dakota from Dickey County in North Dakota and would extend through the state for approximately 219.8 miles. The counties crossed include Brown, Marshall, Day, Clark, Beadle, Kingsbury, Miner, Hanson, McCook, Hutchinson, and Yankton. Metcalf was contracted on behalf of Keystone to perform the required cultural resources assessments within the state. Their draft survey report was submitted to the South Dakota SHPO and DOS in January 2007. A revised draft report was submitted in September 2007 (Bleier et al. 2007b).

Metcalf undertook a literature review and file search (Level I study) of the preliminary pipeline route in January 2006; this research was revised in September 2006 to incorporate projected changes to the preferred route. The cultural site and survey data collected were located at the South Dakota Archeological Research Center and the South Dakota State Historic Preservation Office. The information was reviewed in relation to a corridor that extended for the length of the proposed pipeline route and was 2 miles wide, centered on the route's proposed centerline. The records search identified 30 cultural resources within this region. These resources included 10 Pre-contact sites and 17 Historic period sites. The specific locations of these resources generally could be plotted in relation to the planned survey corridor. In contrast, the remaining three cultural resources could not be plotted on the Project maps, as precise geographic data were not available for these site leads. A total of 243 Historic period structures and buildings also were plotted within the confines of the 2-mile-wide evaluation zone. The data collected indicated that several Historic period railway lines were the only known cultural resources that would be crossed by the proposed pipeline Project.

TABLE 3.11.1-2
Cultural Resources Survey Status of the Keystone Mainline Project in North Dakota as of November 2007 (Excluding Abandoned Routes)

State	County	Milepost		Status	Miles
		From	To		
North Dakota	Cavalier	0.00	4.58	Not selected for survey in sampling strategy	4.58
North Dakota	Cavalier	4.58	6.83	Survey complete	2.25
North Dakota	Pembina	6.83	8.23	Survey complete	1.40
North Dakota	Pembina	8.23	8.73	Not selected for survey in sampling strategy	0.50
North Dakota	Pembina	8.73	9.16	Survey complete	0.43
North Dakota	Pembina	9.16	15.21	Not selected for survey in sampling strategy	6.05
North Dakota	Pembina	15.21	17.25	Survey complete	2.04
North Dakota	Pembina	17.25	17.47	Required – no access	0.22
North Dakota	Pembina	17.47	18.33	Survey complete	0.86
North Dakota	Pembina	18.33	18.46	Not selected for survey in sampling strategy	0.13
North Dakota	Pembina	18.46	25.19	Survey complete	6.73
North Dakota	Pembina	25.19	29.20	Not selected for survey in sampling strategy	4.02
North Dakota	Pembina	29.20	29.61	Survey complete	0.40
North Dakota	Pembina	29.61	30.72	Not selected for survey in sampling strategy	1.11
North Dakota	Pembina	30.72	32.00	Survey complete	1.28
North Dakota	Walsh	32.00	32.26	Not selected for survey in sampling strategy	0.26
North Dakota	Walsh	32.26	33.07	Not selected for survey in sampling strategy	0.81
North Dakota	Walsh	33.07	33.28	Survey complete	0.21
North Dakota	Walsh	33.28	33.42	Required – no access	0.14
North Dakota	Walsh	33.42	35.11	Not selected for survey in sampling strategy	1.69
North Dakota	Walsh	35.11	35.41	Survey complete	0.30
North Dakota	Walsh	35.41	36.23	Not selected for survey in sampling strategy	0.82
North Dakota	Walsh	36.23	36.53	Survey complete	0.30
North Dakota	Walsh	36.53	36.93	Not selected for survey in sampling strategy	0.41
North Dakota	Walsh	36.93	37.34	Survey complete	0.41
North Dakota	Walsh	37.34	38.02	Not selected for survey in sampling strategy	0.68
North Dakota	Walsh	38.02	38.35	Survey complete	0.34
North Dakota	Walsh	38.35	40.73	Not selected for survey in sampling strategy	2.37
North Dakota	Walsh	40.73	40.86	Survey complete	0.14
North Dakota	Walsh	40.86	41.25	Not selected for survey in sampling strategy	0.38
North Dakota	Walsh	41.25	42.94	Survey complete	1.69
North Dakota	Walsh	42.94	45.90	Not selected for survey in sampling strategy	2.96
North Dakota	Walsh	45.90	46.59	Survey complete	0.69
North Dakota	Walsh	46.59	48.63	Not selected for survey in sampling strategy	2.04
North Dakota	Walsh	48.63	49.42	Required – no access	0.79
North Dakota	Walsh	49.42	49.58	Survey complete	0.16
North Dakota	Walsh	49.58	53.74	Not selected for survey in sampling strategy	4.17
North Dakota	Walsh	53.74	54.91	Survey complete	1.17
North Dakota	Walsh	54.91	56.79	Not selected for survey in sampling strategy	1.88
North Dakota	Nelson	56.79	57.05	Required – no access	0.26
North Dakota	Nelson	57.05	58.80	Survey complete	1.75
North Dakota	Nelson	58.80	74.79	Not selected for survey in sampling strategy	15.99
North Dakota	Nelson	74.79	75.25	Survey complete	0.47
North Dakota	Nelson	75.25	76.20	Not selected for survey in sampling strategy	0.95
North Dakota	Nelson	76.20	77.25	Survey complete	1.05
North Dakota	Nelson	77.25	79.36	Not selected for survey in sampling strategy	2.11
North Dakota	Nelson	79.36	79.86	Survey complete	0.50

TABLE 3.11.1-2 (Continued)					
		Milepost			
State	County	From	To	Status	Miles
North Dakota	Nelson	79.86	80.43	Not selected for survey in sampling strategy	0.57
North Dakota	Nelson	80.43	82.50	Survey complete	2.07
North Dakota	Nelson	82.50	86.03	Not selected for survey in sampling strategy	3.54
North Dakota	Nelson	86.03	86.72	Survey complete	0.69
North Dakota	Nelson	86.72	87.23	Not selected for survey in sampling strategy	0.51
North Dakota	Nelson	87.23	88.27	Survey complete	1.04
North Dakota	Nelson	88.27	89.55	Not selected for survey in sampling strategy	1.29
North Dakota	Nelson	89.55	90.07	Survey complete	0.51
North Dakota	Nelson	90.07	91.91	Not selected for survey in sampling strategy	1.84
North Dakota	Nelson	91.91	92.91	Survey complete	1.00
North Dakota	Nelson	92.91	93.92	Not selected for survey in sampling strategy	1.01
North Dakota	Steele	93.92	97.96	Not selected for survey in sampling strategy	4.04
North Dakota	Steele	97.96	98.53	Survey complete	0.57
North Dakota	Steele	98.53	101.11	Not selected for survey in sampling strategy	2.58
North Dakota	Steele	101.11	101.50	Survey complete	0.39
North Dakota	Steele	101.50	109.79	Not selected for survey in sampling strategy	8.29
North Dakota	Steele	109.79	110.29	Survey complete	0.50
North Dakota	Steele	110.29	110.83	Not selected for survey in sampling strategy	0.55
North Dakota	Steele	110.83	111.29	Survey complete	0.45
North Dakota	Steele	111.29	112.83	Not selected for survey in sampling strategy	1.54
North Dakota	Steele	112.83	113.34	Survey complete	0.50
North Dakota	Steele	113.34	117.47	Not selected for survey in sampling strategy	4.13
North Dakota	Steele	117.47	118.00	Survey complete	0.53
North Dakota	Steele	118.00	119.13	Not selected for survey in sampling strategy	1.13
North Dakota	Steele	119.13	119.38	Survey complete	0.25
North Dakota	Steele	119.38	122.00	Not selected for survey in sampling strategy	2.62
North Dakota	Steele	122.00	122.55	Survey complete	0.55
North Dakota	Steele	122.55	124.72	Not selected for survey in sampling strategy	2.17
North Dakota	Barnes	124.72	127.87	Not selected for survey in sampling strategy	3.15
North Dakota	Barnes	127.87	128.13	Survey complete	0.26
North Dakota	Barnes	128.13	128.26	Not selected for survey in sampling strategy	0.14
North Dakota	Barnes	128.26	128.90	Survey complete	0.64
North Dakota	Barnes	128.90	134.05	Not selected for survey in sampling strategy	5.14
North Dakota	Barnes	134.05	135.08	Survey complete	1.03
North Dakota	Barnes	135.08	137.78	Not selected for survey in sampling strategy	2.70
North Dakota	Barnes	137.78	139.75	Survey complete	1.97
North Dakota	Barnes	139.75	140.27	Required – no access	0.52
North Dakota	Barnes	140.27	162.59	Not selected for survey in sampling strategy	22.33
North Dakota	Barnes	162.59	164.62	Survey complete	2.02
North Dakota	Barnes	164.62	166.18	Required – no access	1.56
North Dakota	Barnes	166.18	167.33	Survey complete	1.14
North Dakota	Barnes	167.33	167.84	Required – no access	0.51
North Dakota	Ransom	167.84	175.96	Survey complete	8.12
North Dakota	Ransom	175.96	176.22	Not selected for survey in sampling strategy	0.26
North Dakota	Ransom	176.22	176.72	Survey complete	0.50
North Dakota	Ransom	176.72	177.67	Not selected for survey in sampling strategy	0.95
North Dakota	Ransom	177.67	177.76	Survey complete	0.09
North Dakota	Ransom	177.76	178.26	Not selected for survey in sampling strategy	0.50
North Dakota	Ransom	178.26	179.03	Survey complete	0.77
North Dakota	Ransom	179.03	180.89	Not selected for survey in sampling strategy	1.86

TABLE 3.11.1-2 (Continued)					
State	County	Milepost		Status	Miles
		From	To		
North Dakota	Ransom	180.89	181.16	Required – no access	0.27
North Dakota	Ransom	181.16	181.39	Not selected for survey in sampling strategy	0.23
North Dakota	Ransom	181.39	184.11	Survey complete	2.73
North Dakota	Ransom	184.11	185.09	Not selected for survey in sampling strategy	0.97
North Dakota	Ransom	185.09	185.41	Survey complete	0.32
North Dakota	Ransom	185.41	187.44	Not selected for survey in sampling strategy	2.03
North Dakota	Ransom	187.44	187.93	Survey complete	0.49
North Dakota	Ransom	187.93	188.46	Not selected for survey in sampling strategy	0.53
North Dakota	Ransom	188.46	190.03	Survey complete	1.57
North Dakota	Ransom	190.03	191.20	Not selected for survey in sampling strategy	1.17
North Dakota	Ransom	191.20	191.83	Survey complete	0.63
North Dakota	Ransom	191.83	192.57	Not selected for survey in sampling strategy	0.74
North Dakota	Sargent	192.57	194.94	Not selected for survey in sampling strategy	2.37
North Dakota	Sargent	194.94	196.58	Survey complete	1.64
North Dakota	Sargent	196.58	197.00	Required – no access	0.42
North Dakota	Sargent	197.00	198.08	Survey complete	1.08
North Dakota	Sargent	198.08	199.19	Not selected for survey in sampling strategy	1.11
North Dakota	Sargent	199.19	200.20	Survey complete	1.01
North Dakota	Sargent	200.20	200.53	Required – no access	0.33
North Dakota	Sargent	200.53	203.12	Survey complete	2.59
North Dakota	Sargent	203.12	203.62	Required – no access	0.50
North Dakota	Sargent	203.62	205.12	Survey complete	1.50
North Dakota	Sargent	205.12	205.67	Required – no access	0.55
North Dakota	Sargent	205.67	217.80	Not selected for survey in sampling strategy	12.13
Total miles surveyed					**63.73**
Miles outside sampling strategy					**148.01**
Total miles still required to survey					**6.06**

Along with the literature review, Metcalf submitted its research design for cultural resources field studies to the South Dakota SHPO in February 2006. The initial research design was developed in part through discussions with the South Dakota SHPO. The purpose of the research design was to present the methods Metcalf would use to assess the Keystone pipeline and to identify historic properties within the APE. It was based on the results of the site file research and results of previous surveys. The design incorporated a sampling strategy that assessed the route in terms of high and low probabilities for containing historic properties (excluding TCPs); this sampling strategy follows procedures generally accepted by the SHPO and FERC for pipeline projects and is permissible under 36 CFR 800.4(b)(1). The submitted research design used the preliminary pipeline route as its basis; subsequent alterations to the route did not require submission of a new research design but involved implementation of the general procedures outlined in the research design. This process also is generally considered acceptable by the SHPO, FERC, and DOS. The procedures used to identify TCPs and historic properties of cultural or religious importance to Indian tribes is outlined in the discussion of the consultation process (see Section 3.11.4).

The research design proposed that a cultural resources pedestrian survey (labeled a Level II study in South Dakota) be conducted along 38.5 miles of the proposed pipeline, using a 300-foot-wide survey corridor that was centered on the proposed centerline. The sampling strategy focused on landform types that were derived from the known site database and the results of previous surveys. The pedestrian survey was to use survey transects spaced no more than 65.6 feet (20 meters) apart and to use 15.7-inch- (40-centimeter-) diameter shovel probes at locations with poor surface visibility or where cultural materials within 3.3 feet (1 meter) of the ground surface were suspected. The research design further proposed vehicular reconnaissance of the entire pipeline route by geomorphologists to ascertain locations where deeply buried cultural deposits were possible and along 52 miles of the route for archaeologists to field-assess additional Level II survey locations. The SHPO accepted this proposed research plan in a letter dated March 28, 2006.

Metcalf conducted the initial cultural resources field survey of the proposed Keystone pipeline between May and August 2006. Route adjustments to the line were surveyed between October and November 2006; geomorphological testing was also conducted during this period (Bleier et al. 2007b). The survey examined a 300-foot-wide corridor that extended for 49.4 miles; it included 39.5 miles of the original planned route and 9.9 miles of proposed reroutes. While no federally owned land is bisected within the South Dakota project corridor, the areas inspected included properties with easements that were assessed at the request of USFWS.

The South Dakota SHPO sent letters to DOS on March 23 and April 24, 2007, which did not concur with some findings of the initial Metcalf field survey. Metcalf met with the South Dakota SHPO on June 15 to discuss the SHPO comments and agreed to revise the draft report to provide additional details on the literature review and provide additional information to the SHPO and DOS. This amended report was submitted to DOS and the SHPO in September 2007. Further field surveys were conducted by Metcalf in 2007 for additional portions of the original route (as requested by DOS and the SHPO) and for reroutes, appurtenant facilities, and access roads. The surveys conducted from March to August 2007 were reported by Metcalf in an addendum report that was filed with DOS in October 2007 (Stine et al. 2007). The additional surveys included 22.06 miles of additional pipeline route, 37.3 acres of proposed pump stations and 14 access roads totaling 5.03 miles in length; a 50 foot wide assessment corridor was used for the access road surveys.

Table 3.11.1-3 displays the cultural resources survey status of the currently designed pipeline route. It excludes proposed routes that were surveyed for cultural resources but subsequently removed from the APE through abandonment by Keystone (and to avoid confusion from duplicated, changed, and overlapping mileposts). Access was denied to Metcalf along 2.29 miles of the planned survey areas; therefore, the cultural resources inventory of the proposed 30-inch-diameter Keystone pipeline is incomplete at this time. Keystone also has committed to additional field work based on discussions held with DOS and the SHPO in December 2007, specifically for a survey of the proposed pipeline between MP 389.0 and 391.0. Cultural resources surveys for other Project access roads, additional temporary workspace outside the surveyed corridor, pipeline reroutes, and appurtenant facilities are stated as being completed at this time (Stine et al. 2007). However, reports are required for the above project items and for any design changes; these must be submitted and reviewed by the consulting parties prior to land-altering activities occurring within these areas, as outlined in the PA.

TABLE 3.11.1-3
Cultural Resources Survey Status of the Keystone Mainline Project in South Dakota as of November 2007 (Excluding Abandoned Routes)

State	County	Milepost		Status	Miles
		From	To		
South Dakota	Marshall	217.80	218.81	Not selected for survey in sampling strategy	1.01
South Dakota	Marshall	218.81	219.82	Survey complete	1.01
South Dakota	Marshall	219.82	228.66	Not selected for survey in sampling strategy	8.84
South Dakota	Marshall	228.66	229.74	Required – no access	1.08
South Dakota	Marshall	229.74	230.13	Survey complete	0.38
South Dakota	Marshall	230.13	242.60	Not selected for survey in sampling strategy	12.47
South Dakota	Day	242.60	245.15	Not selected for survey in sampling strategy	2.55
South Dakota	Day	245.15	246.13	Survey complete	0.98
South Dakota	Day	246.13	256.15	Not selected for survey in sampling strategy	10.02
South Dakota	Day	256.15	256.68	Required – no access	0.53
South Dakota	Day	256.68	259.68	Not selected for survey in sampling strategy	3.00
South Dakota	Day	259.68	260.16	Survey complete	0.48
South Dakota	Day	260.16	261.85	Not selected for survey in sampling strategy	1.69
South Dakota	Day	261.85	262.53	Survey complete	0.68
South Dakota	Day	262.53	264.15	Not selected for survey in sampling strategy	1.62
South Dakota	Day	264.15	266.69	Survey complete	2.54
South Dakota	Day	266.69	268.28	Not selected for survey in sampling strategy	1.58
South Dakota	Day	268.28	270.37	Survey complete	2.09
South Dakota	Day	270.37	273.36	Not selected for survey in sampling strategy	2.99
South Dakota	Clark	273.36	297.99	Not selected for survey in sampling strategy	24.63
South Dakota	Clark	297.99	300.00	Survey complete	2.01
South Dakota	Clark	300.00	310.17	Not selected for survey in sampling strategy	10.17
South Dakota	Beadle	310.17	311.19	Survey complete	1.02
South Dakota	Beadle	311.19	311.70	Not selected for survey in sampling strategy	0.51
South Dakota	Beadle	311.70	312.22	Survey complete	0.51
South Dakota	Beadle	312.22	314.27	Not selected for survey in sampling strategy	2.06
South Dakota	Beadle	314.27	315.30	Survey complete	1.03
South Dakota	Beadle	315.30	316.37	Not selected for survey in sampling strategy	1.07
South Dakota	Beadle	316.37	318.07	Survey complete	1.70
South Dakota	Beadle	318.07	318.58	Not selected for survey in sampling strategy	0.51
South Dakota	Beadle	318.58	321.66	Survey complete	3.08
South Dakota	Beadle	321.66	322.70	Not selected for survey in sampling strategy	1.04
South Dakota	Beadle	322.70	323.44	Survey complete	0.74
South Dakota	Beadle	323.44	326.79	Not selected for survey in sampling strategy	3.35
South Dakota	Kingsbury	326.79	328.05	Survey complete	1.26
South Dakota	Kingsbury	328.05	333.67	Not selected for survey in sampling strategy	5.62
South Dakota	Kingsbury	333.67	334.19	Survey complete	0.52
South Dakota	Kingsbury	334.19	335.18	Not selected for survey in sampling strategy	0.98
South Dakota	Kingsbury	335.18	336.16	Survey complete	0.98
South Dakota	Kingsbury	336.16	339.18	Not selected for survey in sampling strategy	3.02
South Dakota	Kingsbury	339.18	339.31	Required – no access	0.13
South Dakota	Kingsbury	339.31	340.36	Not selected for survey in sampling strategy	1.05
South Dakota	Kingsbury	340.36	341.36	Survey complete	1.00
South Dakota	Miner	341.36	350.63	Not selected for survey in sampling strategy	9.27
South Dakota	Miner	350.63	351.59	Survey complete	0.97
South Dakota	Miner	351.59	365.47	Not selected for survey in sampling strategy	13.88
South Dakota	Miner	365.47	366.13	Survey complete	0.66

TABLE 3.11.1-3
(Continued)

State	County	Milepost From	Milepost To	Status	Miles
South Dakota	Hanson	366.13	368.80	Not selected for survey in sampling strategy	2.66
South Dakota	Hanson	368.80	369.30	Survey complete	0.50
South Dakota	Hanson	369.30	374.96	Not selected for survey in sampling strategy	5.67
South Dakota	Hanson	374.96	375.57	Survey complete	0.61
South Dakota	Hanson	375.57	376.00	Not selected for survey in sampling strategy	0.43
South Dakota	Hanson	376.00	378.03	Survey complete	2.03
South Dakota	Hanson	378.03	380.19	Not selected for survey in sampling strategy	2.16
South Dakota	McCook	380.19	380.67	Survey complete	0.48
South Dakota	McCook	380.67	383.26	Not selected for survey in sampling strategy	2.59
South Dakota	McCook	383.26	384.25	Survey complete	0.99
South Dakota	McCook	384.25	385.24	Not selected for survey in sampling strategy	0.98
South Dakota	McCook	385.24	386.25	Survey complete	1.01
South Dakota	McCook	386.25	387.28	Not selected for survey in sampling strategy	1.04
South Dakota	McCook	387.28	387.34	Survey complete	0.06
South Dakota	McCook	387.34	387.69	Not selected for survey in sampling strategy	0.35
South Dakota	McCook	387.69	387.85	Survey complete	0.15
South Dakota	McCook	387.85	389.00	Not selected for survey in sampling strategy	1.15
South Dakota	McCook	389.00	391.00	Survey required – SHPO requested	2.00
South Dakota	McCook	381.00	391.47	Not selected for survey in sampling strategy	0.47
South Dakota	Hutchinson	391.47	393.74	Survey complete	2.27
South Dakota	Hutchinson	393.74	396.35	Not selected for survey in sampling strategy	2.61
South Dakota	Hutchinson	396.35	396.78	Survey complete	0.42
South Dakota	Hutchinson	396.78	400.43	Not selected for survey in sampling strategy	3.65
South Dakota	Hutchinson	400.43	400.69	Survey complete	0.26
South Dakota	Hutchinson	400.69	407.04	Not selected for survey in sampling strategy	6.35
South Dakota	Hutchinson	407.04	407.18	Survey complete	0.14
South Dakota	Hutchinson	407.18	407.74	Required – reroute	0.56
South Dakota	Hutchinson	407.74	409.10	Survey complete	1.35
South Dakota	Hutchinson	409.10	415.38	Not selected for survey in sampling strategy	6.28
South Dakota	Yankton	415.38	419.52	Not selected for survey in sampling strategy	4.14
South Dakota	Yankton	419.52	424.74	Survey complete	5.22
South Dakota	Yankton	424.74	428.39	Survey complete	3.65
South Dakota	Yankton	428.39	428.81	Not selected for survey in sampling strategy	0.42
South Dakota	Yankton	428.81	428.89	Survey complete	0.08
South Dakota	Yankton	428.89	432.91	Not selected for survey in sampling strategy	4.01
South Dakota	Yankton	432.91	433.00	Survey complete	0.09
South Dakota	Yankton	433.00	433.20	Not selected for survey in sampling strategy	0.20
South Dakota	Yankton	433.20	434.25	Survey complete	1.06
South Dakota	Yankton	434.25	436.77	Not selected for survey in sampling strategy	2.51
South Dakota	Yankton	436.77	437.61	Survey complete	0.84
Total miles surveyed					**44.88**
Miles outside sampling strategy					**170.64**
Total miles still required to survey					**4.29**

3.11.1.3 Nebraska

Mainline Project

The Mainline Project would enter Nebraska from Yankton County, South Dakota and would extend through the state for approximately 214.6 miles. The counties crossed include Cedar, Wayne, Stanton, Platte, Colfax, Butler, Seward, Saline, Jefferson, and Gage. American Resources Group, Ltd. (ARG) and SWCA Environmental Consultants (SWCA) were contracted on behalf of Keystone to perform the required cultural resources background research and field assessments in the state. Keystone also entered into an agreement with Kinder Morgan and Rockies Express Pipeline LLC to purchase the results of cultural resource studies that were conducted in 2005/2006 for the proposed Rockies Express (REX) Natural Gas Pipeline Project. Keystone submitted the REX Project reports (Schwegman et al. 2006, Schwegman 2006, Rieken 2007, Anderson and Aberle 2007, Shah Lomas 2007c) as evidence of existing survey coverage at potential Keystone Project ancillary facilities, access roads, and 12.3 miles of collocated corridor in Jefferson and Gage Counties. The potential environmental impacts of the REX pipeline were assessed as part of FERC's evaluation of FERC Docket CP06-354-000. Portions of the following discussion are derived from the EIS that was produced during that evaluation. Both DOS and the SHPO have accepted that the cultural resources surveys performed for the REX Project adequately address Section 106 compliance requirements for the concomitant aspects of the Keystone Project. Information concerning the use of the REX Project surveys has been subsequently forwarded to all consulting parties.

Prior to the Keystone fieldwork, SWCA performed a records review (labeled a Class I files search in Nebraska) of the proposed pipeline route in January 2006 (Burnett and Slessman 2006a); this research was revised in March 2006 to take into account projected changes to the preferred route (Burnett and Slessman 2006b). The cultural site and survey data were located at the State Historical Preservation Office in Nebraska and the online records of the Nebraska General Land Office (GLO). The information from the State Historic Preservation Office was reviewed in relation to a corridor that extended for the length of the proposed pipeline route and was 2 miles wide, centered on the proposed centerline. The records search identified 40 cultural resources in this area. The resources included 27 Historic period sites, 10 Pre-contact sites, one site with both Pre-contact and Historic period artifact assemblages, and one proto-Historic period (European contact-era) site. The potential age and type of one site could not be determined based on the information presented on the site form. The data indicated that four known cultural resources were plotted within 150 feet of the proposed pipeline centerline. These included two Pre-contact village or burial sites (25BU3 and 25CD21) and two Historic period cabin or trail sites (25CX7 and 25PT108). The review of GLO records examined land parcels situated within 150 feet of the proposed pipeline centerline. This search identified 14 properties, including roads between Fort Leavenworth and Laramie, Fort Kearney and Nebraska City, Fort Kearney and Omaha, and Omaha and Fort Sterling. A Union Pacific & Burlington system railroad crossing was noted.

Along with the literature review, Keystone, through its cultural resource contractor, submitted its initial and revised research designs for cultural resources field studies to the Nebraska SHPO in February and March 2006 (Burnett and Slessman 2006a, 2006b). An email dated March 8, 2006, also was sent to the SHPO that summarized the research design. The purpose of the research design was to present the methods ARG would use to assess the Keystone pipeline and to identify historic properties within the APE. It was based on the results of the site file research and results of previous surveys. The design incorporated field evaluation of the entire proposed pipeline corridor, wherever previous survey coverage had not been achieved. It focused on identifying Section 106-defined historic properties within the proposed Project areas, excluding TCPs. It was developed in part through discussions with the Nebraska SHPO. The submitted research design used the preliminary pipeline route as its basis; subsequent alterations to the route did not require submission of a new research design but involved implementation of the general procedures outlined in the research design. This process also is considered acceptable by the SHPO, FERC, and DOS. The procedures used to identify TCPs and historic properties of cultural or religious importance to Indian tribes is outlined in the discussion of the consultation process (see Section 3.11.4).

The research design proposed that a cultural resources field survey be conducted along the entire proposed pipeline, using a 300-foot-wide survey corridor. Where collocated with another pipeline, the survey would cover 60 feet to the collocated side and 240 feet to the non-collocated side. At greenfield sections, the survey corridor would be centered on the proposed centerline. The pedestrian survey was to use survey transects spaced no more than 98.4 feet (30 meters) apart and to use shovel tests at locations where surface visibility was less than 10 percent. These shovel tests also would be spaced 98.4 feet (30 meters) apart. The research design further proposed that the Phase I survey results would be used to determine potential geomorphological studies, at locations where deeply buried cultural deposits may be possible. The SHPO accepted the proposed research plan in a letter dated March 8, 2006. No federally owned or managed land that requires review by a federal agency is present within the Nebraska Project corridor.

ARG conducted the initial cultural resources and geoarchaeological field surveys of the proposed Mainline Project route from May to June and October to November 2006; the area surveyed did not include the collocated REX pipeline section in Jefferson and Gage Counties (discussed separately below). ARG examined a 300-foot-wide corridor that extended for 214 miles of the planned pipeline route and included 24.8 miles of additional survey that resulted from route design changes (Ensor et al. 2007). Additional surveys were conducted by ARG in 2007 for proposed reroutes and Project items (Anderson et al. 2007a). These surveys, conducted in July 2007, included 40.97 miles of additional pipeline route and 69.15 acres of proposed pump station facilities. Consistent with the approved research design, the field-inspected locations were examined through pedestrian survey and shovel testing. Geomorphological testing at 35 locations also was performed during this period; 15 locations were recommended for additional research.

Keystone has abandoned portions of the originally proposed route due to landowner concerns, the presence of wetland or biological concerns, or for cultural resources that are potential historic properties. Table 3.11.1-4 displays the cultural resources survey status of the currently designed pipeline route. It excludes proposed routes that were surveyed for cultural resources but subsequently removed from the APE through abandonment by Keystone (and to avoid confusion from duplicated, changed, and overlapping mileposts). Access to 15.62 miles of the planned survey area was denied to ARG; therefore, the cultural resources inventory of the proposed 30-inch-diameter Keystone pipeline is incomplete at this time. Cultural resources surveys and geomorphological studies for Project access roads, additional temporary workspace outside of the surveyed corridor, pipeline reroutes, and appurtenant facilities are ongoing. Further survey reports must be submitted and reviewed by consulting parties prior to land-altering activities occurring within these areas, as outlined in the PA.

Keystone submitted five REX Project reports to document previous survey coverage of the proposed Mainline Project corridor and potential ancillary facilities (Schwegman et al. 2006, Schwegman 2006, Anderson and Aberle 2007, Rieken 2007, Shah Lomas 2007c). The portion of the Keystone pipeline that is collocated within the REX survey corridor is situated in Jefferson and Gage Counties between MP 637.3 and 649.6. A research design for the Nebraska segment of the REX Project was submitted to the SHPO in December 2005 (Schwegman et al. 2006). The FERC EIS for the REX Project states that the Nebraska SHPO indicated on January 6, 2006, that the entire pipeline route in Nebraska should be surveyed. This would include the portion of the REX pipeline that is collocated with the Mainline Project. The research design in the submitted report (Schwegman et al. 2006) indicates that the pipeline corridor was examined through a combination of shovel testing and pedestrian survey, identical to the methodology utilized for the Keystone survey.

TABLE 3.11.1-4
Cultural Resources Survey Status of the Keystone Mainline Project in Nebraska as of November 2007 (Excluding Abandoned Routes)

State	County	Milepost From	Milepost To	Status	Miles
Nebraska	Cedar	437.61	437.86	Not required – surveyed for REX Project	0.25
Nebraska	Cedar	437.86	440.00	Survey complete	2.14
Nebraska	Cedar	440.00	440.15	Required – no access	0.15
Nebraska	Cedar	440.15	441.87	Survey complete	1.72
Nebraska	Cedar	441.87	441.91	Required – no access	0.05
Nebraska	Cedar	441.91	447.04	Survey complete	5.13
Nebraska	Cedar	447.04	447.66	Required – no access	0.61
Nebraska	Cedar	447.66	474.69	Survey complete	27.03
Nebraska	Wayne	474.69	479.63	Survey complete	4.94
Nebraska	Wayne	479.63	479.94	Required – no access	0.31
Nebraska	Wayne	479.94	480.45	Survey complete	0.50
Nebraska	Wayne	480.45	480.93	Required – no access	0.49
Nebraska	Wayne	480.93	493.21	Survey complete	12.28
Nebraska	Stanton	493.21	495.18	Survey complete	1.97
Nebraska	Stanton	495.18	495.43	Required – no access	0.25
Nebraska	Stanton	495.43	496.19	Survey complete	0.76
Nebraska	Stanton	496.19	498.69	Required – no access	2.50
Nebraska	Stanton	498.69	510.65	Survey complete	11.96
Nebraska	Stanton	510.65	510.69	Required – no access	0.04
Nebraska	Stanton	510.69	518.11	Survey complete	7.42
Nebraska	Platte	518.11	522.17	Survey complete	4.06
Nebraska	Colfax	522.17	522.26	Required – no access	0.09
Nebraska	Colfax	522.26	535.90	Survey complete	13.64
Nebraska	Colfax	535.90	536.41	Required – no access	0.51
Nebraska	Colfax	536.41	542.68	Survey complete	6.27
Nebraska	Colfax	542.68	543.17	Required – no access	0.49
Nebraska	Colfax	543.17	544.61	Survey complete	1.43
Nebraska	Butler	544.61	545.24	Required – no access	0.64
Nebraska	Butler	545.24	550.55	Survey complete	5.31
Nebraska	Butler	550.55	550.87	Required – no access	0.31
Nebraska	Butler	550.87	563.65	Survey complete	12.78
Nebraska	Butler	563.65	564.14	Required – no access	0.50
Nebraska	Butler	564.14	566.75	Survey complete	2.60
Nebraska	Butler	566.75	567.22	Required – no access	0.47
Nebraska	Butler	567.22	568.22	Survey complete	1.00
Nebraska	Seward	568.22	575.86	Survey complete	7.64
Nebraska	Seward	575.86	575.91	Required – no access	0.05
Nebraska	Seward	575.91	589.17	Survey complete	13.27
Nebraska	Seward	589.17	589.93	Required – no access	0.75
Nebraska	Seward	589.93	593.01	Survey complete	3.09
Nebraska	Seward	593.01	593.28	Required – no access	0.27
Nebraska	Saline	593.28	599.57	Survey complete	6.29
Nebraska	Saline	599.57	599.72	Required – no access	0.14
Nebraska	Saline	599.72	603.40	Survey complete	3.68

TABLE 3.11.1-4 (Continued)					
State	County	Milepost		Status	Miles
		From	To		
Nebraska	Saline	603.40	604.27	Required – no access	0.87
Nebraska	Saline	604.27	605.50	Survey complete	1.23
Nebraska	Saline	605.50	607.74	Required – no access	2.24
Nebraska	Saline	607.74	608.74	Survey complete	0.99
Nebraska	Saline	608.74	609.74	Required – no access	1.00
Nebraska	Saline	609.74	611.20	Survey complete	1.47
Nebraska	Saline	611.20	611.25	Required – no access	0.04
Nebraska	Saline	611.25	611.74	Survey complete	0.50
Nebraska	Saline	611.74	612.75	Required – no access	1.01
Nebraska	Saline	612.75	617.95	Survey complete	5.20
Nebraska	Jefferson	617.95	618.45	Survey complete	0.50
Nebraska	Jefferson	618.45	618.94	Required – no access	0.49
Nebraska	Jefferson	618.94	621.58	Survey complete	2.65
Nebraska	Jefferson	621.58	621.98	Required – no access	0.40
Nebraska	Jefferson	621.98	626.19	Survey complete	4.21
Nebraska	Jefferson	626.19	626.60	Required – no access	0.41
Nebraska	Jefferson	626.60	639.29	Survey complete	12.69
Nebraska	Jefferson	639.29	639.82	Required – no access	0.53
Nebraska	Jefferson	639.82	644.37	Not required – surveyed for rex project	4.55
Nebraska	Gage	644.37	652.26	Not required – surveyed for rex project	7.89
Total miles surveyed for Keystone Project					**186.34**
Total miles surveyed for REX Project					**12.69**
Total miles still required to survey					**15.62**

In comparison to the 300-foot-wide corridor used for the Keystone Project, ARG surveyed a 200-foot-wide corridor for the REX Project. This corridor was itself collocated with an existing pipeline ROW for the entire length of the portion that is relevant to the Keystone Project. According to the documents filed by Keystone, all 12.3 miles of the collocated REX pipeline in Jefferson and Gage Counties was surveyed for cultural resources. ARG also inspected six locations along this 12.3-mile-long section where temporary extra workspace areas would lie outside of the 200-foot-wide survey corridor (Schwegman et al. 2006).

ARG also conducted geomorphological investigations at 60 stream-valley locations along the REX corridor, of which five were associated with the section collocated with the Mainline Project. Their report (Schwegman et al. 2006) recommended that 35 stream crossing locations should be further investigated using backhoe trenching, including one of the locations relevant to Keystone. The results of this additional fieldwork were presented in a separate report (Anderson and Aberle 2007). A total of 62 backhoe trenches were excavated to assess the 35 locations recommended from the earlier field effort. Only one of the locations within the Keystone Project APE was found to have a buried Pre-contact archeological site (25JF41; see Table 3.11.2-3).

In their primary document for the cultural resources field survey (Schwegman et al. 2006), ARG reported that a 40-acre area was inventoried to cover the proposed Steele City Compressor Station location (REX MP 431.5 in Gage County). In addition, ARG inspected the location for a proposed Natural Gas Pipeline

Company of America Meter Station (REX MP 423.1 in Jefferson County). An addendum report (Schwegman 2006) that was prepared for the REX Project indicated that cultural resources studies had been completed at a 17.7-acre compressor station location in Phelps County (REX MP 286.9) and at a proposed 1.2-acre site for a proposed meter station in Jefferson County (REX MP 286.9). A separate addendum report (Shah Lomas 2007c) discussed the evaluation of 12 additional temporary workspaces for the REX Project totaling 7.8 acres. The latter report noted the finding of a single cultural resource, a multi-component site that was not recommended as being eligible for listing in the NRHP (Site 25GA128; see Table 3.11.2-3).

The ARG primary report (Schwegman et al. 2006) for the REX Project was submitted to the SHPO on May 15, 2006. In a letter dated June 6, 2006, the Nebraska SHPO agreed with the recommendations in that report. Keystone, through ARG, also submitted a letter to the Nebraska SHPO on November 18, 2006, requesting that survey results for the REX Project be applied to Keystone. Keystone provided maps of the Mainline Project corridor to the SHPO for this analysis. The SHPO responded on November 28, 2006, that this was acceptable. The SHPO also sent two letters on June 4, 2007, to ARG that concurred with the field findings for submitted addenda reports (Anderson and Aberle 2007, Shah Lomas 2007).

Cushing Extension

Only 2.51 miles of the proposed Cushing Extension pipeline is situated within the state of Nebraska (Table 3.11.1-5). This segment is in the southeastern portion of Jefferson County and extends due south into Washington County, Kansas. The preliminary Project plans anticipated 2.42 miles of pipeline to be located within the state, which was examined for cultural resources by Geo-Marine, Inc. in February 2007. The survey involved examination of a 300-foot-wide linear corridor through pedestrian survey transects spaced approximately 100 feet apart. ARG, which replaced Geo-Marine as the cultural resources contractor after fieldwork was completed by Geo-Marine, filed a draft technical report with with DOS and the SHPO in August 2007, indicating that no cultural resource concerns were present (Shah Lomas 2007d).

TABLE 3.11.1-5
Cultural Resources Survey Status of the Keystone Cushing Extension in Nebraska as of November 2007 (Excluding Abandoned Routes)

State	County	Milepost From	Milepost To	Status	Miles
Nebraska	Jefferson	0.00	0.34	Required – no access	0.34
Nebraska	Jefferson	0.34	2.51	Survey completed	2.17
Total miles surveyed					**2.17**
Total miles still required to survey					**0.34**

The applicant provided information in December 2007 indicating that a portion of this route will be abandoned and that a new reroute will require cultural resources survey, as shown in Table 3.11.1-5. Access was denied to ARG along 0.34 mile of this planned survey area; therefore, the cultural resources inventory of the proposed Cushing Extension pipeline in Nebraska is incomplete at this time. The cultural resources survey results for this reroute, along with any required Project access roads, additional temporary workspace outside of the surveyed corridor, and appurtenant facilities must be submitted and reviewed by the consulting parties prior to land-altering activities occurring within these areas, as outlined in the PA.

3.11.1.4 Kansas

Mainline Project

The Mainline Project would enter Kansas from Gage County, Nebraska and would extend through the state for 98.67 miles. The counties crossed include Marshall, Nemaha, Brown, and Doniphan. ARG was contracted on behalf of Keystone to perform the required cultural resources assessments within the state. Keystone also entered into an agreement with Kinder Morgan and Rockies Express Pipeline LLC to purchase the results of cultural resources studies that were conducted in 2005/2006 for the proposed REX Project. Keystone submitted the REX report (Myers et al. 2006a) as evidence of existing survey coverage at potential Keystone Project ancillary facilities and access roads, and along the collocated pipeline corridor. The potential environmental impacts of the REX pipeline were assessed as part of FERC's evaluation of the project (FERC Docket CP06-354-000). Portions of the following discussion are derived from the EIS that was produced during that evaluation. Both DOS and the SHPO have accepted that the surveys performed for the REX West Project adequately address Section 106 compliance requirements for the concomitant aspects of the Keystone Project.

Prior to commencing fieldwork, in November 2005, ARG undertook a literature and file search of the proposed REX pipeline route. The searches collected online cultural site and survey data that were located at the Kansas State Historical Society. The information was reviewed in relation to a corridor that extended for the length of the proposed pipeline route and was 2 miles wide, centered on the proposed centerline. The records search identified 29 cultural resources within this zone, including 24 Pre-contact sites, two Historic period sites, and three sites with both Historic period and Pre-contact cultural components. The data indicated that none of these known cultural resources lies within the projected REX pipeline (and, by extension, the Keystone) APE.

ARG submitted its research design for the REX cultural resources field studies to the Kansas SHPO in November 2005. It proposed that a cultural resources field survey be conducted along 36.7 miles of the proposed pipeline, using a 200-foot-wide survey corridor. The sampling strategy used to select the survey segments focused on landform types that were derived from the known site database and the results of previous surveys. Pedestrian survey using transects spaced no more than 49.2 feet (15 meters) apart was to be employed at landforms with existing land disturbance, on landforms with slopes greater than 20 percent, and at areas demonstrating greater than 40-percent surface visibility. The survey was to use 13.8- to 17.7-inch- (35- to 45-centimeter-) diameter shovel tests spaced 49.2 feet (15 meters) apart at survey locations where surface visibility decreased below the 40-percent threshold. The research design further proposed geomorphological testing at 25 locations where deeply buried cultural deposits were considered possible. The Kansas SHPO accepted the proposed research plan in a letter dated December 14, 2005.

ARG conducted their initial cultural resources field survey of the proposed REX pipeline route in 2006 (Myers et al. 2006a). The surveys examined a 200-foot-wide corridor that measured 40 feet toward the existing pipeline and 160 feet to the side opposite the existing pipeline. A total of 48 separate segments in Marshall, Nemaha, Brown, and Doniphan Counties were field examined. This sample comprised 36.4 miles of the entire pipeline route. ARG also examined 31 locations where temporary extra workspaces would lie outside of the 200-foot-wide survey corridor. According to the documents filed by Keystone, all of the collocated REX pipeline that was selected for survey in Kansas has been examined for cultural resources. The inventory of the concomitant sections of the proposed Keystone pipeline is therefore also complete at this time (barring future route adjustments).

As part of the REX Project, ARG surveyed a proposed meter station location and access road (REX MP 497.8). No cultural resources concerns were found (Myers et al. 2006). ARG also received permission to examine a 0.14-mile section of the REX corridor for which land access had been denied, 10 additional temporary workspaces that lay outside the original corridor, and two pipeline reroutes (Shah Lomas 2007a). A single Historic period cultural resource (Site 14MH164) was located at one of the latter reroutes (Table 3.11.2-5). Additional cultural resources surveys for Project access roads, additional temporary workspace, pipeline reroutes, and appurtenant facilities are ongoing. Keystone anticipates that an addendum report will be filed for these aspects of the Project in September 2007.

ARG conducted geomorphological investigations at 25 stream-valley locations and recommended that 12 of these stream crossing locations receive further investigation, using backhoe trenching (Myers et al. 2006a). The results of this additional fieldwork were presented in a separate report (Anderson and Schwegman 2007). A total of 22 backhoe trenches were excavated and resulted in identification of a single buried Pre-contact archeological site (14NH112; see Table 3.11.2-6). Geoarcheological studies for the Kansas portion of the REX Project are now considered complete. The Kansas SHPO sent a letter to ARG on April 17, 2007, that accepted both the level of effort and findings of the geoarcheological report. DOS also agrees with the Section 106 findings of FERC and the SHPO for all aspects of the above REX West surveys, where they overlap with the Keystone Project.

Keystone has abandoned portions of the originally proposed REX West route due to landowner concerns, the presence of wetland or biological concerns, or for cultural resources that are potential historic properties. Table 3.11.1-6 displays the cultural resources survey status of the currently designed pipeline route. It excludes proposed routes that were surveyed for cultural resources but subsequently removed from the APE through abandonment by Keystone (and to avoid confusion from duplicated, changed, and overlapping mileposts). Access to all of the planned survey area was granted to ARG; therefore, the cultural resources inventory of the proposed 30-inch-diameter Keystone pipeline in Kansas is complete, barring any future route deviations. Cultural resources surveys for Project access roads, additional temporary workspace outside of the surveyed corridor, pipeline reroutes, and appurtenant facilities may still occur. If so, further survey reports must be submitted and reviewed by the consulting parties prior to land-altering activities occurring within these areas, as outlined in the PA.

Cushing Extension

The Cushing Extension lateral pipeline would enter Kansas from Jefferson County, Nebraska and would extend through the state for approximately 210.36 miles. The counties crossed include Washington, Clay, Dickinson, Marion, Butler, and Cowley. Geo-Marine, Inc. and ARG were the companies contracted by Keystone to perform the required cultural resources background investigations and assessments within the state. Prior to commencing fieldwork, in March 2006, ARG submitted a research design to the SHPO that included a records review and plan to conduct field surveys for the Cushing Extension pipeline route in Kansas. The purpose of the research design was to present the field methods to be used to assess the Cushing Extension pipeline and to identify historic properties within the APE. It was based on the results of the site file research and results of previous surveys. The design incorporated a sampling strategy that assessed the route in terms of high and low probabilities for containing Section 106-defined historic properties (excluding TCPs); this strategy follows procedures generally accepted by the SHPO and FERC for pipeline projects in Kansas. The submitted research design used the preliminary pipeline route as its basis; subsequent alterations to the route did not require submission of a new research design but involved implementation of the general procedures outlined in the research design. This process also is considered acceptable by the SHPO, FERC, and DOS. The procedures used to identify TCPs and historic properties of cultural or religious importance to Indian tribes is outlined in the discussion of the consultation process (see Section 3.11.4).

TABLE 3.11.1-6
Cultural Resources Survey Status of the Keystone Mainline Project in Kansas as of November 2007 (Excluding Abandoned Routes)

State	County	Milepost From	Milepost To	Status	Miles
Kansas	Marshall	652.26	681.19	Not required (REX Project corridor)	28.93
Kansas	Nemaha	681.19	686.93	Not required (REX Project corridor)	5.74
Kansas	Nemaha	686.93	687.59	Survey completed	0.65
Kansas	Nemaha	687.59	691.05	Not required (REX Project corridor)	3.46
Kansas	Nemaha	691.05	692.02	Survey completed	0.97
Kansas	Nemaha	692.02	696.08	Not required (REX Project corridor)	4.06
Kansas	Nemaha	696.08	696.26	Survey completed	0.19
Kansas	Nemaha	696.26	706.02	Not required (REX Project corridor)	9.76
Kansas	Brown	706.02	715.20	Not required (REX Project corridor)	9.18
Kansas	Brown	715.20	715.71	Survey completed	0.51
Kansas	Brown	715.71	716.73	Not required (REX Project corridor)	1.02
Kansas	Brown	716.73	717.24	Survey completed	0.51
Kansas	Brown	717.24	722.41	Not required (REX Project corridor)	5.17
Kansas	Brown	722.41	723.48	Survey completed	1.07
Kansas	Brown	723.48	724.41	Not required (REX Project corridor)	0.93
Kansas	Brown	724.41	725.41	Survey completed	0.99
Kansas	Brown	725.41	725.53	Not required (REX Project corridor)	0.12
Kansas	Brown	725.53	725.70	Survey completed	0.17
Kansas	Brown	725.70	727.00	Not required (REX Project corridor)	1.30
Kansas	Brown	727.00	727.93	Survey completed	0.93
Kansas	Brown	727.93	730.58	Not required (REX Project corridor)	2.65
Kansas	Doniphan	730.58	740.06	Not required (REX Project corridor)	9.48
Kansas	Doniphan	740.06	740.63	Survey completed	0.57
Kansas	Doniphan	740.63	750.92	Not required (REX Project corridor)	10.29
Total miles surveyed for Keystone Project					**6.57**
Miles within REX Project area					**92.10**
Total miles still required to survey					**0.00**

The SHPO responded in a letter dated March 17, 2006, agreeing with the essential components of the plan but requested several clarifications and alterations to the sampling strategy. Keystone subsequently retained Geo-Marine, which filed with the Kansas SHPO a revised research plan for the Cushing Extension in December 2006. The Geo-Marine research plan included a record review of previously identified cultural resources and surveys. The records used online cultural site and survey data that were housed at the Kansas State Historical Society. The information was reviewed in relation to a corridor that extended for the length of the proposed pipeline route and was 2 miles wide, centered on the proposed centerline.

The records search identified 129 cultural resources within this zone, including 104 Pre-contact sites, three Historic period sites, six sites with both Historic period and Pre-contact cultural components, and 16 sites for which temporal information was unavailable. The data indicated that eight known cultural resources may lie within the projected Cushing Extension APE. Seven of these sites were listed as being of Pre-contact age (14BU337, 14BU1304, 14CO414, 14CY407, 14MN358, 14MN359, and 14WH318), and one site (14BU383) included both Historic period and Pre-contact assemblages. None of these eight sites had been assessed previously for their potential eligibility for listing in the NRHP. The research design also noted that five listed NRHP properties are located within 1 mile of the proposed Project. They include two Historic period bridges; a frame farm house; a Historic period lodge dating to the early 1900s; and the Marion Archeological District, which comprises 26 archaeological sites that mainly date 300 – 500 years ago and are associated with the Great Bend Aspect cultural period.

The Geo-Marine research design proposed a cultural resources field survey along 40 pipeline segments that total 104.5 miles of the proposed lateral route, using a 300-foot-wide survey corridor. The sampling strategy used to select the survey segments focused on landform types that were derived from the known site database and the results of previous surveys. A pedestrian survey using transects spaced no more than 49.2 feet (15 meters) apart generally was to be used at landforms with greater than 40-percent surface visibility. The field methods specified the use of 13.8-inch- (35-centimeter-) diameter shovel tests spaced 98.4 feet (30 meters) apart at survey locations where surface visibility decreased below the 40-percent threshold and at locations based on the judgment of the field director. The research design further proposed geomorphological testing at 59 locations where deeply buried cultural deposits were considered possible. This research design, developed in part through discussions with the Kansas SHPO, was accepted by the SHPO in a letter dated January 9, 2007.

Geo-Marine initiated cultural resource field studies within the Cushing Extension corridor in January 2007. In February, ARG replaced Geo-Marine as the cultural resources contractor and completed the field investigation. ARG contacted the SHPO to discuss the change and revised the research design to increase the level of survey by 5.1 miles, to an approximate total of 109.6 miles of the proposed lateral route. These survey areas were primarily added because of the presence of Historic period trails.

ARG provided an initial technical report stating that .85 miles of the proposed Cushing Extension pipeline was surveyed for cultural resources between January and March 2007 (Aberle et al. 2007). Additional cultural resources surveys, conducted from March to August 2007, were reported by ARG in a status letter dated August 23, 2007. They included 11.57 miles of additional pipeline route, 5 acres associated with a proposed pump station location, and 12 access roads. Geomorphological testing was also reported by Anderson (2007) for 60 locations. Of these, 21 were assessed as requiring additional research and 11 were not completed due to a landowner denying access to the properties. The Cushing Extension also crosses approximately 3.6 miles of federally owned land.

Table 3.11.1-7 displays the cultural resources survey status of the currently designed Cushing Extension route in Kansas. It excludes proposed routes that were surveyed for cultural resources but subsequently removed from the APE through abandonment by the applicant (and to avoid confusion from duplicated, changed, and overlapping mileposts). Access was denied to ARG along 23.95 miles of the planned survey areas; therefore, the cultural resources inventory of the proposed Cushing Extension pipeline is incomplete at this time. Geoarchaeological testing and cultural resources surveys for Project access roads, additional temporary workspace outside the surveyed corridor, pipeline reroutes, and appurtenant facilities are ongoing. Further survey reports must be submitted and reviewed by the consulting parties prior to land-altering activities occurring within these areas, as outlined in the PA.

TABLE 3.11.1-7 Cultural Resources Survey Status of the Keystone Cushing Extension in Kansas as of November 2007 (Excluding Abandoned Routes)					
		Milepost			
State	County	From	To	Status	Miles
Kansas	Washington	2.51	5.04	Survey completed	2.53
Kansas	Washington	5.04	6.55	Not selected for survey in sampling strategy	1.51
Kansas	Washington	6.55	7.19	Survey completed	0.64
Kansas	Washington	7.19	8.00	Not selected for survey in sampling strategy	0.81
Kansas	Washington	8.00	9.10	Survey completed	1.10
Kansas	Washington	9.10	9.74	Required – no access	0.64
Kansas	Washington	9.74	15.45	Survey completed	5.71
Kansas	Washington	15.45	15.68	Not selected for survey in sampling strategy	0.22
Kansas	Washington	15.68	16.18	Survey completed	0.51
Kansas	Washington	16.18	17.14	Not selected for survey in sampling strategy	0.96
Kansas	Washington	17.14	18.16	Survey completed	1.01
Kansas	Washington	18.16	19.66	Not selected for survey in sampling strategy	1.51
Kansas	Washington	19.66	20.67	Survey completed	1.01
Kansas	Washington	20.67	21.17	Not selected for survey in sampling strategy	0.50
Kansas	Washington	21.17	23.06	Survey completed	1.89
Kansas	Washington	23.06	23.68	Not selected for survey in sampling strategy	0.62
Kansas	Washington	23.68	24.49	Survey completed	0.81
Kansas	Washington	24.49	25.78	Not selected for survey in sampling strategy	1.29
Kansas	Washington	25.78	26.41	Survey completed	0.63
Kansas	Washington	26.41	28.57	Not selected for survey in sampling strategy	2.16
Kansas	Washington	28.57	30.10	Survey completed	1.53
Kansas	Washington	30.10	32.80	Not selected for survey in sampling strategy	2.70
Kansas	Clay	32.80	34.05	Survey completed	1.25
Kansas	Clay	34.05	34.26	Not selected for survey in sampling strategy	0.22
Kansas	Clay	34.26	35.84	Survey completed	1.57
Kansas	Clay	35.84	36.13	Not selected for survey in sampling strategy	0.29
Kansas	Clay	36.13	37.75	Survey completed	1.62
Kansas	Clay	37.75	38.66	Not selected for survey in sampling strategy	0.91
Kansas	Clay	38.66	38.92	Survey completed	0.25
Kansas	Clay	38.92	40.65	Not selected for survey in sampling strategy	1.73
Kansas	Clay	40.65	41.34	Survey completed	0.69
Kansas	Clay	41.34	42.83	Not selected for survey in sampling strategy	1.49
Kansas	Clay	42.83	43.83	Required – no access	1.00
Kansas	Clay	43.83	44.67	Survey completed	0.84
Kansas	Clay	44.67	49.39	Not selected for survey in sampling strategy	4.72
Kansas	Clay	49.39	50.05	Survey completed	0.66
Kansas	Clay	50.05	50.60	Required – no access	0.55
Kansas	Clay	50.60	51.58	Not selected for survey in sampling strategy	0.97
Kansas	Clay	51.58	51.91	Required – no access	0.33
Kansas	Clay	51.91	52.16	Survey completed	0.25
Kansas	Clay	52.16	52.56	Required – no access	0.40
Kansas	Clay	52.56	53.37	Survey completed	0.81
Kansas	Clay	53.37	53.44	Required – no access	0.07
Kansas	Clay	53.44	53.61	Survey completed	0.17
Kansas	Clay	53.61	54.71	Required – no access	1.10
Kansas	Clay	54.71	55.47	Survey completed	0.76

TABLE 3.11.1-7 (Continued)					
		Milepost			
State	County	From	To	Status	Miles
Kansas	Clay	55.47	58.48	Survey completed	3.01
Kansas	Clay	58.48	59.90	Not selected for survey in sampling strategy	1.42
Kansas	Clay	59.90	60.47	Survey completed	0.58
Kansas	Clay	60.47	60.62	Not selected for survey in sampling strategy	0.15
Kansas	Clay	60.62	61.27	Survey completed	0.65
Kansas	Clay	61.27	61.99	Not selected for survey in sampling strategy	0.72
Kansas	Dickinson	61.99	62.50	Survey completed	0.51
Kansas	Dickinson	62.50	65.89	Not selected for survey in sampling strategy	3.39
Kansas	Dickinson	65.89	66.10	Survey completed	0.21
Kansas	Dickinson	66.10	68.02	Not selected for survey in sampling strategy	1.93
Kansas	Dickinson	68.02	68.28	Survey completed	0.25
Kansas	Dickinson	68.28	68.79	Required – no access	0.51
Kansas	Dickinson	68.79	72.03	Survey completed	3.25
Kansas	Dickinson	72.03	72.56	Required – no access	0.52
Kansas	Dickinson	72.56	73.90	Not selected for survey in sampling strategy	1.35
Kansas	Dickinson	73.90	76.15	Survey completed	2.24
Kansas	Dickinson	76.15	76.68	Required – no access	0.53
Kansas	Dickinson	76.68	77.47	Survey completed	0.79
Kansas	Dickinson	77.47	79.21	Not selected for survey in sampling strategy	1.74
Kansas	Dickinson	79.21	80.81	Survey completed	1.60
Kansas	Dickinson	80.81	83.29	Not selected for survey in sampling strategy	2.49
Kansas	Dickinson	83.29	83.93	Survey completed	0.64
Kansas	Dickinson	83.93	84.82	Not selected for survey in sampling strategy	0.89
Kansas	Dickinson	84.82	85.59	Survey completed	0.77
Kansas	Dickinson	85.59	85.99	Not selected for survey in sampling strategy	0.39
Kansas	Dickinson	85.99	86.32	Required – no access	0.33
Kansas	Dickinson	86.32	88.39	Survey completed	2.07
Kansas	Dickinson	88.39	90.80	Not selected for survey in sampling strategy	2.41
Kansas	Dickinson	90.80	92.66	Survey completed	1.86
Kansas	Dickinson	92.66	93.51	Not selected for survey in sampling strategy	0.85
Kansas	Dickinson	93.51	94.00	Required – no access	0.49
Kansas	Dickinson	94.00	94.79	Survey completed	0.79
Kansas	Dickinson	94.79	95.00	Not selected for survey in sampling strategy	0.21
Kansas	Dickinson	95.00	95.51	Survey completed	0.51
Kansas	Dickinson	95.51	96.42	Not selected for survey in sampling strategy	0.91
Kansas	Dickinson	96.42	97.51	Survey completed	1.09
Kansas	Dickinson	97.51	98.23	Not selected for survey in sampling strategy	0.72
Kansas	Dickinson	98.23	98.53	Required – no access	0.30
Kansas	Dickinson	98.53	99.42	Survey completed	0.89
Kansas	Marion	99.42	99.83	Not selected for survey in sampling strategy	0.41
Kansas	Marion	99.83	100.52	Survey completed	0.69
Kansas	Marion	100.52	101.25	Not selected for survey in sampling strategy	0.72
Kansas	Marion	101.25	102.15	Survey completed	0.90
Kansas	Marion	102.15	102.53	Not selected for survey in sampling strategy	0.39
Kansas	Marion	102.53	103.78	Survey completed	1.25
Kansas	Marion	103.78	106.03	Not selected for survey in sampling strategy	2.25

TABLE 3.11.1-7 (Continued)					
		Milepost			
State	County	From	To	Status	Miles
Kansas	Marion	106.03	106.78	Survey completed	0.75
Kansas	Marion	106.78	108.03	Not selected for survey in sampling strategy	1.24
Kansas	Marion	108.03	109.04	Survey completed	1.01
Kansas	Marion	109.04	109.28	Required – no access	0.24
Kansas	Marion	109.28	111.29	Not selected for survey in sampling strategy	2.01
Kansas	Marion	111.29	112.23	Survey completed	0.94
Kansas	Marion	112.23	113.74	Required – no access	1.51
Kansas	Marion	113.74	114.84	Survey completed	1.10
Kansas	Marion	114.84	115.10	Required – no access	0.26
Kansas	Marion	115.10	116.06	Survey completed	0.97
Kansas	Marion	116.06	116.60	Required – no access	0.53
Kansas	Marion	116.60	117.00	Survey completed	0.40
Kansas	Marion	117.00	118.10	Required – no access	1.10
Kansas	Marion	118.10	119.59	Survey completed	1.49
Kansas	Marion	119.59	120.59	Not selected for survey in sampling strategy	1.00
Kansas	Marion	120.59	121.36	Survey completed	0.78
Kansas	Marion	121.36	123.10	Not selected for survey in sampling strategy	1.73
Kansas	Marion	123.10	124.73	Survey completed	1.63
Kansas	Marion	124.73	127.23	Not selected for survey in sampling strategy	2.50
Kansas	Marion	127.23	130.90	Survey completed	3.66
Kansas	Marion	130.90	132.79	Not selected for survey in sampling strategy	1.90
Kansas	Marion	132.79	133.78	Survey completed	0.98
Kansas	Marion	133.78	134.06	Not selected for survey in sampling strategy	0.28
Kansas	Marion	134.06	134.87	Survey completed	0.81
Kansas	Marion	134.87	135.70	Not selected for survey in sampling strategy	0.83
Kansas	Marion	135.70	136.88	Survey completed	1.18
Kansas	Butler	136.88	137.39	Required – no access	0.52
Kansas	Butler	137.39	137.78	Survey completed	0.38
Kansas	Butler	137.78	139.18	Not selected for survey in sampling strategy	1.41
Kansas	Butler	139.18	141.92	Survey completed	2.73
Kansas	Butler	141.92	142.90	Required – no access	0.98
Kansas	Butler	142.90	143.16	Survey completed	0.26
Kansas	Butler	143.16	144.57	Not selected for survey in sampling strategy	1.41
Kansas	Butler	144.57	145.44	Survey completed	0.87
Kansas	Butler	145.44	146.94	Not selected for survey in sampling strategy	1.50
Kansas	Butler	146.94	147.44	Survey completed	0.50
Kansas	Butler	147.44	148.45	Not selected for survey in sampling strategy	1.01
Kansas	Butler	148.45	149.39	Survey completed	0.94
Kansas	Butler	149.39	150.64	Not selected for survey in sampling strategy	1.26
Kansas	Butler	150.64	151.50	Survey completed	0.86
Kansas	Butler	151.50	153.00	Not selected for survey in sampling strategy	1.50
Kansas	Butler	153.00	155.91	Survey completed	2.91
Kansas	Butler	155.91	156.35	Required – no access	0.44
Kansas	Butler	156.35	158.14	Survey completed	1.79
Kansas	Butler	158.14	158.36	Required – no access	0.22
Kansas	Butler	158.36	159.41	Survey completed	1.05
Kansas	Butler	159.41	159.92	Required – no access	0.51

TABLE 3.11.1-7 (Continued)					
		Milepost			
State	County	From	To	Status	Miles
Kansas	Butler	159.92	161.81	Survey completed	1.89
Kansas	Butler	161.81	161.87	Required – no access	0.07
Kansas	Butler	161.87	162.43	Survey completed	0.56
Kansas	Butler	162.43	163.69	Required – no access	1.26
Kansas	Butler	163.69	164.39	Survey completed	0.70
Kansas	Butler	164.39	165.48	Not selected for survey in sampling strategy	1.09
Kansas	Butler	165.48	165.91	Survey completed	0.44
Kansas	Butler	165.91	167.88	Not selected for survey in sampling strategy	1.96
Kansas	Butler	167.88	168.08	Survey completed	0.20
Kansas	Butler	168.08	168.71	Required – no access	0.64
Kansas	Butler	168.71	174.08	Not selected for survey in sampling strategy	5.37
Kansas	Butler	174.08	176.60	Survey completed	2.51
Kansas	Butler	176.60	178.61	Not selected for survey in sampling strategy	2.01
Kansas	Cowley	178.61	179.35	Not selected for survey in sampling strategy	0.74
Kansas	Cowley	179.35	179.71	Survey completed	0.36
Kansas	Cowley	179.71	180.75	Not selected for survey in sampling strategy	1.04
Kansas	Cowley	180.75	181.41	Required – no access	0.67
Kansas	Cowley	181.41	184.53	Not selected for survey in sampling strategy	3.11
Kansas	Cowley	184.53	185.01	Survey completed	0.49
Kansas	Cowley	185.01	186.03	Required – no access	1.02
Kansas	Cowley	186.03	186.37	Survey completed	0.34
Kansas	Cowley	186.37	186.67	Required – no access	0.30
Kansas	Cowley	186.67	187.55	Survey completed	0.87
Kansas	Cowley	187.55	188.05	Required – no access	0.51
Kansas	Cowley	188.05	188.57	Survey completed	0.52
Kansas	Cowley	188.57	190.57	Required – no access	2.01
Kansas	Cowley	190.57	191.58	Survey completed	1.01
Kansas	Cowley	191.58	192.22	Required – no access	0.64
Kansas	Cowley	192.22	192.61	Not selected for survey in sampling strategy	0.39
Kansas	Cowley	192.61	193.03	Survey completed	0.41
Kansas	Cowley	193.03	197.61	Not selected for survey in sampling strategy	4.58
Kansas	Cowley	197.61	198.60	Survey completed	0.99
Kansas	Cowley	198.60	204.54	Not selected for survey in sampling strategy	5.94
Kansas	Cowley	204.54	207.01	Required – no access	2.47
Kansas	Cowley	207.01	207.95	Not selected for survey in sampling strategy	0.95
Kansas	Cowley	207.95	208.41	Survey completed	0.46
Kansas	Cowley	208.41	209.39	Required – no access	0.98
Kansas	Cowley	209.39	211.20	Not selected for survey in sampling strategy	1.81
Kansas	Cowley	211.20	211.52	Required – no access	0.32
Kansas	Cowley	211.52	212.59	Not selected for survey in sampling strategy	1.07
Kansas	Cowley	212.59	212.87	Survey completed	0.28
Total miles surveyed					**90.80**
Miles outside sampling strategy					**95.61**
Total miles still required to survey					**23.95**

3.11.1.5 Missouri

The Keystone pipeline would enter Missouri from Doniphan County, Kansas and would extend through the state for approximately 98 miles. The counties crossed include Buchanan, Clinton, Caldwell, Carroll, Chariton, Randolph, Audrain, Montgomery, Lincoln, and St. Charles. ARG was contracted on behalf of Keystone to perform the required cultural resources field assessments in the state. Keystone also entered into an agreement with Kinder Morgan and Rockies Express Pipeline LLC to purchase the results of cultural resource studies that were conducted in 2005/2006 for the proposed REX Natural Gas Pipeline Project. Keystone submitted several REX Project reports (Myers et al. 2006b, Aberle 2007, Rieken 2007b, Myers et al. 2007, Shah Lomas 2007b) as evidence of existing survey coverage at potential Keystone Project ancillary facilities, access roads, and 173.2 miles of collocated corridor within Buchanan, Clinton, Caldwell, Carroll, Chariton, Randolph, and Audrain Counties. The potential environmental impacts of the REX pipeline were assessed as part of the evaluation of FERC Docket CP06-354-000. Portions of the following discussion are derived from the EIS that was produced during that evaluation. Both DOS and the SHPO have accepted that the surveys performed for the REX West Project adequately address Section 106 compliance requirements for the concomitant aspects of the Keystone Project.

Prior to the Keystone fieldwork commencing, ARG undertook a files search of the proposed pipeline route in January and February 2006. The searches collected cultural site and survey data that were housed at the Archeological Survey of Missouri. The information was reviewed in relation to a corridor that extended for the length of the proposed pipeline route and was 2 miles wide, centered on the proposed centerline. The record searches identified 72 cultural resources that generally could be associated with the Project region. These resources included 12 Historic period sites, 47 Pre-contact sites, seven sites with both Pre-contact and Historic period artifact assemblages, and three sites where the information did not provide specific information on the age of the cultural resource. The data indicated that 17 known cultural resources (23BN8, 23BN38, 23CI11, 23CH73, 23MT74, 23LN11, 23LN13, 23LN14, 23LN24, 23LN48, 23LN57, 23LN192, 23LN202, 23SC5, 23SC29, 23SC670, and 23SC776) were located within the proposed survey corridor. These cultural resources included 10 of the Pre-contact sites, three of the multi-component Historic period/Pre-contact sites, two Historic period sites, and two of the sites with unknown cultural remains. The eligibility for listing in the NRHP of all but two of these 17 cultural resources had not previously been established. Pre-contact site 23BN38 was recommended as ineligible for listing in the NRHP during a 1991 study; site 23LN11 was recommended as being potentially eligible for listing in the NRHP based on information collected during the 1930s, 1950s, and in 1996 (Titus 2006a). The review of archival records identified 169 potential Historic period structures and features within or in proximity to the Project corridor. These included 155 residential structures, six schools, three cemeteries, two railroad stations, one church, one barn, and one post office (Titus 2006a).

Along with the literature review, ARG submitted its research design for cultural resources field studies to the Missouri SHPO in March 2006 (Titus 2006a). The purpose of the research design was to present the field methods ARG would use to assess the Keystone pipeline and to identify historic properties within the APE, excluding TCPs. It was based on the results of the site file research and results of previous surveys. The design incorporated a sampling strategy that assessed the route in terms of high and low probabilities for containing Section 106-defined historic properties (excluding TCPs); this sampling strategy follows procedures generally accepted by the SHPO and FERC for pipeline projects in Missouri and is permissible under 36 CFR 800.4(b)(1). The submitted research design used the preliminary pipeline route as its basis; subsequent alterations to the route did not require submission of a new research design but involved implementation of the general procedures outlined in the research design. This process also is considered acceptable by the SHPO, FERC, and DOS. The procedures used to identify TCPs and historic properties of cultural or religious importance to Indian tribes is outlined in the discussion of the consultation process (see Section 3.11.4).

The Keystone research design proposed a cultural resources field survey for 153.8 miles of the proposed pipeline corridor; the research design was accepted by the Missouri SHPO in a letter dated March 15, 2006. Keystone subsequently decided to submit the REX Project field survey results for the 173.2 miles of collocated ROW in Missouri. Consequently, the number of miles selected for a cultural resources survey as part of the Keystone Project was reduced to 78.0 miles. The sampling strategy used to select the survey segments focused on landform types that were derived from the known site database and the results of previous surveys. The pedestrian survey was to use survey transects spaced 49.2 to 65.6 feet (15 to 20 meters) apart. Shovel tests were to be used on un-eroded landforms with slopes under 20 percent and where surface visibility was less than 25 percent. These shovel tests would be spaced 49.2 feet (15 meters) apart, with a diameter of 11.8 to 15.7 inches (30 to 40 centimeters), and would be excavated to 19.7 inches (50 centimeters) below ground surface. The SHPO accepted the proposed research plan in a letter dated March 15, 2006.

ARG conducted the initial set of cultural resource and geomorphological field surveys from spring 2006 to August 2007; the areas surveyed did not include the collocated REX West pipeline (discussed separately below) but did encompass route deviations from the REX line (Myers et al. 2007). ARG examined a 200-foot-wide survey corridor when the proposed pipeline was collocated with an existing ROW and a 300-foot-wide corridor at areas of new construction. A special 550-foot-wide corridor was used for a 1.4-mile-long segment that terminated at the Mississippi River. In total, ARG reported that 103.57 miles of the Keystone Project corridor, including route design changes, was surveyed for cultural resources and that 39.4 acres of additional land was surveyed for three potential pump station facilities. Keystone also filed a letter report with DOS and COE in August that reported cultural resources surveys conducted at Confluence Point State Park in St. Charles County, an area managed by COE (Titus 2007a). These surveys involved pedestrian survey at 5-meter intervals within areas where ground visibility exceeded 25 percent and shovel tests excavated at 15-meter intervals in lands with poor surface exposures. The survey corridor was 300 feet wide in greenfield environments and 200 feet wide where the corridor was collocated with an existing pipeline corridor. The total length of the corridor examined on COE-regulated lands was 1.43 miles.

Keystone has abandoned portions of the originally proposed route due to landowner concerns, the presence of wetland or biological concerns, or for cultural resources that are potential historic properties. Table 3.11.1-8 displays the cultural resources survey status of the currently designed pipeline route. It excludes proposed routes that were surveyed for cultural resources but subsequently removed from the APE through abandonment by Keystone (and to avoid confusion from duplicated, changed, and overlapping mileposts). Access to 19.48 miles of the planned survey area was denied to ARG; therefore, the cultural resources inventory of the proposed 30-inch-diameter Keystone pipeline is incomplete at this time. Geomorphological testing at 16 locations also was performed during this period; nine of these locations were recommended for additional research, and one could not be examined due to a landowner denying survey permission (Myers et al. 2007a). Cultural resources surveys and geomorphological studies for Project access roads, additional temporary workspace outside of the surveyed corridor, pipeline reroutes, and appurtenant facilities are therefore ongoing. Further survey reports must be submitted and reviewed by the consulting parties prior to land-altering activities occurring within these areas, as outlined in the PA.

TABLE 3.11.1-8 Cultural Resources Survey Status of the Keystone Mainline Project in Missouri as of November 2007 (Excluding Abandoned Routes)					
State	County	Milepost From	Milepost To	Status	Miles
Missouri	Buchanan	750.92	751.19	Not required (REX Project corridor)	0.27
Missouri	Buchanan	751.19	753.07	Survey completed	1.88
Missouri	Buchanan	753.07	756.94	Not required (REX Project corridor)	3.87
Missouri	Buchanan	756.94	758.43	Survey completed	1.49
Missouri	Buchanan	758.43	770.30	Not required (REX Project corridor)	11.87
Missouri	Buchanan	770.30	771.30	Survey completed	0.99
Missouri	Clinton	771.30	783.94	Not required (REX Project corridor)	12.65
Missouri	Clinton	783.94	784.65	Survey completed	0.70
Missouri	Clinton	784.65	787.38	Not required (REX Project corridor)	2.73
Missouri	Clinton	787.38	787.70	Survey completed	0.32
Missouri	Clinton	787.70	787.98	Not required (REX Project corridor)	0.28
Missouri	Clinton	787.98	789.33	Survey completed	1.35
Missouri	Clinton	789.33	791.76	Not required (REX Project corridor)	2.43
Missouri	Clinton	791.76	792.02	Survey completed	0.26
Missouri	Clinton	792.02	792.87	Not required (REX Project corridor)	0.85
Missouri	Caldwell	792.87	799.82	Not required (REX Project corridor)	6.95
Missouri	Caldwell	799.82	800.27	Survey completed	0.45
Missouri	Caldwell	800.27	815.50	Not required (REX Project corridor)	15.24
Missouri	Caldwell	815.50	815.82	Survey completed	0.32
Missouri	Caldwell	815.82	816.07	Not required (REX Project corridor)	0.25
Missouri	Caldwell	816.07	816.20	Survey completed	0.13
Missouri	Caldwell	816.20	817.18	Not required (REX Project corridor)	0.98
Missouri	Carroll	817.18	821.51	Not required (REX Project corridor)	4.33
Missouri	Carroll	821.51	821.70	Survey completed	0.19
Missouri	Carroll	821.70	830.37	Not required (REX Project corridor)	8.66
Missouri	Carroll	830.37	830.54	Survey completed	0.17
Missouri	Carroll	830.54	830.92	Not required (REX Project corridor)	0.38
Missouri	Carroll	830.92	831.06	Survey completed	0.14
Missouri	Carroll	831.06	833.47	Not required (REX Project corridor)	2.41
Missouri	Carroll	833.47	833.66	Survey completed	0.20
Missouri	Carroll	833.66	843.43	Not required (REX Project corridor)	9.77
Missouri	Chariton	843.43	850.92	Not required (REX Project corridor)	7.49
Missouri	Chariton	850.92	852.37	Survey completed	1.45
Missouri	Chariton	852.37	855.87	Not required (REX Project corridor)	3.51
Missouri	Chariton	855.87	856.09	Survey completed	0.22
Missouri	Chariton	856.09	867.22	Not required (REX Project corridor)	11.13
Missouri	Chariton	867.22	867.87	Survey completed	0.65
Missouri	Chariton	867.87	869.23	Not required (REX Project corridor)	1.36
Missouri	Chariton	869.23	869.70	Survey completed	0.46
Missouri	Chariton	869.70	869.99	Not required (REX Project corridor)	0.29
Missouri	Chariton	869.99	870.47	Survey completed	0.48
Missouri	Chariton	870.47	875.45	Not required (REX Project corridor)	4.98
Missouri	Randolph	875.45	883.61	Not required (REX Project corridor)	8.16
Missouri	Randolph	883.61	883.88	Survey completed	0.27
Missouri	Randolph	883.88	896.86	Not required (REX Project corridor)	12.98
Missouri	Randolph	896.86	897.39	Survey completed	0.53
Missouri	Audrain	897.39	898.39	Survey completed	1.00

TABLE 3.11.1-8 (Continued)					
State	County	Milepost		Status	Miles
		From	To		
Missouri	Audrain	898.39	911.78	Not required (REX Project corridor)	13.39
Missouri	Audrain	911.78	912.04	Survey completed	0.26
Missouri	Audrain	912.04	918.96	Not required (REX Project corridor)	6.91
Missouri	Audrain	918.96	919.36	Survey completed	0.40
Missouri	Audrain	919.36	921.00	Not required (REX Project corridor)	1.65
Missouri	Audrain	921.00	921.60	Survey completed	0.60
Missouri	Audrain	921.60	924.63	Not selected for survey in sampling strategy	3.04
Missouri	Audrain	924.63	925.87	Survey completed	1.24
Missouri	Audrain	925.87	926.31	Not selected for survey in sampling strategy	0.44
Missouri	Audrain	926.31	926.63	Survey completed	0.32
Missouri	Audrain	926.63	928.50	Not selected for survey in sampling strategy	1.87
Missouri	Audrain	928.50	929.57	Survey completed	1.07
Missouri	Audrain	929.57	931.38	Not selected for survey in sampling strategy	1.81
Missouri	Audrain	931.38	932.23	Survey completed	0.84
Missouri	Audrain	932.23	935.95	Not selected for survey in sampling strategy	3.72
Missouri	Montgomery	935.95	940.18	Not selected for survey in sampling strategy	4.23
Missouri	Montgomery	940.18	941.21	Survey completed	1.03
Missouri	Montgomery	941.21	941.90	Not selected for survey in sampling strategy	0.69
Missouri	Montgomery	941.90	943.72	Survey completed	1.81
Missouri	Montgomery	943.72	946.71	Not selected for survey in sampling strategy	2.99
Missouri	Montgomery	946.71	948.04	Survey completed	1.33
Missouri	Montgomery	948.04	950.00	Not selected for survey in sampling strategy	1.96
Missouri	Montgomery	950.00	950.18	Survey completed	0.18
Missouri	Montgomery	950.18	950.73	Not selected for survey in sampling strategy	0.55
Missouri	Montgomery	950.73	952.55	Survey completed	1.82
Missouri	Montgomery	952.55	952.75	Not selected for survey in sampling strategy	0.20
Missouri	Montgomery	952.75	953.06	Survey completed	0.31
Missouri	Montgomery	953.06	953.80	Not selected for survey in sampling strategy	0.75
Missouri	Montgomery	953.80	954.64	Survey completed	0.84
Missouri	Montgomery	954.64	955.26	Not selected for survey in sampling strategy	0.61
Missouri	Montgomery	955.26	955.92	Survey completed	0.67
Missouri	Montgomery	955.92	956.28	Not selected for survey in sampling strategy	0.35
Missouri	Montgomery	956.28	956.73	Required – no access	0.45
Missouri	Montgomery	956.73	957.00	Survey completed	0.27
Missouri	Lincoln	957.00	959.86	Required – no access	2.86
Missouri	Lincoln	959.86	962.19	Survey completed	2.33
Missouri	Lincoln	962.19	962.24	Required – no access	0.05
Missouri	Lincoln	962.24	962.64	Survey completed	0.40
Missouri	Lincoln	962.64	962.70	Required – no access	0.06
Missouri	Lincoln	962.70	964.20	Survey completed	1.51
Missouri	Lincoln	964.20	964.49	Required – no access	0.29
Missouri	Lincoln	964.49	964.62	Survey completed	0.13
Missouri	Lincoln	964.62	964.74	Required – no access	0.12
Missouri	Lincoln	964.74	965.05	Survey completed	0.31
Missouri	Lincoln	965.05	965.46	Required – no access	0.41
Missouri	Lincoln	965.46	970.85	Survey completed	5.38
Missouri	Lincoln	970.85	971.02	Required – no access	0.17
Missouri	Lincoln	971.02	974.25	Survey completed	3.23
Missouri	Lincoln	974.25	975.91	Required – no access	1.66
Missouri	Lincoln	975.91	979.90	Survey completed	4.00

TABLE 3.11.1-8 (Continued)					
State	County	Milepost		Status	Miles
		From	To		
Missouri	Lincoln	979.90	980.97	Required – no access	1.07
Missouri	Lincoln	980.98	981.61	Survey completed	0.64
Missouri	Lincoln	981.61	982.30	Required – no access	0.69
Missouri	Lincoln	982.30	982.51	Survey completed	0.21
Missouri	Lincoln	982.51	984.87	Required – no access	2.36
Missouri	Lincoln	984.87	985.65	Survey completed	0.78
Missouri	St. Charles	985.65	986.59	Survey completed	0.94
Missouri	St. Charles	986.59	987.14	Required – no access	0.55
Missouri	St. Charles	987.14	1000.71	Survey completed	13.57
Missouri	St. Charles	1000.71	1001.69	Required – no access	0.97
Missouri	St. Charles	1001.69	1002.65	Survey completed	0.96
Missouri	St. Charles	1002.65	1002.91	Required – no access	0.26
Missouri	St. Charles	1002.91	1003.98	Survey completed	1.08
Missouri	St. Charles	1003.98	1004.47	Required – no access	0.49
Missouri	St. Charles	1004.47	1005.20	Survey completed	0.74
Missouri	St. Charles	1005.20	1005.27	Required – no access	0.07
Missouri	St. Charles	1005.27	1007.11	Survey completed	1.84
Missouri	St. Charles	1007.11	1007.30	Required – no access	0.19
Missouri	St. Charles	1007.30	1015.60	Survey completed	8.30
Missouri	St. Charles	1015.60	1015.85	Required – no access	0.25
Missouri	St. Charles	1015.85	1018.16	Survey completed	2.31
Missouri	St. Charles	1018.16	1024.68	Required – no access	6.52
Missouri	St. Charles	1024.68	1024.90	Not required – open water	0.22
Miles within REX Project area					**155.99**
Total miles surveyed for keystone project					**75.28**
Miles outside keystone project sampling strategy					**23.22**
Total miles still required to survey					**19.48**

Keystone submitted a separate report (Myers et al. 2006b) that documents existing cultural resources survey coverage where the Keystone pipeline would be collocated with the proposed REX pipeline corridor (Table 3.11.1-7). The Keystone pipeline lies parallel to the REX pipeline between MP 748.3 and 921.5 in Buchanan, Clinton, Caldwell, Carroll, Chariton, Randolph, and Audrain Counties. A research design for the Missouri segment of the REX Project was submitted to the SHPO by ARG in November 2005. The research design presented in the submitted report (Myers et al. 2006) states that the pipeline corridor was examined through a combination of shovel testing and pedestrian survey, identical to the methodology used for the Keystone survey. Approximately 71 miles of the 175.6 miles of ROW situated in Missouri was expected to be inventoried for cultural resource concerns. The research design also proposed geomorphological testing at 37 locations where deeply buried cultural deposits were considered possible. The Missouri SHPO accepted the proposed testing strategy in a letter dated December 6, 2005.

ARG surveyed a 200-foot-wide corridor for the REX Project (Myers et al. 2006b), that investigated 71.8 miles of the ROW at 92 separate segments along the proposed route in Buchanan, Clinton, Caldwell, Carroll, Chariton, Randolph, and Audrain Counties. Seven additional miles at 19 properties that had been selected for field assessment were not surveyed because land access was denied by the owners (see Table 3.11.1-7). ARG also examined 37 additional temporary extra workspaces that lay outside the 200-foot-wide survey corridor (Myers et al. 2006b). Two separate REX Project supplemental reports have been filed that detail the cultural resources surveys conducted at 7.1 miles of lands where survey permission had previously been denied, six pipeline reroutes, 26 access roads, and over 50 additional temporary workspaces (Rieken 2007b; Shah Lomas 2007b). A total of 12 archeological sites were identified during these studies, which are addressed in Section 3.11.2 and in Table 3.11.2-7. SHPO letters agreeing with the survey methodologies were received by ARG on May 30 and June 15, 2007.

Several ancillary facilities also were assessed during the REX cultural resources investigation. The submitted report (Myers et al. 2006b) states that surveys were completed at a 56-acre compressor station site (REX MP 572.7 in Clinton County) and at a 50-acre parcel surveyed for a proposed meter station (REX MP 712.7 in Audrain County). No cultural resource concerns were identified at these locations. A letter from the Missouri SHPO that concurred with the level of effort and findings was sent to ARG on May 31, 2006.

ARG also conducted geomorphological investigations at 38 stream-valley locations along the proposed REX corridor. Their report (Myers et al. 2006b) recommended that 18 of the examined stream crossing locations be further investigated using backhoe trenching. The results of this additional fieldwork were presented in a separate report (Anderson et al. 2007b). A total of 43 backhoe trenches ultimately were excavated and resulted in identification of three buried Pre-contact archeological sites within the Keystone APE (Sites 23AU1153, 23CH1345, and 23AU1154; see Table 3.11.2-7). Geoarcheological studies for the Missouri portion of the REX Project are now considered complete. The Missouri SHPO sent a letter to ARG on April 17, 2007, that accepted both the level of effort and findings of the geoarcheological report. DOS also agrees with the Section 106 findings of FERC and the SHPO for all aspects of the above REX West surveys, where they overlap with the Keystone Project.

3.11.1.6 Illinois

The Keystone pipeline would enter Illinois from St. Charles County, Missouri and would extend through the west-central portion of the state for approximately 56.9 miles. The counties crossed include Madison, Bond, Fayette, and Marion. ARG was contracted on behalf of Keystone to perform the required cultural resources field assessments in the state.

In January 2006, prior to the Keystone fieldwork commencing, ARG performed a records review of the proposed pipeline route. The file searches collected cultural site and survey data that were housed at the Illinois Historic Preservation Agency. The information was reviewed in relation to a corridor that extended for the length of the proposed pipeline route and was 2 miles wide, centered on its proposed centerline. These record searches identified a large number of cultural resources that generally could be associated with the project region, particularly in Madison County. The records review therefore focused on sites within one-quarter mile of the proposed Keystone centerline to develop its literature review (Titus 2006b).

The data indicated that 20 known cultural resources (11MS17, 11MS26, 11MS111, 11MS178, 11MS348, 11MS400, 11MS441, 11MS619, 11MS620, 11MS831, 11MS1143, 11MS1144, 11MS1293, 11MS1292, 11MS1600, 11MS2007, 11MS2018, 11MS2186, 11FY20, and 11FY138) were plotted within the then-proposed survey corridor. These cultural resources included 17 Pre-contact sites, one Historic period site, and two sites that were not identified as the site forms were not available. The eligibility for listing in the NRHP of 12 cultural resources had not been previously established. Four of the Pre-contact sites (11MS178, 11MS17, 11MS2018, and 11FY138) were recommended as being potentially eligible for listing, while two Pre-contact sites (11MS1292 and 11MS2007) were declared ineligible based on the results of previous surveys. The review of archival records identified 45 potential Historic period structures or buildings and features in or in close proximity to the Project corridor. These included 42 residential structures, two schools, one cemetery, and one church (Titus 2006b).

Along with the literature review, ARG submitted its research design to the Illinois SHPO in March 2006. The purpose of the research design was to present the field methods ARG would use to assess the Keystone pipeline and to identify historic properties within the APE, excluding TCPs. It used the preliminary pipeline route as its basis; subsequent alterations to the route did not require submission of a new research design but involved implementation of the general procedures outlined in the research design. This process also is considered acceptable by the SHPO, FERC, and DOS. The procedures used to identify TCPs and historic properties of cultural or religious importance to Indian tribes is outlined in the discussion of the consultation process (see Section 3.11.4).

The research design proposed a cultural resources field survey of the entire proposed pipeline, using a 200- to 300-foot-wide survey corridor. The APE would be assessed by pedestrian survey using transects spaced no more than 49.2 feet (15 meters) apart at landforms with existing land disturbance and on landforms with slopes greater than 20 percent. On landforms with less than 20-percent slope and with at least 25-percent surface visibility, the pedestrian survey transects were to be spaced 16.4 feet (5 meters) apart. Where surface visibility dropped below 25 percent, these landforms also would be subjected to 11.8- to 12.2-inch- (30- to 40-centimeter-) diameter shovel tests spaced 49.2 feet (15 meters) apart. The research design proposed geomorphological testing at 18 locations where deeply buried cultural deposits were considered possible. The Illinois SHPO accepted the proposed research plan.

In October 2007, ARG reported the results of the cultural resources surveys and geomorphological testing that have been conducted in Illinois from May 2006 to June 2007 (Myers et al. 2007b). The surveys examined a 200- to 300-foot-wide corridor. The 200-foot-wide corridor measured 40 feet toward an existing collocated pipeline and 160 feet to the side opposite the existing pipeline. The 300-foot-wide corridor was limited to greenfield sections and was 150 feet to either side of the proposed Keystone centerline. Consistent with the approved research design, the field-inspected locations were examined through pedestrian survey and shovel testing.

The Myers et al. report states that 73.28 miles of the pipeline route was surveyed for cultural resources, along with two pumping station facilities that totaled 97 acres in area. The surveyed total includes approximately 3.0 miles of lands within the Carlyle Lake Wildlife Management Area (WMA) in Fayette County, which is overseen by COE. These surveys used a 200-foot-wide survey corridor, as it was collocated with an existing pipeline. ARG submitted a separate interim report for the Carlyle Lake WMA in January 2007 (Myers 2007). COE sent a reply to ARG on March 8, 2007, that agreed with the survey effort but requested additional subsurface testing at one of the three archeological sites found within the area (Site 11FY203; see Table 3.11.2-8). Keystone conducted an additional pedestrian survey at 2-meter intervals, excavated the additional shovel tests at 10-meter intervals within the site area, and submitted an updated letter report to DOS and COE in July 2007 (Titus 2007b). Geomorphological testing at 19 locations also was performed during this period; eight of these locations were recommended for additional research (Myers et al. 2007b).

Keystone has abandoned portions of the originally proposed route due to landowner concerns, the presence of wetland or biological concerns, or for cultural resources that are potential historic properties. Table 3.11.1-9 displays the cultural resources survey status of the currently designed pipeline route. It excludes proposed routes that were surveyed for cultural resources but subsequently removed from the APE through abandonment by Keystone (and to avoid confusion from duplicated, changed, and overlapping mileposts). Access was denied to Metcalf along 6.06 miles of the planned survey areas;

TABLE 3.11.1-9
Cultural Resources Survey Status of the Keystone Mainline Project in Illinois as of November 2007 (Excluding Abandoned Routes)

State	County	Milepost		Status	Miles
		From	To		
Illinois	Madison	1024.90	1025.07	Not required – Mississippi River	0.17
Illinois	Madison	1025.07	1028.23	Survey complete	3.16
Illinois	Madison	1028.23	1028.56	Required – no access	0.33
Illinois	Madison	1028.56	1029.41	Survey complete	0.86
Illinois	Madison	1029.41	1031.54	Required – no access	2.13
Illinois	Madison	1031.54	1032.37	Required – no access	0.83
Illinois	Madison	1032.37	1034.09	Survey complete	1.72
Illinois	Madison	1034.09	1034.98	Required – no access	0.89
Illinois	Madison	1034.98	1035.86	Survey complete	0.87
Illinois	Madison	1035.86	1036.54	Required – no access	0.68
Illinois	Madison	1036.54	1036.72	Survey complete	0.18
Illinois	Madison	1036.72	1038.16	Required – no access	1.44
Illinois	Madison	1038.16	1042.29	Survey complete	4.13
Illinois	Madison	1042.29	1042.57	Required – no access	0.28
Illinois	Madison	1042.57	1047.38	Survey complete	4.81
Illinois	Madison	1047.38	1047.42	Required – no access	0.05
Illinois	Madison	1047.42	1048.76	Survey complete	1.34
Illinois	Madison	1048.76	1048.80	Required – no access	0.04
Illinois	Madison	1048.80	1049.31	Survey complete	0.51
Illinois	Madison	1049.31	1049.43	Required – no access	0.12
Illinois	Madison	1049.43	1050.07	Survey complete	0.64
Illinois	Madison	1050.07	1050.19	Required – no access	0.12
Illinois	Madison	1050.19	1053.65	Survey complete	3.46
Illinois	Bond	1053.65	1059.69	Survey complete	6.04
Illinois	Bond	1059.69	1059.76	Required – no access	0.07
Illinois	Bond	1059.76	1067.82	Survey complete	8.07
Illinois	Bond	1067.82	1068.06	Required – no access	0.24
Illinois	Bond	1068.06	1069.59	Survey complete	1.53
Illinois	Bond	1069.59	1069.85	Required – no access	0.26
Illinois	Bond	1069.85	1072.37	Survey complete	2.52
Illinois	Fayette	1072.37	1076.69	Survey complete	4.32
Illinois	Fayette	1076.69	1076.90	Required – no access	0.21
Illinois	Fayette	1076.90	1077.29	Survey complete	0.40
Illinois	Fayette	1077.29	1077.54	Required – no access	0.25
Illinois	Fayette	1077.54	1078.84	Survey complete	1.30
Illinois	Marion	1078.84	1081.69	Survey complete	2.85
Illinois	Marion	1081.69	1081.80	Required – no access	0.10
Total miles surveyed					**48.70**
Not required (open water)					**0.17**
Total miles still required to survey					**8.04**

therefore, the cultural resources inventory of the proposed 30-inch-diameter Keystone pipeline is incomplete at this time. Geoarchaeological testing and cultural resources surveys for Project access roads, additional temporary workspace outside of the surveyed corridor, pipeline reroutes, and appurtenant facilities are ongoing. Further survey reports must be submitted and reviewed by the consulting parties prior to land-altering activities occurring within these areas, as outlined in the PA.

3.11.1.7 Oklahoma (Cushing Extension)

The Cushing Extension lateral pipeline would enter Oklahoma from Cowley County, Kansas and would cross through the northern portion of the state for 83.12 miles. The counties crossed include Kay, Noble, and Payne. Geo-Marine, Inc. initially was contracted by Keystone to perform the required cultural resources assessments in the state. Prior to commencing fieldwork, in March 2006, Geo-Marine submitted a research design to the SHPO that included a records review and plan to conduct field surveys for the Cushing Extension pipeline route in Kansas.

ARG replaced Geo-Marine as the archeological contractor for the Oklahoma portion of the Cushing Extension and filed a new research design with the SHPO in February 2007. The research plan used the records review previously presented by Geo-Marine (Carrier Jones and Kuehn 2006). The records used online cultural site and survey data that were housed at the Oklahoma State Historical Preservation Office, the Oklahoma Archaeological Survey, and the online NRHP database. The information was reviewed in relation to a corridor that extended for the length of the proposed pipeline route and was 2 miles wide, centered on the proposed centerline. The records search identified 61 cultural resources in this zone, including 31 Pre-contact sites and 30 Historic period sites. The data indicated that 16 known cultural resources lay within the projected Cushing Extension APE (34KA45, 34KA135, 34KA145, 34KA323, 34KA324, 34KA334, 34KA335, 34PY70, 34PY77, 34PY89, 34PY91, 34PY92, 34PY93, 34PY94, 34PY95, and 34PY98). They include seven Pre-contact sites and nine Historic period sites, of which four have been recommended as ineligible for listing in the NRHP. The remaining 12 sites of this group had not been previously assessed for their eligibility status. The research design also identified six Historic period properties listed in the NRHP or on the Oklahoma Landmarks Inventory that lie near but outside the Project APE.

The purpose of the research design was to present the field methods ARG would use to assess the Keystone pipeline and to identify historic properties within the APE, excluding TCPs. It was based on the results of the site file research and results of previous surveys. The submitted research design used the preliminary pipeline route as its basis; subsequent alterations to the route did not require submission of a new research design but involved implementation of the general procedures outlined in the research design. This process also is considered acceptable by the SHPO, FERC, and DOS. The procedures used to identify TCPs and historic properties of cultural or religious importance to Indian tribes is outlined in the discussion of the consultation process (see Section 3.11.4).

The revised ARG research design proposed that cultural resources field surveys be conducted along the entire proposed lateral route, using a 300-foot-wide survey corridor. A pedestrian survey using transects spaced no more than 65.6 feet (20 meters) apart was to be conducted at landforms exceeding 10-percent surface visibility and exhibiting less than 20-percent slope. The field methods also specified the use of shovel tests spaced 65.6 feet (20 meters) apart at level landforms where the ground surface was obscured; this interval was to be reduced to 32.8-foot (10-meter) intervals when cultural materials were encountered. The research design further proposed geomorphological testing at 13 locations where deeply buried cultural deposits were considered possible. The SHPO responded in a letter dated March 1, 2007, that agreed with the essential components of the plan but noted how the SHPO expected Historic period structures and buildings to be recorded. No federally owned or managed land that requires review by a federal agency is present along the proposed Cushing Extension route in Oklahoma.

ARG provided an initial technical report that stated 63.33 miles of the proposed Cushing Extension pipeline was surveyed for cultural resources between February and March 2007 (Shah Lomas et al. 2007). Geomorphological testing was also reported by Shah Lomas et al. (2007) for 13 water crossings. Of these, five were assessed as requiring additional research and two were not completed due to a landowner denying access to the properties.

The applicant has abandoned portions of the originally proposed route due to landowner concerns, the presence of wetland or biological concerns, or for cultural resources that are potential historic properties. Table 3.11.1-10 displays the cultural resources survey status of the currently designed Cushing Extension route in Kansas. It excludes proposed routes that were surveyed for cultural resources but subsequently removed from the APE through abandonment by the applicant (and to avoid confusion from duplicated, changed, and overlapping mileposts). Access was denied to ARG along 23.06 miles of the planned survey areas; therefore, the cultural resources inventory of the proposed Cushing Extension pipeline is incomplete at this time. Cultural resources surveys for Project access roads, additional temporary workspace outside the surveyed corridor, pipeline reroutes, appurtenant facilities, and remaining geomorphological tests are ongoing. Further survey reports must be submitted and reviewed by the consulting parties prior to land-altering activities occurring within these areas, as outlined in the PA.

TABLE 3.11.1-10
Cultural Resources Survey Status of the Keystone Cushing Extension in Oklahoma as of November 2007 (Excluding Abandoned Routes)

State	County	Milepost		Status	Miles
		From	To		
Oklahoma	Kay	212.87	213.57	Survey completed	0.70
Oklahoma	Kay	213.57	214.34	Required – no access	0.77
Oklahoma	Kay	214.34	215.84	Survey completed	1.49
Oklahoma	Kay	215.84	216.38	Required – no access	0.54
Oklahoma	Kay	216.38	217.34	Survey completed	0.96
Oklahoma	Kay	217.34	218.35	Required – no access	1.01
Oklahoma	Kay	218.35	223.10	Survey completed	4.75
Oklahoma	Kay	223.10	223.35	Required – no access	0.25
Oklahoma	Kay	223.35	226.36	Survey completed	3.01
Oklahoma	Kay	226.36	226.87	Required – no access	0.51
Oklahoma	Kay	226.87	228.38	Survey completed	1.51
Oklahoma	Kay	228.38	228.87	Required – no access	0.49
Oklahoma	Kay	228.87	233.63	Survey completed	4.75
Oklahoma	Kay	233.63	234.56	Required – no access	0.93
Oklahoma	Kay	234.56	235.42	Survey completed	0.86
Oklahoma	Kay	235.42	237.51	Required – no access	2.09
Oklahoma	Kay	237.51	237.70	Survey completed	0.19
Oklahoma	Kay	237.70	237.75	Required – no access	0.06
Oklahoma	Kay	237.75	238.88	Survey completed	1.13
Oklahoma	Kay	238.88	239.43	Required – no access	0.54
Oklahoma	Kay	239.43	239.93	Survey completed	0.50
Oklahoma	Kay	239.93	240.43	Required – no access	0.50
Oklahoma	Kay	240.43	240.70	Survey completed	0.26
Oklahoma	Kay	240.70	241.10	Required – no access	0.40

TABLE 3.11.1-10 (Continued)					
		Milepost			
State	County	From	To	Status	Miles
Oklahoma	Kay	241.10	244.17	Survey completed	3.07
Oklahoma	Noble	244.17	246.72	Survey completed	2.55
Oklahoma	Noble	246.72	254.39	Required – no access	7.67
Oklahoma	Noble	254.39	259.09	Survey completed	4.70
Oklahoma	Noble	259.09	259.88	Required – no access	0.79
Oklahoma	Noble	259.88	260.32	Survey completed	0.44
Oklahoma	Noble	260.32	260.96	Required – no access	0.64
Oklahoma	Noble	260.96	263.01	Survey completed	2.05
Oklahoma	Noble	263.01	264.07	Required – no access	1.07
Oklahoma	Noble	264.07	266.09	Survey completed	2.02
Oklahoma	Noble	266.09	266.62	Required – no access	0.52
Oklahoma	Noble	266.62	269.35	Survey completed	2.74
Oklahoma	Payne	269.35	269.90	Required – no access	0.55
Oklahoma	Payne	269.90	271.32	Survey completed	1.42
Oklahoma	Payne	271.32	271.84	Required – no access	0.52
Oklahoma	Payne	271.84	275.11	Survey completed	3.27
Oklahoma	Payne	275.11	275.49	Required – no access	0.37
Oklahoma	Payne	275.49	279.95	Survey completed	4.46
Oklahoma	Payne	279.95	280.21	Required – no access	0.26
Oklahoma	Payne	280.21	280.46	Survey completed	0.25
Oklahoma	Payne	280.46	281.30	Required – no access	0.84
Oklahoma	Payne	281.30	288.48	Survey completed	7.18
Oklahoma	Payne	288.48	288.91	Required – no access	0.43
Oklahoma	Payne	288.91	292.64	Survey completed	3.73
Oklahoma	Payne	292.64	292.90	Required – no access	0.26
Oklahoma	Payne	292.90	293.43	Survey completed	0.53
Oklahoma	Payne	293.43	293.63	Required – no access	0.20
Oklahoma	Payne	293.63	295.14	Survey completed	1.51
Oklahoma	Payne	295.14	295.99	Required – no access	0.85
Total miles surveyed					**60.05**
Total miles still required to survey					**23.06**

3.11.2 Potential Impacts and Mitigation

Section 106 of the NHPA (as codified in 36 CFR 800.5) requires federal agencies to apply the “Criteria of Adverse Effect” to determine whether a project will affect historic properties. Impacts are found when an undertaking alters, directly or indirectly, the characteristics of a historic property that qualify it for inclusion in the NRHP, in a manner that diminishes the historical integrity of the property. Impacts may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be distant, or be cumulative.

For the Keystone Project, the principal types of impacts that would occur include physical destruction or damage, to all or part of the property, caused by pipeline trenching or related excavations or boring; introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features by short-term pipeline construction or construction of aboveground appurtenant facilities and roads; and change of the character of the property's use or of physical features within the property's setting that contribute to its significance.

Under Section 106 regulations, historic properties are effectively classified into three basic categories: not eligible, eligible, and unevaluated. Historic properties that are classified as not eligible do not possess the qualities of significance as defined by the NRHP criteria for evaluation (36 CFR 60.4 [a–d]). They are therefore not Section 106 historic properties and do not generally require mitigation measures. Historic properties, including TCPs and properties of traditional or religious significance to Indian tribes, that are designated as eligible by the lead federal agency and SHPO/THPO meet the NRHP criteria for evaluation; these are historic properties under Section 106 guidelines. Negative impacts must be avoided if a finding of No Adverse Effect is to be attached to the historic property. If negative impacts to the property cannot be avoided, mitigation treatment plans must be developed in consultation with the lead federal agency, SHPO, ACHP, Indian tribes, and other relevant consulting parties. In the discussions below, historic properties can also be categorized as unevaluated. This designation simply means that insufficient data were currently available for DOS to state definitively that the cultural resource does, or does not, meet the criteria of significance for listing in the NRHP. As each of these sites has the potential to be a Section 106-defined historic property, they must either be further assessed through National Register evaluation procedures or they must be treated as *de facto* historic properties. If the latter option is selected, avoidance plans must be developed in order to prevent any impact to the cultural remains or features that are present.

To limit impacts to historic properties, and in line with FERC guidelines, the Keystone Project is instituting plans to avoid impacts to historic properties that are unevaluated or that have been found eligible for listing in the NRHP. Avoidance is achieved by rerouting the pipeline corridor and/or related appurtenances, keeping construction activities away from NRHP-eligible properties, limiting the impact to existing demonstrated disturbance areas, and digging underneath the cultural deposits by boring or HDDs. At least 30 days prior to construction commencing in the area, Keystone will be required to file with DOS the results of NRHP assessments, demonstrating that historic properties designated as unevaluated are not historic properties. Alternatively, Keystone must provide plans that detail the specific avoidance procedures to be implemented in order to avoid impact to each eligible and unevaluated site, using the procedures described below. DOS and the consulting parties will evaluate the submitted information, following the protocols outlined in the PA, and will make formal findings of effect.

The following mitigation measures are applicable for historic properties determined to be eligible historic properties or unevaluated properties, in order to have a finding of No Effect or No Adverse Effect:

(1) Avoidance through reroute.

For each reroute, Keystone will file with DOS a map at 1:24,000 scale or better that clearly shows with mileposts the original surveyed corridor, the known boundaries of the eligible or unevaluated property, the reroute that avoids the property, and survey information showing that no historic properties are located within the reroute.

(2) Avoidance through abandonment.

For each abandonment, Keystone will file with DOS a letter that states the facility or road at which the eligible or unevaluated property was located and a statement that the facility or road is no longer associated with the Project.

(3) Avoidance through bore or HDD.

For each instance, Keystone will file with DOS a map and technical drawing that clearly shows the projected depth below surface and the entrance and exit points of the drill in relation to the boundaries of the eligible or unevaluated property.

(4) Avoidance by narrowing construction corridor ("neckdown").

For each instance, Keystone will file with DOS an alignment sheet map at 1:500 scale or better that clearly shows the construction corridor (including additional temporary work space) in relation to the eligible or unevaluated property boundary. Prior to construction commencing in the area, safety fencing must be erected along the relevant outer edges of the eligible or unevaluated property. A qualified monitor must also be present during installation of the pipeline in that area to ensure that accidental impacts do not occur to the property.

(5) Avoidance by limiting impact to existing roadway.

For each instance, Keystone will file with DOS an alignment sheet map at 1:500 scale that clearly shows the access road in relation to the eligible or unevaluated property, a description of the existing state of the roadway, and a statement that Project traffic will be limited entirely to the existing roadway and that the road will not be widened or upgraded as a result of the Project.

Short-term construction-related impacts will be mitigated by implementing measures in Keystone's CMR Plan (Appendix B). If impacts do occur to any eligible historic property or unevaluated cultural resource, they will be resolved through consultation with all consulting parties, using the protocols outlined in the PA that were developed for this project (see Appendix R). The PA addresses unanticipated discoveries, future historic properties identification and evaluation efforts, avoidance commitments and measures, and the process for future consultation.

3.11.2.1 North Dakota

A total of 49 historic properties were identified during surveys of the Mainline Project APE in North Dakota (Bleier et al. 2007a, Stine et al. 2007a). These historic properties were classified as 11 Pre-contact (i.e., prehistoric period) sites, 19 Pre-contact isolated finds, and 19 Historic period sites (Table 3.11.2-1). Each of the 30 Pre-contact historic properties was noted by the presence of stone tools or stone waste flakes in varying quantities. The 19 Historic period historic properties included 10 railroad features, seven farmsteads, and two sites that contained structural depressions or foundation remains. Keystone also has filed a report (Bleier and Stine 2007) that presents the results of additional NRHP evaluative testing at two of the Pre-contact cultural loci (32RM160 and 32RMx89). A research design also has been submitted to the ND SHPO and DOS for forthcoming National Register evaluation testing at three additional Pre-contact-era sites (32RM250, 32WA251, and 32WA260).

TABLE 3.11.2-1 Historic Properties Identified in North Dakota during Keystone Mainline Project Field Surveys as of November 2007				
Project Item	**Site**	**Site Type**	**NRHP Eligibility**	**Anticipated Action by Keystone**
Mainline	32BA1185	Pre-contact scatter	Unevaluated	Avoid by reroute
Mainline	32BA170	Pre-contact scatter	Unevaluated	Avoid by reroute
Mainline	32NEx99	Historic period farmstead	Unevaluated	Avoid by reroute
Mainline	32PB202	Pre-contact scatter	Unevaluated	Avoid by reroute
Mainline	32PB204	Pre-contact scatter	Unevaluated	Avoid by reroute
Mainline	32WA252	Historic period farmstead	Unevaluated	Avoid by reroute
Mainline	32WA252	Historic period farmstead	Unevaluated	Avoid by reroute
Mainline	32WA254	Pre-contact scatter	Unevaluated	Avoid by reroute
Mainline	32WA255	Pre-contact scatter	Unevaluated	Avoid by reroute
Mainline	32RM260	Pre-contact scatter	Unevaluated	Avoidance or NRHP evaluation
Mainline	32WA247	Historic period farmstead (depression)	Unevaluated	Avoidance or NRHP evaluation
Mainline	32WA250	Pre-contact scatter	Unevaluated	Avoidance or NRHP evaluation
Mainline	32WA251	Pre-contact scatter	Unevaluated	Avoidance or NRHP evaluation
Mainline	32BA148	Historic period railroad	Unevaluated	Bore underneath site
Mainline	32BA171	Historic period railroad	Unevaluated	Bore underneath site
Mainline	32NE70	Historic period railroad	Unevaluated	Bore underneath site
Mainline	32NE72	Historic period railroad	Unevaluated	Bore underneath site
Mainline	32RM155	Historic period railroad	Unevaluated	Bore underneath site
Mainline	32SA47	Historic period railroad	Unevaluated	Bore underneath site
Mainline	32SA80	Historic period railroad	Unevaluated	Bore underneath site
Mainline	32ST171	Historic period railroad	Unevaluated	Bore underneath site
Mainline	32WA244	Historic period railroad	Unevaluated	Bore underneath site
Mainline	32WA246	Historic period railroad	Unevaluated	Bore underneath site
Access road	32SA32	Historic period farmstead	Unevaluated	Limit use to existing road
Mainline	32BAx107	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	32BAx108	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	32BAx109	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	32BAx110	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	32BAx111	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	32BAx112	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	32BAx277	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	32PBx176	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	32PBx254	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	32PBx255	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	32PBx256	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	32RM160	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	32RM162	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	32RM163	Historic period depression	Not eligible	None unless corridor moves
Mainline	32RMx260	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	32RMx261	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	32RMx262	Pre-contact isolate	Not eligible	None unless corridor moves

TABLE 3.11.2-1 (Continued)				
Project Item	Site	Site Type	NRHP Eligibility	Anticipated Action by Keystone
Mainline	32RMx263	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	32RMx264	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	32RMx265	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	32RMx89	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	32SA81	Historic period foundation	Not eligible	None unless corridor moves
Pump station	32WA253	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	32WAx211	Pre-contact isolate	Not eligible	None unless corridor moves
Pump station	32WAx234	Pre-contact isolate	Not eligible	None unless corridor moves

NRHP Eligibility = National Register of Historic Places eligibility as determined by DOS.

In total, based on the information provided to date by the applicant, DOS has assessed 25 of the 49 historic properties as not meeting the criteria of significance for listing in the NRHP (36 CFR 60.4 [a-d])[1]. This assessment includes two Historic period farmsteads, the two Historic period sites that contained structural depression or foundation remains, all 19 Pre-contact isolated finds, and the two Pre-contact period artifact scatters that were evaluated through additional testing (Table 3.11.2-1). No additional investigations at these 25 resources are required unless construction activities are projected to fall outside the surveyed corridor. In that event, additional cultural resources surveys must be conducted, following the protocols outlined in the PA.

DOS has evaluated the NRHP significance of the remaining 15 Historic period and nine Pre-contact period historic properties listed in Table 3.11.2-1 as unevaluated. As each of these sites has the potential to be a Section 106-defined historic property, they must either be further assessed through National Register evaluation procedures or they must be completely avoided in order to prevent any impact to the cultural remains or features that are present. Prior to construction commencing, Keystone will be required to file with DOS the results of NRHP site evaluations demonstrating that a listed cultural resource is not a historic property. Alternatively, Keystone must provide plans that detail the specific avoidance procedures to be implemented in order to avoid impacts to the site, in the format described above (see Section 3.11.2). DOS and the consulting parties will evaluate the submitted information, following the protocols outlined in the PA, and make formal findings of effect.

As noted in Section 3.11.1.1, survey permission was denied to Metcalf for 6.06 miles of the proposed Keystone pipeline route that was selected under the sampling strategy. Historic properties surveys for these pipeline sections and all unsurveyed Project access roads, additional temporary workspaces that lie outside of the surveyed corridor, reroutes, and appurtenant facilities in North Dakota must be completed before Section 106 compliance is achieved. Further survey reports must be submitted and reviewed by DOS. In consultation with the SHPO and other consulting parties, DOS will complete the identification and evaluation of historic properties in accordance with 36 CFR § 800.4 before pipeline construction begins, per the stipulations outlined in the PA.

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[1] All determinations of eligibility listed in Section 3.11.2.1 were submitted by DOS to the ND SHPO on September 13, 2007 and December 5, 2007; a reply concurring with these determinations was received on September 20, 2007, and December 6, 2007.

3.11.2.2 South Dakota

A total of 33 historic properties were identified during surveys of the Project APE in South Dakota. Half (17) of the historic properties were identified during field surveys conducted in 2006 and were reported in a technical report that was submitted to DOS and the SHPO (Bleier et al. 2007b). The remaining 16 historic properties have been summarized in an addendum report that was filed with DOS and the SHPO in October 2007 (Stine et al. 2007b). The historic properties were classified as three Pre-contact (i.e., Prehistoric period) sites, five Pre-contact isolated finds, and 25 Historic period sites (Table 3.11.2-2). All three Pre-contact sites were identified by the presence of rock cairns on the ground surface while the Pre-contact isolated finds were defined by the limited presence of bone/stone tools or stone waste flakes. The 25 historic properties included 10 railroad features, 12 farmstead complexes (some with standing structures), one cemetery, a standing structure not associated with a farmstead complex, and a single historic canal feature.

Based on the information provided to date by the applicant, DOS has assessed seven of the 33 historic properties as not meeting the criteria of significance for listing in the NRHP (36 CFR 60.4 [a-d])[2]. This assessment includes all five reported Pre-contact isolated find sites and two abandoned railway lines (Table 3.11.2-2). No additional investigations at these seven sites are required unless construction activities are projected to fall outside the surveyed corridor. In that event, additional cultural resources surveys must be conducted, following the protocols outlined in the PA.

DOS has categorized the NRHP significance of the remaining 23 Historic period and three Pre-contact period historic properties listed in Table 3.11.2-1 as unevaluated. As each of these sites has the potential to be a Section 106-defined historic property, they must either be further assessed through National Register evaluation procedures or they must be completely avoided in order to prevent any impact to the cultural remains or features that are present. Prior to construction commencing, Keystone will be required to file with DOS the results of NRHP site evaluations demonstrating that a listed cultural resource is not a historic property. Alternatively, Keystone must provide plans that detail the specific avoidance procedures to be implemented in order to avoid impact to the site, in the format described in Section 3.11.2. DOS and the consulting parties will evaluate the submitted information, following the protocols outlined in the PA, and will make formal findings of effect.

As noted in Section 3.11.1.2, survey permission was denied to Metcalf for 2.29 miles of the proposed Keystone pipeline route and Keystone has committed to surveying an additional 2 miles of the corridor between MP 389 and 391 at the request of DOS and the SD SHPO. Historic properties surveys for these pipeline sections and any unsurveyed Project access roads, additional temporary workspaces that lie outside of the surveyed corridor, reroutes, and appurtenant facilities in South Dakota must be completed before Section 106 compliance is achieved. Further survey reports must be submitted and reviewed by DOS. In consultation with the SHPO and other consulting parties, DOS will complete the identification and evaluation of historic properties in accordance with 36 CFR § 800.4, preferably before pipeline construction begins. At the request of the SD SHPO, and with the agreement of DOS, Keystone also will support the creation of educational materials (such as a documentary) regarding historic properties and the Project following pipeline construction, will facilitate site visits and overflights of the pipeline by the SHPO during construction, and will conduct additional shovel testing at specified locations requested by DOS and the SHPO.

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[2] All determinations of eligibility listed in Section 3.11.2.2 were submitted by DOS to the SD SHPO on September 13, 2007, December 5, 2007, and December 20, 2007. An initial reply was received on December 17, 2007, and a final reply concerning determinations of eligibility is forthcoming.

TABLE 3.11.2-2
Historic Properties Identified in South Dakota during Keystone Mainline Project Field Surveys as of November 2007

Project Item	Site	Site Type	NRHP Eligibility	Action Required by Keystone
Mainline	39CK2055	Historic period railroad	Not eligible	None unless corridor moves
Mainline	39DA2040	Historic period railroad	Not eligible	None unless corridor moves
Mainline	39MN21	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	39MN22	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	39YK75	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	39YK76	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	39YK80	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	39MK2007	Historic period railroad	Unevaluated	Avoid by bore
Mainline	39ML2000	Historic period railroad	Unevaluated	Avoid by bore
Mainline	39YK2003	Historic period railroad	Unevaluated	Avoid by bore
Mainline	39CK50	Historic period farmstead	Unevaluated	Avoid by reroute
Mainline	39DA0073	Historic period farmstead	Unevaluated	Avoid by reroute
Mainline	39DA070	Historic period farmstead	Unevaluated	Avoid by reroute
Mainline	39DA071	Pre-contact cairn	Unevaluated	Avoid by reroute
Mainline	39HT133	Historic period farmstead	Unevaluated	Avoid by reroute
Mainline	39HT134	Historic period farmstead	Unevaluated	Avoid by reroute
Mainline	39YK77	Pre-contact cairn	Unevaluated	Avoid by reroute
Mainline	39YK78	Historic period farmstead	Unevaluated	Avoid by reroute
Mainline	39YK79	Pre-contact cairn	Unevaluated	Avoid by reroute
Mainline	DA-000-00951	Historic period farmstead	Unevaluated	Avoid by reroute
Mainline	KB-000-00462	Historic period farmstead	Unevaluated	Avoid by reroute
Mainline	SD# 46342	Historic period structure	Unevaluated	Avoid by reroute
Mainline	SD# 46352	Historic period farmstead	Unevaluated	Avoid by reroute
Mainline	SD# 46356	Historic period farmstead	Unevaluated	Avoid by reroute
Mainline	SD# 46359	Historic period cemetery	Unevaluated	Avoid by reroute
Mainline	39BE2072	Historic period railroad	Unevaluated	Bore underneath site
Mainline	39DA2000	Historic period railroad	Unevaluated	Bore underneath site
Mainline	39KB2003	Historic period railroad	Unevaluated	Bore underneath site
Mainline	39ML2000	Historic period railroad	Unevaluated	Bore underneath site
Mainline	39YK2003	Historic period railroad	Unevaluated	Bore underneath site
Mainline	SD# 46385	Historic period canal	Unevaluated	File mitigation (reconstruction) plans
Access road	SD# 46341	Historic period farmstead	Unevaluated	Limit use to existing road
Access road	SD# 46357	Historic period farmstead	Unevaluated	Limit use to existing road
Mainline	39CK2055	Historic period railroad	Not eligible	None unless corridor moves

NRHP Eligibility = National Register of Historic Places eligibility as determined by DOS.

3.11.2.3 Nebraska

Mainline Project

A total of 35 historic properties were identified by ARG during surveys of the Mainline Project APE in Nebraska (Ensor et al. 2007, Anderson et al. 2007a); this total includes surveys of the pipeline corridor and Project items that are shared with the FERC-regulated REX Project in Jefferson and Gage Counties (Anderson and Aberle 2007, Schwegman 2006, Schwegman et al. 2006, Shah Lomas 2007c). The identified historic properties were classified as nine Pre-contact (i.e., prehistoric period) sites, two Pre-contact isolated finds, 22 Historic period sites, and two sites that contained both Pre-contact and Historic period components (Table 3.11.2-3). Twelve of the 13 sites that contained Pre-contact artifacts (including the two multi-component sites) were noted by the presence of stone tools or stone waste flakes in varying quantities; the remaining Pre-contact-era site was classified as a potential burial area. The 22 Historic period historic properties included seven farmsteads, 11 scatters of Historic artifacts, three sites that contained structural remains, and one cemetery.

Based on the information provided to date by the applicant, DOS has evaluated 28 of the 35 historic properties as not meeting the criteria of significance for listing in the NRHP (36 CFR 60.4 [a-d])[3]. This assessment includes the portions of the seven Historic period farmsteads that lie within the surveyed corridor, 10 of the 11 Historic period artifact scatters, two sites exhibiting Historic period structural remains, both multi-component sites, and seven Pre-contact period artifact scatters (Table 3.11.2-3). No additional investigations at these 28 resources are required unless construction activities are projected to fall outside the surveyed corridor. In that event, additional cultural resources surveys must be conducted, following the protocols outlined in the PA.

DOS has categorized the NRHP significance of the remaining three Historic period and four Pre-contact period historic properties listed in Table 3.11.2-3 as unevaluated. As each of these sites has the potential to be a Section 106-defined historic property, they must either be further assessed through National Register evaluation procedures or they must be completely avoided in order to prevent any impact to the cultural remains or features that are present. Prior to construction commencing, Keystone will file the results of NRHP site evaluations demonstrating that a listed cultural resource is not a historic property with DOS. Alternatively, Keystone must provide plans that detail the specific avoidance procedures to be implemented in order to avoid impact to the site, in the format described in Section 3.11.2. DOS and the consulting parties will evaluate the submitted information, following the protocols outlined in the PA, and will make formal findings of effect.

As noted in Section 3.11.1.3, survey permission was denied to ARG for 15.62 miles of the proposed Keystone pipeline route. Historic properties surveys for these pipeline sections, and all unsurveyed Project access roads, additional temporary workspaces that lie outside of the surveyed corridor, reroutes, and appurtenant facilities in South Dakota must be completed before Section 106 compliance is achieved. Further survey reports must be submitted and reviewed by DOS. In consultation with the SHPO and other consulting parties, DOS will complete the identification and evaluation of historic properties in accordance with 36 CFR § 800.4, preferably before pipeline construction begins.

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[3] All determinations of eligibility listed in Section 3.11.2.3 for the Keystone Mainline Project were formally submitted by DOS to the NE SHPO on September 13, 2007, and December 10, 2007. A previous reply from the NE SHPO concurring with the initial determinations was received on January 17, 2007; replies from the NE SHPO concurring with additional determinations were received by DOS on September 25, 2007, and on October 18, 2007.

TABLE 3.11.2-3 Historic Properties Identified in Nebraska during Keystone Mainline Project Field Surveys as of November 2007				
Project Item	**Site**	**Site Type**	**NRHP Eligibility**	**Action Required by Keystone**
Mainline	25CD21	Pre-contact burial	Unevaluated	Avoid by reroute
Mainline	25CX07	Historic period structure	Unevaluated	Avoid by reroute
Mainline	25CX32	Pre-contact Camp	Unevaluated	Avoid by reroute
Mainline	25SA79	Historic period scatter	Unevaluated	Avoid by reroute
Mainline	25SW53	Pre-contact scatter	Unevaluated	Avoid by reroute
Mainline	25SW54	Pre-contact scatter	Unevaluated	Avoid by reroute
Mainline	Pleasant Hill Cemetery	Historic period cemetery	Unevaluated	Avoid by reroute
Mainline	25BU59	Historic period scatter	Not eligible	None unless corridor moves
Mainline	25BU60	Historic period scatter	Not eligible	None unless corridor moves
Mainline	25BU61	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	25CD84	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	25GA126	Historic period scatter	Not eligible	None unless corridor moves
REX pipeline	25GA127	Pre-contact scatter	Not eligible	None unless corridor moves
REX ATWS	25GA128	Pre-contact / Historic period scatter	Not eligible	None unless corridor moves
Mainline	25JF37	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	25JF38	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	25JF39	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	25JF40	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	25JF43	Historic period Windmill	Not eligible	None unless corridor moves
Mainline	25SA77	Historic period scatter	Not eligible	None unless corridor moves
Mainline	25SA78	Historic period scatter	Not eligible	None unless corridor moves
Mainline	25SA80	Historic period scatter	Not eligible	None unless corridor moves
Mainline	25SA81	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	25SA82	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	25SA83	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	25SA84	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	25ST39	Historic period school	Not eligible	None unless corridor moves
Mainline	25ST40	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	25ST41	Historic period scatter	Not eligible	None unless corridor moves
Mainline	25SW51	Pre-contact / Historic period scatter	Not eligible	None unless corridor moves
Mainline	25SW52	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	25SW55	Historic period scatter	Not eligible	None unless corridor moves
Mainline	25SW56	Historic period scatter	Not eligible	None unless corridor moves
Mainline	25SW57	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	25SW58	Historic period scatter	Not eligible	None unless corridor moves

NRHP Eligibility = National Register of Historic Places eligibility as determined by DOS.
REX = Rockies Express Western Phase Project.
ATWS = Additional temporary workspace.

Cushing Extension

As noted in Section 3.11.1.3, no historic properties have been identified to date within the 2.51-mile corridor that was surveyed in Nebraska for the Cushing Extension pipeline (Table 3.11.2-4). Survey permission was denied to ARG for 0.34 mile of the proposed Cushing Extension pipeline route. Historic properties surveys for this pipeline section and any unsurveyed Project access roads, additional temporary workspaces that lie outside of the surveyed corridor, reroutes, and appurtenant facilities in Nebraska must be completed before Section 106 compliance is achieved. Further survey reports must be submitted and reviewed by DOS. In consultation with the SHPO and other consulting parties, DOS will complete the identification and evaluation of historic properties in accordance with 36 CFR § 800.4, preferably before pipeline construction begins.

3.11.2.4 Kansas

Mainline Project

A total of 24 historic properties were identified by ARG during surveys of the Mainline Project APE in Kansas; this total was entirely derived from surveys of pipeline corridor and Project items that are shared with the FERC-regulated REX Project (Myers et al. 2006a, Anderson and Schwegman 2007, Rieken 2007a, Schwegman 2006, Shah Lomas 2007a). These were classified as 12 Pre-contact sites, nine Historic period sites, and three multi-component sites. Each of the 12 Pre-contact historic properties was noted by the presence of stone tools or stone waste flakes in varying quantities. The nine Historic period historic properties included six farmsteads, two sites that displayed Historic period artifact scatters, and one fence feature. The three multi-component sites were two mid-19th- to 20th-century farmsteads and one Historic period artifact scatter with evidence of earlier Pre-contact period occupations. Keystone also has filed a report (Schwegman et al. 2007) that presents the results of additional NRHP evaluative testing at four of the Pre-contact cultural loci (14MH160, 14NH107, 14NH112, and 14NH112).

The field survey report for the REX Project was initially submitted to the Kansas SHPO on May 15, 2006. The Kansas SHPO provided comments in a letter dated June 12, 2006. The SHPO agreed with the recommendations for NRHP eligibility but noted that additional data were needed if the REX survey had recorded and evaluated Historic period standing structures within the Project APE. Based on data submitted by Keystone, Historic period structures are not located within the Project APE.

Based on the information provided to date by the applicant, DOS has assessed all 24 of the REX Project historic properties as not meeting the criteria of significance for listing in the NRHP (36 CFR 60.4 [a-d])[4]. This assessment includes the four Pre-contact period artifact scatters that were evaluated through additional NRHP testing. No additional investigations at these 24 resources are required unless construction activities are projected to fall outside the surveyed corridor. In that event, additional cultural resources surveys must be conducted, following the protocols outlined in the PA.

As noted in Section 3.11.4, ARG was granted survey permission for all of the proposed Keystone pipeline route that was selected under the Keystone and REX Project sampling strategies; therefore, the historic properties inventory of the proposed 30-inch-diameter Keystone pipeline in Kansas is complete, barring any future route deviations. However, historic properties surveys will be required for any new Keystone Project access roads, additional temporary workspace outside of the surveyed corridor, pipeline reroutes, and appurtenant facilities. Further survey reports must be submitted and reviewed by DOS. In consultation with the SHPO and other consulting parties, DOS will complete the identification and evaluation of historic properties in accordance with 36 CFR § 800.4, preferably before pipeline construction begins.

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[4] All determinations of eligibility listed in Section 3.11.2.4 for the Keystone Mainline Project were accepted by the KS SHPO as a part of the REX Project and were accepted for the purposes of the Keystone Project on December 21, 2006.

TABLE 3.11.2-4 Historic Properties Identified in Nebraska during Keystone Cushing Extension Field Surveys as of November 2007				
Project Item	**Site**	**Site Type**	**NRHP Eligibility**	**Action Required by Keystone**
No historic properties identified to date				

TABLE 3.11.2-5 Historic Properties Identified in Kansas during Keystone Mainline Project Field Surveys as of November 2007				
Project Item	**Site**	**Site Type**	**NRHP Eligibility**	**Action Required by Keystone**
REX pipeline	ARG-01	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	ARG-02	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	ARG-03 (14MH160)	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	ARG-04	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	ARG-05	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	ARG-06	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	ARG-07	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	ARG-08	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	ARG-09	Historic period scatter	Not eligible	None unless corridor moves
REX pipeline	ARG-10 (14NH107 & 14NH112)	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	ARG-11	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	ARG-12 (14NH110)	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	ARG-13	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	ARG-14	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	ARG-15	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	ARG-16	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	ARG-17	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	ARG-18	Pre-contact scatter / Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	ARG-19	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	ARG-20	Historic period scatter	Not eligible	None unless corridor moves
REX pipeline	ARG-21	Historic period fence	Not eligible	None unless corridor moves
REX pipeline	ARG-22	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	ARG-23	Pre-contact scatter / Historic period farmstead	Not eligible	None unless corridor moves
REX reroute	14MH164	Pre-contact / Historic period scatter	Not eligible	None unless corridor moves

NRHP Eligibility = National Register of Historic Places eligibility as determined by DOS.
REX = Rockies Express Western Phase Project.

Cushing Extension

A total of 40 historic properties were identified during surveys of the Cushing Extension APE in Kansas. Thirty-eight of the historic properties were located during field surveys that have been reported in a technical report submitted to DOS and the SHPO (Aberle et al. 2007; also Anderson 2007). The remaining two historic properties have been summarized in a status report update that has been filed with DOS for ongoing field surveys, but the full technical details have not yet been presented. These 40 historic properties were classified as seven Pre-contact (i.e., prehistoric period) sites, three Pre-contact isolated finds, 25 Historic period sites, one Historic period isolated find, and four sites that contained both Pre-contact and Historic period components (Table 3.11.2-6). All 14 sites that contained Pre-contact cultural materials (including the five multi-component sites) were noted by the presence of stone tools or stone waste flakes in varying quantities. The Historic period historic properties were 16 farmsteads (which includes three of the multi-component sites, one site that may also have represented a Historic period fort, and one farmstead that may contain unmarked American homestead burials), six sites with structural or foundation remains, five sites with Historic artifact scatters present (including one of the multi-component sites and the single Historic period isolate), two roads/trails, and one cemetery. Keystone has filed a report (Scott et al. 2007) that presents the results of additional NRHP evaluative testing at one of the Pre-contact cultural loci (14WH318).

Based on the information provided to date by the applicant, DOS has assessed 30 of the 40 historic properties as not meeting the criteria of significance for listing in the NRHP (36 CFR 60.4 [a-d])[5]. This assessment includes the portions of 11 Historic period farmsteads that lie within the surveyed corridor, five Historic period sites that contained structural or foundation remains, the four Pre-contact and Historic period isolated finds, six Pre-contact period artifact scatters, two Historic period artifact scatters, and two of the multi-component sites (Table 3.11.2-6). No additional investigations at these 25 resources are required unless construction activities are projected to fall outside the surveyed corridor. In that event, additional cultural resources surveys must be conducted, following the protocols outlined in the PA.

DOS has determined that one of the identified sites is eligible for listing in the NRHP under Criterion D (the ability to yield information important to history or prehistory). The site (14WH318; Table 3.11.2-6) consists of the remains of a large Pre-contact era (Smoky Hills Phase of the Central Plains Tradition) occupation that is located within a Historic period farmstead in Washington County; the Pre-contact component of this site was subjected to additional evaluation in autumn 2007 (Scott et al. 2007). The historic property is situated within the currently proposed Project corridor. Prior to construction commencing, Keystone will be required to file its plans with DOS that detail the specific avoidance procedures to be implemented in order to avoid impacts to the site, in the format described in Section 3.11.2. If an impact to the historic property is anticipated, Keystone must submit a mitigation plan so that DOS and all relevant consulting parties can evaluate the impact, following the protocols outlined in the PA and in 36 CFR 800.5.

DOS has categorized the NRHP significance of the remaining seven Historic period and two Pre-contact period sites listed in Table 3.11.2-6 as unevaluated. This includes the two historic properties for which only summary data have been filed. As each of these sites has the potential to be a Section 106-defined historic property, they must be further assessed through National Register evaluation procedures or they must be completely avoided in order to prevent any impact to the cultural remains or features that are present. Prior to construction commencing, Keystone will be required to file with DOS the results of NRHP site evaluations demonstrating that a listed cultural resource is not a historic property. Alternatively, Keystone must provide plans that detail the specific avoidance procedures to be implemented in order to avoid impact to the site, in the format described in Section 3.11.2. DOS and the consulting parties will evaluate the submitted information, following the protocols outlined in the PA, and will make formal findings of effect.

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[5] All determinations of eligibility listed in Section 3.11.2.4 for the Cushing Extension were submitted by DOS to the KS SHPO on September 13, 2007; replies concurring with these determinations were received on September 6, 2007, September 27, 2007, and October 1, 2007.

TABLE 3.11.2-6
Historic Properties Resources Identified in Kansas during Keystone Cushing Extension Field Surveys as of November 2007

Project Item	Site	Site Type	NRHP Eligibility	Action Required by Keystone
Cushing	14WH318	Pre-contact scatter / Historic period farmstead	Eligible	Avoid by reroute
Cushing	KS-KEY-CX-801	Historic period scatter	Unevaluated	Additional reporting
Cushing	KS-KEY-CX-802	Historic period structure	Unevaluated	Additional reporting
Cushing	Brethren in Christ Cemetery	Historic period cemetery	Unevaluated	Avoid by narrowing construction corridor
Cushing	14BU130	Pre-contact scatter / Historic period farmstead	Unevaluated	Avoid by reroute
Cushing	14MN104	Pre-contact scatter	Unevaluated	Avoid by reroute
Cushing	14MN109	Historic period farmstead or fort	Unevaluated	Avoid by reroute
Cushing	14MN110	Historic period Trail (Santa Fe)	Unevaluated	HDD under site
Cushing	14MN112	Historic period road	Unevaluated	HDD under site
Cushing	14WH103	Historic period farmstead (reported burial)	Unevaluated	Avoid by narrowing construction corridor
Cushing	14WH318	Pre-contact scatter / Historic period farmstead	Unevaluated	NRHP testing and reporting; avoid by reroute
Cushing	14BU126	Pre-contact scatter	Not eligible	None unless corridor moves
Cushing	14BU127	Pre-contact scatter	Not eligible	None unless corridor moves
Cushing	14BU128	Historic period structure	Not eligible	None unless corridor moves
Cushing	14BU129	Pre-contact scatter	Not eligible	None unless corridor moves
Cushing	14BU131	Historic period farmstead	Not eligible	None unless corridor moves
Cushing	14BU132	Historic period scatter	Not eligible	None unless corridor moves
Cushing	14DN101	Historic period foundation	Not eligible	None unless corridor moves
Cushing	14DN102	Historic period foundation	Not eligible	None unless corridor moves
Cushing	14DN103	Historic period farmstead	Not eligible	None unless corridor moves
Cushing	14DN104	Pre-contact scatter	Not eligible	None unless corridor moves
Cushing	14MN101	Pre-contact scatter	Not eligible	None unless corridor moves
Cushing	14MN102	Historic period farmstead	Not eligible	None unless corridor moves
Cushing	14MN103	Historic period farmstead	Not eligible	None unless corridor moves
Cushing	14MN105	Pre-contact scatter / Historic period farmstead	Not eligible	None unless corridor moves
Cushing	14MN106	Historic period structure	Not eligible	None unless corridor moves
Cushing	14MN107	Historic period scatter	Not eligible	None unless corridor moves
Cushing	14MN108	Pre-contact / Historic period scatter	Not eligible	None unless corridor moves
Cushing	14MN111	Pre-contact isolate	Not eligible	None unless corridor moves
Cushing	14WH101	Historic period farmstead	Not eligible	None unless corridor moves
Cushing	14WH102	Pre-contact scatter	Not eligible	None unless corridor moves
Cushing	14WH104	Historic period farmstead	Not eligible	None unless corridor moves
Cushing	IF-01	Pre-contact isolate	Not eligible	None unless corridor moves
Cushing	IF-02	Pre-contact isolate	Not eligible	None unless corridor moves
Cushing	IF-03	Historic period isolate	Not eligible	None unless corridor moves
Cushing	KS-KEY-CX-101	Historic period farmstead	Not eligible	None unless corridor moves
Cushing	KS-KEY-CX-204	Historic period farmstead	Not eligible	None unless corridor moves
Cushing	KS-KEY-CX-205	Historic period farmstead	Not eligible	None unless corridor moves

TABLE 3.11.2-6 (Continued)				
Project Item	Site	Site Type	NRHP Eligibility	Action Required by Keystone
Cushing	KS-KEY-CX-206	Historic period farmstead	Not eligible	None unless corridor moves
Cushing	KS-KEY-CX-208	Historic period farmstead	Not Eligible	None unless corridor moves
Cushing	KS-KEY-CX-601	Historic period structure	Not Eligible	None unless corridor moves

NRHP Eligibility = National Register of Historic Places eligibility as determined by DOS.

As noted in Section 3.11.1.4, survey permission was denied to ARG for 23.95 miles of the proposed Keystone Cushing Extension pipeline route that was selected under the sampling strategy. Historic properties surveys for these pipeline sections and all unsurveyed Project access roads, additional temporary workspaces that lie outside of the surveyed corridor, reroutes, and appurtenant facilities in South Dakota must be completed before Section 106 compliance is achieved. Further survey reports must be submitted and reviewed by DOS. In consultation with the SHPO and other consulting parties, DOS will complete the identification and evaluation of historic properties in accordance with 36 CFR § 800.4, preferably before pipeline construction begins.

Additional cultural resources studies for Cushing Extension site evaluation testing and the survey of access roads, additional temporary workspace, pipeline reroutes, and appurtenant facilities in Kansas are ongoing. Keystone filed additional reports for these aspects of the Project in October and December 2007. Keystone also has indicated that geomorphological testing results will be filed with DOS in March 2008.

3.11.2.5 Missouri

A total of 109 historic properties were identified by ARG during surveys of the Keystone Project APE in Missouri (Myers et al. 2007b; also Titus 2007a). This total includes surveys of the pipeline corridor and Project items that are shared with the FERC-regulated REX Project (Myers et al. 2006b, Anderson et al. 2007b, Myers et al. 2007c, Rieken 2007b, Shah Lomas 2007b). The identified historic properties were classified as 58 Pre-contact (i.e., prehistoric period) sites, four Pre-contact isolated finds, 36 Historic period sites, and 11 sites that contained both Pre-contact and Historic period components (Table 3.11.2-7). All 73 sites that contained Pre-contact artifacts (including the 11 multi-component sites) were noted by the presence of stone tools or stone waste flakes in varying quantities. The 47 Historic period historic properties included 32 farmsteads (including eight associated with multi-component sites), six Historic artifact scatters (including three multi-component sites), three cemeteries, three well features, one hunting camp, one road, and the remains of one industrial site. Keystone also has filed two reports (Aberle 2007; Myers et al. 2007a that present the results of additional NRHP evaluative testing at 16 of the cultural loci (23AU137, 23CH343, 23CH344, 23CH348, 23CH1345, 23CI088, 23LN298, 23LN299, 23LN300, 23LN301, 23LN303, 23LN307, 23LN308, 23MT420, 23SC1055, and 23SC1056).

Based on the information provided to date by the applicant, DOS has assessed 90 of the 109 historic properties as not meeting the criteria of significance for listing in the NRHP (36 CFR 60.4 [a-d])[6]. This assessment includes the portions of 21 Historic period farmsteads that lie within the surveyed corridor; the three Historic period artifact scatters; and the three Historic period well features, road, hunting camp, and industrial site. It also includes 45 of the Pre-contact period artifact scatters (including 14 of the sites that were further assessed through NRHP evaluative testing), all four Pre-contact era isolated finds, and 10 of the 11 multi-component sites (Table 3.11.2-7). DOS has made a finding that NRHP eligibility determinations are not required for six of the Pre-contact sites and one of the multi-component sites, as they are not situated within the current Project APE. No additional investigations at these 96 resources are required unless construction activities are projected to fall outside the surveyed corridor. In that event, additional cultural resources surveys must be conducted, following the protocols outlined in the PA.

DOS has determined that two of the identified sites that were subjected to further evaluation (23CH348 and 23CI088; Table 3.11.2-7) are eligible for listing in the NRHP under Criterion D (the ability to yield information important to history or prehistory). These sites include a large Pre-contact era (Middle to Late Woodland) occupation site in Chariton County and a 19th-century farmstead in Clinton County (Myers et al. 2007a). Both of these historic properties are situated within portions of the Project corridor that are shared with the REX Project. Prior to construction commencing, Keystone will be required to file plans with DOS that detail the specific avoidance procedures to be implemented in order to avoid impacts to these two sites, in the format described in Section 3.11.2. If impacts to the historic properties are anticipated, Keystone must submit its mitigation and treatment plan so that DOS, the SHPO, ACHP, and all relevant consulting parties can evaluate the impact, following the protocols outlined in the PA and in 36 CFR 800.5.

DOS has categorized the NRHP significance of the remaining five Historic period and six Pre-contact period historic properties listed in Table 3.11.2-7 as unevaluated. As each of these sites has the potential to be a Section 106-defined historic property, they must either be further assessed through National Register evaluation procedures or they must be completely avoided in order to prevent any impact to the cultural remains or features that are present. Prior to construction commencing, Keystone will be required to file with DOS the results of NRHP site evaluations demonstrating that a listed cultural resource is not a historic property. Alternatively, Keystone must provide plans that detail the specific avoidance procedures to be implemented in order to avoid impact to the site, in the format described in Section 3.11.2. DOS and the consulting parties will evaluate the submitted information, following the protocols outlined in the PA, and will make formal findings of effect.

As noted in Section 3.11.1.5, survey permission was denied to ARG for 19.48 miles of the proposed Keystone pipeline route. Historic properties surveys for these pipeline sections and all unsurveyed Project access roads, additional temporary workspaces that lie outside of the surveyed corridor, reroutes, and appurtenant facilities in South Dakota must be completed before Section 106 compliance is achieved. Further survey reports must be submitted and reviewed by DOS. In consultation with the SHPO and other consulting parties, DOS will complete the identification and evaluation of historic properties in accordance with 36 CFR § 800.4, preferably before pipeline construction begins.

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[6] All determinations of eligibility listed in Section 3.11.2.5 were submitted by DOS to the MO SHPO on September 13, 2007, and on December 12, 2007; a reply from the MO SHPO concurring with these determinations is forthcoming. The use of REX pipeline NRHP determinations of eligibility was agreed to by the MO SHPO on August 23, 2007.

TABLE 3.11.2-7
Historic Properties Identified in Missouri during Keystone Mainline Project Field Surveys as of November 2007

Project Item	Site	Site Type	NRHP Eligibility	Action Required by Keystone
REX pipeline	23CH348	Pre-contact scatter	Eligible	Submit avoidance or mitigation plan
REX pipeline	23CI0088	Historic period farmstead	Eligible	Submit avoidance or mitigation plan
Mainline	23SC2102	Pre-contact scatter	Unevaluated	Additional reporting; avoid by narrowing construction corridor
Mainline	MO-LN-105	Pre-contact scatter	Unevaluated	Additional survey and reporting
Mainline	23SC1054	Pre-contact scatter	Unevaluated	Avoid by narrowing construction corridor
Mainline	23SC2087	Pre-contact scatter	Unevaluated	Avoid by narrowing construction corridor
Mainline	23SC2086	Historic period farmstead	Unevaluated	Avoid by reroute
Mainline	Ebenezer Cemetery	Historic period cemetery	Unevaluated	Avoid by reroute
Mainline	Immaculate Conception Cemetery	Historic period cemetery	Unevaluated	Avoid by reroute
REX pipeline	23AU139	Historic period Cemetery (Barnett)	Unevaluated	Avoid by reroute or by reducing width of construction corridor
REX access road	23CW1040	Historic period farmstead	Unevaluated	Avoidance or NRHP evaluation
Mainline	23SC2071	Pre-contact scatter	Unevaluated	Avoidance or NRHP evaluation
Mainline	23LN1345	Pre-contact scatter	Unevaluated	HDD under site
Mainline	23SC2109	Pre-contact scatter	Unevaluated	NRHP testing and reporting
Mainline	23AU1144	Pre-contact scatter / Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	23AU1153	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	23AU1154	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	23AU137	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	23AU138	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	23AU140	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	23AU141	Pre-contact scatter / Historic period farmstead	Not eligible	None unless corridor moves
Mainline	23AU142	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23AU143	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	23BN1130	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	23BN40	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	23BN72	Historic period road	Not eligible	None unless corridor moves
REX pipeline	23BN73	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	23CA158	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	23CH1345	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	23CH1346	Historic period farmstead / Pre-contact isolate	Not eligible	None unless corridor moves
REX access road	23CH1347	Historic period farmstead	Not eligible	None unless corridor moves
REX reroute	23CH1348	Historic period farmstead	Not eligible	None unless corridor moves

TABLE 3.11.2-7 (Continued)				
Project Item	Site	Site Type	NRHP Eligibility	Action Required by Keystone
REX reroute	23CH1349	Historic period farmstead / Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	23CH338	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	23CH339	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	23CH340	Historic period hunting camp	Not eligible	None unless corridor moves
REX pipeline	23CH341	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	23CH342	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	23CH343	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	23CH344	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	23CH345	Historic period scatter	Not eligible	None unless corridor moves
REX pipeline	23CH346	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	23CH347	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	23CI0087	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	23CI0089	Pre-contact scatter / Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	23CI1088	Pre-contact scatter	Not eligible	None unless corridor moves
REX pipeline	23CW0053	Historic period well	Not eligible	None unless corridor moves
REX pipeline	23CW0054	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	23CW0055	Historic period wells	Not eligible	None unless corridor moves
REX pipeline	23CW0056	Pre-contact isolate	Not eligible	None unless corridor moves
REX pipeline	23CW0057	Pre-contact isolate	Not eligible	None unless corridor moves
REX pipeline	23CW0058	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	23CW0060	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	23CW0061	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	23LN1327	Pre-contact / Historic period scatter	Not eligible	None unless corridor moves
Mainline	23LN1328	Pre-contact / Historic period scatter	Not eligible	None unless corridor moves
Mainline	23LN1329	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23LN1330	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23LN1331	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	23LN1332	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23LN1333	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23LN1334	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23LN1335	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23LN1341	Prehistoric scatter	Not eligible	None unless corridor moves
Mainline	23LN1342	Prehistoric scatter	Not eligible	None unless corridor moves
Mainline	23LN1343	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23LN1344	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23LN1346	Pre-contact / Historic period scatters	Not eligible	None unless corridor moves
Mainline	23LN298	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23LN299	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23LN300	Pre-contact scatter	Not eligible	None unless corridor moves

Table 3.11.2-7 (continued)				
Project Item	**Site**	**Site Type**	**NRHP Eligibility**	**Action Required by Keystone**
Mainline	23LN301	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23LN302	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23LN303	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23LN304	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23LN305	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23LN306	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23LN307	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23LN308	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23MT074	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23MT1419	Historic period well	Not eligible	None unless corridor moves
Mainline	23MT419	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23MT420	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23RN1426	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23SC0776	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	23SC1055	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23SC1056	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23SC1057	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	23SC2068	Historic period industrial	Not eligible	None unless corridor moves
Mainline	23SC2072	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	23SC2073	Historic period scatter	Not eligible	None unless corridor moves
Mainline	23SC2074	Historic period scatter	Not eligible	None unless corridor moves
Mainline	23SC2103	Pre-contact scatter/Historic period farmstead	Not eligible	None unless corridor moves
Mainline	23SC2105	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23SC2106	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23SC2107	Pre-contact scatter/Historic period farmstead	Not eligible	None unless corridor moves
Mainline	23SC2108	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23SC2109	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23SC2110	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	23SC2111	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	23SC2112	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	23SC2113	Historic period farmstead	Not eligible	None unless corridor moves
REX pipeline	23BN03	Pre-contact scatter	Not needed	None (outside Keystone APE)
REX pipeline	23BN08	Pre-contact scatter	Not needed	None (outside Keystone APE)
REX pipeline	23BN38	Pre-contact scatter	Not needed	None (outside Keystone APE)
REX pipeline	23BN59	Pre-contact scatter	Not needed	None (outside Keystone APE)
REX pipeline	23CH073	Pre-contact scatter / Historic period farmstead	Not needed	None (outside Keystone APE)
REX pipeline	23CI0011	Pre-contact scatter	Not needed	None (outside Keystone APE)

APE = Area of potential effect.
HDD = Horizontal directional drilling.
NRHP Eligibility = National Register of Historic Places eligibility as determined by DOS.
REX = Rockies Express Western Phase Project.

3.11.2.6 Illinois

A total of 49 historic properties were identified by ARG during surveys of the Keystone project APE in Illinois (Myers et al. 2007d; also Titus 2007a). The identified historic properties were classified as 27 Pre-contact (i.e., prehistoric period) sites, two Pre-contact isolated finds, 13 Historic period sites, and seven sites that contained both Pre-contact and Historic period components (Table 3.11.2-8). All but one of the 36 sites with a Pre-contact component (including all seven multi-component sites) were noted by the presence of stone tools or stone waste flakes in varying quantities; the sole locus that differed was a mound site that was recorded prior to the Keystone survey (11MS0178). The Historic period historic properties included 13 farmsteads (including three associated with multi-component sites), six Historic artifact scatters (including four multi-component sites), and one cemetery. Keystone also has filed a report (Schwegman et al. 2007b) that presents the results of additional NRHP evaluative testing at eight of the cultural loci (11B155, 11FY204, 11FY205, 11MS2018, 11MS2275, 11MS2276, 11MS2277, and 11MS2278). Keystone has provided information to DOS stating their intention to conduct National Register evaluation testing at three additional Pre-contact era sites (11B159, 11B164, and 11B165).

Based on the information provided to date by the applicant, DOS has assessed 41 of the 49 historic properties as not meeting the criteria of significance for listing in the NRHP (36 CFR 60.4 [a-d])[7]. This assessment includes the portions of nine Historic period farmsteads that lie within the surveyed corridor, two Historic period artifact scatters, 20 of the Pre-contact period artifact scatters (including nine of the sites that were further assessed through NRHP evaluative testing), both Pre-contact era isolated finds and all seven multi-component sites (Table 3.11.2-8). DOS has also made a finding that NRHP eligibility determinations are not required for two of the Pre-contact sites as they are either destroyed or are situated outside the current Project APE. No additional investigations at these 43 resources are required unless construction activities are projected to fall outside the surveyed corridor. In that event, additional cultural resources surveys must be conducted, following the protocols outlined in the PA.

DOS has determined that one of the identified sites subjected to further evaluation is eligible for listing in the NRHP under Criterion D (the ability to yield information important to history or prehistory). This site (11FY205; Table 3.11.2-8) consists of the remains of a large Pre-contact era (Archaic to Woodland Periods) occupation in Fayette County (Schwegman et al. 2007b). The historic property is situated within the currently proposed Project corridor. Prior to construction commencing, Keystone will be required to file its plans with DOS that detail the specific avoidance procedures to be implemented in order to avoid impact to the site, in the format described in Section 3.11.2. If an impact to the historic property is anticipated, Keystone must submit a mitigation plan so that DOS, the SHPO, ACHP, and all relevant consulting parties can evaluate the impact, following the protocols outlined in the PA and in 36 CFR 800.5.

DOS has categorized the NRHP significance of the remaining two Historic period and three Pre-contact period historic properties listed in Table 3.11.2-8 as unevaluated. As each of these sites has the potential to be a Section 106-defined historic property, they must either be further assessed through National Register evaluation procedures, or they must be completely avoided in order to prevent any impact to the cultural remains or features that are present. Prior to construction commencing, Keystone will be required to file with DOS the results of NRHP site evaluations demonstrating that a listed cultural resource is not a historic property. Alternatively, Keystone will provide plans that detail the specific avoidance procedures

[7] All determinations of eligibility listed in Section 3.11.2.6 were submitted by DOS to the IL SHPO on September 13, 2007; a reply concurring with these determinations was received on November 23, 2007. The SHPO submitted a follow-up letter to DOS on December 12 that stated they had mistakenly assessed Site 11MR121 as potentially eligible for listing in the NRHP, instead of not eligible, as they had intended.

to be implemented in order to avoid impact to the site, in the format described in Section 3.11.2. DOS and the consulting parties will evaluate the submitted information, following the protocols outlined in the PA, and will make formal findings of effect.

TABLE 3.11.2-8
Historic Properties Identified in Illinois during Keystone Mainline Project Field Surveys as of November 2007

Project Item	Site	Site Type	NRHP Eligibility	Action Required by Keystone
Mainline	11FY205	Pre-contact scatter	Eligible	Bore or HDD underneath site
Mainline	11MS0178	Pre-contact mound	Unevaluated	Additional survey and reporting
Mainline	Wanda Cemetery	Historic period cemetery	Unevaluated	Additional survey and reporting; avoid by reroute
Mainline	11MR124	Historic period farmstead	Unevaluated	Avoid by reroute
Mainline	11FY020	Pre-contact scatter	Unevaluated	HDD under site
Pump station	11MS2287	Pre-contact scatter	Unevaluated	File abandonment plan
Mainline	11B159	Pre-contact scatter	Unevaluated	NRHP testing and reporting
Mainline	11B164	Pre-contact scatter	Unevaluated	NRHP testing and reporting
Mainline	11B165	Pre-contact scatter	Unevaluated	NRHP testing and reporting
Mainline	11B149	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	11B150	Pre-contact / Historic period scatter	Not eligible	None unless corridor moves
Mainline	11B151	Pre-contact scatter / Historic period farmstead	Not eligible	None unless corridor moves
Mainline	11B152	Historic period scatter	Not eligible	None unless corridor moves
Mainline	11B153	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	11B154	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	11B155	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	11B156	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	11B157	Pre-contact Isolate	Not eligible	None unless corridor moves
Mainline	11B158	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	11B159	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	11B160	Pre-contact / Historic period scatter	Not eligible	None unless corridor moves
Mainline	11B161	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	11B162	Pre-contact isolate	Not eligible	None unless corridor moves
Mainline	11B163	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	11B164	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	11B165	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	11FY197	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	11FY203	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	11FY204	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	11FY206	Pre-contact scatter / Historic period farmstead	Not eligible	None unless corridor moves
Mainline	11MR121	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	11MR122	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	11MR123	Historic period scatter	Not eligible	None unless corridor moves
Mainline	11MR130	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	11MS0831	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	11MS2018	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	11MS2274	Pre-contact / Historic period scatter	Not eligible	None unless corridor moves
Mainline	11MS2275	Pre-contact scatter	Not eligible	None unless corridor moves

TABLE 3.11.2-8 (Continued)				
Project Item	**Site**	**Site Type**	**NRHP Eligibility**	**Action Required by Keystone**
Mainline	11MS2276	Pre-contact scatter / Historic period farmstead	Not eligible	None unless corridor moves
Mainline	11MS2277	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	11MS2278	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	11MS2279	Pre-contact scatter	Not eligible	None unless corridor moves
Pump Station	11MS2280	Pre-contact scatter	Not eligible	None unless corridor moves
Mainline	11MS2281	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	11MS2282	Pre-contact / Historic period scatter	Not eligible	None unless corridor moves
Mainline	11MS2283	Historic period farmstead	Not eligible	None unless corridor moves
Mainline	11MS2284	Prehistoric scatter	Not eligible	None unless corridor moves
Mainline	11MS2285	Prehistoric scatter	Not eligible	None unless corridor moves
Pump Station	11MS2286	Historic farmstead	Not eligible	None unless corridor moves
Mainline	11MS348	Prehistoric scatter	Not eligible	None unless corridor moves
Mainline	11MS1292	Prehistoric scatter	Not needed	None (site outside APE or destroyed)
Mainline	11MS1293	Prehistoric scatter	Not needed	None (site outside APE or destroyed)

APE = Area of potential effect.
HDD = Horizontal directional drilling.
NRHP Eligibility = National Register of Historic Places eligibility as determined by DOS.
REX = Rockies Express Western Phase Project.

As noted in Section 3.11.1.6, survey permission was denied to ARG for 8.04 miles of the proposed Keystone pipeline route. Historic properties surveys for these pipeline sections and all unsurveyed Project access roads, additional temporary workspaces that lie outside of the surveyed corridor, reroutes, and appurtenant facilities in South Dakota must be completed before Section 106 compliance is achieved. Further survey reports must be submitted and reviewed by DOS. In consultation with the SHPO and other consulting parties, DOS will complete the identification and evaluation of historic properties in accordance with 36 CFR § 800.4 before pipeline construction begins.

3.11.2.7 Oklahoma (Cushing Extension)

A total of 15 historic properties were identified by ARG during surveys of the Keystone Cushing Extension APE in Oklahoma (Shah Lomas et al. 2007). The identified historic properties were classified as one Pre-contact (i.e., prehistoric period) site, one Pre-contact isolated find, 12 Historic period sites, and one National Historic Landmark that contains both Historic and Pre-contact attributes (Table 3.11.2-9). The two sites with a Pre-contact component were noted by the presence of stone tools or stone waste flakes in varying quantities. The Historic period historic properties included six farmsteads, one Historic artifact scatter, and five structures (of which four were not assigned designations). The National Historic Landmark, situated in Kay County, is discussed in more detail below.

TABLE 3.11.2-9 Historic Properties Identified in Oklahoma during Keystone Cushing Extension Field Surveys as of November 2007				
Project Item	**Site**	**Site Type**	**NRHP Eligibility**	**Action Required by Keystone**
Cushing Extension	34KA318 (101 Ranch)	National Historic Landmark (Historic and Pre-contact)	Eligible (listed)	Submit avoidance or mitigation plan
Cushing Extension	34KA456	Pre-contact scatter	Unevaluated	Avoidance or NRHP evaluation
Cushing Extension	34NB87	Historic period farmstead	Unevaluated	Avoidance or NRHP evaluation
Cushing Extension	34BN84	Historic period scatter	Not eligible	None unless corridor moves
Cushing Extension	34BN85	Historic period structure	Not eligible	None unless corridor moves
Cushing Extension	Undesignated	Historic period structure	Not eligible	None unless corridor moves
Cushing Extension	Undesignated	Historic period structure	Not eligible	None unless corridor moves
Cushing Extension	Undesignated	Historic period structure	Not eligible	None unless corridor moves
Cushing Extension	Undesignated	Historic period structure	Not eligible	None unless corridor moves
Cushing Extension	34BN86	Historic period farmstead	Not eligible	None unless corridor moves
Cushing Extension	34KA455	Historic period farmstead	Not eligible	None unless corridor moves
Cushing Extension	34NB83	Historic period farmstead	Not eligible	None unless corridor moves
Cushing Extension	34PY110	Historic period farmstead	Not eligible	None unless corridor moves
Cushing Extension	34PY77	Historic period farmstead	Not eligible	None unless corridor moves
Cushing Extension	OK-KEY-CX-104	Pre-contact isolate	Not eligible	None unless corridor moves

NRHP Eligibility = National Register of Historic Places eligibility as determined by DOS.

Based on the information provided to date by the applicant, DOS has evaluated 12 of the 15 historic properties as not meeting the criteria of significance for listing in the NRHP (36 CFR 60.4 [a-d])[8]. This evaluation includes the portions of the six Historic period farmsteads that lie within the surveyed corridor, the sole Pre-contact period isolated find, and all five historic structures (Table 3.11.2-9). No additional investigations of these 12 resources are required unless construction activities are projected to fall outside the surveyed corridor. In that event, additional cultural resources surveys must be conducted, following the protocols outlined in the PA.

One of the historic properties located within the Project APE is a National Historic Landmark; the property is also listed in the NRHP (No. 73001560) as the 101 Ranch Historic District and is known in the Oklahoma Site Files as Site 34KA318. Located in Kay County, the 101 Ranch Historic District was listed in the NRHP for its significance in the areas of Agriculture, Performing Arts, African-American culture, and Commerce. While its primary period of significance is associated with the late 19th century, the 101 Ranch Historic District contains at least two archeological sites within its boundaries, including a Pre-contact component. This National Historic Landmark is situated within the currently proposed

[8] All determinations of eligibility listed in Section 3.11.2.6 were submitted by DOS to the OK SHPO on September 13; a reply concurring with these determinations was received on October 24, 2007.

Project corridor. Keystone has informed DOS that there is a commitment to avoid this property. Prior to construction commencing, Keystone will file plans with DOS that detail the specific avoidance procedures to be implemented, in the format described in Section 3.11.2. If an impact to the historic property is still anticipated, Keystone must submit a mitigation plan so that DOS, the SHPO, ACHP, and all relevant consulting parties can evaluate the impact, following the protocols outlined in the PA and in 36 CFR 800.5.

DOS has categorized the NRHP significance of the remaining single Historic period and single Pre-contact period historic properties listed in Table 3.11.2-9 as unevaluated. As each of these sites has the potential to be considered a Section 106-defined historic property, they must either be further assessed through the NRHP evaluation process or they must be completely avoided to prevent impacts to the cultural remains or features that are present. Prior to construction commencing, Keystone will file with DOS the results of NRHP site evaluations demonstrating that a listed cultural resource is not a historic property. Alternatively, Keystone will provide plans that detail the specific avoidance procedures to be implemented in order to avoid impact to the site, in the format described in Section 3.11.2. DOS and the consulting parties will evaluate the submitted information, following the protocols outlined in the PA, prior to making the formal findings of effect.

As noted in Section 3.11.1.7, survey permission was denied to ARG for 23.06 miles of the proposed Cushing Extension pipeline route. Historic properties surveys for these pipeline sections and all unsurveyed Project access roads, additional temporary workspaces that lie outside of the surveyed corridor, reroutes, and appurtenant facilities in Oklahoma must be completed before Section 106 compliance is achieved. Further survey reports will be submitted and reviewed by DOS. In consultation with the SHPO and other consulting parties, DOS will complete the identification and evaluation of historic properties in accordance with 36 CFR § 800.4, preferably before pipeline construction begins.

3.11.3 Consultation

3.11.3.1 Introduction

Under Section 106 of the NHPA, federal agency officials are required to share project information and consult with consulting parties. This includes Indian tribes, SHPOs, local governments, and applicants for federal permits. For this Project, DOS consulted with seven SHPOs, 87 Indian tribes, numerous federal and state agencies and local governments, and members of the public. Overall, the level of consultation DOS performed with each party was commensurate with the interest and concern that was displayed. Government-to-government consultation meetings, direct mailing, teleconferencing, direct telephone communications, and email were all utilized to keep consulting party members informed and to solicit comments on the Project. Public scoping and comment meetings also were conducted during the EIS process.

Informal discussions with SHPOs and Indian tribes were initiated by Keystone and their consultants in 2006. These initial communications by Keystone followed protocols used by FERC to conduct tribal and agency consultations. The FERC guidelines generally require the applicant to inform these groups of the project application and to seek their comments on it. In July 2006, DOS informed Keystone that its consultants should no longer directly communicate with Indian tribes. In an effort to appropriately observe the government-to-government relationship of the federal government with Indian tribes, DOS elected to retain the position as the lead federal agency under Section 106 and to consult directly with the Indian tribes, SHPOs, and agencies. A summary of the communications that were made by DOS to federal agencies and SHPO offices is presented in Table 3.11.3-1. The communications that have occurred between DOS and Indian tribes is shown in Table 3.11.3-2.

TABLE 3.11.3.1
State Historic Preservation Offices and Other Government Agencies Contacted by the U.S. Department of State Regarding Historic Properties (as of December 2007)

Federal or State Agency	Letters Sent	Phone Contacts*	Emails	Meetings
Advisory Council on Historic Preservation	11/20/07		07/27/07, 07/27/07, 08/06/07, 08/10/07, 09/24/07, 10/10/07, 10/10/07, 10/10/07, 10/11/07, 10/11/07, 10/19/07, 11/02/07, 11/06/07, 11/08/07, 11/09/07, 11/13/07, 11/16/07, 11/16/07, 11/16/07, 11/16/07, 11/16/07, 11/19/07, 11/19/07, 11/24/07, 12/05/07, 12/07/07, 12/10/07, 12/12/07, 12/12/07	10/23/07
North Dakota SHPO	8/3/06, 8/23/06, 1/17/07, 2/1/07, 3/21/07, 6/10/07, 8/13/07, 9/12/07, 9/20/07, 10/02/07, 10/04/07, 10/18/07, 11/20/07	10/5/06, 3/21/07	10/5/06, 2/12/07, 1/16/07, 3/20/07, 3/21/07, 08/08/07, 09/24/07, 10/08/07, 10/09/07, 10/11/07, 10/19/07, 11/2/07, 11/05/07, 11/06/07, 11/08/07, 11/09/07 11/13/07, 11/16/07, 11/24/07, 12/05/07, 12/05/07, 12/05/07, 12/07/07, 12/10/07, 12/12/07, 12/12/07	2/22/07
North Dakota Natural Resources Policy	1/17/07			
South Dakota SHPO	03/28/06, 8/3/06, 1/17/07, 2/1/07, 3/23/07, 6/10/07, 09/12/07, 10/02/07, 10/18/07, 11/20/07	10/5/06, 3/22/07	10/5/06, 2/12/07, 1/16/07, 3/20/07, 3/22/07, 3/27/07, 06/05/07, 08/08/07, 08/08/07, 8/10/07, 08/31/07, 09/19/07, 10/09/07, 10/11/07, 10/19/07, 11/02/07, 11/2/07, 11/06/07, 11/08/07, 11/08/07, 11/09/07, 11/13/07, 11/16/07, 11/24/07, 12/04/07, 12/05/07, 12/07/07, 12/10/07, 12/12/07, 12/12/07	8/28/07, 8/29/07, 10/23/07
South Dakota Public Utilities Commission	1/17/07			
Kansas SHPO	03/02/06, 3/8/06, 8/3/06, 8/30/06, 9/19/06, 12/21/06, 1/9/07, 1/17/07, 2/1/07, 3/27/07, 6/10/07, 8/27/07, 09/06/07, 09/12/07, 09/27/07, 10/01/07, 10/02/07, 10/18/07, 11/20/07	10/5/06	10/5/06, 2/12/07, 1/16/07, 3/20/07, 08/08/07, 09/24/07, 10/09/07, 10/11/07, 10/19/07, 11/2/07, 11/06/07, 11/08/07, 11/09/07, 11/13/07, 11/16/07, 11/24/07, 12/05/07, 12/07/07, 12/10/07, 12/12/07, 12/12/07	
Kansas Corp. Commission for Oil and Gas	1/17/07			
Kansas Department of Health and Environment	1/17/07			

TABLE 3.11.3.1 (Continued)				
Federal or State Agency	**Letters Sent**	**Phone Contacts***	**Emails**	**Meetings**
Missouri SHPO	1/07/05, 8/3/06, 1/10/07, 1/17/07, 1/26/07, 2/1/07, 6/10/07, 08/20/07, 09/12/07, 10/02/07, 10/16/07, 10/18/07, 11/20/07	10/5/06, 2/8/07, 3/21/07	10/5/06, 2/12/07, 1/16/07, 3/20/07, 08/08/07, 8/17/07, 8/20/07, 09/13/07, 09/24/07, 10/09/07, 10/11/07, 10/16/07, 10/17/07, 10/19/07, 11/02/07, 11/06/07, 11/08/07, 11/09/07, 11/09/07, 11/13/07, 11/16/07, 11/24/07, 12/05/07, 12/07/07, 12/10/07, 12/12/07, 12/12/07	8/28/07, 8/29/07
Missouri Natural Resources Department	1/17/07			
Illinois SHPO	1/07/05, 05/18/06, 8/3/06, 1/17/07, 2/1/07, 2/9/07, 6/10/07, 08/23/07, 9/12/07, 10/02/07, 10/04/07, 10/11/07, 10/18/07, 11/20/07, 11/21/107	10/5/06, 3/13/07	2/12/07, 1/16/07, 3/13/07, 3/20/07, 08/08/07, 8/20/07, 09/24/07, 10/02/07, 10/09/07, 10/11/07, 10/19/07, 11/02/07, 11/06/07, 11/8/07, 11/08/07, 11/09/07, 11/13/07, 11/16/07, 11/21/07, 11/24/07, 11/29/07, 12/05/07, 12/07/07, 12/10/07, 12/12/07, 12/12/07	2/27/07, 8/28/07, 8/29/07
Illinois Commerce Commission	1/17/07			
Illinois EPA Groundwater Section	1/17/07			
Illinois Hydrogeology Compliance	1/17/07			
Oklahoma SHPO	8/3/06, 9/12/06, 9/19/06, 1/17/07, 2/1/07, 6/10/07, 8/13/07, 09/12/07, 10/02/07, 10/03/07, 10/11/07, 10/18/07, 10/24/07, 11/20/07	10/5/06	2/112, 2/12/07, 1/16/07, 3/20/07, 08/08/07, 8/20/07, 10/09/07, 10/11/07, 10/19/07, 11/2/07, 11/06/07, 11/08/07, 11/08/07, 11/08/07, 11/09/07, 11/13/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/07/07, 12/10/07, 12/12/07, 12/12/07	2/27/07
Oklahoma Office of the Secretary of the Environment	1/17/07			
Oklahoma Office of the Governor	1/17/07			

TABLE 3.11.3-2
Federally Recognized Native American Tribes Contacted by the U.S. Department of State (as of December 2007)

Native American Nation	Office State	Letters Sent	Telephone Contacts	Emails Sent	Faxes Sent	Meetings Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Absentee Shawnee Tribe of Indians of OK	OK	8/3/06, 2/1/07, 2/9/07, 3/22/07, 9/29/07, 10/02/07, 10/18/07, 11/20/07	10/6/06, 2/16/07, 5/15/07(vm), 6/22/07, 7/12/07, 8/15/07	6/22/07, 10/05/07, 10/15/07, 10/16/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07	2/8/07, 2/15/07			√		TBD
Blackfeet Nation	MT	8/3/06, 3/22/07, 9/29/07, 10/02/07, 10/18/07, 11/08/07, 11/20/07, 11/21/07	5/15/07(vm), 5/15/07, 6/22/07, 6/25/07, 6/28/07, 7/10/07, 7/10/07(lm), 7/11/07, 7/18/07(vm), 8/21/07, 10/17/07, 10/17/07, 12/05/07(lm), 12/12/07(vm)	7/3/07, 7/4/07, 7/6/07, 7/11/07, 8/21/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 12/04/07, 12/05/07, 12/05/07, 12/10/07, 12/10/07, 12/12/07, 12/12/07		8/28/07, 8/29/07, 10/23/07		√		TBD
Caddo Tribe of OK	OK		10/6/06, 2/16/07, 5/15/07(vm), 5/21/07(vm), 6/22/07(lm), 6/25/07, 6/27/07		2/8/07, 2/15/07		√			TBD
Cherokee Nation	OK	8/3/06, 2/1/07, 9/29/07, 10/02/07, 10/18/07, 11/08/07, 11/20/07, 11/21/07	10/5/06, 2/16/07, 5/15/07(vm), 5/15/07(vm), 6/22/07(vm), 6/25/07(vm), 6/26/07, 6/28/07	10/5/06, 3/5/07, 8/15/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/02/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07	2/8/07, 2/15/07		√			

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contacts	Emails Sent	Faxes Sent	Meetings Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Cheyenne - Arapaho Tribe of OK	OK	8/3/06, 9/19/06, 2/1/07, 9/29/07, 10/02/07, 10/18/07, 11/20/07, 11/21/07	10/6/06, 2/16/07, 5/15/07(nr), 5/18/07(vm), 6/7/07(nr), 6/22/07(vm), 6/25/07(vm), 6/26/07(nr), 6/28/07(nr), 6/29/07, 7/10/07, 7/12/07(vm)	6/29/07, 7/31/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/02/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/11/07, 12/12/07, 12/12/07	2/8/07, 2/15/07	8/28/07, 8/29/07		√		TBD
Cheyenne River Sioux	SD	8/3/06, 9/19/06, 1/17/07, 2/1/07, 9/29/07, 10/02/07, 10/18/07, 11/20/07	10/6/06, 2/16/07, 3/27/06, 5/15/07(vm), 5/15/07(lm), 5/15/07(lm), 6/18/07(lm), 6/19/07, 8/15/07, 8/16/07	6/20/07, 8/20/07, 8/20/07, 9/19/07, 10/05/07, 10/15/07, 10/16/07, 11/16/07, 11/19/07	2/8/07, 2/15/07		√			TBD
Chickasaw Nation of OK	OK	8/3/06, 2/1/07, 8/13/07, 9/29/07, 10/02/07, 10/18/07, 11/20/07	10/5/06, 2/16/07, 5/15/07(lm), 6/22/07(vm), 6/25/07(vm), 6/25/07, 6/26/07(lm), 6/26/07, 7/2/07(vm), 7/18/07(lm)	6/26/07, 7/9/07, 7/23/07, 8/3/07, 10/05/07, 10/15/07, 10/16/07, 11/16/07, 11/19/07, 11/27/07, 11/28/07	2/8/07, 2/15 not thru, 2/16/07 not thru		√			TBD
Chippewa-Cree	MT	8/3/06, 1/17/07, 2/1/07, 08/16/07, 9/29/07, 10/02/07, 10/18/07, 11/20/07, 11/21/07	10/5/06, 2/16/07, 5/15/07(nr), 6/22/07(lm), 6/25/07, 6/28/07, 6/29/07, 7/10/07(lm), 8/15/07, 8/16/07, 12/05/07	6/29/07, 09/19/07, 09/21/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/16/07, 10/16/07, 10/19/07, 11/02/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07	2/8/07, 2/15/07	8/28/07, 8/29/07		√		TBD

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contacts	Emails Sent	Faxes Sent	Meetings Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Choctaw Nation of OK	OK	8/3/06, 2/1/07	10/5/06, 2/16/07, 5/15/07, 5/15/07, 5/15/07, 5/18/07, 5/21/07(nr), 6/6/07, 6/7/07, 6/7/07 6/7/07	10/5/06, 2/7/07	2/7/07, 2/15/07		√			
Citizen Potawatomi Nation	OK	8/3/06, 2/1/07, 9/29/07, 10/02/07, 10/18/07, 11/20/07	2/16/07, 3/9/07	10/5/07, 10/15/07, 10/16/07, 11/16/07, 11/19/07, 11/24/07	2/8/07, 2/15/07				√	
Comanche Nation	OK	3/22/07	5/15/07				√			
Confederated Salish and Kootenai Tribes of the Flathead Indian Nation	MT	3/22/07	5/15/07(vm), 5/15/07, 6/22/07(vm), 6/27/07				√			TBD
Crow Creek Sioux	SD	8/3/06, 9/19/06, 1/17/07, 2/1/07, 11/20/07	10/5/06, 2/16/07, 6/7/07	2/15/07, 11/16/07, 11/19/07, 11/24/07	2/8/07, 2/15/07	8/28/07, 8/29/07	√			
Delaware Nation	OK	8/3/06, 2/107, 9/29/07, 10/02/07, 10/18/07, 11/20/07, 11/21/07	10/5/06, 2/16/07, 5/15/07, 6/22/07(vm), 6/27/07, 6/28/07, 7/12/07(lm), 8/15/07, 8/20/07(na)	6/28/07, 6/28/07, 7/13/07, 7/16/07, 7/16/07, 8/15/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/02/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07	2/8/07, 2/15/07			√		

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contacts	Emails Sent	Faxes Sent	Meetings Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Eastern Band of Cherokee Indians	NC	8/3/06, 2/1/07	10/5/06, 2/16/07, 5/15/07(vm), 6/22/07(vm), 6/25/07	2/15/07	2/8/07, 2/15/07		√			
Eastern Shawnee Tribe of OK	MO	8/3/06, 2/1/07	2/16/07, 5/15/07(lm)	2/15/07, 2/20/07, 3/5/07	2/8/07, 2/15/07		√			
Eastern Shoshone Tribe	WY	9/29/07, 10/02/07, 10/18/07, 11/20/07		6/13/07, 8/20/07, 10/05/07, 10/15/07, 10/16/07, 11/16/07, 11/19/07, 11/24/07			√			
Flandreau Santee Sioux Tribe	SD	8/3/06, 9/19/06, 1/17/07, 2/1/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07	10/19/06, 2/16/07, 2/27, 6/7/07(vm), 6/11/07, 6/12/07(vm), 6/13/07, 7/2/07(vm), 7/10/07, 8/15/07(vm), 8/22/07, 8/20/07(vm)	10/19/06, 2/15/07, 6/13/07, 8/9/07, 8/15/07, 8/20/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/02/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07	2/8/07, 2/15/07	8/28/07, 8/29/07	√			
Forest County Potawatomi Community of Wisconsin Potawatomi Indians	WI	8/3/06. 2/1/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07, 11/21/07	10/19/06, 2/16/07, 6/22/07(vm), 6/25/07(vm), 6/27/07(vm), 6/28/07(vm), 6/29/07, 7/18/07(vm), 8/16/07(vm), 8/20/07(vm)	6/29/07, 8/15/07, 8/20/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/2/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07	2/8/07, 2/15/07			√		

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contacts	Emails Sent	Faxes Sent	Meetings Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Fort Peck Tribes	MT	6/28/07, 09/29/07, 10/02/07, 10/09/07, 10/18/07, 11/08/07, 11/20/07, 11/21/07	5/15/07, 5/17/07, 6/6/07, 8/15/07(vm), 8/20/07, 8/20/07(vm), 10/05/07, 12/05/07(lm), 12/10/07	5/17/07, 6/14/07, 6/18/07, 6/19/07, 8/15/07, 8/20/07, 8/20/07, 10/03/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/02/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07		5/30/07, 8/28/07, 8/29/07, 10/23/07		√		TBD
Fort Sill Apache	OK	3/22/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07	5/21/07, 7/10/07(lm), 8/15/07(na), 8/15/07(na)	5/21/07, 7/13/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/2/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07			√			TBD
Gros Ventre and Assiniboine Tribe of Ft. Belknap	MT	3/22/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07		10/5/07, 10/15/07, 10/16/07, 11/16/07, 11/19/07, 11/24/07					√	
Gun Lake Potawatomi	MI	8/3/06, 2/1/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07	10/19/06, 2/16/07, 6/22/07(vm), 6/25/07(vm), 6/27/07(vm), 6/28/07(vm), 6/29/07(vm), 7/3/07(vm), 8/20/07(not in)	10/19/06, 10/05/07, 10/15/07, 10/16/07, 11/16/07, 11/19/07, 11/24/07	2/7/07 bad #, not thru 2/15, 2/16/07		√			

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contacts	Emails Sent	Faxes Sent	Meetings Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Hannahville Indian Community	MI	8/3/06, 2/1/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07	10/19/06, 2/16/07, 6/22/07, 6/25/07, 6/27/07 (vm), 7/3/07	2/15/07, 10/05/07, 10/15/07, 10/16/07, 11/16/07, 11/19/07, 11/24/07	2/8/07, not thru 2/15				√	
Ho-Chunk Nation of Wisconsin	WI	8/3/06, 2/1/07, 2/8/07, 6/28/07, 09/29/07, 10/02/07, 10/18/07, 11/08/07, 11/20/07, 11/21/07	10/19/06, wrong #, 6/22/07 (vm), 6/25/07 (vm), 6/26/07(vm), 6/27/07, 8/16/07(vm), 8/20/07(vm)	2/15/07, 6/27/07, 6/28/07, 7/02/07, 8/9/07, 8/15/07, 8/20/07, 8/22/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/2/07, 11/08/07, 11/09/07,11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07	2/7/07 bad #			√		
Huron Potawatomi Nation	MI	8/3/06, 2/1/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07	10/17/06, 2/16/07, 6/25/07 (lm), 6/27/07 (vm)	2/15/07, 10/05/07, 10/15/07, 10/16/07, 11/16/07, 11/19/07, 11/24/07	2/7/07 bad #				√	
Iowa Tribe of Kansas and Nebraska	KS	8/3/06, 9/19/06, 2/1/07, 11/08/07, 11/20/07, 11/21/07	2/16/07 no answer, 6/18/07, 6/18/07	2/15/07, 7/27/07, 10/19/07, 11/16/07, 11/19/07, 11/24/07, 12/06/07	2/8/07, 2/15/07	11/14/06, 10/23/07		√		
Iowa Tribe of Oklahoma	OK	8/3/06, 2/1/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07	10/5/06, 2/16/07, 3/9/07, 6/18/07 (vm), 7/2/07	2/15/07, 6/20/07, 8/9/07, 10/05/07, 10/15/07, 10/16/07, 11/16/07, 11/19/07, 11/24/07	2/7 bad #, 2/15/07	11/16/06, 11/16/06, 8/28/07, 8/29/07	√			TBD

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contacts	Emails Sent	Faxes Sent	Meetings Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Jena Band of Choctaw Indians	LA	8/3/06, 2/1/07	2/16/07 no answer, 6/21/07 (vm), 6/22/07	2/15/07	2/8/07, 2/15/07		√			
Jicarilla Apache Tribe	NM	3/22/07	6/21/07, 6/25/07	5/21/07, 5/22/07, 5/23/07	5/21/07, 5/22/07, 5/23/07		√			
Kaw Tribe of Oklahoma	OK	8/3/06, 9/19/06, 10/4/06, 1/17/07, 2/1/07, 11/08/07, 11/21/07	10/04/06, 2/16/07, 5/21/07, 5/23/07, 5/24/07, 5/30/07, 6/15/07, 12/05/07(vm), 12/12/07	10/05/06, 2/15/07, 5/21/07, 5/22/07, 5/23/07, 10/09/07, 10/11/07, 10/19/07, 11/2/07, 11/08/07, 11/09/07, 12/05/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07	2/8/07, 2/15/07			√		
Kialegee Tribal Town of the Creek Nation of Oklahoma	OK	8/3/06, 2/1/07	10/6/06, # no longer in service, 5/22/07, 5/22/07	10/6/06	2/7/07 bad #, not thru 2/15/07		√			
Kickapoo Traditional Tribe of Texas	TX	8/3/06, 2/1/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07	2/16/07 no answer, 6/21/07 (lm), 6/28/07, 7/3/07	10/5/07, 10/15/07, 10/16/07, 11/16/07, 11/19/07, 11/24/07	2/7/07 bad #, 2/15/07		√			
Kickapoo Tribe of Kansas	KS	8/3/06, 2/1/07, 10/30/07, 11/08/07, 11/16/07, 11/20/07, 11/21/07	10/6/06, 2/16/07, 5/22/07, 5/22/07 (vm), 6/18/07, 6/18/07, 11/16/07, 12/05/07(vm), 12/07/07, 12/07/07	11/2/07, 6/18/07, 11/16/07, 11/19/07, 11/21/07, 11/24/07, 11/29/07, 11/30/07, 12/11/07	2/7/07, 2/15/07	10/23/07		√		

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contact	Email Sent	Fax Sent	Meeting Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Kickapoo Tribe of Oklahoma	OK	8/3/06, 2/1/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07	10/6/06, 2/16/07, 6/18/07, 7/2/07, 7/10/07, 8/16/07(na), 8/20/07(not in)	10/6/06, 6/18/07, 7/13/07, 8/15/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07	2/7/07 bad #, not thru 2/15/07, 2/16/07		√			
Kiowa Indian Tribe of Oklahoma	OK	8/3/06, 2/1/07, 3/22/07	6/18/07 (lm), 6/21/07, 6/25/07, 6/27/07	6/18/07			√			
Lower Brule Sioux	SD	8/3/06, 9/19/06, 1/17/07, 2/1/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07	10/6/06, 2/16/07, 5/11/07, 6/19/07(vm), 6/21/07(vm), 6/25/07(vm), 6/27/07(vm), 6/28/07(vm), 6/29/07(vm), 7/3/07(vm), 8/20/07(vm), 8/23/07	10/6/06, 6/7/07, 6/11/07, 8/23/07, 10/05/07, 10/15/07, 10/16/07, 11/16/07, 11/19/07, 11/24/07	2/7/07 bad #, 2/15/07, 2/16/07				√	
Lower Sioux Indian Community	MN	8/3/06, 1/17/06, 2/1/07, 09/29/07, 10/02/07, 10/18/07, 11/08/07, 11/20/07, 11/21/07	12/5/07, 12/12/07	2/15/07, 6/11/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 10/31/07, 11/2/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/10/07, 12/12/07, 12/12/07	2/7/07 bad#, not thru 2/15/07	8/28/07, 8/29/07, 10/23/07		√		TBD

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contact	Email Sent	Fax Sent	Meeting Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Mandan, Hidatsa and Arikara Nation	ND	8/3/06, 9/19/06, 1/17/07 2/1/07, 11/08/07, 11/21/07	10/5/06, 2/16/07 left message, 12/06/07	2/15/07, 12/06/07	2/8/07, 2/15/07	10/23/07		√		
Miami Tribe of Oklahoma	OK	8/3/06, 2/1/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07	10/5/06, 2/16/07 left message, 5/22/07(vm), 6/25/07, 7/2/07(vm), 7/10/07(vm), 7/20/07, 8/20/07(lm)	6/25/07, 7/13/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/02/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07	2/8/07, 2/15/07		√			TBD
Mille Lacs Band of Ojibwe	MN	9/29/07, 10/02/07, 10/18/07, 11/08/07, 11/20/07, 11/21/07	7/10/07(vm), 12/05/07(vm), 12/12/07	7/24/07, 8/9/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/17/07, 10/19/07, 11/2/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 11/28/07, 12/03/07, 12/05/07, 12/07/07, 12/10/07, 12/12/07, 12/12/07		5/30/07, 8/28/07, 8/29/07, 10/23/07		√		TBD
Modoc Tribe of Oklahoma	OK	3/22/07	6/19/07, 7/10/07(vm), 7/12/07(vm), 7/12/07	6/19/07			√			

TABLE 3.11.3-2 (Continued)										
Native American Nation	**Office State**	**Letters Sent**	**Telephone Contact**	**Email Sent**	**Fax Sent**	**Meeting Held**	**No Objection to Project**	**DOS Consultation Ongoing**	**No Response from Tribe to Date**	**PA Signatory**
Muscogee-Creek Nation	OK	8/3/06, 9/19/06, 11/22/06, 2/1/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07	10/19/06, 2/16/07, 6/19/07(vm), 6/21/07(vm), 6/25/07, 6/27/07(lm), 6/28/07, 8/20/07	6/28/07, 6/28/07, 6/29/07, 7/2/07, 7/13/07, 8/20/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/2/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07	2/7/07, 2/15/07		√			
Northern Arapaho Tribe	WY	3/22/07, 09/29/07, 10/02/07, 10/18/07, 11/08/07, 11/20/07, 11/21/07	5/15/07, 6/13/07, 7/2/07(vm), 7/10/07(vm), 12/05/07(lm), 12/12/07, 12/12/07(vm)	5/15/07, 7/30/07, 8/15/07, 8/20/07, 8/21/07, 8/21/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 10/31/07, 11/02/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/20/07, 11/24/07, 11/28/07, 12/05/07, 12/07/07, 12/10/07, 12/10/07, 12/12/07, 12/12/07		8/28/07, 8/29/07, 10/23/07		√		TBD
Northern Cheyenne Tribe	MT	3/22/07, 09/29/07, 10/02/07, 10/18/07, 11/08/07, 11/20/07, 11/21/07	6/19/07(vm), 6/21/07, 6/25/07, 6/27/07(vm), 6/28/07, 6/29/07, 7/3/07(vm), 12/05/07(lm), 12/06/07	8/14/07,10/02/07, 10/05/07, 10/11/07, 10/15/07, 10/16/07, 10/31/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/11/07		10/23/07		√		
Northern Ute Tribe	UT	9/29/07, 10/02/07, 10/18/07, 11/20/07	6/19/07, 6/21/07, 6/22/07, 6/25/07	10/5/07, 10/15/07, 10/16/07, 11/16/07, 11/19/07, 11/24/07					√	

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contact	Email Sent	Fax Sent	Meeting Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Oglala Sioux	SD	9/19/06, 2/1/07, 09/29/07, 10/02/07, 10/18/07, 11/08/07, 11/20/07, 11/21/07	10/5/06, 2/16/07, 5/11/07, 6/19/07, 6/21/07, 6/25/07, 6/27/07, 8/15/07, 8/20/07(vm), 8/21/07	6/27/07, 6/27/07, 8/21/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/02/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07	2/7/07, 2/15/07	8/28/07, 8/29/07, 10/23/07		√		TBD
Omaha Tribe of Nebraska	NE	8/3/06, 9/19/06, 1/17/07 2/1/07	10/5/06, 2/16/07		2/7/07, 2/15		√			
Osage Nation of Oklahoma	OK	8/3/06, 9/19/06, 2/1/07, 3/22/07, 9/25/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07, 11/21/07	10/5/06, 2/15/07, 3/13/07, 5/23/07, 5/23/07, 7/9/07, 7/18/07(vm), 10/09/07, 10/10/07, 10/15/07, 12/05/07(vm)	2/15/07, 5/23/07, 6/19/07, 6/19/07, 6/19/07, 6/19/07, 6/19/07, 6/19/07, 6/29/07, 7/18/07, 7/19/07, 8/3/07, 8/20/07, 10/03/07, 10/05/07, 10/09/07, 10/10/07, 5/10/10/07, 10/11/07, 10/15/07, 10/19/0710/15/07, 10/15/07, 10/15/07, 10/15/07, 10/16/07, 10/30/07, 10/30/07, 10/30/07, 10/31/07, 11/02/07, 11/05/07, 11/05/07, 11/08/07, 11/09/07, 11/13/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/05/07, 12/06/07, 12/10/07, 12/12/07, 12/12/07	2/7/07, 2/15/07	10/22/07		√		TBD

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contact	Email Sent	Fax Sent	Meeting Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Otoe-Missouri Tribe	OK	8/3/06, 9/19/06, 2/1/07	10/5/06, 2/16/07, 6/19/07	10/5/06, 2/15/07	2/7/07, 2/1/7/07		√			
Ottawa Tribe of Oklahoma	OK	3/22/07	8/3/06, 9/19/06, 2/1/07, 9/29/07, 10/02/07, 10/18/07, 11/08/07, 11/20/07, 11/21/07	5/23/07			√			
Pawnee Nation of Oklahoma	OK	8/3/06, 9/19/06, 2/1/07, 09/29/07, 10/02/07, 10/18/07, 11/08/07, 11/20/07, 11/21/07	10/6/06, 2/16/07 left message, 5/23/07, 7/2/07(vm), 12/05/07(vm)	9/27/06, 2/7/07, 2/15/07, 3/28/07, 5/23/07, 6/19/07, 06/20/07, 8/15/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/2/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 12/03/07, 12/05/07, 12/10/07, 12/10/07, 12/12/07, 12/12/07	2/7/07, 2/15/07	8/28/07, 8/29/07		√		TBD
Peoria Indian Tribe of Oklahoma	OK	8/3/06, 9/19/06, 2/1/07	10/5/06, 2/16/07, 5/23/07(vm), 6/19/07(vm)	2/7/07, 2/15/07	2/7/07, 2/15/07		√			
Poarch Band of Creek Indians	AL	8/3/06, 9/19/06, 2/1/07	10/5/06, 2/16/07, 6/19/07(vm), 6/25/07(vm), 6/28/07	10/5/06, 2/15/07	2/7/07, 2/15/07		√			

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contact	Email Sent	Fax Sent	Meeting Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Pokagon Band of Potawatomi Indians of Michigan	MI	9/19/06, 2/1/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07	10/5/06, 2/16/07 busy, 6/21/07, 8/20/07(lm)	10/6/06, 2/15/07, 6/25/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/2/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07	2/7/07, not thru 2/15			√		TBD
Ponca Tribe of Indians of Oklahoma	OK	8/3/06, 9/19/06, 2/1/07, 2/7/07, 10/02/07, 10/18/07, 11/20/07, 11/21/07	2/16/07 left message, 6/7/07(vm), 6/19/07, 6/21/07	6/25/07, 6/25/07, 7/7/07, 7/9/07, 7/10/07, 8/15/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/02/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07	2/8/07, 2/1/07	11/16/06		√		TBD
Ponca Tribe of Nebraska	NE	3/22/07, 09/29/07	6/19/07, 7/3/07	6/19/07, 11/08/07, 11/09/07			√			
Praire Island Band of Potawatomi Indians	KS	9/19/06, 2/1/07, 09/29/07	5/23/07, 6/19/07		no fax#		√			
Prairie Island Indian Community	MN	8/3/06, 9/19/06, 2/1/07	9/20/06(vm), 5/23/07(vm), 6/19/07, 6/19/07(vm), 06/20/07, 7/10/07	6/20/07, 10/11/07, 10/11/07	2/7/07, not thru 2/15		√			
Quapaw Tribe	OK	9/19/06, 2/1/07	2/16/07, 6/7/07(lm), 6/8/07, 6/8/07		2/8/07, 2/15/07		√			

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contacts	Emails Sent	Faxes Sent	Meetings Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Red Lake Band of Chippewa Indians of Minnesota	MN	8/3/06, 1/17/07, 2/1/07, 2/7/07	2/16/07, 6/19/07		bad fax#, not thru 2/15, 2/16/07		√			
Rosebud Sioux Tribe	SD	9/19/06, 2/1/07, 2/9/07, 09/29/07, 10/02/07, 10/17/07, 10/18/07, 10/29/07, 11/05/07, 11/08/07, 11/15/07, 11/20/07	2/16/07, 8/20/07, 8/20/07	2/15/07, 10/05/07, 10/15/07, 10/16/07, 11/16/07, 11/19/07, 11/24/07, 11/29/07	2/8/07, 2/15/07	10/23/07		√		TBD
Sac and Fox in Iowa	IA	8/3/06, 2/1/06, 2/9/07, 7/6/07	2/1/06, 6/25/07(vm), 6/29/07(lm), 7/3/07	2/15/07, 2/16/07, 7/3/07, 7/3/07	2/8/07, 2/15/07		√			
Sac and Fox of the Missouri in Kansas and Nebraska	KS	8/3/06, 2/1/07, 2/9/07, 11/05/07, 11/08/07, 11/20/07, 11/21/07	2/16/07, 10/18/07	2/16/07, 11/16/07, 11/19/07, 11/24/07	2/9/07, not thru 2/15	10/23/07	√			
Sac and Fox Nation of Oklahoma	OK	8/3/06, 2/1/07, 2/9/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07	6/21/07, 2/16/07, 7/18/07	2/15/07, 2/16/07, 6/25/07, 7/6/07, 7/10/07, 7/13/07, 7/17/07, 8/1/07, 10/05/07, 10/15/07, 10/16/07, 11/16/07, 11/19/07, 11/24/07	2/8/07, 2/15/07			√		TBD

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contacts	Emails Sent	Faxes Sent	Meetings Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Santee Sioux Tribe of Nebraska	NE	8/3/06, 1/17/07, 2/1/07, 2/9/07, 09/29/07, 10/02/07, 10/18/07, 10/26/07, 11/08/07, 11/20/07, 11/21/07	2/16/07, 8/15/07, 8/15/07(lm), 8/20/07, 11/15/07, 12/06/07, 12/06/07	2/15/07, 2/16/07, 3/1/07, 5/10/07, 7/5/07,8/7/07, 8/9/07, 8/15/07, 8/20/07, 8/20/07, 8/20/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/2/07, 11/08/07, 11/09/07, 11/13/07, 11/13/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/06/07, 12/07/07, 12/10/07, 12/12/07, 12/12/07	2/8/07, 2/15/07	5/30/07, 8/28/07, 8/29/07, 10/23/07		√		TBD
Shakopee Mdewankanton Sioux	MN	8/3/06, 2/1/07, 2/9/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07, 11/21/07	6/25/07, 2/16/07	2/15/07, 10/05/07, 10/15/07, 10/16/07, 11/16/07, 11/19/07, 11/24/07	2/8/07, 2/15/07		√			TBD
Shawnee Tribe	OK	2/1/07, 2/9/07	6/25/07	3/5/07, 10/11/07	2/9/07, 2/15/07		√			

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contacts	Emails Sent	Faxes Sent	Meetings Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Sisseton-Wahpeton Oyate Sioux	SD	8/3/06, 9/19/06, 1/17/07, 2/1/07, 2/9/07, 09/27/07, 09/29/07, 10/02/07, 10/18/07, 11/08/07, 11/15/07, 11/20/07, 11/21/07	8/3/06, 9/19/06, 1/17/07, 2/1/07, 2/9/07, 09/27/07, 09/29/07, 10/02/07, 10/18/07, 11/08/07, 11/15/07, 11/20/07, 11/21/07	3/28/07, 4/11/07, 5/10/07, 7/24/07, 7/26/07, 7/31/07, 7/31/07, 8/9/07, 09/28/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/15/07, 10/16/07, 10/16/07, 10/19/07, 11/02/07, 11/08/07, 11/09/07, 11/15/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07	no fax#	5/30/07, 8/28/07, 8/29/07, 10/23/07		√		TBD
Sisseton-Wahpeton Oyate Wahpekutz	SD	9/18/07, 09/29/07, 10/02/07, 10/18/07, 11/08/07, 11/21/07	9/18/07	7/31/07, 09/18/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/18/07, 10/19/07, 11/08/07, 11/09/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07		5/30/07, 8/28/07, 8/29/07, 10/23/07		√		TBD
Southern Ute Indian Tribe	CO	3/22/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07	6/29/07(vm)	10/5/07, 10/15/07, 10/16/07, 11/16/07, 11/19/07, 11/24/07					√	
Spirit Lake Tribe	ND	9/19/06. 11/17/06, 1/17/07, 2/1/07, 2/9/07, 09/29/07, 10/02/07, 10/18/07, 11/08/07, 11/20/07, 11/21/07	12/12/07	10/5/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/02/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/10/07, 12/12/07, 12/12/07	2/9/07, 2/15/07	5/30/07, 8/28/07, 8/29/07, 10/23/07		√		TBD

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contacts	Emails Sent	Faxes Sent	Meetings Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Standing Rock Sioux Tribe	ND	2/9/07, 9/19/06, 1/17/07, 2/1/07, 9/10/07, 9/12/07, 09/12/07, 09/19/07, 09/29/07, 10/02/07, 10/10/07, 10/18/07, 10/31/07, 10/31/07, 11/01/07, 11/02/07, 11/08/07, 11/09/07, 11/15/07, 11/15/07, 11/20/07, 11/21/07	2/28/07, 8/15/07, 8/16/07	3/2/07, 8/15/07, 09/04/07, 09/05/07, 09/19/07, 09/24/07, 09/25/07, 9/26/07, 10/01/07, 10/02/07, 10/03/07, 10/05/07, 10/09/07, 10/10/07, 10/11/07, 10/11/07, 10/15/07, 10/15/07, 10/15/07, 10/16/07, 10/19/07, 11/02/07, 11/08/07, 11/09/07, 11/14/07, 11/14/07, 11/14/07, 11/16/07, 11/19/07, 11/24/07, 11/27/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07	2/9/07, 2/15/07	5/30/07, 8/28/07, 8/29/07, 10/23/07, 10/24/07		√		TBD
Stockbridge-Munsee Tribe	WI						√			
Three Affiliated Tribes	ND	3/22/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07	6/25/07(vm), 6/28/07(vm), 6/29/07, 8/20/07, 8/20/07(lm)	6/29/07, 6/29/07, 8/14/07, 8/15/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/02/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07		8/28/07, 8/29/07		√		TBD

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contacts	Emails Sent	Faxes Sent	Meetings Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Tonkawa Tribe	OK	2/1/07, 3/12/07, 2/9/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07, 11/21/07	6/7/07(vm), 6/25/07(vm), 6/29/07(vm), 7/3/07, 8/1/07, 8/2/07	7/3/07, 7/13/07, 7/16/07, 7/17/07, 7/17/07, 8/2/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 11/02/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07	2/8/07, 2/15/07			√		TBD
Trenton Indian Service Area	ND	3/22/07	6/28/07	6/28/07, 6/29/07, 6/29/07			√			
Turtle Mountain Band of Chipewa	ND	8/3/06, 9/19/06, 11/2/06, 1/17/07, 2/1/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07	2/16/07,6/25/07(vm), 6/28/07(vm), 6/29/07(vm), 7/3/07(vm), 7/10/07(vm)	2/15/07, 2/16/07, 10/05/07, 10/15/07, 10/16/07, 10/19/07, 11/16/07, 11/19/07, 11/24/07	2/9/07, 2/15/07	10/25/07	√			TBD
United Keetoowah Band of Cherokee Indians	OK	8/3/06, 9/19/06, 2/1/07, 2/9/07, 09/29/07, 10/02/07, 10/18/07, 11/08/07, 11/20/07, 11/21/07	2/16/07 bad #, 8/16/07	2/15/07, 7/30/07, 8/15/07, 8/20/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 11/2/07, 11/08/07, 11/09/07, 11/16/07, 11/19/07, 11/24/07, 12/05/07, 12/10/07, 12/12/07, 12/12/07	2/9/07, 2/15/07, 8/16/07, 8/16/07			√		TBD
Upper Sioux-Pezihutazizi	MN	8/3/06, 2/1/07, 2/9/07, 11/08/07, 11/21/07	2/16/07 message, 6/26/07(vm), 6/28/07		2/8/07, 2/15/07		√			TBD

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contacts	Emails Sent	Faxes Sent	Meetings Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Ute Mountain Tribe	CO	3/22/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07	6/26/07(vm), 6/28/07(vm), 6/29/07(vm), 7/3/07(vm)	10/5/07, 10/15/07, 10/16/07, 11/16/07, 11/19/07, 11/24/07					√	
White Earth Band of Minnesota Chippewa	MN	8/3/06, 1/17/07, 2/1/07, 2/9/07, 09/29/07, 10/02/07, 10/18/07, 11/20/07	2/16/07 message, 6/26/07(vm), 6/28/07, 6/29/07(vm)	2/15/07, 10/05/07, 10/15/07, 10/16/07, 11/16/07, 11/19/07, 11/24/07	2/8/07, 2/15/07				√	
Wichita and Affiliated Tribes	OK	9/19/06, 2/1/07, 2/9/07	2/16/07 na, 6/28/07		2/8/07, not thru 2/15		√			
Winnebago Tribe	NE	2/1/07	2/16/07 message, 6/26/07(vm), 6/26/07, 6/28/07, 7/2/07	6/26/07, 6/26/07, 6/26/07, 6/28/07	2/9/07, 2/15/07		√			
Wyandotte Nation	OK	2/1/07, 2/9/07	2/16/07 message, 6/26/07, 7/10/07, 7/10/07(vm)	6/26/07, 6/26/07	2/8/07, 2/15/07		√			

TABLE 3.11.3-2
(Continued)

Native American Nation	Office State	Letters Sent	Telephone Contacts	Emails Sent	Faxes Sent	Meetings Held	No Objection to Project	DOS Consultation Ongoing	No Response from Tribe to Date	PA Signatory
Yankton Sioux	SD	8/3/06, 9/19/06, 2/1/07, 3/12/07, 09/29/07, 10/02/07, 10/18/07, 11/08/07, 11/20/07, 11/21/07	8/15/07(na), 8/16/07(na), 8/20/07	6/12/07, 6/29/07, 7/2/07, 7/6/07, 7/20/07, 7/20/07, 7/31/07, 7/31/07, 8/15/07, 8/20/07, 8/31/07, 8/31/07, 10/05/07, 10/09/07, 10/11/07, 10/15/07, 10/16/07, 10/19/07, 11/2/07, 11/08/07, 11/09/07, 11/13/07, 11/13/07, 11/13/07, 11/15/07, 11/16/07, 11/16/07, 11/19/07, 11/21/07, 11/24/07, 11/29/07, 12/05/07, 12/10/07, 12/11/07, 12/12/07, 12/12/07		5/30/07, 10/23/07		√		TBD

lm = Left message.
TBD = To be determined.
vm = Left voice mail.

3.11.3.2 Federal and State Agency Consultation

In an effort to coordinate compliance with NEPA and Section 106, DOS consulted with federal agencies whose participation in the Project was considered an undertaking as per 36 CFR 800.16(y). These agencies included the USDA (FSA, RUS, and NRCS), COE, and USFWS. On October 25, 2006, the ACHP entered consultation finding that Criteria 3 and 4 of Appendix A, *Criteria for Council Involvement in Reviewing Individual Section 106 Cases*, of the regulations (36 CFR Part 800) implementing Section 106 of the NHPA, had the potential to be met. All of these agencies are signatories to a PA. Separately, DOE will ensure that Section 106 of the NHPA is followed for related actions of the Project that fall under their regulatory oversight. Through a series of teleconferences and meetings with these agencies, DOS identified overlapping responsibilities for Section 106 on certain federally owned or managed lands in the Project area. Most notably, COE and USFWS have reviewed and approved the findings of historic properties investigations on properties that they own or manage, in coordination with DOS. DOS also actively worked with all federal agencies toward implementing the PA by soliciting and responding to comments or concerns.

In a November 8, 2007 letter to DOS, the ACHP expressed a number of questions regarding the DOS's coordination of NEPA with Section 106, the applicability of NAGPRA, the condemnation of historic properties, the extra-territorial application of Section 402 of the NHPA, the initiation and subsequent performance of consultation with Indian tribes, the appropriate use of sample field investigations, and the incomplete identification of historic properties of religious and cultural significance to Indian tribes. DOS responded in a November 30, 2007 letter that addressed the ACHP's questions.

DOS also has consulted with several state agencies, including the seven SHPO offices in the Project area: South Dakota SHPO, North Dakota, SHPO, Nebraska SHPO, Kansas SHPO, Missouri SHPO, Oklahoma SHPO, and Illinois SHPO. DOS has consulted with each SHPO to develop appropriate research and field survey methods that adequately identified and evaluated historic properties. DOS also has consulted with the SHPOs to gain concurrence on the APE, NRHP eligibility of historic properties, Project effects, and development of a PA. Any concerns expressed by the SHPOs were addressed through monthly teleconferences and/or meetings.

The South Dakota SHPO submitted several substantive comments subsequent to publishing of the Draft EIS. The South Dakota SHPO expressed concerns regarding consultation of Indian tribes, identification of TCPs and sites of religious and cultural importance, and use of an inadequate archaeological sampling model. In order to address these and other issues presented by the South Dakota SHPO, the Applicant agreed to all avoidance measures outlined in the DOS determination of eligibility letter dated December 5, 2007, a pedestrian survey of a 2-mile long section of the Project corridor, the inclusion of additional areas for subsurface testing, supporting the development of education materials, facilitation of site visits by the SHPO during construction, and providing the South Dakota SHPO with updates as construction monitoring reports are prepared. DOS also has endeavored to address the identification of properties of religious and cultural significance, including TCPs, as noted below.

Each SHPO has been actively consulted concerning filing of the various Unanticipated Discoveries Plans for each state. With the assistance of the ACHP, two drafts of the Unanticipated Discoveries Plans were shared with all consulting parties for comment. These were distributed to the consulting parties on September 12, 2007, and on October 19, 2007. The final approved plans will be an attachment to the PA. DOS also actively worked with all consulting parties to develop a PA. Working closely with the ACHP, DOS presented drafts of the PA to all consulting parties for comment on July 30, 2007, September 18, 2007, and October 19, 2007. The comments on these drafts were reviewed and incorporated into a final draft. The final draft is currently under review by the ACHP and DOS. It will soon be ready for signature. The PA will become a condition of the Presidential Permit.

3.11.3.3 Native American Consultation

The list of Indian tribes that were notified for this project was derived from lists maintained by SHPOs, state tribal liaisons, THPOs, the U.S. Bureau of Indian Affairs, and recommendations from other tribes. Even though the Project does not bisect any Native American reservations, several Indian tribes requested consultation, consistent with 36 CFR 800.2(c)(2)(ii), due to the Project's potential to affect tribal historic properties that are situated on ancestral lands. DOS is continuing consultation with the tribes who have interests in the Project.

In compliance with 36 CFR 800.2 and confidentiality requirements, DOS provided consulting Indian tribes with information pertaining to any findings or determinations that were derived from historic properties reports prepared for portions of the Project's APE. Following an initial round of consultation completed in July 18, 2007, 22 Indian tribes had notified DOS as having no interest either in consulting or objecting to the Project; 13 tribes had yet to respond to requests for consultation. Consultation with the remaining Indian tribes has been ongoing since publication of the Draft EIS. Following an additional round of calls, letters, and consultation meetings through December 2007, 31 tribes expressed an interest in receiving updates regarding the progress of the Project, with 24 tribes requesting consulting party status in writing to DOS. The consulting tribes are listed in Table 3.11.3-3. A summary of the tribal consultation efforts is included in Table 3.11.3-2.

Considerable effort and time has been expended contacting individual tribes to determine their level of interest and their willingness to consult with DOS. As part of this consultation outreach, several of the tribes requested development of a Tribal Advisory Committee (TAC). The TAC was developed based on the inclusion of tribes who wanted to participate. The TAC met via monthly conference calls before Indian tribes expressed a preference for face-to-face consultation. These meetings served as a forum for Indian tribes to express concerns about the Project's potential for impacts to historic properties. The TAC approach was abandoned when several tribes requested small group and individual face-to-face consultation rather than a large group approach over the telephone.

In recognition of the United States Government's trust responsibilities and consistent with the intent of Executive Order 13175 – *Consultation and Coordination with Indian Tribal Governments,* DOS held several combined government-to-government and Section 106 meetings with Indian tribes. These meetings are listed in Table 3.11.3-4. On May 30, 2007, a meeting was convened in North Dakota that was attended by officials representing DOS, USFWS, COE, ACHP, Western, DOE, SD SHPO, OK SHPO, and officials that represented eight Sioux tribes (the Sisseton-Wahpeton Oyate, Yankton Sioux, SWO Wahpekutz, Santee Sioux Nation of Nebraska, Standing Rock Sioux, Spirit Lake Tribe, Fort Peck Tribes, and Mille Lacs Band of Ojibwe). At this meeting, the tribes made several requests that were taken into account by DOS, as noted in the Group Consultation Meeting Summary (Table 3.11.3-5).

At additional government-to-government consultation meetings held on August 28–29 and October 22–24, 2007, several Indian tribes reiterated their concerns about the Project's potential to affect historic properties that could include TCPs and sites of traditional religious and/or cultural importance, as well as the concerns noted above. Many of these same concerns were expressed by the ACHP in its November 8, 2007 letter to DOS. Table 3.11.3-5 outlines DOS's efforts to resolve these concerns.

The ACHP also had questions about the identification of religious and cultural sites of importance to Indian tribes in a November 8, 2007 letter to DOS. In an attempt to resolve these concerns, on

November 8, 2007, DOS extended an offer to the 31consulting tribes to fund studies of religious and cultural significance, including TCPs, by the consulting tribes within the Project corridor. To date, one Indian tribe has agreed to conduct the studies, which are due to be completed by February 1, 2008. DOS addressed the concerns of the ACHP through a letter on November 30, 2007, and continues to work with the Indian tribes and the ACHP in the finalization of the PA.

TABLE 3.11.3-3
Consulting Tribes under Section 106

1	Blackfeet Nation
2	Cherokee-Arapaho Tribe of Oklahoma
3	Chippewa-Cree
4	Fort Peck Tribes
5	Kickapoo Tribe of Kansas
6	Sisseton-Wahpeton Oyate Sioux
7	Sissteon Wahpeton Oyate Wahpekute
8	Santee Sioux Nation of Nebraska
9	MHA Nation
10	Flandreau Santee Sioux Tribe
11	Northern Arapahoe Tribe
12	Standing Rock Sioux Tribe
13	Rosebud Sioux
14	Spirit Lake Tribe
15	Yankton Sioux
16	Iowa Tribe of Kansas and Nebraska
17	Mille Lacs Band of Ojibwe
18	Kaw Tribe
19	Fort Sill Apache
20	Sac and Fox Nation of the Missouri in Kansas and Nebraska
21	Osage Nation of Oklahoma
22	Pawnee Nation of Oklahoma
23	United Keetoowah Band of Cherokee
24	Cherokee Nation
25	Lower Sioux Indian Community
26	Ho-Chunk Nation of Wisconsin
27	Oglala Sioux
28	Forest County Potawatomi
29	Delaware Nation
30	Kickapoo Tribe of Oklahoma
31	Miami Tribe of Oklahoma
32	Tonkawa Tribe
33	Three Affiliated Tribes
34	Pokagon Band of Potawatomi
35	Ponca Tribes of Oklahoma
36	Muscogee Creek Nation
37	Cheyenne-Arapaho Tribe of Oklahoma
38	Northern Cheyenne Tribe

TABLE 3.11.3-4
List of Group Consultation Meetings with Indian Tribes

Date	Place	Indian Tribes Present	Agencies Represented
May 30, 2007	Dakota Magic Casino, ND	Sisseton-Wahpeton Oyate Sioux, Yankton Sioux, Sisseton-Wahpeton Wahpekutz, Santee Sioux Nation of Nebraska, Standing Rock Sioux, Spirit Lake Tribe, Fort Peck Tribes, and Mille Lacs Band of Ojibwe, Standing Rock Sioux Tribe, Yankton Sioux	DOS, USFWS, COE, SD SHPO, OK SHPO, ACHP by phone
August 28, 2007	Royal River Casino, Flandreau, SD	Blackfeet Nation, Cheyenne-Arapaho Tribe of OK, Chippewa-Cree, Crow Creek Sioux, Flandreau Santee Sioux Tribe, Fort Peck Tribes, Iowa Tribe of Oklahoma, Lower Sioux Community, Mille Lacs Band of Ojibwe, Northern Arapaho Tribe, Oglala Sioux, Pawnee Nation of Oklahoma, Santee Sioux Tribe of Nebraska, Sisseton-Wahpeton Oyate Sioux, Sisseton-Wahpeton Oyate Wahpekutz, Spirit Lake Tribe, Standing Rock Sioux Tribe, Three Affiliated Tribes	DOS, IL SHPO, SD SHPO, USFWS, BLM
August 29, 2007	Royal River Casino, Flandreau, SD	Blackfeet Nation, Cheyenne-Arapaho Tribe of OK, Chippewa-Cree, Crow Creek Sioux, Flandreau Santee Sioux Tribe, Fort Peck Tribes, Iowa Tribe of Oklahoma, Lower Sioux Community, Mille Lacs Band of Ojibwe, Northern Arapaho Tribe, Oglala Sioux, Pawnee Nation of Oklahoma, Santee Sioux Tribe of Nebraska, Sisseton-Wahpeton Oyate Sioux, Sisseton-Wahpeton Oyate Wahpekutz, Spirit Lake Tribe, Standing Rock Sioux Tribe, Three Affiliated Tribes	DOS, IL SHPO, SD SHPO, BLM, COE
October 22, 2007	Osage Indian Reservation Pawhuska, OK	Andrea Hunter, Osage Nation THPO	DOS
October 23, 2007	Prairie Knights Casino, Fort Yates, ND	Fort Peck Tribes, Iowa Tribe of Kansas and Nebraska, Kickapoo Tribe of Kansas, MHA Nation, Mille Lacs Band of Ojibwe, Northern Arapaho Tribe, Oglala Sioux, Rosebud Sioux Tribe, Sac and Fox of the Missouri in Kansas and Nebraska, Santee Sioux Tribe of Nebraska, Sisseton-Wahpeton Oyate Sioux, Sisseton-Wahpeton Oyate Wahpekuz, Spirit Lake Tribe, Standing Rock Sioux Tribe, Yankton Sioux	DOS, SD SHPO, COE
October 24, 2007	Prairie Knights Casino, Fort Yates, ND	Fort Peck Tribes, Iowa Tribe of Kansas and Nebraska, Kickapoo Tribe of Kansas, MHA Nation, Mille Lacs Band of Ojibwe, Northern Arapaho Tribe, Oglala Sioux, Rosebud Sioux Tribe, Sac and Fox of the Missouri in Kansas and Nebraska, Santee Sioux Tribe of Nebraska, Sisseton-Wahpeton Oyate Sioux, Sisseton-Wahpeton Oyate Wahpekuz, Spirit Lake Tribe, Standing Rock Sioux Tribe, Yankton Sioux	DOS, ACHP Note: The Indian tribes left the meeting early

TABLE 3.11.3-4
(Continued)

Date	Place	Indian Tribes Present	Agencies Represented
December 18, 2007	Dept. of State, Washington, DC	Fort Peck Tribe, Kaw Nation of Oklahoma, Mille Lacs Band of Ojibwe, Chippewa-Cree, Osage, Pawnee Nation of Oklahoma, Northern Cheyenne Tribe, Northern Arapaho Tribe, Lower Sioux Indian Community, Kickapoo Tribe of Kansas, Spirit Lake Tribe, Blackfeet Nation, Santee Sioux Tribe of Nebraska, MHA Nation, Iowa Tribe of Kansas and Nebraska	DOS, COE

TABLE 3.11.3-5
Summary Table of Tribal Concerns Addressed by DOS during Group Consultation Meetings

Tribal Action Items	DOS Discussion
May 30, 2007 Consulting Tribes Group Consultation Meeting	
1. Set up another meeting with all project-related information and invite the Canadian First Nations Tribes.	DOS set up another 2-day meeting on August 28–29, 2007, and asked for contacts of Canadian First Nations Tribes.
2. Establish a Tribal Advisory Committee (TAC) with a tribal liaison.	A TAC was formed and maintained until the next tribal consultation meeting in August, when DOS was asked to eliminate the TAC.
3. Outline the protocols for inadvertent discovery of human remains – establish a TAC if necessary.	The Unanticipated Discovery Plans for both artifacts and human remains are official attachments to the Programmatic Agreement (PA).
4. Complete a 100% archaeological survey in North and South Dakota.	Sample field investigations are routinely used in South and North Dakota and are permissible under 36 CFR 800.4(b)(1). Project reports were sent to Indian tribes.
5. Tribal members should be funded to undertake their own survey for traditional cultural properties (TCPs).	In August, DOS asked the Indian tribes if a tribal member would like to lead a study of religious and cultural significant sites, including TCPs. No consensus was reached about who would lead this study, and no tribes informed DOS in writing that they were interested. On November 8, 2007, DOS offered to fund studies of traditional religious and cultural sites, as well as TCPs.
6. Work with the ACHP to resolve issues concerning the 100% survey.	The ACHP officially entered consultation on October 25, 2006. Following a letter from the ACHP on November 8, 2007, requesting clarification of survey methods used in South Dakota, DOS responded in a letter dated November 30, 2007. The letter provided additional justification for the identification and evaluation methods used in South Dakota.

TABLE 3.11.3-5 (Continued)	
Tribal Action Items	**DOS Discussion**
August 28–29, 2007 Consulting Tribes Group Consultation Meeting	
1. An integrated, inter-agency historic properties management plan is needed. Who will manage the project in the future?	A PA implemented through 36 CFR 800 represents a more useful planning and consultation tool as the Project proceeds from planning to construction to operation. It governs the process of consultation; inadvertent discoveries; the responsibilities of consulting parties; the avoidance, minimization, and/or mitigation of impacts to historic properties; and the resolution of disagreements. DOS will remain the lead federal agency for the duration of the Project and will be principally responsible for all future findings, determinations, and cultural resources oversight.
2. A TCP/sites of religious and cultural importance survey is needed.	On November 8, 2007, DOS formally offered in writing, to fund a study of religious and cultural significance, including TCPs, to each consulting tribe. Thirty-one tribes who had shown an interest in completing this study were offered this funding. No tribes responded in writing.
3. The TAC should not be continued and face-to-face, government-to-government meetings should be conducted.	The TAC was abandoned in favor of face-to-face, government-to-government meetings.
4. 100% of the project corridor should be surveyed.	"Sample field investigations" are an appropriate means of identifying historic properties as per 36 CFR 800.4(b)(1). The methods for deriving the selective sampling of areas have been further explained and justified in Final EIS Section 3.11.1
5. Canadian tribes should be included in consultation, and impacts to sites in Canada should be considered.	DOS made several attempts to contact members of the Canadian First Nations. No response has been received to date. The federal undertakings within this Project do not occur beyond the territorial boundaries of the United States. DOS therefore is not required to consider the impacts to historic properties in Canada.
6. Tribes should be compensated for participation in any TCP studies.	On November 8, 2007, DOS offered to fund a TCP/sites of religious and cultural importance survey to each consulting tribe.
7. The process for tribal involvement in inadvertent discoveries should be clear.	The roles of tribes in inadvertent discoveries are outlined in the Unanticipated Discoveries Plans that are attached to the PA. The tribes have also been afforded an opportunity to comment on these plans prior to their implementation.
8. If a site cannot be avoided, what is the process for contacting/consulting with tribes?	While the Project has yet to adversely affect a historic property, the process for consultation with tribes if an impact is unavoidable is outlined in the PA.
9. For NEPA consultation on the Draft EIS, the Indian tribes want to be involved and consulted through every step of TCP identification, inadvertent discovery plans, and environmental justice.	The Indian tribes have been consulted at every phase of the Keystone Project. From the initial scoping meetings, through the Draft EIS comment period, and to present, the tribes have been supplied with any information that was requested and have been afforded opportunities to comment on the identification and evaluation methods and efforts, all official determinations and findings, the PA, and the Unanticipated Discoveries Plans.

TABLE 3.11.3-5 (Continued)	
Tribal Action Items	**DOS Discussion**
10. The tribes wish to have a tribal liaison appointed by DOS.	DOS is unable to appoint a dedicated tribal liaison at this point. All official consultation with Indian tribes will be conducted through the DOS's Bureau of Oceans and International Environmental and Scientific Affairs, Office of Environmental Policy.
11. DOS needs to address properties that have yet to be surveyed.	Sites that have yet to be identified, due to the area not being included in the sample or because of property owner objection, will be handled either immediately following condemnation, through the Unanticipated Discoveries Plans, as well as through the PA.
12. DOS needs to schedule additional meetings so that tribal concerns can be heard and addressed, and so that the federal government and tribes can gain a better understanding of their respective cultures.	Following the May 30, 2007 meeting, DOS scheduled additional meetings on August 28–29, 2007, October 22–23, 25, 2007, and December 18, 2007.
13. DOS needs to address the applicability of NAGPRA.	NAGPRA applies only to lands that are controlled by federal agencies. Approximately 3 miles of federally owned land are on the proposed Mainline Project corridor and 3.6 miles along the Cushing Extension corridor. In addition to these lands, an easement for a property in Missouri held by the Natural Resources Conservation Service will be considered property "controlled" by the federal government. Prior to construction, determinations regarding the applicability of NAGPRA on lands that are either administered or featuring easements held by the USFWS will be made. These determinations will be shared with all consulting parties and explained in the PA.
October 22, 2007 Government-to-Government Consultation Meeting with Osage Tribe	
1. Discussed the possibilities of a 100% survey.	The PA will ensure that historic properties that were not surveyed are protected through Unanticipated Discoveries Plans and a process for consultation with all consulting parties.
2. Discussed the need for including National Park Service (NPS) legal terminology for standards and methodology accreditation as an appendix in the PA. Even though it is already included in the document, it would be stronger if it was included as an Appendix H.	The NPS guidelines referring to the identification and evaluation of historic properties, as well as the professional standards, are referenced in the PA; DOS will ensure that the Applicant complies with these standards.
3. All staging areas have not been identified, and inaccessible areas have not been surveyed. Dr. Hunter suggested having a monitor to ensure compliance with burial laws in Kansas and Missouri.	Monitors will be used at select locations for the Project, but DOS will ensure that the Applicant complies with all state laws. The relevant state laws governing the treatment of human remains are included as an attachment to the PA.

TABLE 3.11.3-5 (Continued)	
Tribal Action Items	**DOS Discussion**
October 23, 2007, Consulting Tribes Group Consultation Meeting	
1. The tribes have not had enough time to review the documentation.	The Draft EIS was released on August 10, and the comment period was completed in September; comments were accepted through November 2007.
2. Tribes do not recognize international boundaries; DOS should be assessing impacts to historic properties abroad.	Canada has its own environment impact assessment process, and historic properties are being considered as a part of that process. DOS cannot impose or enforce U.S. laws in Canada. Furthermore, the federal undertaking does not occur in Canada.
3. There has been a general lack of consultation regarding the methodologies and research designs prepared for the archaeological surveys prepared for South and North Dakota. There should be 100% surveys for those two states.	The PA will ensure that historic properties that were not surveyed are protected through Unanticipated Discoveries Plans and a process for consultation with all consulting parties. All information regarding the survey methodologies and research designs have been forwarded to the Indian tribes for their review and comments.
4. NAGPRA applies to the corridor.	NAGPRA applies only to lands that are controlled by federal agencies. Approximately 3 miles of federally owned land are on the proposed Mainline Project corridor and 3.6 miles along the Cushing Extension corridor.
5. How will the Project avoid historic properties?	Keystone will employ several different methods of avoidance, including reroutes, boring, and neckdowns. DOS is encouraging avoidance of all historic properties.
6. The tribes have requested a tribal liaison at DOS.	DOS is unable to appoint a dedicated tribal liaison at this point. All official consultation with Indian tribes will be conducted through the DOS's Bureau of Oceans and International Environmental and Scientific Affairs, Office of Environmental Policy.
7. Private individuals do not want Keystone to survey their land.	Many property owners do not wish to relinquish certain rights to their land and do not want it to be surveyed as a consequence. Keystone will need to wait for state condemnation procedures to be complete before unsurveyed private property can be surveyed by archaeologists.
8. Will there be tribal monitors?	Monitors will be used at select locations for the Project, but DOS will ensure that the Applicant complies with all state laws. The relevant state laws governing the treatment of human remains are included as an attachment to the PA.
9. We want a 100% survey for sites of religious or cultural significance.	On November 8, 2007, DOS offered to fund studies of traditional religious and cultural sites as well as TCPs. To date, only two tribes have agreed to undertake the survey.
10. Tribes have a right to determine sites eligible for the NRHP.	Ultimately, DOS makes determinations of NRHP eligibility; however, DOS acknowledges that Indian tribes possess special expertise in assessing the eligibility of historic properties that may have religious and cultural significance to them. DOS therefore will take that special knowledge into account.

TABLE 3.11.3-5 (Continued)	
Tribal Action Items	**DOS Discussion**
October 24, 2007 Government-to-Government Consultation Meeting with Standing Rock Tribe	
The Standing Rock Tribe left the meeting and gave up their opportunity for their day of government-to-government consultation.	DOS set up the meeting on October 24, 2007, as the day for government-to-government consultation with the Standing Rock Tribe. Per numerous Indian tribes' requests at this meeting, another meeting was held on December 18, 2007. All consulting parties were asked to join the meeting with DOS.
December 18, 2007 Government-to-Government Consultation Meeting with Consulting Tribes	
Seventeen Indian tribes sent representatives to this meeting. Issues discussed included the following questions about permits (what, when, and who): Role of other federal agencies Protocols of tribal consultation, timeline, and tribal resolutions PA, NEPA, and NHPA Experts Tribal socioeconomic impacts (jobs, royalty-trust fund, sacred sites)	DOS listened to the Indian tribes represented at the meeting and to COE staff who attended. DOS answered the questions posed by the Indian tribes to provide further clarification to everyone at the meeting. There appear to be some differences of opinion between some of the Indian tribes and DOS on what constitutes government-to government consultation. The December 18 meeting was the fifth government-to-government Section 106 consultation meeting that was held for the Project. The Indian tribes were invited to meet as a group due to their previous request to organize the meeting in this manner. Tribal elders and tribal chairmen and chairwomen have been invited to all of the consultation meetings. DOS will be responding to some of the questions and requests made by some of the Indian tribal representatives in writing.

3.11.4 Public Involvement

In a manner consistent with 36 CFR 800.2(d)(1–3), DOS has followed ACHP guidance in its efforts to involve the public in the Section 106 process through the NEPA process. As stated previously, DOS placed notices in the Federal Register (including the NOI and the notice of availability for the Draft EIS) and provided copies of the NOI and Draft EIS to local communities within the Project APE. Thirteen public scoping meetings were held along the pipeline corridor and 13 public comment meetings on the Draft EIS were held along the corridor. DOS provided direct mailings to stakeholders through mailing lists that included approximately 6,000 individuals and organizations. The public comment period for the Draft EIS ended on September 24, 2007. In October and November 2007, 13 property owners in South and North Dakota directly affected by the Project requested consulting party status in writing to DOS consistent with 36 CFR 800.3(f)(3) (see Table 3.11.3-6). The property owners also requested that Level III archaeological surveys be conducted on their properties, and six explicitly requested tribal participation in those surveys. Following consultation with the SHPOs of North and South Dakota, DOS will determine whether these property owners should be consulting parties. While the property owners maintain a potential economic interest and are directly affected by the Project, DOS determined that the property owners' requests for surveys of their respective properties and their requests for tribal involvement could be granted under the terms of the PA. On December 12, 2007, DOS submitted a letter to that effect to the property owners.

TABLE 3.11.3-6 Affected Property Owners Who Requested Consulting Status Consistent with 36 CFR 800.3(f)(3)					
Property Owner Name	**County of Affected Property**	**State**	**Request for Consultation?**	**Request for Level III Archaeological Survey?**	**Request for Tribal Involvement in Archaeological Survey?**
Major Richard Starke	Barnes	North Dakota	Yes	Yes	Yes
Mr. Calvin Heitzman	Hanson	South Dakota	Yes	Yes	No
Mr. Raymond Anderson	Marshall	South Dakota	Yes	Yes	No
Mr. Ed Goss	Butte	South Dakota	Yes	Yes	Yes
Mr. Joe Wurtz	Brown	South Dakota	Yes	Yes	No
Mr. James Bush	Marshall	South Dakota	Yes	Yes	No
Ms. Mary Opsahl	Clark	South Dakota	Yes	Yes	Yes
Ms. Kim Madsen	Clark	South Dakota	Yes	Yes	Yes
Ms. Kim Madsen	Beadle	South Dakota	Yes	Yes	Yes
Mr. Kaley John Mack	Clark	South Dakota	Yes	Yes	Yes
Mr. and Mrs. Delwin & Pam Hofer	Beadle	South Dakota	Yes	Yes	No
Mr. and Mrs. Richard and Charlene Schmit	Miner	South Dakota	Yes	Yes	No
Mr. Kent Moeckly (for Merl Moeckly Company)	Marshall	South Dakota	Yes	Yes	No

Note: Mr. Moeckly’s property was surveyed as requested and no historical properties were found.

3.11.5 Unanticipated Discoveries Plans

Keystone, through its cultural resources contractor ARG, submitted operational plans to the SHPOs and DOS for the Project that Keystone will implement in the event that unanticipated cultural materials or human remains are encountered during the construction phase of the Project. The filed REX Project plans also apply to the portion of the Keystone pipeline that is collocated with the REX pipeline. The plans were submitted on March 21, 2006, to the Nebraska and Kansas SHPOs and on April 5, 2006, to the Missouri SHPO as appendices to the filed REX Project historic properties inventory reports (Myers et al. 2006a, 2006b; Schwegman et al. 2006a). In a letter to ARG dated March 29, 2006, the Nebraska SHPO accepted the plan as filed. The Kansas and Missouri SHPOs both requested minor revisions to the filed Unanticipated Discoveries Plans. ARG made the requested changes, and both SHPOs accepted the revised plans. FERC also concurred with the plan in the EIS that was prepared for the REX pipeline under FERC Docket CP06-354-000.

Keystone, through its cultural resources contractors, has filed similar Unanticipated Discoveries Plans with DOS for those portions of the Keystone Mainline Project that are not associated with the REX pipeline and for the Cushing Extension. DOS requested minor changes to the plans filed for the North Dakota and South Dakota portions of the Project. Metcalf made the requested changes and re-filed the plans with DOS and the SHPOs. In a letter to DOS dated March 23, 2007, the South Dakota SHPO requested an additional change to the South Dakota plan. Metcalf met with the South Dakota SHPO on June 15, 2007, to discuss the SHPO comments and has agreed to make the requested changes.

To address concerns regarding the use of Unanticipated Discoveries Plans by Indian tribes, DOS subsequently created additional drafts of the plans on September 12, 2007, and on October 19, 2007, and supplied them to all consulting parties. After receiving additional comments from consulting parties, DOS worked closely with the ACHP to standardize the content of the plans but within the parameters of the different state laws concerning inadvertent discoveries and the uncovering of human remains. These standardized plans will be provided to all consulting parties for concurrence prior to the issuance of the ROD. Following review by consulting parties, the Unanticipated Discoveries Plans became attachments to the PA

3.11.6 Summary

Keystone has completed historic property surveys for the majority of the proposed Keystone Mainline Project and Cushing Extension in North Dakota, South Dakota, Nebraska, Kansas, Missouri, Illinois, and Oklahoma. Additional historic properties inventories and geomorphological testing remain to be completed for lands where owners refused survey permission and for many Project access roads, additional temporary workspaces, pipeline reroutes, and appurtenant facilities. DOS consultation with Indian tribes is ongoing regarding the definition of TCPs and properties of cultural and religious significance within the Project APE. Consequently, there will be ongoing review of new data regarding the identification of, Project effects to, and mitigation of historic properties after the PA is signed and the ROD is issued. The process of complying with Section 106 of the NHPA is not complete.

A PA (see Appendix R) is being used to conclude the Section 106 review of historic properties. The PA ensures that an appropriate formal process is followed for the determination of TCPs and properties of cultural and religious significance within the Project APE and to complete the remaining cultural resources surveys. Excluding the definition of TCPs and properties of cultural and religious significance, the remaining areas of compliance to be conducted by Keystone in each state are discussed below.

3.11.6.1 North Dakota

Historic properties surveys still need to be conducted for 6.06 miles of the Keystone Mainline Project route in North Dakota. In addition, unevaluated reroutes, access roads, warehouse yards, pipe storage yards, compressor stations, and temporary workspaces outside of the pipeline survey corridor need to be inspected. Once these locations have been finalized and/or survey permission has been obtained, these areas need to be inventoried and the results submitted by Keystone to DOS for review. DOS, in consultation with the North Dakota SHPO and other consulting parties, will then make a determination(s) of eligibility and Project effects.

To date, 49 historic properties have been identified within the Keystone Mainline Project APE in North Dakota. Of these, 25 have been assessed by DOS as being ineligible for listing in the NRHP and require no further action unless construction activities are projected to fall outside of the surveyed corridor. The remaining 24 historic properties have been designated as unevaluated properties. As each of these sites has the potential to be a Section 106-defined historic property, they must either be further assessed through National Register evaluation procedures or they must be completely avoided in order to prevent any impact to the cultural remains or features that are present.

3.11.6.2 South Dakota

Historic properties surveys still need to be conducted for 4.29 miles of the Mainline Project pipeline route in South Dakota. In addition, unevaluated reroutes, access roads, warehouse yards, pipe storage yards, compressor stations, and temporary workspaces outside of the pipeline survey corridor need to be inspected. Once these locations have been finalized and/or survey permission has been obtained, these areas need to be inventoried and the results submitted by Keystone to DOS for review. DOS, in consultation with the South Dakota SHPO and other consulting parties, will then make a determination(s) of eligibility.

To date, 33 historic properties have been identified within the Keystone Mainline Project APE in South Dakota. Seven of these have been assessed by DOS as being ineligible for listing in the NRHP and require no further action unless construction activities are projected to fall outside of the surveyed corridor. The remaining 23 historic properties have been designated as unevaluated properties. As each of these sites has the potential to be a Section 106-defined historic property, they must either be further assessed through National Register evaluation procedures or they must be completely avoided in order to prevent any impact to the cultural remains or features that are present.

3.11.6.3 Nebraska

Mainline Project

Historic properties surveys still need to be conducted for 15.62 miles of the Mainline Project route in Nebraska. In addition, unevaluated reroutes, access roads, warehouse yards, pipe storage yards, compressor stations, and temporary workspaces outside of the pipeline survey corridor need to be inspected; and geoarchaeological testing at 15 locations needs to be completed. Once these locations have been finalized and/or survey permission has been obtained, these areas need to be inventoried and the results submitted by Keystone to DOS for review. DOS, in consultation with the Nebraska SHPO and other consulting parties, will then make a determination(s) of eligibility and Project effects.

To date, 35 historic properties have been identified within the Keystone Mainline Project APE in Nebraska, including locations that are shared with the REX Project. Of these, 28 have been assessed by DOS as being ineligible for listing in the NRHP and require no further action unless construction activities are projected to fall outside of the surveyed corridor. The remaining seven historic properties have been designated as unevaluated properties. As each of these sites has the potential to be a Section 106-defined historic property, they must either be further assessed through National Register evaluation procedures or they must be completely avoided in order to prevent any impact to the cultural remains or features that are present.

Cushing Extension

Historic properties surveys still need to be conducted for 0.34 mile of the Cushing Extension route in Nebraska. In addition, unevaluated reroutes, access roads, warehouse yards, pipe storage yards, compressor stations, and temporary workspaces outside of the pipeline survey corridor may need to be inspected. Once these locations have been finalized and/or survey permission has been obtained, these areas need to be inventoried and the results submitted by Keystone to DOS for review. DOS, in consultation with the Nebraska SHPO and other consulting parties, will then make a determination(s) of eligibility and Project effects.

3.11.6.4 Kansas

Mainline Project

Historic properties surveys have been completed at all required portions of the Keystone Mainline Project route in Kansas. However, unevaluated reroutes, access roads, warehouse yards, pipe storage yards, compressor stations, and temporary workspaces outside of the pipeline survey corridor may need to be inspected. Once these locations have been finalized, any unreported areas need to be inventoried and the results submitted by Keystone to DOS for review. DOS, in consultation with the Kansas SHPO and other consulting parties, will then make a determination(s) of eligibility and determination of Project effects.

To date, 24 historic properties have been identified within the Keystone Mainline Project APE in Kansas, consisting solely of locations that are shared with the REX Project. All 24 sites have been assessed by DOS as being ineligible for listing in the NRHP and require no further action unless construction activities are projected to fall outside of the surveyed corridor.

Cushing Extension

Historic properties surveys still need to be conducted for 23.95 miles of the Cushing Extension route in Kansas. In addition, unevaluated reroutes, access roads, warehouse yards, pipe storage yards, compressor stations, and temporary workspaces outside of the pipeline survey corridor need to be inspected; and geoarchaeological testing at 32 locations needs to be completed. Once these locations have been finalized and/or survey permission has been obtained, these areas need to be inventoried and the results submitted by Keystone to DOS for review. DOS, in consultation with the Kansas SHPO and other consulting parties, will then make a determination(s) of eligibility and evaluation of Project effects.

To date, 40 historic properties have been identified within the Cushing Extension APE in Kansas. One site has been assessed as an eligible historic property under Criterion D, while 30 sites have been assessed by DOS as being ineligible for listing in the NRHP and require no further action unless construction activities are projected to fall outside of the surveyed corridor. The remaining nine historic properties have been designated as unevaluated properties. As each of these sites has the potential to be a Section 106-defined historic property, they must they must either be further assessed through National Register evaluation procedures or they must be completely avoided in order to prevent any impact to the cultural remains or features that are present.

3.11.6.5 Missouri

Historic properties surveys still need to be conducted for 19.48 miles of the Keystone Mainline Project route in Missouri. In addition, unevaluated reroutes, access roads, warehouse yards, pipe storage yards, compressor stations, and any temporary workspace areas outside of the pipeline survey corridor need to be inspected. Once these locations have been finalized and/or survey permission has been obtained, these areas should be inventoried and the results submitted by Keystone to DOS for review. DOS, in consultation with the Missouri SHPO and other consulting parties, will then make a determination(s) of eligibility and evaluation of Project effects.

To date, 109 historic properties have been identified within the Keystone Mainline Project APE in Missouri. Of these, 96 have been assessed by DOS as being ineligible for listing in the NRHP or lie outside the Project APE. These 96 resources require no further action unless construction activities are projected to fall outside of the surveyed corridor. DOS has made a determination that two archaeological sites are historic properties that are eligible for listing in the NRHP under Criterion D. Prior to construction commencing, Keystone will be required to file plans with DOS that detail the avoidance procedures that will be implemented in order to avoid impacts to these sites. If impacts to the historic properties are anticipated, Keystone must submit its mitigation and treatment plan so that DOS, the SHPO, ACHP, and all relevant consulting parties can evaluate the impact. The remaining 11 historic properties have been designated as unevaluated properties. As each of these sites has the potential to be a Section 106-defined historic property, they must either be further assessed through National Register evaluation procedures or they must be completely avoided in order to prevent any impact to the cultural remains or features that are present.

3.11.6.6 Illinois

Historic properties surveys still need to be conducted for 8.04 miles of the Keystone Mainline Project route in Illinois. In addition, unevaluated reroutes, access roads, warehouse yards, pipe storage yards, compressor stations, and temporary workspaces outside of the pipeline survey corridor need to be inspected; and geoarchaeological testing at eight locations needs to be completed. Once these locations have been finalized and/or survey permission has been obtained, these areas need to be inventoried and the results submitted by Keystone to DOS for review. DOS, in consultation with the Illinois SHPO and other consulting parties, will then make a determination(s) of eligibility and evaluate Project effects.

To date, 49 historic properties have been identified within the Keystone Mainline Project APE in Illinois. Of these, 43 have been assessed by DOS as being ineligible for listing in the NRHP or lie outside the Project APE. These 43 resources require no further action unless construction activities are projected to fall outside of the surveyed corridor. DOS has made a determination that one archaeological site is a historic property that is eligible for listing in the NRHP under Criterion D. Prior to construction commencing, Keystone will be required to file plans with DOS that detail the avoidance procedures that will be implemented in order to avoid impacts to this site. If impacts to the historic properties are anticipated, Keystone must submit its mitigation and treatment plan so that DOS, the SHPO, ACHP, and all relevant consulting parties can evaluate the impact. The remaining five historic properties have been designated as unevaluated properties. As each of these sites has the potential to be a Section 106-defined historic property, they must they must either be further assessed through National Register evaluation procedures or they must be completely avoided in order to prevent any impact to the cultural remains or features that are present.

3.11.6.7 Oklahoma (Cushing Extension)

Historic properties surveys still need to be conducted for 23.06 miles of the Cushing Extension route in Oklahoma. In addition, unevaluated reroutes, access roads, warehouse yards, pipe storage yards, compressor stations, and temporary workspaces outside of the pipeline survey corridor need to be inspected; and geoarchaeological testing at seven locations needs to be completed. Once these locations have been finalized and/or survey permission has been obtained, these areas need to be inventoried and the results submitted by Keystone to DOS for review. DOS, in consultation with the Oklahoma SHPO and other consulting parties, will complete the determination(s) of eligibility and evaluate Project effects.

To date, 15 historic properties have been identified within the Cushing Extension APE in Oklahoma. Of these, 12 have been assessed by DOS as being ineligible for listing in the NRHP and require no further action unless construction activities are projected to fall outside of the surveyed corridor. One of the historic properties located within the current Project APE is a National Historic Landmark, listed in the NRHP as the 101 Ranch Historic District. Keystone has informed DOS that it is committed to avoiding this property. Prior to construction commencing, Keystone will be required to file its plans with DOS that detail the specific avoidance procedures to be implemented to avoid impacts to the site. If an impact to the historic property is still anticipated, Keystone must submit a mitigation plan so that DOS, the SHPO, ACHP, and all relevant consulting parties can evaluate the impact. The remaining two historic properties have been designated as unevaluated properties. As each of these sites has the potential to be a Section 106-defined historic property, they must either be further assessed through National Register evaluation procedures or they must be completely avoided in order to prevent any impact to the cultural remains or features that are present.

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3.12 AIR QUALITY AND NOISE

3.12.1 Air Quality

As described in Section 2.0, the Keystone Project consists of installation of pipeline and construction of pump stations and associated facilities. The proposed pump stations would be electrically driven, with electricity to be provided from existing local electric utilities. Backup power at each pump station would be provided by an uninterruptible power supply (UPS). A 5-kW gasoline-powered standby generator set would provide extended backup to each UPS for essential services. A small (200-gallon) gasoline storage tank would be located with each backup generator. No other stationary sources of air pollutants are proposed.

3.12.1.1 Environmental Setting

Regional climate and meteorological conditions can influence the transport and dispersion of air pollutants that affect air quality. The existing climate and ambient air quality in the Keystone Project area are described below.

Regional Climate

The proposed Keystone Project would be constructed in portions of North Dakota, South Dakota, Nebraska, Kansas, Missouri, Illinois, and Oklahoma. These areas are located within the humid continental climate, which is noted for its variable weather patterns and large temperature ranges that can exceed 82 ˚F. The project area lies in the boundary 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 and resulting in precipitation. Representative climate data for Grand Forks, North Dakota; Lincoln, Nebraska; Salisbury, Missouri; and Tulsa, Oklahoma are presented in Table 3.12.1-1.

Ambient Air Quality

Ambient air quality is regulated by federal, state, and local agencies. EPA has established national ambient air quality standards (NAAQS) for seven criteria pollutants: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter (PM_{10} particulates and $PM_{2.5}$ particulates), carbon monoxide (CO), ozone (O_3), and lead (Pb). The NAAQS were developed to protect human health (primary standards) and human welfare (secondary standards). State air quality standards cannot be less stringent than the NAAQS. South Dakota, Nebraska, Kansas, Missouri, Illinois, and Oklahoma have adopted ambient air quality standards that are the same as the NAAQS for all seven criteria pollutants, whereas North Dakota has more stringent standards for SO_2 (i.e., 0.023 ppm annual average, 0.099 ppm 24-hour average, and 0.273 ppm 1-hour average). Table 3.12.1-2 lists the NAAQS for the seven criteria pollutants.

TABLE 3.12.1-1
Representative Climate Data in the Vicinity of the Keystone Pipeline

Location/ Measurement (Average)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Annual
Grand Forks, North Dakota													
Maximum temperature (ºF)	13.5	20.4	32.6	51.8	67.5	76.2	81.2	80.2	69.0	55.3	34.7	19.8	50.2
Minimum temperature (ºF)	-5.5	1.1	14.6	30.7	42.1	52.2	56.6	54.3	44.5	33.3	18.0	2.5	28.7
Total precipitation (inches)	0.69	0.50	0.80	1.18	2.31	3.17	3.09	2.69	1.97	1.37	0.87	0.62	19.27
Total snowfall (inches)	10.0	5.2	7.1	2.8	0.2	0	0	0	0	1.0	6.8	7.9	41.1
Snow depth (inches)	7	7	4	0	0	0	0	0	0	0	1	4	2
Lincoln, Nebraska													
Maximum temperature (ºF)	33.4	40.0	50.5	63.7	73.8	84.5	89.2	86.6	78.7	66.4	49.5	37.3	62.8
Minimum temperature (ºF)	11.9	17.9	27.2	38.8	50.1	60.7	66.0	63.6	53.1	40.3	27.4	16.4	39.4
Total precipitation (inches)	0.72	0.86	2.04	2.87	4.25	3.75	3.42	3.36	2.92	1.88	1.56	0.76	28.39
Total snowfall (inches)	6.5	5.4	4.9	1.5	0	0	0	0	0	0.6	2.7	5.3	26.8
Snow depth (inches)	2	2	0	0	0	0	0	0	0	0	0	1	0
Salisbury, Missouri													
Maximum temperature (ºF)	36.4	42.6	53.2	65.9	75.7	84.0	88.6	87.3	80.1	69.0	53.5	41.1	64.8
Minimum temperature (ºF)	17.4	22.5	31.2	42.9	53.0	62.0	66.3	63.8	55.5	44.4	33.0	22.8	42.9
Total precipitation (inches)	1.63	1.68	2.75	3.57	4.92	4.84	4.29	3.84	4.22	3.31	2.50	1.95	39.51
Total snowfall (inches)	6.4	4.5	3.2	0.4	0	0	0	0	0	0	1.1	4.6	20.2
Snow depth (inches)	2	1	0	0	0	0	0	0	0	0	0	0	0
Tulsa, Oklahoma													
Maximum temperature (ºF)	46.5	52.9	62.4	72.1	79.6	88.0	93.8	93.2	84.1	74.0	60.0	49.6	71.4
Minimum temperature (ºF)	26.3	31.1	40.3	49.5	59.0	67.9	73.1	71.2	62.9	51.1	39.3	29.8	50.1
Total precipitation (inches)	1.60	1.95	3.57	3.95	6.11	4.72	2.96	2.85	4.76	4.05	3.47	2.43	42.42
Total snowfall (inches)	3.0	2.1	1.4	0	0	0	0	0	0	0	0.6	2.0	9.1
Snow depth (inches)	NA [a]	NA [a]	NA [a]	0	NA [a]	0	0	0	0	0	NA [a]	NA [a]	NA [a]

Notes:

ºF = Degrees Fahrenheit.

All measurements in the table are averages.

[a] Data for snow depths are not available.

Source: ENSR 2006a.

TABLE 3.12.1-2 National Ambient Air Quality Standards			
Pollutant	**Time Frame**	**Primary**	**Secondary**
Particulate matter less than 10 microns in diameter	Annual[a]	Revoked	Revoked
	24-hour[b]	150 μg/m^3	150 μg/m^3
Particulate matter less than 2.5 microns in diameter	Annual[c]	15 μg/m^3	15 μg/m^3
	24-hour[d]	35 μg/m^3	NA
Sulfur dioxide	Annual	0.030 ppm (80 μg/m^3)	NA
	24-hour[b]	0.14 ppm (365 μg/m^3)	NA
	3-hour[b]	NA	0.5 ppm (1,300 μg/m^3)
Carbon monoxide	8-hour[b]	9 ppm (10,000 μg/m^3)	NA
	1-hour[b]	35 ppm (40,000 μg/m^3)	NA
Nitrogen dioxide	Annual	0.053 ppm (100 μg/m^3)	0.053 ppm (100 μg/m^3)
Ozone	8-hour[e]	0.08 ppm (157 μg/m^3)	0.08 ppm (157 μg/m^3)
	1-hour[f]	0.12 ppm (235 μg/m^3)	0.12 ppm (235 μg/m^3)
Lead	Quarterly	1.5 μg/m^3	1.5 μg/m^3

Notes:

μg = Microgram(s).

m^3 = Cubic meter(s).

NA = Not applicable.

ppm = Part(s) per million.

[a] Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, the United States Environmental Protection Agency revoked the annual PM_{10} standard in 2006 (effective December 17, 2006).

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

[c] To attain this standard, the 3-year average of the weighted annual mean particulate matter less than 2.5 microns in diameter concentrations from single- or multiple community-oriented monitors must not exceed 15.0 μg/m^3.

[d] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 μg/m^3 (effective December 17, 2006).

[e] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations, measured at each monitor within an area over each year, must not exceed 0.08 ppm.

[f] The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is $\leq$ 1. As of June 15, 2005, EPA revoked the 1-hour ozone standard in all areas, except the fourteen 8-hour ozone nonattainment Early Action Compact Areas.

EPA has characterized all areas of the United States as attainment, unclassifiable, maintenance, or nonattainment. Areas where the ambient air concentration of a pollutant is less than the NAAQS are designated as attainment; areas where no ambient air quality data are available are designated as unclassifiable. Unclassifiable areas are treated as attainment areas for the purposes of permitting stationary sources. Areas are designated as nonattainment when a pollutant's ambient air concentration is greater than the NAAQS. If an area was designated as nonattainment and has since demonstrated compliance with the NAAQS, it is considered a maintenance area. While maintenance areas are treated as attainment areas for the purposes of permitting stationary sources, states may have specific provisions to ensure that the area will continue to comply with the NAAQS.

The Keystone Project would pass through nonattainment areas in Illinois and Missouri. Madison County, Illinois and St. Charles, Missouri are both designated as nonattainment for the 8-hour ozone and $PM_{2.5}$ federal standards. Ozone is not emitted directly into the air but rather develops as inversion-layer ozone formed through photochemical reactions between atmospheric oxygen, oxides of nitrogen (NO_x), and volatile organic compounds (VOCs) in the presence of sunlight (ultraviolet light). The major sources of NO_x and VOC precursor emissions include motor vehicles, industrial facilities, electric utilities, gasoline storage facilities, chemical solvents, and biogenic sources. $PM_{2.5}$ sources include direct emission from a wide variety of source types, including both mobile and stationary combustion sources. $PM_{2.5}$ also results from atmospheric particle formation from the reaction of gaseous air pollutants, including SO_2 and ammonia (NH_3). Because of this nonattainment designation, the Keystone Project would be subject to a General Conformity determination, as described further in Sections 3.12.1.2 and 3.12.1.3.

A network of ambient air quality monitoring stations has been established by EPA and state and local agencies to measure and track the background concentrations of criteria pollutants across the United States, and to assist in designation of nonattainment areas. To characterize the background air quality in the regions surrounding the proposed Keystone Project area, data from air quality monitoring stations were obtained. A summary of the available regional background air quality concentrations is presented in Table 3.12.1-3.

3.12.1.2 Regulatory Requirements

The Clean Air Act (CAA) and its implementing regulations (42 USC 7401 et seq., as amended in 1977 and 1990) are the basic federal statutes and regulations governing air pollution in the United States. The following federal requirements have been reviewed for applicability to the proposed Keystone Project:

- New Source Review (NSR) / Prevention of Significant Deterioration (PSD),
- Air Quality Control Regions (AQCRs),
- New Source Performance Standards (NSPS),
- National Emission Standards for Hazardous Air Pollutants (NESHAPs) / Maximum Achievable Control Technology (MACT),
- Chemical Accident Prevention Provisions,
- Title V Operating Permits, and
- General Conformity Rule.

New Source Review/Prevention of Significant Deterioration

The NSR permitting program was established as part of the 1977 Clean Air Act Amendments (CAAA). NSR is a preconstruction permitting program that ensures that air quality is not significantly degraded from the addition of new or modified major emissions sources.[1] In poor air quality areas, NSR ensures that new emissions do not inhibit progress toward cleaner air. In addition, the NSR program ensures that any large new or modified industrial source will be as clean as possible, and that the best available pollution control is utilized. The NSR permit establishes what construction is allowed, how the emission source is operated, and which emission limits must be met.

If construction or modification of a major stationary source located in an attainment area would result in emissions greater than the significance thresholds, the project must be reviewed in accordance with PSD regulations. Construction or modification of a major or, in some jurisdictions, non-major stationary source in a nonattainment or PSD maintenance (Section 175A) area requires that the project be reviewed in accordance with nonattainment NSR regulations.

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[1] A major stationary pollutant source in a nonattainment area has the potential to emit more than 100 tons per year (tpy) of any criteria pollutant. In PSD areas, the threshold level may be either 100 or 250 tpy, depending on the source.

TABLE 3.12.1-3
Regional Background Air Quality Concentrations for the Keystone Project

Location	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)		SO_2 (ppm)			CO (ppm)		NO_2 (ppm)	O_3 (ppm)	
	24-Hr	Annual	24-Hr	Annual	24-Hr	3-Hr	8-Hr	1-Hr	Annual	8-Hr[a]	1-Hr
Wood River, Madison County, Illinois	76	12.5	32	0.003	0.011	0.037	NA	NA	NA	0.077	0.105
Highway 94, St. Charles County, Missouri	NA	11.9	31	NA	NA	NA	NA	NA	0.008	0.091	0.126
Aberdeen, Brown Country, South Dakota	57	8.3	22	NA	NA	NA	NA	NA	NA	NA	NA
Fargo, Cass County, North Dakota	73	8.4	24	0.000	0.002	0.003	NA	NA	0.006	0.065	0.071
Lincoln, Lancaster County, Nebraska	NA	9.0	25	NA	NA	NA	NA	NA	NA	NA	NA
Wichita, Sedgwick County, Kansas	71	9.0	26	NA	NA	NA	3.0	4.0	0.009	0.073	0.090
Highway 77, Kay County, Oklahoma	115	9.8	27	0.001	0.004	0.009	0.06	2.5	NA	0.085	0.104

Notes:

µg = Microgram(s).
CO = Carbon monoxide.
m^3 = Cubic meter(s).
NA = Not applicable.
NO_2 = Nitrogen dioxide.
O_3 = Ozone.
ppm = Part(s) per million.
PM_{10} = Particulate matter less than 10 microns in diameter.
$PM_{2.5}$ = Particulate matter less than 2.5 microns in diameter.
SO_2 = Sulfur dioxide.

[a] The 8-hour average ozone concentrations are the fourth-highest daily maximums.

Source: EPA. 2006. Monitor Values Report. Available online at: <http://www.epa.gov/air/data/reports.html>.

The proposed Keystone Project would not include construction of significant stationary sources of air pollutants[2]. In addition, mobile source emissions and fugitive emissions during the construction phase would be excluded from the determination of "potential to emit" for applicability purposes in accordance with the CAA. Therefore, the proposed Keystone Project would not trigger NSR or PSD review.

Air Quality Control Region

AQCRs are categorized as Class I, Class II, or Class III. Class I areas are designated specifically as pristine natural areas or areas of natural significance; these areas receive special protections under the CAA because of their good air quality. If a new source or major modification to an existing source is subject to the PSD program requirements and is within 62 miles (100 kilometers) of a Class I area, the facility is required to notify the appropriate federal officials and assess the impacts of the proposed project on the Class I area. Class III designations, intended for heavily industrialized zones, can be made only on request and must meet all requirements outlined in 40 CFR Part 51.166. The remainder of the United States is designated as Class II.

No Class I areas are within 62 miles (100 kilometers) of the Keystone Project ROW. The nearest Class I areas to the proposed project would be the Mingo National Wildlife Refuge near Puxico, Missouri (approximately 120 miles south of where the pipeline would cross into Illinois) and the Wichita Mountains Wildlife Refuge northwest of Lawton, Oklahoma (approximately 137 miles southwest of the Cushing Terminal). In addition, the proposed Keystone Project does not include construction or operation of significant stationary sources of air pollutants. Therefore, the Keystone Project would not trigger a federal Class I area impact assessment.

New Source Performance Standards

The NSPS, codified at 40 CFR Part 60, establish requirements for new, modified, or reconstructed units in specific source categories. NSPS-requirements include emission limits, monitoring, reporting, and record keeping.

Keystone's 5-kW gasoline-fired generators would be subject to proposed 40 CFR 60 Subpart JJJJ for stationary spark ignition internal combustion engines. The pollutants to be regulated by the proposed rule are nitrogen oxides (NOx), carbon monoxide (CO), and non-methane hydrocarbons (NMHC). In addition, a sulfur limit on gasoline is being proposed. Owners and operators of stationary engines subject to the requirements of the rule would be required to operate and maintain their stationary engines according to the manufacturer's written instructions. Manufacturers of stationary engines would be required to certify that their engines meet the emission standards.

During construction, Keystone proposes to locate temporary fuel transfer stations at contractor yards. The stations would consist of two to three 10,000-gallon storage tanks for diesel fuel and one 10,000-gallon storage tank for gasoline. Details regarding the fuel transfer stations are provided in Section 2.1.1.3. Table 2.1-5 summarizes the maximum daily and annual throughput for each transfer station site. The regulatory applicability of 40 CFR 60 Subpart XX depends on the gasoline throughput of the transfer facility. As long as the throughput of Keystone's transfer facilities are less than 75,700 liters per day (i.e., 19,998 gallons per day), they would be exempt from Subpart XX. The regulatory applicability of 40 CFR

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[2] Keystone proposes to install one 5-kW backup gasoline-fired generator and one 200-gallon gasoline storage tank at each pump station. Although estimated operation of the generator would be 20 hours per year, full load operations at 8,760 hours per year would result in emissions of less than 10 tpy cumulative for all regulated pollutants.

60 Subpart Kb depends on the construction date, size, and vapor pressure of the storage vessel and its contents. As long as Keystone stores only diesel fuel in tanks larger than 75 cubic meters (19,813 gallons) and constructed after July 23, 1984, the Keystone Project would be exempt from Subpart Kb.

No other subparts would apply because the proposed Keystone Project does not include construction or operation of any specific source categories of air pollutants.

National Emission Standards for Hazardous Air Pollutants/ Maximum Achievable Control Technology

NESHAPs—codified in 40 CFR Parts 61 and 63—regulate hazardous air pollutant (HAP) emissions. Part 61 was promulgated prior to the 1990 CAAA and regulates only eight types of hazardous substances (asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride). The Keystone Project would not include facilities that fall under one of the source categories regulated by Part 61; therefore, the requirements of Part 61 are not applicable.

The 1990 CAAA established a list of 189 additional HAPs, resulting in the promulgation of Part 63. Also known as the MACT standards, Part 63 regulates HAP emissions from major sources of HAPs and specific source categories that emit HAPs. Part 63 considers any source with the potential to emit 10 tpy of any single HAP or 25 tpy of HAPs in aggregate as a major source of HAPs. None of the Keystone Project facilities would have the potential to emit HAP emissions greater than 10 tpy for a single HAP, nor would they have the potential to emit 25 tpy of multiple HAPs. Thus, the proposed Keystone Project facilities would not be considered a major source of HAP emissions and would not be subject to NESHAPs.

Chemical Accident Prevention Provisions

The chemical accident prevention provisions, codified in 40 CFR Part 68, are federal regulations designed to prevent the release of hazardous materials in the event of an accident and to minimize potential impacts if a release did occur. The regulations contain a list of substances and threshold quantities for determining applicability to stationary sources. If a stationary source stores, handles, or processes one or more substances on this list in a quantity equal to or greater than specified in the regulation, the facility must prepare and submit a Risk Management Plan. If a facility does not have a listed substance onsite, or if the quantity of a listed substance is below the applicability threshold, the facility does not need to prepare a Risk Management Plan. No hazardous materials subject to the Chemical Accident Prevention Provision/ Risk Management Plan (40 CFR Part 68) would be stored at any of the Keystone Project aboveground facilities (TransCanada 2007c).

Title V Operating Permits

Title V of the federal CAA requires individual states to establish an air operating permit program. The requirements of Title V are outlined in 40 CFR Parts 70 and 71, and the permits required by these regulations are often referred to as Part 70 or 71 permits. Because the proposed Keystone Project would not include operation of significant stationary sources of air pollutants, the Keystone Project would not trigger Title V permitting.

It is possible that, by triggering proposed 40 CFR 60 Subpart JJJJ for stationary spark ignition internal combustion engines, Title V permitting may be required. Although the proposed rule states that owners or operators of an area source subject to this proposed rule would be exempt from the obligation to obtain a permit under 40 CFR parts 70 or 71 (provided they are not subject to 40 CFR 70.3[a] or 40 CFR 71.3[a]), some state regulations may be more stringent. Keystone would be an area source and would meet the federal exemption, but will need to consult with state permitting agencies to ensure that they follow the federal rule and Title V permitting would not be required.

General Conformity Rule

The General Conformity Rule was designed to require federal agencies to ensure that proposed projects conform to the applicable State Implementation Plan (SIP). General Conformity regulations apply to project-wide emissions of pollutants for which the project areas are designated as nonattainment (or, for ozone, its precursors NO_x and VOC) that are not subject to NSR and that are greater than the significance thresholds. Federal agencies are able to make a positive conformity determination for a proposed project if any of several criteria in the General Conformity Rule are met. These criteria include:

- Emissions from the project are specifically identified and accounted for in the SIP attainment or maintenance demonstration; or
- Emissions from the action are fully offset within the same area through a revision to the SIP, or a similarly enforceable measure that creates emissions reductions so that there is no net increase in emissions of that pollutant.

A General Conformity analysis is required for pollutant emissions that would occur in nonattainment areas not subject to NSR. For the Keystone Project, Madison County, Illinois and St. Charles, Missouri are both designated as nonattainment for the 8-hour federal ozone (precursors are NO_x and VOC) and $PM_{2.5}$ standards. Therefore, emissions of NO_x, VOCs, and $PM_{2.5}$ from project-related sources would be considered under the General Conformity Rule. The required evaluation of the proposed Keystone Project under General Conformity includes an applicability analysis via a comparison of potential emissions to applicability threshold levels, as well as a conformity determination if the emissions are greater than applicability threshold levels. Each federal agency is required to make a Conformity Determination before the action is taken. For more details on Keystone's General Conformity analysis, see Section 3.12.1.3.

3.12.1.3 Potential Impacts and Mitigation

Two types of impacts on air quality were considered for this analysis: temporary impacts resulting from emissions associated with construction activities and long-term or permanent impacts resulting from emissions generated from continued operation of a stationary source.

Construction Impacts

Air quality impacts associated with construction of the proposed Keystone Project would include emissions from fugitive dust, fossil-fueled construction equipment, open burning, and temporary fuel transfer systems and associated storage tanks.

Fugitive Dust

Fugitive dust is a source of respirable airborne particulate matter, including PM_{10} and $PM_{2.5}$. Fugitive dust results from land clearing, grading, excavation, concrete work, blasting and dynamiting, and vehicle traffic on paved and unpaved roads. The amount of dust generated is a function of construction activities, silt, moisture content of the soil, wind speed, frequency of precipitation, vehicle traffic, vehicle types, and roadway characteristics. Emissions would be greater during drier summer and autumn months, and in fine-textured soils.

Emissions of particulate matter arising from fugitive dust are regulated by state and local agencies. Typically, the regulations require measures to prevent fugitive dust from becoming airborne and leaving the property boundary, such as application of dust suppressants. Specific requirements also can include development and approval of a fugitive dust control plan. The Keystone Project, including the Cushing Extension, would affect approximately 21,221 acres of land in seven states during the construction phase. The majority of pipeline construction activity would pass by a specific location within a 30-day period (completing approximately 14 to 22 miles per month), thereby resulting in short-term and temporary impacts at any one location during construction.

- As described in its CMR Plan (Appendix B), Keystone would implement proven dust-minimization practices to control fugitive dust emissions during construction, such as applying water sprays and surfactant chemicals, and stabilizing disturbed areas. Additional dust control measures may be required by state or local ordinances. Keystone would comply with all applicable state and local regulations with respect to truck transportation and fugitive dust emissions.

Fossil-Fueled Construction Equipment

Large earth-moving equipment, skip loaders, trucks, and other mobile sources may be powered by diesel or gasoline and are sources of combustion emissions, including NO_x, CO, VOCs, SO_2, PM_{10}, $PM_{2.5}$, and small amounts of HAPs. Gasoline and diesel engines must comply with the EPA mobile source regulations in 40 CFR Part 86 for on-road engines and 40 CFR Part 89 for non-road engines; these regulations are designed to minimize emissions. Furthermore, to implement the CAA, EPA has established rules to require that sulfur content in on-road and off-road diesel fuel be significantly reduced. On June 1, 2006, 80 percent of diesel fuel for on-road use produced by U.S. refineries was required to be reduced from 500 to 15 ppm sulfur. Additionally, on June 1, 2007 diesel fuel for non-road engines must be reduced from 5,000 to 500 ppm sulfur. On June 1, 2010 EPA will require that all on and off-road (non-road) diesel fuel meets a limit of 15 ppm sulfur.

Keystone proposes to use the construction equipment listed in Table 3.12.1-4 in a typical construction spread. Construction of the pipeline would proceed as shown in Figure 2.2-1. Keystone would construct the pipeline in 11 construction spreads or completed lengths, with eight spreads along the Mainline Project and three spreads along the Cushing Extension (Section 2.2.4). Construction would occur simultaneously on Spreads 1 and 2 in 2008 and on Spreads 3, 4, 5, 6, 7, and 8 in 2009. Each spread would require 6 months to complete.

Keystone would maintain all fossil-fueled construction equipment in accordance with manufacturer's recommendations to minimize construction-related emissions.

Open Burning

Open burning of land clearing materials from construction activities has the potential to affect air quality. All of the states along the route of the proposed Keystone Project regulate open burning through local permitting, approval, and notification processes. Keystone would obtain all necessary open burning permits, approvals, and notifications prior to conducting any open burning of land clearing materials. Keystone would follow all open burning regulations during such activities, including restrictions on burn location, material, and time, as well as consideration of local air quality.

TABLE 3.12.1-4 Construction Equipment per Spread for the Keystone Project	
Description of Equipment	**Units per Spread**
On-Road Equipment	
Automobiles	2
Bus	15
Pickup 4x4	235
Welding rig	85
Winch truck	2
Dump truck	2
Flatbed truck (one ton)	10
Fuel truck	2
Grease truck	2
Mechanic rig	10
Skid truck	2
Stringing truck and trailer	10
Lowboy (rig)	4
Off-Road Equipment	
Welding tractor D6	2
Angle dozer D6	4
Angle dozer D7	14
Angle dozer D8	8
Angle dozer LGP D6	4
Angle dozer LGP D7	2
Angle dozer with ripper D8	4
Backhoe 330	31
Backhoe 345	4
Backhoe rubber-tired	4
Bending machine 22-36	2
Crane LS-318 (60 ton)	4
Crane LS-98A (35 ton)	2
Farm tractor	6
Fork lift 980	2
Front-end loader 977	4
Motor grader 14G	3
Motor grader 16	1
Sideboom 571	6
Sideboom 572	24
Sideboom 583	16
Air compressor (1,750 cubic feet per minute)	2
Pressure pump	2
Water pump (4 inch)	4
Water pump (6 inch)	4
Fill pump	2

Source: TransCanada 2007b.

Temporary Fuel Transfer Systems and Associated Storage Tanks

Temporary fuel transfer systems and tanks have the potential to release VOC emissions. However, because Keystone would be storing mainly diesel fuel with a low vapor pressure, releases of VOCs would be minimal.

Connected Actions

Power Lines and Substations. Measures listed below would be implemented by servicing electric cooperatives or their contractors in the modification or construction of electric transmission lines:

- Western or its contractor would utilize such practicable methods and devices as are reasonably available to control, present, and otherwise minimize atmospheric emissions or discharges of air contaminants. Dust control watering of access roads and work areas would occur during the project when air quality is compromised by construction activities. Disturbed areas would be scarified to facilitate natural revegetation, provide for proper drainage, and prevent erosion.
- Equipment and vehicles that show excessive emissions of exhaust gases due to poor engine adjustments, or other inefficient operating conditions, would not be operated until repairs or adjustments are made.

Conclusion

Because pipeline construction moves through an area relatively quickly, air emissions typically would be localized, intermittent, and short term. Emissions from fugitive dust, construction equipment combustion, open burning, and temporary fuel transfer systems and associated tanks would be controlled to the extent required by state and local agencies as explained above. If Keystone complies with applicable regulations, the Keystone Project emissions from construction-related activities would not significantly affect local or regional air quality.

Operations Impacts

Keystone proposes that all pipeline pumps would be electrical, with a UPS serving as backup. A 5-kW gasoline generator and 200-gallon gasoline storage tank would serve as extended backup to each UPS for essential services. Consequently, there would be no long-term emissions from the proposed Keystone Project operations, except for very minimal emissions from the backup gasoline generator[3] and small fugitive emissions from valves, tanks, and pumping equipment. Because operating emissions are minimal, no operational permits would be required. As a result, the Keystone Project would not cause or contribute to a violation of any federal, state, or local air quality standards.

Connected Actions

Wood River Refinery Expansion. ConocoPhillips operates the Wood River Refinery and Wood River Products Terminal located in Madison County, Illinois. The refinery underwent air quality permitting to authorize various changes. The refinery proposed to increase both the total crude processing and the percentage of heavier crude at the refinery because of the growing volumes of Canadian heavy crude (e.g., the Keystone Pipeline Project). The permitting accounts for the emissions increases related to the Wood River Products Terminal. The Illinois EPA considered the refinery project and changes to the terminal as a single project for the purpose of permitting and applicability to federal and state regulations. On July 19, 2007, the Illinois EPA issued the requisite permit to ConocoPhillips. Thereafter, a challenge to that permit was filed with the United States EPA's Environmental Appeals Board, where the matter remains pending. If the Appeals Board denies review of the Illinois EPA permit, litigation is possible.

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[3] Each 5-kW gasoline backup generator would result in emissions of less than 10 tpy cumulative for all regulated pollutants, assuming full load operations (operations are not expected to be full load).

Alternatively, if it grants review and agrees in part or in whole with the petitioners, the terms and conditions of the present permit may need to be altered.

The proposed project triggers the PSD and NSR permitting requirements due to potential CO and VOC emissions increases. There are net emission decreases of NO_x, SO_2, and particulate matter (PM_{10} particulates and $PM_{2.5}$ particulates) after accounting for credible contemporaneous emission increases and decreases. The new and modified units that would contribute to the increase in CO emissions would undergo a Best Available Control Technology (BACT) analysis as part of PSD. The new and modified units that will contribute to the increase in VOC emissions would undergo a Lowest Achievable Emission Rate (LAER) analysis as part of NSR because the area is nonattainment for 8-hour ozone (precursor compounds are NO_x and VOCs).

The emissions associated with a major project in a nonattainment area must not interfere with the state plan to achieve attainment of the NAAQS. To account for the emissions increase from a major project proposed in a nonattainment area, the applicant must provide compensating emission reductions from other sources that have not been relied on in the attainment plan. These emission reductions commonly are referred to as emission offsets. ConocoPhillips must obtain creditable emission decreases or offsets from the existing sources in the St. Louis/Metro-East ozone nonattainment area. Because this area is a moderate nonattainment area, emission offsets must be provided at a ratio of 1.15:1.0 (i.e., for each ton of VOC emissions from the project, 1.15 ton of offsets must be provided). At this ratio, ConocoPhillips is required to provide VOC emission offsets of 440.1 tpy to account for the project net emission increase of 407.0 tpy. Acquisition of the emission offsets is required to be completed 90 days after issuance of the permit or prior to commencement of construction, whichever occurs later. Because of these mandatory emission offset requirements, the proposed improvements to the ConocoPhillips facility are not expected to result in adverse air quality impacts.

Nevertheless, the pending challenge to the Illinois EPA-issued permit takes issue with the failure of the state agency to impose limits on greenhouse gases emitted by the facility as part of the BACT analysis. The United States EPA has stated that, for the present, the BACT process is not an appropriate vehicle for addressing climate change concerns. In the context of permitting a new coal-fired power plant in Utah, EPA stated that addressing these concerns in the context of local permitting was not appropriate. This issue, too, is now pending before the agency's Environmental Appeals Board.

General Conformity

Section 176(c) of the CAA prohibits federal actions in nonattainment or PSD maintenance areas that do not conform to the SIP for the attainment and maintenance of NAAQS. Therefore, the purpose of the General Conformity determination is to ensure: (1) that federal activities do not interfere with the budgets in the SIPs; (2) that actions do not cause or contribute to new violations; and (3) attainment and maintenance of the NAAQS. Conformity can be demonstrated by showing: (1) that emission increases are allowed in the SIP; (2) that the state agrees to include emission increases in the SIP; (3) that no new violations of NAAQS, or that no increase in the frequency or severity of violations would occur; (4) offsets; and (5) mitigation. Some actions that are excluded from the General Conformity determination include those already subject to NSR and those covered by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or other environmental laws.

The Keystone Project proposes to cross two regions that are designated as nonattainment for the federal ozone and $PM_{2.5}$ standards. Therefore, emissions of $PM_{2.5}$ and ozone precursor compounds (NO_x and VOCs) would be evaluated against the General Conformity applicability threshold levels. All Keystone Project emissions of $PM_{2.5}$, NO_x, and VOCs emitted during construction and operation would be evaluated because no emissions would be covered under air permit programs. In addition, those emissions from construction (i.e., mobile sources) of the Wood River Refinery and Wood River Products Terminal upgrades also would need to be evaluated because they are not included in the NSR permitting.

Written approval of conformance with the SIP would not be necessary for the Keystone Project because estimated emissions are below the General Conformity applicability threshold levels. See Table 3.12.1-5 for estimated emissions.

3.12.2 Noise

3.12.2.1 Environmental Setting

The ambient sound level of a region is defined by the total noise generated within the specific environment and is usually comprised of sound emanating from natural and artificial sources. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of the day and throughout the week. This variation is caused in part by changing weather conditions and the effects of seasonal vegetative cover.

The proposed Keystone Project would be constructed in primarily rural agricultural areas of North Dakota, South Dakota, Nebraska, Kansas, Missouri, Illinois, and Oklahoma. It is estimated that the existing ambient noise level in the Keystone Project area is approximately 35 dBA. This is an assumed noise level. Areas similar to the Keystone sites have background noise levels in the 35-dBA range. Field studies would be conducted prior to construction to confirm the background noise levels (TransCanada 2007c).

Noise Receptors near the Pipeline ROW

Approximately 593 residences (465 for the Mainline Project and 128 for the Cushing Extension) and three commercial/public assembly places (three for the Mainline Project and 0 for the Cushing Extension) are within 500 feet of the proposed pipeline centerline (ENSR 2006a; TransCanada 2007d, Table 3.8-3). See additional discussion of buildings close to the ROW in Sections 3.9.3.5 and 3.9.4.5.

In addition, recreational and special interest areas would be crossed by the proposed route (ENSR 2006a; TransCanada 2007d, Table 3.8-4). Section 3.9.3 and Table 3.9.3-7 provide information on recreational and special interests lands intersected by the Mainline Project, the majority of which are privately owned. Section 3.9.4.7 and Table 3.9.4-7 provide information on the recreational and special interest land intersected by the Cushing Extension.

Sixty-seven USFWS wetland easements in North Dakota and South Dakota would be crossed by the Mainline Project (see Table 3.9.3-8). As described in Section 3.9.4.7, the proposed Cushing Extension facilities would not cross any wetland easements. No other national, state, or local parks or forests are within 500 feet of the proposed centerline, including wilderness or wilderness study areas.

TABLE 3.12.1-5 Estimated Emissions from Activities in Nonattainment Areas for the Keystone Project			
Emission Source	**$PM_{2.5}$ (tpy)**	**NO_x (tpy)**	**VOC (tpy)**
Annual general conformity applicability threshold levels	100	100	50
St. Charles County, Missouri			
Construction emissions			
On-road equipment	<0.1	<0.1	<0.1
Off-road equipment	0.8	18.3	6.1
Open burning[a]	0	0	0
Fugitive dust	<0.1	0	0
Fugitive VOC	0	0	<1.0
Total construction emissions	<1.0	<18.4	<7.2
Below thresholds?	Yes	Yes	Yes
Operating emissions			
Pump station (PS-36)	<0.1	<0.2	<0.3
Total operating emissions	<0.1	<0.2	<0.3
Below thresholds?	Yes	Yes	Yes
Madison County, Illinois			
Construction emissions			
On-road equipment	<0.1	<0.1	<0.1
Off-road equipment	0.8	12.0	4.1
Open burning[b]	0	0	0
Fugitive dust	<0.1	0	0
Fugitive VOC	0	0	<1
Wood river refinery/terminal upgrade	3.0	31.0	2.0
Total construction emissions	<4.0	<43.1	<7.2
Below thresholds?	Yes	Yes	Yes
Operating emissions			
Pump station (PS-37)	<0.1	<0.2	<0.3
Total operating emissions	<0.1	<0.2	<0.3
Below thresholds?	Yes	Yes	Yes

Notes:

$PM_{2.5}$ = Particulate matter less than 2.5 microns in diameter.
NA = Not available at the time of publication of the draft EIS.
NO_x = Oxides of nitrogen.
VOC = Volatile organic compounds.
tpy = Tons per year.

[a] Open burning is not permitted during summer months in St. Charles County, Missouri. In the remaining months, a permit may be required for the type and volume of open burning planned.

[b] Open burning is not permitted in Madison County, Illinois.

Source: TransCanada 2007c. J. White email dated Dec 13, 2007

Noise Receptors near Pump Stations

Table 3.12.2-1 summarizes the nearest noise-sensitive areas (NSAs) and the number of residences/ structures within 1 mile and 0.5 mile of each proposed pump station. The proximity of the nearest NSAs ranges from 280 feet at pump station (PS-) 29 to 5,180 feet at PS-27. However, less than 200 residences are within 0.5 mile of all pumpstations for both the Mainline Project and Cushing Extension combined.

3.12.2.2 Regulatory Requirements

Two measurements used by federal agencies to relate the time-varying quality of environmental noise to its known effect on people are the 24-hour equivalent sound level (Leq(24)) and the day-night sound level (Ldn). The Leq(24) is the level of steady sound with the same total (equivalent) energy as the time-varying sound of interest, averaged over a 24-hour period. The Ldn is the Leq(24) with 10 decibels on the A-weighted decibel scale (dBA) added to nighttime sound levels between the hours of 10 p.m. and 7 a.m. to account for people's greater sensitivity to sound during nighttime hours.

In 1974, EPA published "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety." This document provides information for state and local agencies to use in developing their ambient noise standards. EPA identified outdoor and indoor noise levels to protect public health and welfare. An Leq(24) of 70 dB was identified as the level of environmental noise that would prevent any measurable hearing loss over a lifetime. An Ldn of 55 dBA outdoors and an Ldn of 45 dBA indoors were identified as noise thresholds that would prevent activity interference or annoyance. These levels are not "peak" levels but are 24-hour averages over several years. Occasional high levels of noise may occur. An Ldn of 55 dBA is equivalent to a continuous noise level of 48.6 dBA. Typical noise levels are as follows:

- Quiet room: 28–33 dBA
- Refrigerator: 40–43 dBA
- Computer: 47–35 dBA
- Forced hot air heating system: 42–52 dBA
- Microwave: 55–59 dBA
- Clothes dryer: 56–58 dBA

With regard to increases in decibels measured on the A-weighted noise level scale, the following relationships occur:

- A change of 1 dBA cannot be perceived by humans, except in carefully controlled laboratory environments;
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference by humans;

TABLE 3.12.2-1
Structures within 1 Mile of Pump Stations for the Keystone Project

State/ County	Pump Station	Milepost of Pump Station	Distance to Nearest Noise-Sensitive Area (feet)	Direction from Pump Station	Number of Structures within 1 Mile of Pump Station[a]	Number of Residences within 1 Mile of Pump Station	Number of Residences within 0.5 Mile of Pump Station
MAINLINE PROJECT							
North Dakota							
Walsh	PS-15	34.3	2,800	NW	23	4	0
Nelson	PS-16	76.0	4,350	S-SE	3	1	0
Steele	PS-17	123.6	4,600	S-SE	6	1	0
Ransom	PS-18	171.0	2,400	S-SW	13	1	1
Sargent	PS-19	216.6	400	E	4	1	1
South Dakota							
Day	PS-20	263.2	--	--	2	0	0
Beadle	PS-21	310.2	3,300	NE	57	16	0
Miner	PS-22	358.8	--	--	0	0	0
Hutchinson	PS-23	406.6	2,300	N-NE	54	7	1
Nebraska							
Cedar	PS-24	454.6	1,550	E	67	9	4
Stanton	PS-25	505.5	800	N-NW	38	5	3
Butler	PS-26	552.9	375	NW	75	10	2
Saline	PS-27	604.3	5,180	N-NW	23	2	0
Jefferson	PS-28	639.7	2,950	N	28	5	0
Kansas							
Nemaha	PS-29	691.6	280	NW	68	11	4
Doniphan	PS-30	741.8	1,750	NW	80	18	8
Missouri							
Clinton	PS-31	786.6	320	S	66	21	5
Carroll	PS-32	832.0	1,650	SE	43	9	2
Chariton	PS-33	867.6	850	NW	69	11	4
Audrain	PS-34	902.0	2,855	SE	26	7	0
Montgomery	PS-35	947.7	1,350	S-SE	59	20	1
St. Charles	PS-36	982.2	1,350	NE	92	39	10
Illinois							
Madison	PS-37	1026.8	1,950	E-NE	1,600[b]	1,600[b]	136
Fayette	PS-38	1053.6	620	S	59	18	5
CUSHING EXTENSION							
Kansas							
Dickinson	C-30	CE 94.4	3,775	SW	26	6	0
Cowley	C-32	CE186.6	2,910	N-NW	2	1	0
Oklahoma							
Kay	C-33	CE 240.9	1,300	E	39	14	6

Notes:

a Indeterminate if structures are occupied or just sheds/storage/barns.

b Residential subdivisions with numerous structures. Number of structures calculated using a structure density of five per acre.

Source: TransCanada 2007d.

- A change in level of at least 5 dBA is required before any noticeable change in human response would be expected; and
- A 10-dBA change is subjectively heard as approximately a doubling in loudness and can cause an adverse response.

None of the states that would be traversed by the proposed Keystone Project have a different regulatory noise limit (except Illinois, which has limits dependent on the land class and noise frequency as set out by Title 35 Subtitle H Chapter I of the Illinois Administrative Code), although many have local ordinances governing noise from construction or industrial activities.

3.12.2.3 Potential Impacts and Mitigation

Noise impacts for a pipeline project generally fall into two categories: temporary impacts resulting from operation of construction equipment, and long-term or permanent impacts resulting from operation of the facility.

Construction Impacts

Construction of the proposed Keystone Project would be similar to other pipeline projects in terms of schedule, equipment used, and types of activities. Construction would increase noise levels in the vicinity of project activities, and the noise levels would vary during the construction period, depending on the construction phase.

Pipeline construction generally proceeds at rates ranging from several hundred feet to 1 mile per day. However, due to the assembly-line method of construction, pipeline construction activities in any one area could last from 1 week to 30 days. Construction of aboveground facilities would take approximately 18 months to complete. Because the construction moves through an area relatively quickly, noise impacts typically would be localized, intermittent, and short term.

Residential, agricultural, and commercial areas within 500 feet of the Mainline Project and the Cushing Extension ROW would experience short-term inconvenience from the construction equipment noise. Although individuals and livestock in the immediate vicinity of the construction activities may be temporarily disturbed, the impact on the noise environment at any specific location along the proposed pipeline route would be short term. Similarly, noise associated with construction of the proposed aboveground facilities would be intermittent during the construction period, but the overall impact would be temporary and is not expected to be significant. Further, nighttime noise levels would normally be unaffected because most construction activities would be limited to daylight hours.

Noise impacts from construction would be mitigated in accordance with Keystone’s CMR Plan (Appendix B) to minimize effects on individuals, sensitive areas, and livestock. During permitting activities for the project, Keystone would determine whether state, county or local noise regulations exist for a given location. If local noise regulations exist, Keystone would develop site-specific noise mitigation plans to comply with any specific regulations and would seek any applicable authorizations or variances. Noise mitigation plans would be provided to the construction contractors for implementation and would be enforced by construction inspectors using portable sound meters. Because preliminary research has not identified any applicable state or county noise ordinances along the pipeline route, Keystone is not proposing any construction noise assessments or surveys at this time (TransCanada 2007c).

To ensure that residential and commercial areas within 500 feet of construction activities are not affected by noise levels, Keystone would give advanced notice to landowners prior to construction, limit the hours during which construction activities with high-decibel noise levels are conducted, coordinate work schedules, and ensure that construction proceeds quickly through such areas. In the event that the contractor expects noise levels to exceed regulated noise standards—based on the types of construction equipment used or construction procedures, notice would be given to Keystone so that immediate noise attenuation could be achieved. To further reduce noise impacts to residential and commercial areas Keystone will set up a toll-free telephone line for landowners to report any construction noise-related issues. It is understood that during occasional, short-term intervals, noise levels will exceed 55dBa. There are no regulations in rural areas along the pipeline route applicable to construction noise. In municipal areas, pipeline construction noise levels will comply with any applicable municipal regulations. In areas near residences and businesses where construction activities or noise levels may be considered disruptive, Keystone would coordinate work schedules to minimize disruption.

Operations Impacts

Noise impacts from operation of the pipeline would be from the pump stations. Material traveling through the buried pipeline would not emit audible noise above the surface or a perceptible level of vibration.

Concern has been expressed during both scoping and within comments on the DEIS relative to the potential for noise generation by proposed pump stations, particularly given the generally rural nature of the area within which the pump stations would be constructed and operated. During operation of the pipeline, the noise associated with the electrically driven pump stations would be limited to the vicinity of the facilities. Keystone prepared a preliminary noise assessment survey for a typical pump station, as illustrated in Table 3.12.2-2. The assessment assumed wind speeds of 8 miles per hour, a temperature of 75 ˚F, and three pumps operating at 3,000 kW cumulative.

TABLE 3.12.2-2
Sound Attenuation from Proposed Pump Stations for the Keystone Project

Distance (feet)	Sound Level (dBA)
Background	35
300	55
700	49
1,000	46
1,300	43
1,600	42
2,000	41
2,300	40
2,600	39
3,000	38
3,300	38
3,600	38
3,900	37
4,200	37
4,600	37
5,000	37

Source: TransCanada 2007b.

Table 3.12.2-2 shows that sound levels would attenuate nearly to existing ambient noise levels (35 dBA) within 4,000 feet of the facility and would be considered minor. Although noise impacts from the electrically powered pump stations are projected to be minor, Keystone would perform a noise assessment survey during operations to confirm the level of noise at each listed noise-sensitive area. A Type I integrating sound level meter would be used to determine the sound levels near the proposed pump stations. The device can determine peak and average sound levels over specified time intervals and at various distances from the nearest noise sources to the nearest sensitive receptors (TransCanada 2007c).

If the noise attributable to operation of any pump station exceeds 55 dBA Ldn at any noise-sensitive area, Keystone would implement noise mitigation measures to ensure that regulation levels are not exceeded, as specified in its CMR Plan (Appendix B). Mitigation measures can include construction of berms around the facilities or planting vegetation screens. As such, Keystone would minimize noise impacts to ensure that project-related operations would not result in a significant effect on the noise environment.

3.12.3 References

EPA. See U.S. Environmental Protection Agency.

TransCanada. See TransCanada Keystone Pipeline, L.P.

TransCanada Keystone Pipeline, L.P. 2007b. Response to Data Request #1. Submitted to U.S. Department of State by TransCanada Keystone Pipeline, L.P. Application for Presidential Permit. January 29.

TransCanada Keystone Pipeline, L.P. 2007c. Response to Data Request #2. Submitted to U.S. Department of State by TransCanada Keystone Pipeline, L.P. Application for Presidential Permit. April 4.

TransCanada Keystone Pipeline, L.P. 2007d. Supplemental Filing #9. Submitted to U.S. Department of State by TransCanada Keystone Pipeline, L.P. Application for Presidential Permit. September 10.

U.S. Environmental Protection Agency. 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. (USEPA 550/9-74-004.) March.

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3.13 RELIABILITY AND SAFETY

Transportation of crude oil by pipeline involves some risk to the public and the environment in the event of an accident or an unauthorized action, and subsequent release of oil. Spills of crude oil from the proposed Keystone pipeline and appurtenant facilities would have a finite rate of occurrence, would affect the environment to varying degrees, and would be a concern to all of stakeholders. This section includes a summary of:

- Safety standards,
- Safety history,
- Risk assessment,
- Impacts, and
- Mitigation.

Appendix L provides a detailed discussion of the reliability and safety issues summarized in this section.

3.13.1 Safety Standards

This section summarizes the regulatory and industry standards to which the proposed crude oil pipeline would be designed, constructed, operated, and maintained. Details related to safety standards are provided in Appendix L.

3.13.1.1 U.S. Department of Transportation Standards

DOT is mandated to provide pipeline safety under 49 USC Chapter 601. OPS administers the national regulatory program to ensure the safe transportation of hazardous liquids, including crude oil, by pipeline. It develops safety regulations and other approaches to risk management that mandate safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards that set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve safety. The Pipeline and Hazardous Materials Safety Administration (PHMSA) ensures that people and the environment are protected from the risk of pipeline incidents.

The rules governing pipeline safety are included in 49 USC Chapter 601. Of those, Parts 190, 194, 195, 198, and 199 are relevant to hazardous liquid (including crude oil) pipelines. The following is a brief summary of the more important parts of 49 USC Chapter 601 with regard to the Keystone Project.

- Part 190 describes the procedures used by OPS in carrying out their regulatory duties, including inspection of pipelines and enforcement of the regulations.
- Part 194 contains requirements for oil spill response plans intended to reduce the environmental impact of oil discharged from onshore oil pipelines.
- Part 195 prescribes the safety standards and reporting requirements for hazardous liquid pipelines, including detailed requirements on a broad spectrum of areas related to the safety and environmental protection of hazardous liquid pipelines.
- Part 198 prescribes regulations governing grants-in-aid for state pipeline safety compliance programs.

- Part 199 requires operators of gas and hazardous liquid pipelines to establish programs for preventing alcohol misuse and to test employees for the presence of alcohol and prohibited drugs; it also provides the procedures and conditions for this testing.

Parts 194 and 195 specifically require Keystone to develop a comprehensive ERP for the pipeline, to be reviewed and approved by OPS prior to operation (the draft ERP is included as Appendix C). OPS also would conduct periodic inspections of the pipeline during operation, and would review and approve the pipeline Integrity Management Plan for high consequence areas (HCAs) that Keystone would be required to prepare. HCAs are defined as:

(1) A commercially navigable waterway, which means a waterway where a substantial likelihood of commercial navigation exists;

(2) A high population area, which means an urbanized area—as defined and delineated by the Census Bureau—that contains 50,000 or more people and has a population density of at least 1,000 people per square mile;

(3) Another populated area, which means a place—as defined and delineated by the Census Bureau—that contains a concentrated population, such as an incorporated or unincorporated city, town, village, or other designated residential or commercial area; and

(4) An unusually sensitive area—explicitly defined in 49 CFR Part 195.6 as drinking water or ecological resource areas that are unusually sensitive to environmental damage from hazardous liquid pipeline releases.

The HCA regulation requires that new hazardous liquid pipelines identify HCAs prior to operation and that a written integrity management program be in place within 1 year after the start of operation including baseline assessments by the date that pipeline operation begins. Depending on the findings of the assessment, the operator must take preventive and mitigating measures to protect the HCA from the consequences of a pipeline failure. These measures include conducting a risk analysis of the pipeline segment to identify additional actions to enhance public safety or for environmental protection.

Keystone has submitted a Risk Assessment and Environmental Consequence Analysis (ENSR 2006b) and a Frequency-Volume Study (DNV 2006); these serve as the risk analysis required for HCAs. The Risk Assessment and Environmental Consequence Analysis (ENSR 2006b) includes Table 4-13, which summarizes Keystone’s estimate of pipeline miles within various types of HCAs. Keystone estimates that approximately 170 miles of the Keystone Mainline Project and 71 miles of the Cushing Extension would be within HCAs. Keystone will submit to OPS an Integrity Management Plan for HCAs prior to pipeline operation. The Keystone Risk Assessment and Environmental Consequence Analysis and the Frequency-Volume Study are discussed in more detail in Appendix L.

3.13.1.2 Standards and Regulations for Affected States

OPS is responsible for oversight and inspections of interstate pipelines such as the proposed Keystone pipeline; in states where OPS and the state have a special agreement in place, the state may carry out these functions. OPS regulates, inspects, and enforces interstate liquid pipeline safety requirements in all the states that would be crossed by the proposed Keystone pipeline.

States may adopt regulations with requirements that supplement or exceed federal requirements. All the states that would be crossed by the proposed pipeline have adopted state One-Call systems to reduce the potential for third-party damage to utilities during projects that involve excavations or soil borings. The laws and regulations of each state that would be affected by the Keystone Project contain no other requirements exceeding federal requirements, except for Administrative Code 165, Chapter 20 in the State of Oklahoma that regulates gas and hazardous liquid pipeline safety. Oklahoma assesses an annual fee on pipeline operators, has reporting requirements, and requires notices prior to construction.

3.13.1.3 Industry Standards

Pipeline design would comply with pertinent industry standards, including:

- American Society of Mechanical Engineers (ASME)/American National Standards Institute (ANSI) Code B31.4, "Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols." This standard addresses requirements for materials of construction, welds, inspection, and testing for cross-country hazardous liquid pipelines. It requires a mainline block valve on the upstream side of major river crossings and public water supply reservoirs, and either a block valve or a check valve on the downstream side.
- American Petroleum Institute (API) 570 Piping Inspection Code, Inspection, Repair, Alteration, and Re-Rating of In-Service Piping Systems. This code was developed for the petroleum refining and chemical processing industries but may be used for any piping system.
- API RP 1102, Recommended Practices for Liquid Petroleum Pipelines Crossing Railroads and Highways. This recommended practice is a requirement of ASME/ANSI B31.4.
- API RP 1109, Recommended Practice for Marking Liquid Petroleum Pipeline Facilities. ASME/ANSI B31.4 advises that this API RP 1109 shall be used as a guide.
- NACERP 01-69, Control of External Corrosion on Underground or Submerged Metallic Piping Systems. ASME/ANSI B31.4 refers to sections of this recommended practice as a guide for an adequate level of cathodic protection.

3.13.2 Safety History

This section summarizes the safety history of onshore hazardous liquid pipeline operations in the United States, including specific hazardous liquid pipeline operating experience in the states that would be traversed by the proposed pipeline. A more detailed review is found in Appendix L.

3.13.2.1 PHMSA's Oil Pipeline Statistics

Spills are reported to PHMSA on standard forms, in accordance with 49 CFR Section 195.50. PHMSA maintains a database of pipeline incident reports (available online: <http://primis.phmsa.dot.gov/comm/reports/psi.html>, accessed in February 2007). Pipeline incident reports encompass onshore and offshore natural gas and hazardous liquid pipelines. In this section, the term "hazardous liquid pipelines" is used for information based on hazardous liquid pipeline data.

Hazardous liquid pipeline incidents include those that are categorized as "serious" or "significant." A "serious" hazardous liquid pipeline safety incident is one involving a fatality or an injury requiring in-patient hospitalization. "Significant" hazardous liquid pipeline safety incidents include spills releasing 2,100 gallons (50 bbls) or more; spills of 210 gallons (5 bbls) of highly volatile liquid; spills resulting in total costs of $50,000 or more (1984 dollars); or spills that include fire, explosion, injury, or death.

The PHMSA spill report data web site includes summary tables that provide overviews of serious incidents and significant incidents reported over the last 20 years, ending in 2005. Because the PHMSA data set is truncated on the lower end at the reporting limit of 50 bbls[1], the data understate the actual number of incidents and overstate the average spill volumes.

Table 3.13.2-1 shows the average number of serious incidents in a year for hazardous liquid pipeline operators. The summary data show a decreasing trend in serious pipeline incidents. The data include 113 serious incidents reported for 20 years (1986–2005).

TABLE 3.13.2-1
Nationwide Hazardous Liquid Pipeline Systems, Annual Averages of Serious Incidents (1986–2005)

Time Period	Serious Incidents per Year
5-year average (2001–2005)	3
10-year average (1996–2005)	5
20-year average (1986–2005)	6

Source: PHMSA 2007.

Table 3.13.2-2 shows the number of significant incidents in a year for all hazardous liquid pipeline operators. The summary data show a decreasing trend in annual incident frequency, injuries, and spill volume. Table 3.13.2-3 is a summary of PHMSA significant pipeline safety incidents for hazardous liquid pipelines (by cause) for the 20-year period from 1986 through 2005. The dominant incident cause is an outside force that results from one or more of the following:

- Excavation damage from encroachment of mechanical equipment (22 percent);
- Natural force damage such as earth movements due to soil settlement, washouts, or geologic hazards (5 percent); and
- Other outside force damage (1 percent) (Table 3.13.2-3).

Older pipelines have a higher frequency of outside force incidents partly because their location is less likely to be precisely known or marked, and because their diameters are in aggregate disproportionately smaller and therefore more easily crushed or broken.

[1] Of the 600 spills reported in the PHMSA database between 1996 and 2005, 16 percent were reported as less than 2,100 gallons (50 barrels).

TABLE 3.13.2-2
Nationwide Hazardous Liquid Pipeline Systems, Annual Averages for Significant Incidents (1986–2005)

Period	Number of Incidents	Fatalities	Injuries	Property Damage [a, b]	Gross Barrels Lost	Barrels Recovered	Net Barrels Lost
5-year average (2001–2005)	123	2	7	$73,426,467	99,526	35,724	63,802
10-year average (1996–2005)	138	2	8	$88,783,825	127,828	53,319	74,509
20-year average (1986–2005)	153	2	14	$62,509,194	160,347	64,460	95,888

Note:

Totals for the period from 1986 through 2005: 3,051 incidents; 44 fatalities; 272 injuries; $1,250,183,884 property damage; 3,206,945 barrels lost; 1,289,191 barrels recovered, and 1,917,754 net barrels lost.

[a] The costs shown in the tables are in 2005 dollars. Costs are adjusted via the Bureau of Economic Analysis, Government Printing Office inflation values.

[b] For years 2002 and later, property damage was estimated as the sum of all public and private costs reported in the 30-day incident report, adjusted to 2005 dollars. For years prior to 2002, accident report forms did not include a breakdown of public and private costs; therefore, property damage for these years is the reported total property damage field in the report, adjusted to 2005 dollars.

Source: PHMSA 2007.

TABLE 3.13.2-3
Nationwide Hazardous Liquid Pipeline Systems, Causes of Significant Incidents (1986–2005)

Cause	Number of Incidents	Percent of Total Incidents (%)	Fatalities	Injuries	Property Damage [a, b]	Percent of Property Damage (%)
All other causes	736	24	20	127	$239,498,819	19
Corrosion	724	24	1	17	$255,514,544	20
Excavation damage	675	22	15	85	$141,841,074	11
Human error	204	7	3	29	$28,032,680	2
Material failure	542	18	2	9	$304,928,405	24
Natural force damage	147	5	3	5[c]	$247,870,514	20
Other outside force damage	23	1	0	0	$32,497,848	3
Total	**3,051**	**100**	**44**	**272**	**$1,250,183,884**	**100**

Note:

Significant incidents are those incidents reported by pipeline operators that meet any of the following conditions: (1) fatality or injury requiring in-patient hospitalization; (2) $50,000 or more in total costs, measured in 1984 dollars; (3) highly volatile liquid releases of five barrels or more, or other liquid releases of 50 barrels or more; (4) liquid releases resulting in an unintentional fire or explosion

[a] The costs shown in the tables are in 2005 dollars. Costs are adjusted via the Bureau of Economic Analysis, Government Printing Office inflation values.

[b] For years 2002 and later, property damage is estimated as the sum of all public and private costs reported in the 30-day incident report, adjusted to 2005 dollars. For years prior to 2002, accident report forms did not include a breakdown of public and private costs; therefore, property damage for these years is the reported total property damage field in the report, adjusted to 2005 dollars.

Source: PHMSA 2007.

Corrosion is another dominant incident cause, constituting 24 percent of all hazardous liquid pipeline incidents over the past 20 years. The frequency of incidents is also strongly dependent on pipeline age because corrosion is a time-dependent process (Keifner and Trench 2001). Pipeline age is important when assessing risk based on records of incident frequencies. In 2004, the Transportation Research Board (TRB 2004) published a review of pipelines that included "Pipeline Safety Data and Trends" as an appendix and relied heavily on previous work done for API (Keifner and Trench 2001). The API work confirms that hazardous liquid pipeline age is a significant spill risk factor. Several industry standards and practices and DOT requirements would tend to reduce the potential for spill incidents associated with the proposed pipeline relative to industry experience.

Intentional acts do not appear as a specific causal item in the PHMSA data. Terrorism has become a very real issue for energy infrastructure. DHS has been involved with FERC and other federal agencies in developing a coordinated approach to protecting the energy facilities of the United States, and continues to coordinate with these agencies to address this issue.

3.13.2.2 TransCanada Company-Specific Oil Pipeline Operating History

TransCanada is a well known and longstanding natural gas transportation company in Canada and the United States, with limited experience operating crude oil pipeline systems. Through a 50/50 joint venture, TransCanada and Alberta Energy Company (now EnCana Corporation) purchased the Platte pipeline in February 1996 and developed and constructed the Express pipeline in 1996. Together, the Express and Platte pipelines constitute a 1,700-mile system between Hardesty, Alberta and Wood River, Illinois. The system became operational in February 1997, with commercial deliveries beginning in April 1997. Alberta Energy Company operated the Express and Platte systems on behalf of the joint venture partnership until October 2000, when TransCanada divested its 50-percent interest to Encana Corporation.

Although TransCanada did not operate the Express and Platte pipeline systems, Keystone has provided a search of all records available to it, as well as the Freedom of Information Act On-Line Library at the PHMSA website (available online: <http://ops.dot.gove/state/IA98.htm>), to identify pipeline incidents that occurred during TransCanada's ownership interest in the system. No incidents were found to have occurred in Canada. One incident occurred in the United States in 1996: in Section 8, T53N, R17W, Chariton County, (Salisbury Station), approximately 3 miles west on Highway 24 near Salisbury, Missouri. The DOT-assigned identification number was 19960027. Corrosion is listed as the cause of the release of 220 bbls of crude oil**,** of which an unknown amount was recovered. No habitat, resources, or human services were affected.

The limited operating history with oil pipelines precludes comparison of accident and oil spill incident rates specific to TransCanada with the industry average rates. The extent of specific operating experience does not affect the regulatory requirements to be met by the operator.

3.13.2.3 Oil Pipeline Incident History in States That Would Be Traversed by Keystone

Of the 600 crude oil spills reported in the PHMSA database between 1996 and 2005, 9 percent were very large (defined as greater than 100,000 gallons [2,380 bbls]). Five of the very large spills were reported in Oklahoma. No other very large spills were reported from states in the Keystone Project area. Insufficient incident data and pipeline mileage on a state-by-state basis prevent a statistical analysis with conclusions applicable to estimating very large spill incident frequencies for the proposed Keystone pipeline.

3.13.3 Risk Assessment

This section summarizes the potential for oil spills from the proposed Project, including potential types of spills and sources, and an evaluation of oil spill frequency and volume that may be expected. A more detailed description of the components and methods included in the risk assessment are found in Appendix L.

3.13.3.1 Construction Spills

The majority of construction spills tend to be relatively small, refined products (e.g., gasoline, diesel, and lubricating and hydraulic fluids); and most result from vehicle and construction equipment fueling and maintenance in construction staging areas or along the construction ROW. A tanker truck accident or a fuel storage tank failure is the most likely source of the largest construction spills. Fueling operations can be a source of frequent but small spills. Construction staging areas may include portable fuel and oil storage tanks, staged onsite during the course of the construction activity. The potential oil spill volume from these sources would be small relative to the potential oil spill volume from a pipeline incident. Specific preventive and mitigating measures found in this section under “Mitigation Measures” address potential spills from construction activities.

3.13.3.2 Operations Spills

Spills from the pipeline or associated pump stations, valves, or pigging facilities could occur during operation and have the potential to result in larger-volume spills and could occur any time in the year.

A large spill is most likely to result from a major pipeline break. Although pipeline leak detection technology could identify a leak and shut down flow quickly, actual response with containment equipment and cleanup crews may be delayed for several reasons, including:

- The exact leak location may not be known;
- Snow or other factors may hinder visual detection; and
- The leak is remote from response capabilities, and reporting the leak may be delayed.

Pipeline operational spills can occur anywhere along a pipeline from leaks, drips, and spills. Oil releases from the pipeline can occur due to corrosion, damage caused by third parties performing excavation or soil borings, external forces due to landslides or washouts, or other causes. Pump station operational leaks can occur from causes similar to pipeline leaks or maintenance activities, such as changing filters and pig launching or receiving incidents.

3.13.3.3 Oil Spill Frequency and Volume

Risk of oil spills is expressed as a combination of spill frequency and spill volume and is assessed using failure frequencies that are derived from general hazardous liquid pipeline operating history. General incident frequencies and spill volumes then were reviewed for relevance to the proposed Keystone Project. This risk assessment approach has been performed at different levels. As part of the NEPA review, a frequency-volume analysis was performed using PHMSA data specific to the states that would be crossed by the proposed pipeline. Incidents occurring in Canada have been documented by regulatory agencies and popularly reported (e.g., Glenavon oil spill; available online: <http://dogwoodinitiative.org/ newsstories/pipelineoilspillraisesquestions>). However, data on these incidents are not readily available or expected in formats amenable to pooling with PHMSA data for analysis. Keystone submitted a Project-specific analysis that used various reference frequencies for different types of incidents and was adjusted for Project-specific factors (ENSR 2006b, DNV 2006). Use of these different approaches results in a range of spill frequencies that “bracket” the number of spills expected from the proposed pipeline. Details of how the different approaches are used and variations in results are provided in Appendix L.

Spill frequencies and volumes estimated from PHMSA data and applied to the proposed Keystone pipeline are presented in Table 3.13.3-1. The frequency factors give an overall frequency (for spills or leaks greater than 50 bbls) between 1.1 and 1.49 spills per year, depending on which data set is used as the basis. The volume factors give an estimated annual gross spill volume between 18,000 and 60,000 gallons (429 and 1,420 bbls) per year, depending on the data set used as the basis.

Keystone submitted a frequency-volume study (DNV 2006) and a Risk Assessment and Environmental Consequence Analysis (ENSR 2006b) This study evaluated hypothetical pipeline releases from three hole sizes—small holes (<0.1-inch diameter), medium holes (1-inch diameter), and large holes (>10-inch diameter) from various failure causes. The report also evaluated the risk at two different pipeline flows—435,000 and 591,000 bpd. These are the nominal and maximum proposed throughputs for the Keystone pipeline. Spill frequencies were estimated from historical data and modified by factors specific to the Keystone Project in order to estimate spill frequencies for the Keystone pipeline system. The study produced an overall frequency for spills or leaks greater than 2,100 gallons (50 bbls) of 0.143 spill per year for the nominal flow of 435,000 bpd and 0.186 spill per year for the 657,000-bpd maximum flow case. Table 3.13.3-2 summarizes the results for both flows.

TABLE 3.13.3-1
Projected Spill Incidents (>50 Barrels) per Year
for the Proposed Keystone Project

Spill Incidents per Year	Full PHMSA Hazardous Liquids Dataset [a]	PHMSA Data–Keystone States [b]	PHMSA Data–Crude Oil [c]
Incidents per mile per year	0.00081	0.0009	0.00109
Mainline Project(1,078 miles)	0.87	0.96	1.17
Cushing Extension (293 miles)	0.24	0.26	0.31
Keystone Project total (1,371 miles)	**1.10**	**1.23**	**1.49**

Notes:

PHMSA = Pipeline and Hazardous Materials Safety Administration.

Columns may not add due to rounding.

[a] “Full” includes all hazardous liquid pipelines in the United States, onshore and offshore.

[b] “Keystone states” includes data only for onshore hazardous liquid pipelines in the states that would be crossed by the Keystone pipeline.

[c] “Crude oil” includes data only for onshore crude oil pipeline incidents, all states.

Source: PHMSA 2007.

TABLE 3.13.3-2 Spill Frequency Associated with the Proposed Keystone Project—Keystone's Analysis		
Pipeline	**Spills per Year [a]**	**Spills per Year [b]**
Mainline Project (1,078 miles)	0.112	0.146
Cushing Extension (293 miles)	0.031	0.040
Keystone Project total (1,371 miles)	**0.143**	**0.186**

[a] Calculated based on specific analysis for the Keystone Project of spill probabilities for 435,000 bpd (DNV 2006).

[b] Calculated based on specific analysis for the Keystone Project of spill probabilities for 657,000 bpd (DNV 2006).

Source: DNV 2006.

The PHMSA data gives a spill frequency that is an order of magnitude higher than that given by the analysis performed by Keystone for the Keystone Project. Although future events cannot be predicted with certainty, spill frequencies can be used to estimate the number of events that might occur. Actual frequency may differ from the predicted values of either analysis. Explanations for the differences between spill frequency estimates include:

- PHMSA data reflect incidents on existing pipeline infrastructure. With implementation of DOT's Integrity Management Rule, continually improving industry operating practices, and advancements in best available control technology (BACT), the number of spills is expected to decline from historical levels of older pipelines.
- The Keystone analysis (DNV 2006) used an additive method, starting from specific types of incidents and adding their respective frequencies. This approach would omit incidents from other causes.
- Based on these factors, the PHMSA data would tend to overestimate the Keystone spill frequency, and the DNV method would tend to underestimate the spill frequency. The expected frequency of incidents would probably be a value between the two estimates.

For purposes of the risk and impact assessment of the Keystone pipeline, a reasonable generalization is that small spills are likely to occur and very large spills are highly unlikely to occur. Although large to very large spills are highly unlikely to occur, they have occurred in the past (as indicated by the PHMSA data); therefore, the potential impacts of such events should be considered. It is also important to consider that, as additional engineering and design information and refinements become available, Keystone would update its risk assessment and submit the updated assessment in subsequent filings with DOS.

3.13.4 Impacts Related to Oil Spills

Crude or refined oil released into the environment (spills) may affect natural resources, human uses and services, and aesthetics to varying degrees, depending on the cause, size, type, volume, location, season, environmental conditions, and associated response actions. Small oil spills (e.g., intermittent leaks and drips from construction machinery and operating equipment) are almost certain to occur during construction and operation of the Keystone Project. There is also a finite potential for a spill of sufficient magnitude to substantially affect natural resources and human uses of the environment. This section summarizes impacts from a range of potential oil spill scenarios associated with the proposed Keystone Project. Details on the potential scenarios are provided in Appendix L.

Oil spills are typically unpredictable in cause, location, time of occurrence, size, and duration (J. L. Mach et al. Hart Associates 2000). The potential occurrence of oil spills can be assessed by analyzing the risk of spills based on historical operation of pipeline systems. When an oil spill occurs, the resulting environmental impact depends on a number of factors, including:

- Fate and behavior of the spilled oil (i.e., potential for a spill reaching an environmental receptor),
- Concentration and chemical composition of the oil, and
- Toxicity (hazard) of the oil to the receptor.

Given the range of potential events and environmental and released oil variables that could occur during an oil spill, an assessment of potential oil spill impacts requires a depiction of hypothetical potential spill scenarios and environmental variables that reasonably bracket spilled oil behavior and fate. These scenarios are provided with the caveat that they are necessarily simplified and do not represent the entire spectrum of possible values or combinations of values and events that might be realized in actual spills. The full assessment of spill scenarios and environmental variables prepared for this EIS (Appendix L) is summarized in the following sections.

3.13.4.1 Factors Affecting Oil Spill Impacts

Impacts related to oil spills can be affected by the release location, type of oil released, volume of oil released, nearby receptors and resource uses, seasonal variations, response time and response actions, weather, water levels, and other factors that are discussed below.

Location of Spill

Most spills would occur and be contained within, or in close association with, the pipeline ROW or the associated infrastructure, such as construction yards, pump stations, and maintenance yards. During construction, refined product spills also could occur from incidents such as tank truck accidents along roads leading to the construction sites. These spills typically would be small and would be promptly cleaned up as required by federal, state, and local regulations before they reached offsite lands or water bodies. Some spills from vehicles, including fuel and other tank trucks running off the roads, may result in much or all of a load being spilled to the land, wetlands, ponds and lakes, or flowing water bodies adjacent to the road or pad. Based on the pipeline spill data base, operational spills from the pipeline system itself would be more likely in areas where subsurface excavations are more frequent and in areas where corrosion potential is high.

Type of Oil

For the Keystone Project, the materials that could be released during the construction or operations phase include:

- Crude oil;
- Refined oil—diesel, gasoline, hydraulic fluid, transmission oil, lubricating oil and grease, waste oil, mineral oil, solvents, and other petroleum-based products; and

- Other hazardous materials—methanol, antifreeze, water-soluble chemicals, corrosion inhibitors, scale inhibitors, drag-reducing agents, and biocides.

Refined oil products could be released in relatively small quantities during construction or operation of the Keystone Project. Crude oil releases during operations could range from small to large volumes along the pipeline route. Corrosion inhibitors, scale inhibitors, drag-reducing agents, and biocides are considered part of the crude oil stream. Crude oil that would be transported by the Keystone Project originates as bitumen, a thick black oil extracted from the WCSB tar sands. For the bitumen to be transported by pipeline, an upgrading technology is applied to convert the bitumen to synthetic crude oil. The general chemical composition, solubility, toxicity, persistence, and other properties of the synthetic crude oil are described in Appendix L.

Volume

Spill volumes can be categorized as:

- Very small spills—less than 5 bbl (<210 gallons),
- Small spills—5–49.9 bbl (210–2,100 gallons),
- Significant[2] spills—50–499,9 bbl (2,100–21,000 gallons),
- Large spills—500–5,000 bbl (21,000–210,000gallons), and
- Very large spills—>5,000 bbl (>210,000 gallons).

This size classification is generally similar to the unofficial categories used by OPS for spill reporting. The very small spill and very large spill categories were added because the vast majority of spills are less than 210 gallons and very rarely spills do exceed 210,000 gallons.

Habitat, Natural Resources, and Human Use Receptors

The impact of an oil spill would be heavily influenced by the types of receptors (i.e., habitats, natural resources, and human uses) that might be exposed to the oil. Sensitive receptor categories, listed in order of increasing perceived sensitivity to an oil spill, include:

- Terrestrial–agricultural land—includes grazing, field and row crops, fallow fields, and similar land uses;
- Terrestrial–natural habitat—includes native and second-growth forests, naturally restoring grasslands, and similar areas that are not being used directly by people;
- Groundwater—emphasis is on areas where the water table is close to the surface and is overlain by soils permeable to oil or karst formations;
- Aquatic–wetland habitat—includes all areas that meet the definition of wetlands;
- Aquatic–lake/pond habitat—includes agricultural stock ponds, small and large lakes, reservoirs, and similar non-flowing water bodies;
- Aquatic–stream/small river habitat—includes smaller flowing water bodies and those that are intermittent or ephemeral;

[2] Terminology from OPS spill reporting requirements.

- Aquatic–large river habitat—includes large flowing water bodies (i.e., the Platte River and the Missouri River) that are perennial, support commercial traffic, and may be restricted by dams and major reservoirs;
- Threatened and endangered species and their critical habitat—a special case of resources that may be found in any of the habitats but are limited in population size or spatial distribution;
- Human use–residential—areas where the pipeline ROW is near rural, suburban, or urban populations;
- Human use–commercial—areas (especially large rivers) that may be closed to normal use during a spill response action and result in substantial economic impacts;
- Human use–recreational—areas (especially lakes, small and large rivers, and reservoirs and associated parks) used by people for various recreational activities;
- Human use–water intakes—usually in reservoirs, large rivers, and some groundwater aquifers from which drinking water, industrial cooling water, or agricultural water supplies are obtained.

Season

The season in which a spill occurs could dramatically influence its behavior, resulting impacts, and the cleanup response actions. Seasonal effects are categorized for spring through fall and for winter.

The duration of the spring–fall season depends on the location along the pipeline route and the weather regime of the year. In this analysis, the season generally is defined as the period when the ground is free of snow and access to the pipeline ROW is not restricted by snow and ice. Most of the rivers and creeks are flowing; ponds, lakes, and reservoirs are open water; land is mostly snow-free; and biological use of land and water bodies is high. Currents, winds, and passive spreading forces would disperse spills that reach the water bodies. Spills to land would directly affect the vegetation, although dispersal of the spilled material is likely to be impeded by the vegetation. Spills to wetlands may float on the water or be dispersed over a larger area than would spills to dry land or to snow-covered land.

In winter, water bodies may be covered with ice, and snow partially to completely covers the land surface. Dispersal of material spilled to the land generally would be slowed, although not necessarily stopped by freezing within the active layer and by the snow cover. Depending on the depth of snow cover, as well as the temperature and volume of spilled material, the spill may reach the underlying dormant vegetation or wetlands, ponds, and lakes. Similarly, spills to flowing rivers and creeks generally would be restricted in areal distribution by the snow and ice covering the water body, compared to seasons with little or no snow and ice cover. Spills under the ice to creeks, rivers, and ponds/lakes might disperse slowly as the currents are generally slow to non-existent in winter. Also, because of the snow and ice, winter spills may be harder to detect and, when found, more difficult to contain and clean up.

Spring melt is the short transition period between winter and spring when thawing begins and river flows increase substantially and quickly, often to flood stages. Major floods could cause bank erosion, and any released oil entering the river could be widely dispersed and difficult to contain or clean up.

Weather and Water Levels

Weather, especially rapid warming periods and heavy rainfall, may cause snowmelt and runoff that could result in major flood flows in the larger rivers; these flood flows could breech levees, erode river banks and channels, and expose the pipeline to structural forces. If spilled oil is released to the flooded area, especially to flowing waters, the oil could be distributed to adjacent terrestrial, wetland, and aquatic habitats. High wind velocity may result in widespread distribution of any material released under pressure. Major flooding or adverse weather conditions (e.g., high winds, tornadoes, blizzards, and extreme cold) also may limit the ability to detect a suspected release, as well as hinder or stop the spill response contractors from implementing oil spill containment and cleanup operations.

Keystone Response Time and Actions

For the very small to most significant spills, response time and actions typically would prevent the oil from reaching sensitive receptors or would contain and clean up the spill before it causes significant environmental impacts. For large to very large oil spills and potentially some significant spills, especially those that reach aquatic habitats, the response time between initiation of the spill event and arrival of the response contractors would influence the magnitude of impacts to the natural environment and human uses. Once the response contractors are at the spill scene, the efficiency, effectiveness, and environmental sensitivity of the response actions (e.g., containment and cleanup of oil, and protection of resources and human uses from further oiling) would substantially influence the type and magnitude of additional environmental impacts. Keystone's plans to prevent, detect, and mitigate oil spills are discussed in more detail in the following section and in Appendix C.

Keystone Actions to Prevent, Detect, and Mitigate Oil Spills

Keystone has designed and committed to a comprehensive slate of processes, procedures, and systems to prevent, detect, and mitigate potential oil spills that may occur during pipeline operations. These are summarized below and described in more detail in Appendix C (Keystone's Draft Emergency Response Plan [ERP]).. The Final ERP that will contain further detail would be completed in the first quarter of 2009.

Prevention. Keystone has conducted a pipeline threat analysis using the pipeline-industry published list of threats under ASME B31.8S and by PHMSA to determine the applicable threats to the Keystone pipeline. Safeguards then were developed to protect against these potential threats, which have been identified as follows:

- Manufacturing defects – flaws in the seam of the pipeline created during the manufacturing process;
- Construction damage – flaws such as dents, cracks, nicks in the coating that are a result of transport, or construction;
- Corrosion (internal and external) – defects that develop over time during operation;
- Mechanical damage – external contact with the pipeline (e.g., backhoes, excavators, and drills); and
- Hydraulic event – overpressure of the pipeline.

Safeguards have been implemented during the design phase of the Project and would be implemented during construction and operations of the pipeline. These include the pre-qualification and surveillance during production by steel suppliers, pipe mills, and coating plants using formal qualification and surveillance processes consistent with ISO standards.

The regulations require the use of a design safety factor contained in 49 CFR 195.106 to establish a maximum operating pressure for steel pipelines. This formula for calculating maximum operating pressure specifies a design safety factor of 0.72 for onshore pipelines. This factor of safety ensures that the maximum allowable operating pressure (MAOP) of the pipeline would not exceed 72% of the specified minimum yield strength (SMYS) of the steel used to construct the pipeline. Under the federal Pipeline Safety Act, a waiver of any regulatory requirement may be granted by the federal Pipeline and Hazardous Materials Safety Administration (PHMSA) if the agency finds that granting the waiver is not inconsistent with pipeline safety (49 USC 60118). On November 17, 2006, Keystone filed a request for waiver of 49 CFR 195.106, seeking permission to use an 0.80 design factor, meaning that the MAOP of the proposed Keystone pipeline would not exceed 80% of the SMYS of the steel used to construct the pipeline. This waiver has been granted for rural areas; therefore, the Keystone pipeline at a maximum operating level will be 20% below the yield strength of the steel used to construct the pipeline.

PHMSA undertook an extensive, detailed technical review of Keystone's request. PHMSA also engaged outside experts in the field of steel pipeline fracture mechanics, leak detection, and supervisory control and data acquisition (SCADA) systems to assist in the review of Keystone's application. PHMSA publicly noticed Keystone's application and incorporated the concerns expressed in public comment into its review. As a result of its review, PHMSA issued a Special Permit allowing Keystone to design, construct, and operate its crude oil pipeline project using a design factor and operating stress level of 80 percent of the steel pipe's SMYS in most areas.

In issuing the Special Permit, PHMSA found specifically that allowing Keystone to operate at 80 percent of SMYS is consistent with pipeline safety and that it "will provide a level of safety equal to or greater than that which would be provided if the pipelines were operated under existing regulations." The Special Permit contains 51 conditions that Keystone must comply with, addressing such areas as steel properties, manufacturing standards, fracture control, quality control, puncture resistance, hydrostatic testing, pipe coating, overpressure control, welding procedures, depth of cover, SCADA, leak detection, pigging, corrosion monitoring, pipeline markers, in-line inspection, damage prevention program, and reporting. Failure to comply with any condition may result in revocation of the Special Permit. In addition, the Special Permit is not applicable to certain sensitive areas, including commercially navigable HCAs; high population HCAs; highway, railroad, and road crossings; and pipeline located within pump stations, mainline valve assemblies, pigging facilities, and measurement facilities. Issuance of the Special Permit was based on PHMSA's determinations that the aggregate effect of Keystone's actions and PHMSA's conditions provide for more inspections and oversight than would occur on pipelines installed under the existing regulations, and that PHMSA's conditions would require Keystone to more closely inspect and monitor its pipeline over its operational life than similar pipelines installed without a Special Permit. The pipe is non-destructively examined, hydrostatically tested, and mechanically tested to prove strength, fracture control, and fracture propagation properties in the mill. All pipes are traceable. The pipe also is examined for fatigue related defects when it is off-loaded from rail cars at stockpile sites.

Pipe welds and coating are inspected using non-destructive methods. The pipeline is hydrostatically tested to a minimum of 100 percent of specified minimum yield strength (SMYS) once placed into the trench, and an in-line inspection is performed for construction-related damage. The pipeline is coated with fusion-bonded epoxy (FBE), and corrosion protection (CP) systems are installed to protect all facilities.

During operations, Keystone would enforce a specification for sediment and water content in the commodities transported, in addition to implementing a comprehensive Integrity Management Program that would use prevention tools such as in-line inspection, CP system surveys, geotechnical monitoring, corrosion coupons and associated testing, corrosion inhibitor and biocide injection, aerial patrol, and public awareness programs. Ground-level patrols would be undertaken in the event of a suspected leak but are not routinely undertaken as is the case with aerial patrols.

Detection. Keystone would utilize a comprehensive Supervisory Control and Data Acquisition (SCADA) system to monitor and control the pipeline. Data provided by the SCADA system would alert the Operations Control Center (OCC) operator to an abnormal operating condition, indicating a possible spill or leak. A back-up communication system also would be available should SCADA communications fail between field locations and the OCC.

The SCADA system would continuously monitor pipeline conditions and update information provided to the OCC operator. Data received via the SCADA system also would be directed to the dedicated leak detection system, capable of independently sending an alarm to the OCC operator.

Keystone also would incorporate computer-based accumulated gain/loss volume trending to assist in identifying low rate or seepage releases below the 1.5- to 2-percent-by-volume detection threshold referenced in Section 2.3.2. These low rate releases often are referred to as pinhole leaks. This involves performing calculations on routine time intervals (approximately 30 minutes) of the volume of oil gained or lost within a pipeline segment bounded by flow measurement equipment. By accumulating these gain/loss results over a succession of time intervals, the cumulative imbalance, if any, of the segment can be determined. Once this cumulative imbalance exceeds a prescribed threshold, further investigation and evaluation is required. Thresholds would be established based on the accuracy and repeatability of flow measurement equipment and the extent to which flow imbalances generated by the normal operation of the pipeline can be tuned out.

In the event that a volume imbalance is identified and warrants further investigation, Keystone would use measures such as the following to identify the leak location:

- Shut-in pressure testing between isolation valves to identify pressure loss within a pipeline segment;
- Aerial and ground patrols to provide direct observation and identification of leak location;
- Internal inspection surveys; and
- Other methods of external leak detection, including odorant-based.

Spill Response Procedures. Standard operating and response procedures would be utilized by the OCC operator in responding to abnormal pipeline conditions, including leak alarms. The OCC operator would have the full and complete authority to execute a pipeline shutdown. Keystone's OCC operator would follow prescribed procedures in responding to possible spills that may be reported from sources such as:

- Abnormal pipeline condition observed by the OCC operator,
- Leak detection system alarm,
- Employee reported, and
- Third party reported.

Upon receipt of notification, as outlined above, the OCC operator would execute the following procedures:

- Follow prescribed OCC operating and response procedures for specific directions on abnormal pipeline condition or alarm response;
- Dispatch First Responders;
- Shut down the pipeline within a predetermined time threshold if abnormal conditions or leak alarm cannot be positively ruled out as a leak; and
- Complete internal notifications, as outlined below.

The chart on the following page outlines the notification process for reporting and evaluating a potential oil spill, as well as activation of the Oil Spill Response Plan. The Regional Emergency Operations Center (EOC**)** Manager (Qualified Individual) is the key individual responsible for evaluating and activating the Oil Spill Response Plan.

All Keystone employees are authorized to communicate directly with the OCC should they observe conditions that may signify a possible spill.

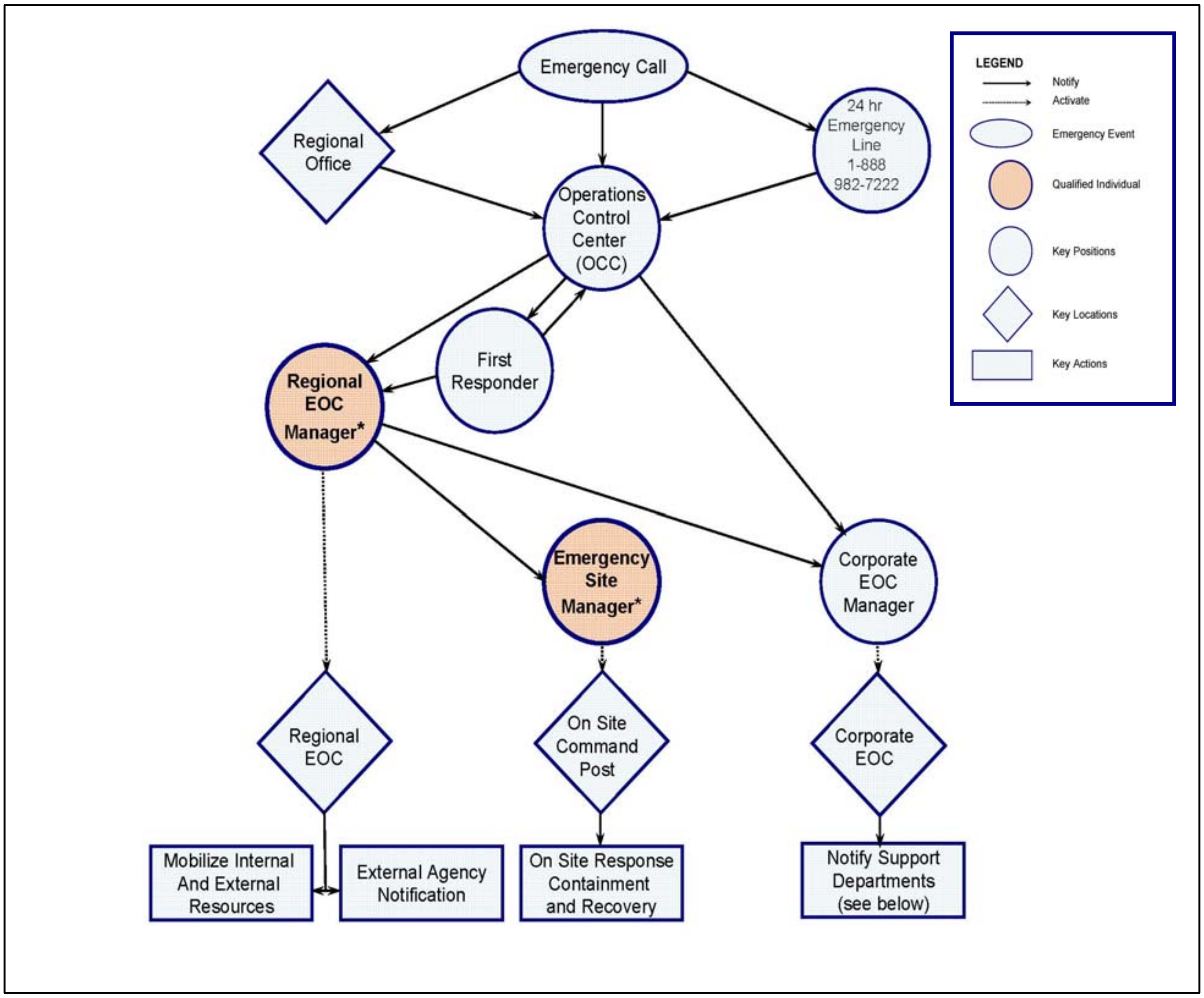
OCC operators have the full and complete authority to shut down the pipeline and proceed with pipeline segment isolation in the area of the leak. The OCC can designate any qualified Keystone field employee as a First Responder in order to mitigate the early impacts of the spill. The First Responder is required to immediately respond and investigate the suspected location.

Procedures are established within Keystone outlining regular signing and financial authority limits. It is recognized that these standard authorities may not apply in an emergency due to the requirement to immediately contain and control the emergency situation.

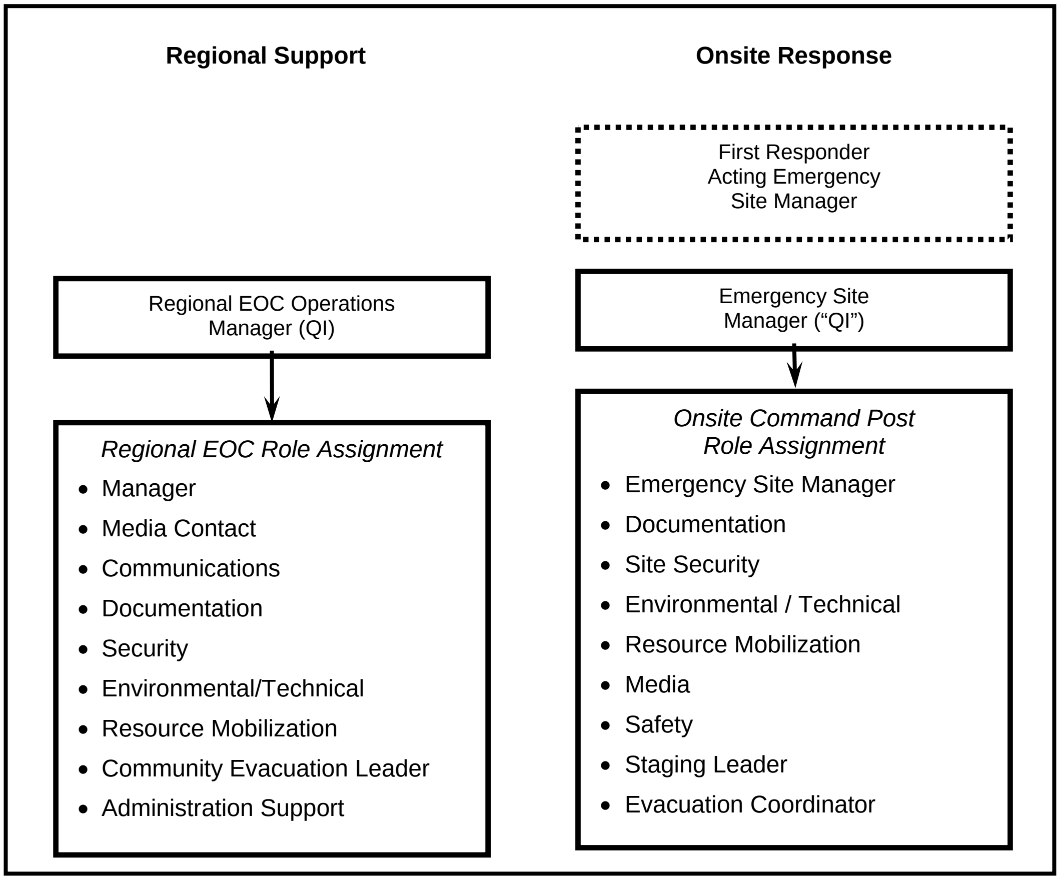
Accordingly, Keystone has established the following policy related to financial authority in an emergency:

> "The Emergency Site Manager (Qualified Individual) or Region EOC Manager (QI) has financial authority to obtain Tier 1, 2, and 3 resources and any other resources necessary to contain and control the emergency situation."[3]

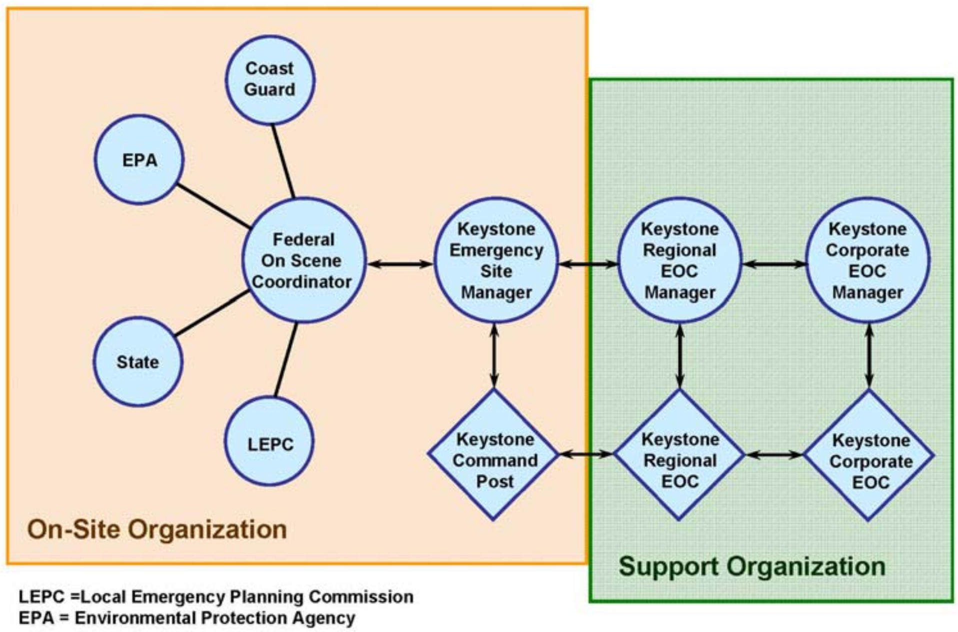
[3] Tiers are response time categories to remove a substantial threat of a worst-case discharge. Table 3.13.4-1 describes the response time requirements along the Keystone pipeline, as defined in 49 CFR Part 194.115(b).


Emergency Call
Regional Office
24 hr Emergency Line 1-888 982-7222
Operations Control Center (OCC)
First Responder
Regional EOC Manager*
Emergency Site Manager*
Corporate EOC Manager
Regional EOC
On Site Command Post
Corporate EOC
Mobilize Internal And External Resources
External Agency Notification
On Site Response Containment and Recovery
Notify Support Departments (see below)
LEGEND
Notify
Activate
Emergency Event
Qualified Individual
Key Positions
Key Locations
Key Actions

The organizational chart for the keystone oil spill response team is presented below. The Emergency Site Manager (QI) in conjunction with the Regional EOC Manager (QI) is responsible for creating an oil spill response organization to effectively manage the incident. Role assignments for the Regional EOC and the Command Post represent the specific functional areas that the Emergency Site Manager (QI) and Regional EOC Manager (QI) determine are necessary to address a specific spill.



The diagram below outlines the action and communication paths under a Unified Command Structure. The Emergency Site Manager (QI) is the primary contact for the Federal On-Scene Coordinator.



Response Time. In the event of a potential pipeline leak or spill, the estimated time to complete an emergency pipeline shutdown and close remotely operable isolation valves is as follows:

- Stop pumping units at all pump station locations: approximately 9 minutes
- Close remotely operable isolation valves: approximately 3 minutes
- **Total time: approximately 12 minutes**

Consistent with industry practice and in accordance with regulations, including 49 CFR Part 194.115, Keystone's response time to transfer such additional resources to a potential leak site would follow an escalating or tier system. Dependent on the nature of site-specific conditions and resource requirements, Keystone would meet or exceed the following requirements along the entire length of the pipeline system (Table 3.13.4-1).

TABLE 3.13.4-1
Response Time Requirements along the Keystone Pipeline

49 CFR Part 194	Tier 1 Resources	Tier 2 Resources	Tier 3 Resources
High-volume area[a]	6 hours	30 hours	54 hours
All other areas	12 hours	36 hours	60 hours

[a] "High-volume area" indicates an area where an oil pipeline with a nominal outside diameter of 20 inches or more crosses a major river or other navigable waters; because of the velocity of the river flow and vessel traffic on the river, this area would require a more rapid response in the case of a worst-case discharge or the substantial threat of such a discharge.

Spill Response Equipment. In general, the types of emergency response equipment that would be pre-positioned for access by Keystone are highlighted below (A more detailed description would be provided in the Final ERP, to be prepared in the first quarter 2009):

- Pick-up trucks, 1-ton trucks and vans;
- Vacuum trucks;
- Work and safety boats;
- Containment boom;
- Skimmers;
- Pumps, hoses, fittings, and valves;
- Generators and extension cords;
- Air compressors;
- Floodlights;
- Communications equipment including cell phones, two-way radios, and satellite phones;
- Containment tanks and rubber bladders;
- Expendable supplies, including absorbent booms and pads;
- Assorted hand and power tools, including shovels, manure forks, sledge hammers, rakes, hand saws, wire cutters, cable cutters, bolt cutters, pliers, and chain saws;
- Ropes, chains, screw anchors, clevis, and other boom connection devices;
- Personnel protective equipment, including rubber gloves, chest and hip waders
- Air monitoring equipment to detect H_2S, O_2 Lower Explosive Level, and benzene concentrations; and
- Wind socks, signage, air horns, flashlights, megaphones, and fluorescent safety vests.

Additional equipment, including helicopters, fixed-wing aircraft, all-terrain vehicles, snowmobiles, backhoes, dump trucks, watercraft, bull dozers, and front-end loaders also may be accessed depending on site-specific circumstances. Other types, numbers, and locations of equipment would be determined upon conclusion of the pipeline detailed design and the completion of Keystone's Final ERP (Oil Spill Response Plan). This plan would be completed in the first quarter of 2009 and submitted to PHMSA prior to commencing operations.

The primary task of the Tier 1 response team is to minimize the spread of product on the ground surface or water in order to protect the public and unusually sensitive areas, including ecological, historical, and archeological resources and drinking water locations. The Emergency Site Manager ("QI") would perform an initial assessment of the site for specific conditions, including the following:

- The nature and amount of the spilled product;
- The source, status, and release rate of the spill;
- Direction(s) of spill migration;
- Known or apparent impact of subsurface geophysical features that may be affected;
- Overhead and buried utility lines and pipelines;
- Nearby population, property, or environmental features and land or water use that may be affected; and
- Concentration of wildlife and breeding areas.

The Emergency Site Manager (QI) would request additional resources in terms of personnel, equipment, and materials from the Tier 2 and. if necessary, the Tier 3 response teams. Once containment activities have been successfully concluded, efforts then would be directed toward the recovery and transfer of free product. Site cleanup and restoration activities would then follow, all of which are conducted in accordance with the authorities having jurisdiction, including development of a natural resource damage assessment in the event that it is required.

Spill Response Personnel and Training. The number of emergency responders comprising specific response teams would be determined upon completion of Keystone's Emergency Response Plan (Oil Spill Response Plan) in the first quarter of 2009. Emergency responders would meet or exceed the requirements of 49 CFR Part 194.115, and would typically be comprised of Hazardous Waste Operations and Emergency Response ("HAZWOPER") trained personnel as follows:

- Tier 1: 8 HAZWOPER trained personnel (includes Emergency Site Manager ("QI") and Command Post Safety Officer).
- Tier 2: 12 HAZWOPER trained personnel.
- Tier 3: 24 HAZWOPER trained personnel.

Keystone's training requirements for key personnel are provided below. The response organization would follow the industry accepted Incident Command System ("ICS") and would typically consist of personnel both on site and within an established remote or Regional Emergency Operations Center ("EOC)".

Table 3.14.4-2 lists identified positions and training requirements for onsite personnel.

Table 3.14.4-3 lists identified positions and training requirements for the personnel related to the Regional Emergency Operations Center.

TABLE 3.14.4-2
Positions and Training Requirements for Keystone Onsite Spill Response Personnel

Position	Specialized Training to Meet Oil Spill Response Duties
First Responders	Hazardous Waste Operations and Emergency Response (HAZWOPER) training to Hazmat Technician Level 3 with annual refresher, as required
	Keystone Emergency Management System (EMS) training
	National Fire Protection Association (NFPA) training
Emergency Site Manager – Qualified Individual	HAZWOPER training to Hazmat Level 4 Specialist with annual refresher, as required
	ICS Communication training
	Keystone EMS training
	NFPA training
Command Post Media	Keystone EMS training
	Keystone Media Relations training
Command Post Safety	Keystone EMS training
	Advanced safety related training
Command Post Documentation	Keystone EMS training
Command Post Site Security	Keystone EMS training
Command Post Resource Mobilization	Keystone EMS training
Command Post Environmental/Technical	Keystone EMS training
Command Post Staging Leader	Keystone EMS training
Command Post Evacuation Coordinator	Keystone EMS training

Locations of Spill Responders. Keystone would base emergency responders consistent with industry practice and in compliance with applicable regulations, including 49 CFR Part 194 and 49 CFR Part 195. Consequently, emergency responders would be based in closer proximity to the following areas:

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

The specific locations of other emergency responders would be determined upon conclusion of the pipeline detailed design and completion of Keystone's ERP (Oil Spill Response Plan). The final ERP would be completed by the first quarter of 2009 and submitted to PHMSA prior to commencing operations.

TABLE 3.14.4-3 Positions and Training Requirements for Keystone Regional Emergency Operations Center Spill Response Personnel	
Position	**Specialized Training to Meet Oil Spill Response Duties**
Regional Emergency Operations Center (EOC) Manager – Qualified Individual	HAZWOPER training to the Level of Hazardous Materials Specialist with annual refresher, as required ICS training Keystone EMS training
Regional EOC Media Contact	Keystone EMS training Keystone Media Relations training
Regional EOC Communications	Keystone EMS training
Regional EOC Documentation	Keystone EMS training
Regional EOC Security	Keystone EMS training
Regional EOC Environmental / Technical	Keystone EMS training
Regional EOC Resource Mobilization	Keystone EMS training
Regional EOC Community Evacuation Leader	Keystone EMS training
Regional EOC Administration Support	Keystone EMS training

Oil Spill Containment Strategies. With respect to spill containment, Keystone's containment strategies would include land-based and water-based measures, as follows:

- Land based:
  - Confining the spilled oil to as small an area as practical;
  - Preventing spilled product from migrating offsite;
  - Preventing spilled product from reaching waterways or water bodies; and
  - Blocking culverts, manholes, or other possible means for further product migration.
- Water based:
  - Confining the spill as close as practical to the spill source;
  - Containing the spill prior to it becoming wider and more difficult to effectively contain;
  - Preventing the spilled material from reaching rivers, streams, and other water bodies; and
  - Protecting sensitive areas in the direction of spill movement.

Typical containment and recovery techniques utilized to contain potential land-based spills would include:

- Earth containment berms,
- Street containment,
- Culvert blocking,
- Storm drain blocking,
- Sorbent booms / barriers, and
- Interception barriers.

Typical containment and recovery techniques utilized to contain potential water-based spills would include:

- Beach berming,
- Beach sumps,
- Boom techniques,
- Calm water containment booms,
- Flowing water containment booms,
- Open water containment booms,
- Exclusion booms,
- Cascading booms,
- Skimmers,
- Suction devices,
- Rotating discs,
- Weir devices,
- Blocking dams,
- Flowing water dams,
- Sorbent booms and barriers,
- Spills on ice,
- Spills under ice, and
- Spills during freeze-up or break-up.

Typical cleanup techniques would include:

- Pressurized equipment,
- Water flooding,
- Manual labor,
- Sorbents,
- Natural recovery,
- Bioremediation,
- Burning, and
- Dispersants and other chemicals.

Spill Training Exercises and Drills. Keystone's exercise program is designed to meet the exercise requirements as outlined in the National Preparedness for Response Exercise Program Guidelines developed by the U.S. Coast Guard and adopted by the PHMSA, the Minerals Management Service, and EPA. Participation in this program ensures that the Company meets all federal exercise requirements mandated by the Oil Pollution Act of 1990 (OPA '90).

The primary elements of the exercise program are notification exercises, tabletop exercises, Company-owned equipment deployment exercises, contractor exercises, unannounced exercises by government agencies, and area-wide exercises up to and including actual field drills conducted by industry and government agencies.

Keystone would ensure that operating personnel participate in exercises or responses on an annual basis in order to ensure that they remain trained and qualified to operate the equipment in the operating environment and to ensure that the Oil Spill Response Plans are effective. However, personnel and equipment that are assigned to multiple Response Zones would participate in only one deployment exercise per year.

The exercise year for all Keystone facilities would be from January 1 to December 31.

In addition to the exercise program described in Table 3.14.4-4, Keystone would be required to participate in unannounced federal agency-led exercises, and in other area exercises when requested by appropriate authorities.

TABLE 3.14.4-4
Keystone's Spill Training Exercise Program

Exercise Type (for Each Response Zone)	Exercises Conducted in Triennial Cycle
Qualified individual notification (one per year to be conducted during non-business hours to ensure that the notification process is tested during non-business hours once per year)	12
Spill management team tabletop (One must involve a worst-case discharge scenario)	3
Equipment deployment (Using either internal and/or external)	3
Unannounced (Any of the above exercises-with the exception to the qualified individual notification exercise-satisfy this requirement if conducted unannounced)	3

Notes:

Tabletop exercise is an exercise of the response plan and the spill management team's response efforts without the actual deployment of equipment.

Spill management team is the group of personnel identified to staff the appropriate organizational structure to manage spill response implementation in accordance with the response plan.

Internal exercises are those that are conducted wholly within the plan holder's organization. Internal exercises include personnel such as the qualified individual and those affiliated with the plan holder's spill management team, including Oil Spill Response Officers. The internal exercises do not involve other members of the response community.

External exercises are those that extend beyond the internal focus of the plan holder's organization and involve other members of the response community. The external exercises are designed to examine the response plan and the plan holder's ability to coordinate with the response community to conduct an effective response to an incident.

3.13.4.2 Factors Affecting the Behavior and Fate of Spilled Oil

The environmental fate of released oil is controlled by many factors, and persistence cannot be predicted with great accuracy. Major factors affecting the environmental fate include the type of product, spill volume, spill rate, temperature of the oil, terrain, receiving environment, time of year, and weather. Crude oil would weather differently than diesel or refined products in that both diesel and refined products would evaporate at a faster rate than crude oil.

The characteristics of the receiving environment, such as the type of land cover, soil porosity, land surface topography and gradient, type of freshwater body, presence of ice on water or snow on land, and flowing water current velocity, would affect how the spill behaves. In ice-covered waters, many of the same weathering processes are occurring as in open water; however, the ice changes the rates and relative importance of these processes (Payne et al. 1991).

The time of year when a spill occurs substantially affects the fate of the crude oil. The season controls climatic factors such as temperature of the air, water, or soil; depth of snow cover; whether there is ice or open water; and the depth of the active layer. During winter, the air temperature can be so cold as to modify the viscosity of the oil so that it would spread less and could even solidify. The lower the ambient temperature, the less crude oil evaporates. Frozen ground would limit the depth of penetration of any spill.

3.13.4.3 Types of Oil Spill Impacts

Oil spills can result in physical, chemical or toxicological, and biological impacts.

Physical Impacts

Physical impacts of oil spills to natural resources and human uses typically result from physical coating of soils, sediments, plants, animals, or areas used by people. Typical physical impacts include:

- Smothering living organisms so they cannot feed or obtain oxygen;
- Coating feathers or fur, which reduces their insulating efficiency and results in hypothermia;
- Adding weight to the organism so that it cannot move naturally or maintain balance;
- Coating sediments and soils, which reduces water and gas (e.g., oxygen and carbon dioxide) exchange and affects subterranean organisms;
- Coating beaches, water surfaces, and other places used by people; and
- Coating or contaminating existing infrastructure, such as buried waterlines in the spill zone.

Chemical and Toxicological Impacts

Toxicological impacts are the result of chemical and biochemical actions on the biological processes of individual organisms. The results may include direct and acute mortality; sub-acute interference with feeding or reproductive capacity; disorientation; reduced resistance to disease; tumors; reduced or loss of various sensory perceptions; interference with metabolic, biochemical, and genetic processes; and a host of other acute or chronic effects. In general, these impacts are manifested in sick, dying, or dead organisms. Oil spills typically are not toxic to humans, although the fumes from the spilled oil may make people sick if they are exposed long enough to sufficiently high concentrations in the air. Other than response personnel, most people generally are restricted from areas where fumes from the spilled oil potentially would pose a health threat.

Biological Impacts

The physical and chemical impact processes described previously are manifested at the individual organism level. Additional biological and ecological impacts may affect the local population, community, or ecosystem, depending on the location, size, type, season, duration, and persistence of the spill, in addition to the type of habitats and biological resources exposed to the spilled oil. Loss or reproductive impairment of a substantial portion of a population or biological community from an oil spill would be considered a significant environmental impact. Potential biological impacts would be greater if the affected species have long recovery times (e.g., low reproductive rates), have limited geographic distribution in the affected area, are central species in the ecosystem, are key habitat formers, or are otherwise critical to the local biological community or ecosystem. If the species or community is a key recreational or commercial resource, biological impacts at the population or community level also would constitute a significant impact.

3.13.4.4 Oil Spill Scenarios

A range of spill scenarios is provided to facilitate the impact assessment. It is impractical to evaluate all the reasonably likely, let alone possible, combinations of factors that are associated with and constitute an oil spill impact assessment. Most of the spills that may result in significant environmental impacts are likely to be crude oil from the pipeline. For that reason and because a key criterion for the OPS spill reporting system is the volume of oil released, the spill scenarios are based on the spill volumes listed in Section 3.13.4.2.

Very Small and Small Spills

The most common scenarios are the very small (< 5 bbl) and small (5–49.9 bbl) spills of diesel, hydraulic fluid, transmission oil, and antifreeze on work pads, roads, and facility parking or work areas. Some small spills may result from slow and small leaks of crude oil from the pipeline (also known as pinhole leaks). Most of these small spills would not reach non-facility land or water bodies. However, some of the spills could reach natural or cultivated land, or could seep into the soil toward groundwater or into nearby water bodies remote from the roads and pads. The few small spills that reached terrestrial habitats typically would affect a limited area adjacent to the road, ROW, or pad. Even the small spills that reached water bodies generally would result in a limited impact because of the small volume of oil involved.

Significant and Large Spills

Significant (50–499.9 bbl) and large (500–5,000 bbl) spills are much less common. Significant spills are more likely to: (1) be caused by accidents at construction and operation/maintenance sites; (2) be composed of refined products; and (3) occur on or near roads, construction pads, facility sites, or along the ROW.

Large spills are more likely to be crude oil releases from the pipeline and typically would occur in the ROW. Both significant and large spills are likely to result from tanker truck accidents (during construction), outside forces such as excavators and major earth movement, or corrosion of the pipe. Significant and large spills are more likely than small ones to reach natural or agricultural lands and water bodies adjacent to the ROW, roads, and pads. For the spills that reach water bodies, especially flowing streams and rivers, the area of impact generally would be more extensive than for the small spills because of the larger volume of oil involved. Likewise, the potential for large spills to reach groundwater surfaces is greater than for small spills. Large spills that result from a rupture in the pipeline, for whatever reason, are likely to be detected quickly by the SCADA system; both automatic and manual responses would be quickly activated to stop and isolate the leak.

Very Large Spills

Very large (>5,000 bbl) spills are a highly unlikely, but nonetheless possible, event. They are likely to result from a major rupture or a complete break (referred to as a “guillotine rupture”) in the pipeline and would release crude oil somewhere along the ROW. Causes could include corrosion; major earth movement resulting from slides, earthquakes, or flood flows eroding river banks at non-HDD crossings; mechanical damage from excavation work; or vandalism and terrorist actions. The actual volumes spilled could vary, depending on the location and the activation methods and times for valves, pressure in the line, actual location of the break, the extent to which the pipeline follows the topographic contours and presence of low spots in the pipeline, and other factors.

Very large spills are likely to reach both land and adjacent water bodies, especially if they occur in the ice-free seasons. The proximity of the pipeline to major streams and rivers may be the most important factor in the spill scenarios. In general, if the spilled material flows to dry land, natural or agricultural, the oil probably would not disperse very far. Crude oil is more viscous and would percolate downward more slowly than diesel fuel or other refined products. A substantial portion of crude oil may adhere to soil particles, thereby reducing the amount that reaches the groundwater. Once at the upper groundwater surface, most crude oil would float and may move downgradient with the groundwater. If a very large spill reaches a flowing creek or river, the oil could be dispersed for substantial distances downstream. In flood flows, the oil also could be distributed over the flooded natural, agricultural, or residential/ commercial lands and could flow into ponds, reservoirs, and lakes. Whether a very large spill would reach these rivers or streams would depend on several variables, including the type, temperature, and volume of oil spilled; the topographic relief and slope; air temperature; presence of snow or vegetation; and response time and actions.

3.13.4.5 Assessment of Impact Magnitude

Based on the worldwide literature accumulated over the past 50 years on oil spill impacts to ecosystems and human uses (e.g., NRC 1985, 2003a, 2003b), the magnitude of impact is primarily a function of the size of the spill, type of oil, and sensitivity of the receptors affected. For the Keystone Project, the crude oil stream represents the most likely source of an oil spill release that could produce a significant environmental impact. The size of a crude oil spill and the receptor types therefore would be key variables for estimating the magnitude of potential environmental impacts from such a spill. The size of the spill, measured in barrels, is an objective variable that can be measured or estimated within a reasonable margin of error in most cases. Receptor sensitivity, however, is more subjective and is markedly influenced by the perspectives and biases of the evaluators. The relative sensitivities of receptors that could be affected by the Keystone Project are presented as a hierarchy in Table 3.13.4-5, based on historical spill sensitivity assessments and typical stakeholder input.

The magnitude of environmental impacts generally increases within a receptor type as spill size increases (i.e., from left to right in the table). Within a spill size, the magnitude of impact increases with increasing sensitivity of the receptors (i.e., from top to bottom in the table). Combining size and sensitivity, the magnitude of impacts generally increases from top left to bottom right in the table. In many oil spills, the relative value of impacts on natural resources, including wildlife and wildlife habitats, is perceived to be higher or lower than the value of impacts to human uses, depending on stakeholder biases. Table 3.13.4-5 attempts to reflect a consensus of the ranking of these values, recognizing that the concept of "impact assessment and magnitude" is an anthropogenic one and not a component of ecosystem function.

3.13.5 Resource-Specific Impacts

This section summarizes potential Project-related impacts on specific resources that could result from oil spills and leaks.

TABLE 3.13.4-5
Significance of Environmental Impacts of Crude Oil Spills with Increasing Oil Spill Size and Increasing Sensitivity of Receptors

Type Of Receptor [a]	Size of Spill (in barrels) Very Small (<5 bbl)	Small (5–49.9 bbl)	Significant (50–499.9 bbl)	Large (500–5,000 bbl)	Very Large (>5,000 bbl)
Terrestrial–agricultural land	Negligible	Negligible to minor	Minor to substantial	Minor to substantial	Substantial
Terrestrial–natural habitat	Negligible	Minor	Minor to substantial	Substantial	Substantial
Groundwater	Negligible	Negligible	Negligible to minor	Minor to substantial	Substantial
Aquatic–wetlands	Negligible	Minor	Minor to substantial	Substantial	Major to catastrophic
Aquatic–lakes and ponds	Negligible	Negligible to minor	Minor to substantial	Substantial	Major
Aquatic–streams and small rivers	Negligible	Negligible to minor	Substantial	Major	Major to catastrophic
Aquatic–large rivers	Negligible	Negligible	Minor	Substantial to major	Major to catastrophic
Threatened and endangered species and habitat	Negligible to minor	Minor to substantial	Substantial	Substantial to major	Major to catastrophic
Human use–commercial	Negligible	Negligible to minor	Minor	Minor to substantial	Substantial to major
Human use–residential	Negligible	Negligible to minor	Minor	Minor to substantial	Substantial to major
Human use–recreational	Negligible	Negligible to minor	Minor to substantial	Substantial to major	Major to catastrophic
Human use– water intakes	Negligible to minor	Negligible to minor	Minor	Minor to major	Major to catastrophic

Notes:

Negligible impact—little to no detectable impact on most resources; maybe some visible presence of oil on land, vegetation, or water. No to very few organisms apparently killed or injured. Temporary (days) and very local to spill site.

Minor impact—measurable presence of oil and limited impacts on local habitats and organisms. Temporary (days to weeks) and local (acres). Some organisms (likely birds, fish, and aquatic macroinvertebrates) may be killed or injured in the immediate area.

Substantial impact—patchy to continuous presence of oil on terrestrial and aquatic habitats near the spill site. Impacts may be present for weeks to a few months and may affect tens of acres or a few miles of stream/river habitat. Local community- and population-level effects on organisms and human uses of the area.

Major impact—patchy to continuous and heavy presence of oil on terrestrial and aquatic habitats near the spill site and for substantial distances downgradient of the spill site. Impacts may be present for weeks to months and potentially for a year or more. Area may include many acres to sections of land or wetlands and several miles of riverine habitat. Local community- and population-level impacts on organisms and habitats, and disruption of human uses of local oiled areas.

Catastrophic impact—mostly continuous or nearly continuous presence of oil on all habitats near and for substantial distances downgradient of the spill site. Impacts may be present for months to years. Area may include many acres to sections of land or wetlands, and several to numerous miles of river or other aquatic habitat. May cause local and regional disruption of human uses. May cause local and regional impacts to biological populations and communities.

[a] In increasing order of sensitivity from top to bottom.

3.13.5.1 Geology

The proposed Keystone Project does not involve geological features that have received state or federal protection.

Paleontological Resources

Most spills are confined to a construction or facility pad, access roadway, or pipeline ROW—or to an adjacent area. The primary exceptions are large to very large spills from pipelines that affect areas beyond the ROW. For example, a large to very large spill may enter a river crossing the ROW, and oil may be carried for several miles downstream to a paleontological site, should any be found to be present. Although no known sensitive paleontological resources would be crossed by the pipeline, surficial materials along the proposed ROW may contain Quaternary vertebrate fossils. Glacial deposits in particular may contain fossils of mastodon, mammoth, horses, and other Pleistocene large vertebrates (Paleontology Portal). Vertebrate fossils are relatively rare, and locations containing vertebrate fossils are more likely to be scientifically significant than those containing invertebrate or plant fossils. Where exposed, bedrock may contain Cretaceous and earlier marine fossils. Upper Cretaceous bedrock outcrops may contain fossils of marine organisms, including turtles, fish, ammonites, and various invertebrates. Pennsylvanian bedrock outcrops may contain fossils of marine invertebrates, including mussels, echinoids, bryozoans, crinoids, snails, corals, and trilobites. Pennsylvanian rocks in Illinois may contain plant fossils. Permian outcrops may contain fish and shark fossils. Along the Cushing Extension route in Noble County, Oklahoma, the Wellington Formation has yielded non-mammal vertebrate, invertebrate, and plant fossils (Paleontology Portal).

Because no areas of known sensitive paleontological resources would be crossed by the Keystone pipeline ROW or facilities, the likelihood of impacts on these resources from an oil spill is remote.

Mineral and Fossil Fuel Resources

The proposed route does not cross any active surface mines or quarries, but potentially valuable sand, gravel, clay, and stone resources may lie within the proposed Mainline Project ROW for the approximately 800 miles that traverse glacial deposits. Sand, gravel, crushed stone, and dimensional limestone are also present along the Kansas portion of the Cushing Extension ROW (ENSR 2006a). As discussed in preceding sections, impacts from spills vary with the type of oil, volume, site features (e.g., topography), season, hydrologic factors (e.g., spread by surface waters), degradation (e.g., volatilization), and the type and distribution of resources present. For surface and near-surface resources such as sand, gravel, clay and stone, small to significant spills may result in localized reduction in resource availability and value depending on actions involved in the incident response and subsequent remedial activities. For large and very large spills, the impacts may be proportionally greater. However, the distribution of these mineral resources and their relatively undeveloped state along the ROW indicate that the overall potential for impacts to the resources and their associated industries is small. In North Dakota, South Dakota, and Nebraska, the proposed route would cross deposits of sand, gravel, clay, and stone; but the acreage of deposits covered by the proposed ROW is insignificant compared to the total acreage of deposits present in each state. Thus, impacts from spills in the vicinity of these resources would be negligible for small or even significant spills that are rapidly contained. Even large spills would result in minor impact because of the distribution of these resources and their current state of development.

The proposed Mainline Project route does not cross the well pads of any active or proposed oil or gas wells (ENSR 2006a). The proposed Cushing Extension ROW in Kansas crosses or passes near several oil and gas fields. In addition to four abandoned oil fields in Clay County, the proposed route passes near the active El Dorado oil field (Brooks et al. 1975 in ENSR 2006a). In Oklahoma, numerous oil and gas fields are in the vicinity of the proposed Cushing Extension route. Oil and gas fields that would be crossed by the Mainline Project and Cushing Extension ROWs are identified in Table 3.1.3-1 (in Section 3.1.3). Impacts of spills of any size that are rapidly and effectively addressed, as expected, are not likely to result in any contamination or alteration of these oil and gas resources due to pipeline location and the depth and containment afforded by the extraction equipment, operations, and sites.

In Kansas, coal beds are present in Pennsylvanian rocks below the proposed route; they are too deep to mine, although coal bed methane production is a possibility (Charpentier and Rice 1995). The proposed route crosses approximately 40 miles of underlying coal seams between Wood River and Patoka, Illinois, where coal is mined with underground methods (USGS 2004 in ENSR 2006a). Coal fields that would be crossed by the Mainline Project are identified in Table 3.1.3-2 (in Section 3.1.3); no coal fields would be crossed by the Cushing Extension. Oil spills are not expected to affect coal resources.

3.13.5.2 Soils and Sediments

Soils

The impact of oil spills on soil is a function of several variables, including the type of oil, permeability of the soil, type and amount of vegetation and other surface cover, and the release point (e.g., above or on the surface or below ground). Crude oil, lubricating oil, and similar heavy oils would be less likely to penetrate through the surface soil layers than refined oil (for example, gasoline or diesel), which could infiltrate through the vegetation, debris, and litter cover. Refined products are more likely to reach the soil—especially in the warmer snow-free seasons because their low viscosity would allow penetration into the vegetation and even the thin snow layers.

Once the oil reaches the soil surface, the depth of penetration into the soil would depend on the viscosity of the spilled oil, the porosity of the soil, and the extent to which the soil is frozen or saturated with liquid water. Porous soils (e.g., sand, gravel, and moraines) are generally more permeable than clays and silts, especially if the latter are saturated. Karst areas may be especially vulnerable to impacts from a spill.

Spills could affect soils indirectly by affecting the vegetation, which could die and expose the soil to water and wind erosion even if the soil was not directly affected by the spilled material. Spill cleanup is more likely to affect the soils than the presence of the spilled material itself, unless the cleanup is well controlled and heavy traffic and digging are minimized (especially for spills in summer).

Sediments

Sediments (defined here as submerged soils in wetlands and aquatic habitats) are typically fine grained and saturated with water. The sediment may be coarser grained in fast-flowing streams and rivers, and in areas where glacial moraines dominate the soil types. Crude or refined oils typically do not penetrate beyond the surface layer in sediments unless (1) there is a substantial amount of turbulence that mixes the oil and sediments, followed by deposition of the mixture in low-energy areas; (2) the interstitial spaces are large enough (e.g., in gravel and coarse sand) to allow for penetration of the oil as it sinks; or (3) physical activities associated with spill response actions mix the surface-deposited oil-sediment mixture into deeper subsurface levels of the sediment profile. Refined products also typically would not penetrate sediments because of their water content but may penetrate or be mixed further into the sediments under the same turbulent or cleanup actions as for crude oil.

3.13.5.3 Water Resources

Surface Water

An oil spill that reached a freshwater body could reduce dissolved oxygen DO and increase toxicity to aquatic organisms. Decreases in DO concentrations in wetlands, ponds, and small lakes could result from decreased oxygen influx from the air because of the relative impermeability of the oil slick to oxygen and the relatively high rate of natural sediment respiration in many shallow water bodies. In winter, even under ice, an oxygen deficit would not be expected to result from a small spill in most waters because low biological abundance and activity result in low to negligible respiration rates in the sediment and water column. Sediment respiration has even less relative effect in the thicker water column of lakes deep enough not to freeze solid in winter. Such lakes, even those that hold fish, tend to be supersaturated with DO in winter (BLM and MMS 1998). During open water periods in most of the water bodies, especially the larger lakes, rivers, and streams, spilled materials would result in no detectable impacts on DO levels. The relatively high river volume (relative to the volume of oil) and the high rate of water flow would disperse the oil before it affected DO concentrations.

Although spills are not considered a part of routine operations, there is the possibility of a crude oil release occurring with the potential to affect surface water bodies. A large spill could affect drinking water sources and irrigation water supplies. Implementation of the procedures in Section 3 of Keystone's CMR Plan (Appendix B) would minimize the potential for spills and leaks to affect surface water resources. Keystone's draft ERP (Appendix C) describes actions to reduce the potential for crude oil releases to affect surface water and groundwater resources.

Minor temporary to short-term surface water quality degradation is possible from maintenance equipment and vehicle spills or leaks. During all construction activities, all refueling would be conducted at least 100 feet away from all surface water bodies. Although washout-related spills are not considered a part of routine operations, in the event that channel migration or streambed degradation threatens to expose the pipeline, protective activities such as reburial or bank armoring are likely be implemented. In its CMR Plan (Appendix B), Keystone has committed to a minimum depth of cover of 5 feet below the bottom of all water bodies, maintained for a distance of at least 15 feet to either side of the edge of the water body. However, in Keystone's Frequency and Volume Analysis Report (DNV 2007) the likelihood of washout-related spills for cover depths less than or equal to 10 feet is estimated to be twice that for cover greater than 10 feet. Channel incision of several meters is typical of many Midwestern streams and rivers; such incision would expose and threaten pipelines buried 5 feet below the channel bed. Furthermore, channel incision can sufficiently increase bank heights to destabilize the slope, ultimately widening the stream. Sedimentation within a channel also can trigger lateral bank erosion, such as the expansion of a channel meander opposite a point bar. Bank erosion rates can exceed several meters per year. Maintaining an adequate burial depth for pipelines 15 feet (5 meters) beyond either side of the active stream channel may necessitate bank protection measures that would increase both maintenance costs and environmental impacts. In light of these concerns, Keystone has committed to having the design of water crossings assessed by a qualified professional scientist or engineer to ensure that the depth of the pipeline near the water crossing is adequate based on flood scour potential and also to ensure that the pipeline depth is maintained for an adequate distance back from either side of the active channel. All water crossing designs would also be reviewed by the COE prior to the issuance of construction permits. The level of assessment for each crossing would vary based on the professional judgment of the qualified design personnel. The pipeline would be installed as determined to be necessary to address any hazards identified by the assessment. The design of the crossings would also include the specification of appropriate stabilization and restoration measures.

Control valves would be installed on both sides of larger perennial streams for the Mainline Project and the Cushing Extension pipelines. In the event of a crude oil release, the presence of valves and enactment of Keystone's ERP and spill containment measures would minimize the potential for any crude oil releases to affect surface water resources.

Groundwater

In the region of the proposed Keystone Project route, unconsolidated deposit aquifers in Quaternary-aged sediments are the most productive aquifers and are the source of water for thousands of shallow wells (Whitehead 1996). Shallow groundwater in this region is often used for agricultural, domestic, and industrial purposes. The Mainline Project route does not cross over any sole source aquifers, as designated by EPA Regions 5, 6, 7, and 8 (EPA 2007). (A detailed description of groundwater aquifers in proximity to the Project is presented in Section 3.3.1.1 and Appendix J.)

Significant spills of refined products, especially diesel, and significant to very large spills of crude oil may reach groundwater if the overlying soils are porous and not water saturated and if the water table is relatively near the surface. Areas near major wetlands and meandering streams or rivers are key examples where the water table may be close to the surface and the soils are wet to saturated, depending on rainfall and snowmelt conditions. In some of these areas, it may be difficult to distinguish between groundwater and surface water.

Diesel fuel has a low viscosity and likely would percolate toward the water table, where it would float on the water. It may move downgradient with the groundwater, although potentially at a lower rate than the groundwater. Some of the diesel may become dispersed in the groundwater, contaminating the groundwater for agricultural or domestic drinking supply uses. Also, the oil-contaminated groundwater may contaminate surface waters (e.g., wetlands, ponds and lakes, streams and rivers) if the groundwater surfaces and discharges into these surface water areas.

Crude oil is more viscous and would percolate downward more slowly. Also, a substantial portion of the crude oil may adhere to the soil particles, thereby reducing the amount that reaches the groundwater. Once the crude oil reaches the upper groundwater surface, most of it would float and may move downgradient with the groundwater—although probably more slowly. The oil also would undergo some biodegradation, adsorption to soil particles, and dispersion into the water—all of which effectively results in a natural attenuation remediation of the contamination. Like diesel fuel, the crude oil may reduce or eliminate agricultural or domestic uses of the groundwater and may contaminate surface water bodies if the contaminated groundwater discharges into these waters.

Overall, it is not anticipated that groundwater quality would be affected by disposal activities, spills, or leaks during construction activities. Many of the aquifers present in the subsurface beneath the proposed route are isolated by the presence of glacial till, which characteristically inhibits downward migration of water and contaminants into these aquifers. However, shallow or near-surface aquifers are also present beneath the proposed route. Temporary fueling stations would be used to refuel construction equipment. To prevent releases, fuel tanks or fuel trailers would be placed within secondary containment structures equipped with impervious membrane liners. Implementation of procedures outlined in Sections 2 and 3 of Keystone's CMR Plan (Appendix B) would ensure that (1) contractors would be prepared to respond to any spill incident; and (2) all contaminants would be contained and not allowed to migrate into the aquifer during construction activities, regardless of the depth of the underlying aquifer.

During the life of the Keystone Project, potential minor short- to long-term groundwater quality degradation is possible from equipment and vehicle spills or leaks. Routine operation and maintenance is not expected to affect groundwater resources; however, if a crude oil release occurred, crude oil could migrate into subsurface aquifers and into areas where these aquifers are used for water supplies. Keystone's draft ERP (Appendix C) describes actions to be taken in the event of a crude oil release or other accident. As noted earlier, the ERP would be finalized prior to initiation of operation.

3.13.5.4 Wetlands

Impacts of spills of crude oil or refined products to wetlands are influenced primarily by the type of oil, the amount and proportion of water surface area covered, the type of vegetation present in the wetland, and cleanup response actions. Refined products tend to be more toxic than crude oil, while crude oil tends to cause more physical impacts (e.g., smothering). Because the oil tends to remain on the water surface, the slick may affect the oxygen exchange between water and air. A large and continuous slick may result in a low DO environment under the released oil. The slick of refined product also may result in toxic components being dissolved and dispersed in the underlying water column over a large area. Dense stands of emergent vegetation tend to act like an oil boom and collect oil at the edges of the stand because the oil adheres to the vegetation. As noted earlier, crude oil tends to infiltrate the vegetation stands less than refined products because the crude oil is more viscous. Aggressive and intrusive cleanup methods tend to mix the oil into the water and especially the sediments (which are often anoxic below the surface layer), where the oil may have long-lasting effects. Such cleanup methods may directly affect the vegetation, sediments, and animals more than the spilled oil. Passive cleanup methods, especially natural attenuation and biodegradation processes, generally result in much less impact on wetland resources.

Spills of refined product (e.g., diesel or gasoline) that affect wetlands are more likely to occur during construction and are more likely to be very-small to small-volume spills from construction pads or from access roads. If the spills occur in winter, the wetland may be covered in ice; the spilled product may be contained by snow and remain on top of the ice. In either case, it probably would be recovered before it directly affected the wetland habitat and associated vegetation or animals. For spills occurring during the rest of the year, most of the product would float on the water or wet soil surface—although some of the volatile fraction may dissolve or disperse in the water where it could injure or kill organisms. Although gasoline spills evaporate quickly, they may cause a short-term acute toxicological effect on animals in the wetland; and the vegetation may be chemically "burned" from the water line up. Diesel spills tend to be more persistent, and the oil may become incorporated into the sediments as well as adhere to the emergent vegetation.

Crude oil spills could occur only during operation. Most spills that could affect wetlands would occur in the ROW, where the pipeline crosses wetlands or water bodies such as ponds, lakes, reservoirs, streams, rivers, or adjacent riparian habitats. Crude oil spills that occur in winter may be restricted in the area affected because the cold plus the snow would increase the oil viscosity. In warmer seasons, large to very large spills of crude oil may flow into wetlands, where oil would cover the water surface, coat plants and animals, and restrict oxygen exchange between air and water. Some of the crude oil may sink, become incorporated into the sediments, and remain there for years—depending on the amount of biodegradation and chemical or physical weathering that takes place.

Very small refined product or crude oil spills generally would cause negligible to minor impacts on wetlands unless the wetland is small and isolated from other water bodies. In these cases, the ecological impacts may be substantial because the majority of the wetland may be exposed to the oil. Some significant and many large to very large spills would result in substantial to catastrophic ecological impacts on wetlands because of the large size of the spill and the proportion of the wetlands that would be affected. Impacts may approach a catastrophic level in areas where the wetlands are heavily used by migratory waterfowl and the spill occurs during the spring or fall migration.

3.13.5.5 Biological Resources

Terrestrial

Vegetation

Because most spills are very small and would likely occur within the ROW, their effects would not reach natural or agricultural terrestrial habitats and would negligibly affect the vegetation and associated animals. However, some of the significant and the large to very large spills could reach the adjacent vegetation and habitat by directly flowing from the facility, or spilling from a pipeline leak in the ROW. During winter in the northern areas of the pipeline corridor, sufficient snow cover or sufficiently low temperatures may slow the flow of spilled oil and allow spill cleanup efforts to occur before oil spreads substantial distances from the spill source. Thus, even a large spill could result in a limited impact to vegetation and habitat. Cleanup operations, however, could cause impacts on vegetation and habitat if activities are not implemented carefully and with regard for minimal disturbance of the surface soils and vegetation. Whenever there are warmer temperatures and little to no snow cover, the spilled oil may flow a greater distance on the land surface thereby increasing the area where vegetation is potentially affected.

Most oil spills would cover less than an acre, but large to very large spills might cover several to tens of acres. After past spills, terrestrial habitats and ecosystems have shown a good potential for recovery; wetter areas have recovered more quickly (Jorgenson and Martin 1997, McKendrick 2000b). The length of time that a spill persists depends on several factors, including oil and soil temperature, availability of oleophilic microorganisms (organisms that biodegrade oil), soil moisture, and the concentration of the product spilled. For the most part, the effects of oil spills on land would be localized and are not expected to contaminate or alter the quality of habitat outside a limited area. Spills that occur within or near streams, rivers, and lakes could indirectly affect riparian vegetation and habitat along these water bodies.

Birds

Minor spills on or near the roads, pads, or facilities would not affect populations of birds, although a few individual shorebirds, waterfowl, and raptors (and very few passerine birds) could be exposed to the spilled oil. These exposed individuals are likely to die from hypothermia or from the toxic effects of ingesting the oil. Potential similar impacts would be limited to a few individual birds, especially waterfowl and shorebirds using the small ponds and creeks that could be affected by very small to small spills. These spills would not cause a population-level impact.

A substantial to very large spill onto dry land could cause the mortality of small numbers of shorebirds and passerines from direct contact. If the spilled material entered local or inter-connected wetlands, water-dependent birds and waterfowl, plus additional shorebirds, could be exposed. The numbers of individuals oiled would depend primarily on wind conditions and on the numbers and location of birds following entry of the spill into the water. Impacts would be detectable at the local population level, especially for resident species with limited geographic distribution.

If the spill entered a wetland, stream, or small river, a variety of waterfowl and shorebird species could be present, particularly during the spring and fall migrations. Losses resulting from the spill in this case could be substantial and at the population level for resident species, but likely would be negligible for migrating species with large geographic distributions. If raptors, eagles, owls, vultures, and other predatory or scavenging birds are present in the spill vicinity, they could become secondarily oiled by eating oiled birds. Mortality of breeding raptors likely would represent a minor loss for the local population but is not likely to affect the regional population.

If a large spill moved into wetlands, adjacent riparian habitats, or the open water habitats of other major rivers along the ROW, several waterfowl species that breed, stage, or stop there during migration may be at risk. A spill entering a major river in spring, especially at flood stage could contaminate overflow areas or open water where spring migrants of several waterfowl species concentrate before occupying nesting areas or continuing their migration.

Lethal effects are expected to result from moderate to heavy oiling of any birds contacted. Oiled individuals could lose the water repellency and insulative capacity of their feathers and subsequently die from hypothermia. Light to moderate exposure could reduce future reproductive success because of pathological effects on liver or endocrine systems (Holmes 1985) that interfere with the reproductive process and are caused by oil ingested by adults during preening or feeding. Stress from ingested oil can be additive to ordinary environmental stresses, such as low temperatures and metabolic costs of migration. Oiled females could transfer oil to their eggs, which at this stage could cause mortality, reduced hatching success, or possibly deformities in young. Oil could adversely affect food resources, causing indirect, sub-lethal effects that decrease survival, future reproduction, and growth of the affected individuals.

In addition to the expected mortality due to direct oiling of adult and fledged birds, potential effects include mortality of eggs due to secondary exposure by oiled brooding adults; loss of ducklings, goslings, and other non-fledged birds due to direct exposure; and lethal or sub-lethal effects due to direct ingestion of oil or ingestion of contaminated foods (e.g., insect larvae, mollusks, other invertebrates, or fish). Population depression at the local or regional scale is greater than for smaller spills. However, the effects of even a large spill are attenuated with time as habitats are naturally or artificially remediated and populations expand to again utilize them.

Mammals

Typical oil spills, even large to very large ones, would result in a limited impact on most of the terrestrial mammals found in the pipeline area. The proportion of habitat affected would be very small relative to the size of the habitat utilized by most of the mammals. Most of the mammals would not be present in the immediate vicinity of the spill or would be limited in abundance and distribution in the general area.

A large to very large spill that reaches the land in or adjacent to the pipeline ROW could affect terrestrial mammals directly or indirectly through impacts to their habitat or prey. For example, a large spill likely would affect vegetation, the principal food of the larger herbivorous mammals—both wild (i.e., deer) and domestic (i.e., cattle). Some to most of these animals probably would not ingest oiled vegetation, because they tend to be selective grazers and are particular about the plants they consume. For most spills, control and cleanup operations (ground traffic, air traffic, and personnel) at the spill site would frighten animals away from the spill and reduce the possibility of these animals grazing on the oiled vegetation. Nevertheless, the spilled oil could affect the vegetation and reduce its availability as food for several years. This impact would be limited in area and would not affect the overall abundance of food for the grazing mammals.

For large spills that are not immediately or successfully cleaned up, the potential for contamination would persist for a longer time and the likelihood of animals being exposed to the weathered oil would be greater. Cleanup success could vary, depending on the environment. Over time, any remaining oil would gradually degrade. Although oiling of animals likely would not remain a threat after cleanup efforts, some toxic products could remain for some time. Depending on the spill environment, part of the oil could persist for up to 5 years.

Small mammals and furbearers could be affected by spills due to oiling or ingestion of contaminated forage or prey items. These impacts would be localized around the spill area and would not cause population-level impacts.

3.13.5.6 Fisheries

If the oil reaches aquatic habitats, spills could affect fish, macroinvertebrates (e.g., mussels, crustaceans, insects, and worms), algae and aquatic plants, amphibians, and reptiles. Aquatic habitats include wetlands, ponds, lakes, reservoirs, drainage ditches, streams, rivers, and cavern lakes in karst formations.

For the majority of spills, especially very small to large spills, impacts likely would be negligible to minor. Spill response would contain and remove almost all of the oil from ice-covered water bodies prior to snowmelt during winter. During the rest of the year, spills could reach and affect water bodies and aquatic habitats before spill response is initiated or completed.

The effects of oil spills on freshwater fish, macroinvertebrates, and other aquatic organisms have been documented and discussed in numerous previous spills. The specific effect depends on the concentration of petroleum present, the length of exposure, and the stage of development involved (larvae and juveniles are generally most sensitive). If lethal concentrations are encountered (or sub-lethal concentrations over a long enough period), mortality of aquatic organisms might occur. Extensive mortality caused by oil spills is seldom observed except in small, enclosed water bodies and in the laboratory environment. Concentrations observed under the oil slick of oil spills usually have been less than the acute values for fish, macroinvertebrates, and plankton. The concentration in flowing rivers and creeks in the Keystone Project area also would be relatively low, even for most substantial to large oil spills.

If an oil spill of sufficient size occurred in a small body of water with restricted water exchange (e.g., ponds and small slow-flowing creeks) that contained fish or other sensitive aquatic species, lethal and sub-lethal effects could occur for the fish and food resources in that water body. Toxic concentrations of oil in a confined area would result in greater lethal impacts on larval/juvenile fish versus adults. If a large to very large spill reached a slow-flowing, small to moderate size river in summer, the impacts due to toxic exposures may be greater than in the same river when flows are higher and water temperatures are cooler.

McKim (1977) found that, in most instances, larval and juvenile stages were more sensitive than adults or eggs. Increased mortality of larval fish is expected because they are relatively immobile and are often found at the water's surface, where contact with oil is most likely. Adult fish would be able to avoid contact with oiled waters during a spill in the open water season, but survival would be expected to decrease if oil were to reach an isolated pool of ice-covered water. Barsdate et al. (1980) found that photosynthesis was briefly reduced and then returned to normal levels after several months in a closed lake. *Carex aquatilis*, a vascular plant, was affected after the first year because of emerging leaves encountering oil. Certain aquatic insects and invertebrates that lived in these plant beds were reduced in numbers, presumably from entrapment in the oil on plant stems. Some of the insects were still absent 6 years after the spill. Reducing food resources in a closed lake or pond, as described above, would decrease fitness and potentially reduce reproduction until prey species recovered.

Another potential impact could occur if oil that spilled during a high-water event (e.g., spring floods or a dike failure) was dispersed into some of the adjacent wetlands or lakes with continuous or ephemeral connection to the rivers and large creeks. Lethal effects to fish in streams and some lakes are unlikely during high-water events such as floods because toxic concentrations of oil are unlikely to be reached. However, toxic levels may be reached in lakes that are normally not connected to the river/creek system except during the high-water periods. If the oil concentrations in the water column reach toxic levels, these fish could suffer mortality or injury.

Although lethal effects of oil on fish have been established in laboratory studies (Rice et al. 1979, Moles et al. 1979), large kills following oil spills are not well documented. This is likely because toxic concentrations are seldom reached. In instances where oil does reach the water, sub-lethal effects are more likely to occur, including changes in growth, feeding, fecundity, survival rates, and temporary displacement. Other possibilities include interference with movements to feeding, overwintering, or spawning areas; localized reduction in food resources; and consumption of contaminated prey.

Most oil spills are not expected to measurably affect fish populations in the Project area over the life of the Keystone Project. Oil spills occurring in a small body of water containing fish with restricted water exchange might be expected to kill a small number of individual fish but are not expected to measurably affect fish populations. The same assessment is generally applicable to many of the macroinvertebrates, amphibians, and reptiles because they are motile and generally have a wide geographic distribution. However, freshwater mussels, all of which are sedentary and many of which have limited geographic distribution could be affected at a population level in large to very large spills that affect a substantial segment of a stream or river.

Although very unlikely to occur, a large to very large spill from a break in the pipeline under or adjacent to a river could affect water quality, aquatic resources, and other water-associated resources (e.g., birds and riparian habitats), as well as subsistence and recreational uses of the down-current areas. If the spill is not detected—especially under ice, the volume of oil could be substantial compared to the volume of the receiving water downcurrent from the spill. Fish and macroinvertebrates in the deeper pools may be exposed and likely would die. In addition, containment and cleanup of a large or very large oil spill could be difficult, depending on the season of occurrence (e.g., winter freezeup compared to spring breakup or summer open water). The energized fluid released would mix with water and the oil is likely to emulsify, dissolve, disperse, and adhere to sediment particles. Fish and other aquatic animals and plants, and riparian habitats could be affected for a substantial portion of the down-current channel.

3.13.5.7 Threatened and Endangered Species

Most of the potential impacts to the habitats used by threatened, endangered, and protected species are included in the previous discussions of impacts on biological resources. The important additional consideration for these species is that, by definition, their distribution and population sizes are limited. Although exposure to oil may adversely affect only a few individuals or a small, localized population of individuals, such a loss may represent a significant portion of the population and gene pool. Consequently, even a very small or small spill could substantially affect a threatened or endangered species. Spilled oil is more likely to affect species that heavily use or completely depend on aquatic and wetland habitats than those in terrestrial habitats.

3.13.5.8 Land Use, Recreation and Special Interest Areas, and Visual Resources

Agriculture is the predominant land use along the pipeline corridor, comprising about 94 percent of land crossed by the Keystone Project. As noted earlier, a large to very large spill could affect agricultural activities, including irrigation water supplies. Potential effects would be minimized by implementing Keystone's CMR Plan and ERP (Appendices B and C, respectively).

Spills ranging from very small to very large would be confined to construction and maintenance pads, roads, facility sites, or the immediate vicinity of the pipeline ROW. Impacts on recreational uses and wilderness-type values (scenic quality, solitude, naturalness, or primitive/unconfined recreation) resulting from spills likely would be confined to the same areas and therefore would be negligible to minor. Should a significant to very large spill reach a stream or river, the impacts may be substantial to catastrophic. The spilled oil might be visible and thus could result in a short-term (and possibly long-term) impact on recreation values. Fishing, boating, kayaking, camping, scenic values, and other recreation pursuits could be affected as a result of an oil spill in a riverine environment that is used by recreationists. The obvious short-term effects would be the oil residues in areas of use. The long-term effects would possibly be reduction or loss of fishing and diminished scenic value of the area, as oil residue could take a long time to weather and not be detectable.

3.13.5.9 Socioeconomics

Oil spills may affect several components of the socioeconomic environment, including:

- Agricultural activities;
- Water intakes and water supplies (both drinking water and agricultural irrigation water);
- Other commercial activities; and
- Populated areas, especially residential areas, and other HCAs.

The risk to populated areas and other HCAs along the Keystone Project can be compared with the general risk to the population encountered in everyday life. Proposed actions that result in negligible additional risk are generally acceptable. The National Center for Health Statistics (CDC 2006; URL http://www.cdc.gov/nchs/fastats/pdf/mortality/nvsr54_13_t01.pdf) age-adjusted average annual death rate in the United States is approximately 830 per 100,000 (approximately 0.8 percent). The DOT reports the historical average risk to the general population per year associated with hazardous liquids transmission pipelines, such as the Keystone pipeline, is 1 in 27,708,096 (DOT 2006). Therefore, the predicted risk of fatality to the public from incidents associated with the Keystone pipeline over and above the normal U.S. death rate is negligible (approximately 0.000004 percent).

Short term disruption in local agricultural production could result from a spill that enters agricultural lands. The extent of the economic impact would depend on the number of productive acres affected. Crop losses likely would be reimbursed by Keystone; therefore, the short-term economic impact would be minor. If a spill affected recreational lands, businesses relying on hunting, fishing, and sightseeing activities could experience a short-term negative impact.

Response to oil spills could generate local economic activity for the duration of the spill response activity.

3.13.5.10 Cultural Resources

As noted, most spills are confined to maintenance or construction pads, roadways, facility sites, the pipeline ROW, or an adjacent area. Further, cultural and historical resources identified in the environmental analysis that would be potentially eligible under the NHPA have been avoided by Keystone through small changes in the proposed pipeline alignment. Therefore it is not expected that these resources would be affected by most spills or by subsequent spill cleanup.

Although cleanup from these spills could be invasive, there is little chance that cultural resources would be affected by either the spill or cleanup. Because occurrence of most of the potentially eligible surface and subsurface cultural resources near the facilities and pipeline ROW would will be documented and avoided prior to construction, the risk of impact is low.

Depending on where the spill occurs, Keystone's Unanticipated Discoveries Plan approved for the spill area would address any potential cultural resources encountered during a spill or associated cleanup activities. Implementation of the plan(s) would avoid impacts on inadvertently encountered cultural resources.

3.13.5.11 Air

Impacts on air quality from an oil spill are localized and transient, even for very large spills. Evaporation of the lighter hydrocarbon fractions typically occurs within 1 or 2 days, and the vapors are usually dissipated below risk levels within a short distance of the source. The oil spill response contractors or Keystone pipeline health and safety personnel would monitor air for hydrocarbon vapors. They would restrict public access to areas exceeding specified risk levels while also ensuring that authorized personnel within the restricted areas are equipped with and using appropriate personal protective equipment.

Based on modeling work by Hanna and Drivas (1993), the majority of volatile organic compounds (VOCs) from crude oil spills likely would evaporate almost completely within a few hours after the spill occurred, especially during late spring-early fall, when many of the biological resources (including migratory birds) are present. The heavier compounds take longer to evaporate, particularly at the colder temperatures typical of the winter season, and might not peak until more than 24 hours after the spill. In the event of an oil spill on land, the air quality effects would be less severe than those for a spill on water because some of the oil could be absorbed by vegetation or into the ground.

A diesel spill would evaporate faster than a crude oil spill. Ambient hydrocarbon concentrations would be higher for a diesel spill than for a crude oil spill but would persist for a shorter time. Further, because any such spill would probably be smaller than potential crude oil spills, air quality effects from a diesel spill likely would be even lower than for other spills.

Impacts on air quality related to oil spills would be localized and short term. The associated VOC air emissions would result in little impact on the biological or physical resources of the Keystone Project area.

3.13.6 Mitigation Measures

The Keystone pipeline system will be designed, constructed, and maintained in a manner that meets or exceeds industry standards and regulatory requirements. The proposed Keystone Project would be built within an approved ROW. Signage would be installed at all road, railway, and water crossings—indicating that a pipeline is located in the area—to help prevent third-party damage or impact to the pipeline. Keystone would manage a crossing and encroachment approval system for all other operators. Keystone would ensure safety near its facilities through a combination of programs encompassing engineering design, construction, and operations; public awareness and incident prevention programs; and emergency response programs.

To prevent or mitigate potential oil spills during pipeline construction, measures would be implemented at each construction or staging area where fuel, oil, or other liquid hazardous materials are stored, dispensed, or used. Implementation of the procedures in Section 3 in Keystone's CMR Plan (Appendix B) would minimize the potential for spills and leaks to affect surface water resources. During construction activities, all refueling would be conducted at least 100 feet away from all surface water bodies. Keystone's ERP (Appendix C) describes actions to reduce the potential for crude oil releases to affect surface water and groundwater resources. During all construction activities, all refueling would be conducted at least 100 feet away from all surface water bodies.

To prevent or mitigate potential oil spills during pipeline construction, measures would be implemented at each construction or staging area where fuel, oil, or other liquid hazardous materials are stored, dispensed, or used. In addition to the mitigation included in the CMR Plan (Appendix B), Keystone has agreed to the following mitigation measures:

- For all locations subject to CWA Section 311, Keystone would prepare a. site-specific oil Spill Prevention, Control, and Countermeasure (SPCC) Plan that contains all requirements of 40 CFR Part 112 for every location used for staging fuel or oil storage tanks and for every location used for fuel or oil transfer. Each SPCC Plan would be prepared prior to introducing the subject fuel, oil, or hazardous material to the subject location.
- Prior to construction, all project personnel would be given an orientation outlining the environmental permit requirements and environmental specifications including the requirement that fuel or oil storage tanks cannot be placed closer than 100 feet to wetlands or water bodies.
- Environmental inspectors would place signs a minimum of 100 feet from the boundaries of all wetlands and water bodies prior to construction. The construction contractor would not be allowed to place a fuel or oil storage tank without first getting the environmental inspector to inspect the tank site for compliance with the 100-foot setback requirement and receiving approval of the tank site from the environmental inspector.
- During construction, no fuel or storage tank would be allowed to be relocated within or to a new construction yard by the contractor without first getting the environmental inspector to inspect the tank site for compliance with the 100-foot setback requirement and receiving approval of the tank site from the environmental inspector.
- Fuel and storage tanks would be placed only at contractor yards. No fuel and storage tanks would be placed on the construction ROW.
- No oil or hazardous material storage, staging, or transfer with the exception of refueling stations would occur within 50 feet of any surface water body, surface drainage, storm drain drop inlet, or HCA. As described above, refueling stations would not be located within 100 feet of these areas.
- Any fuel truck that transports and dispenses fuel to construction equipment or Keystone Project-related vehicles along the construction ROW or within equipment staging and material areas would carry an oil spill response kit and spill response equipment onboard at all times. In the event that response materials are depleted through use, or their condition is deteriorated through age, the materials would be replenished prior to placing the fueling vehicle back into service.
- Fixed-fuel dispensing locations would be provided, with a means of secondary containment to capture fuel from leaks, drips, and overfills.

Historically, the most significant risk associated with operating a crude oil pipeline is the potential for third-party excavation damage. Keystone would mitigate this risk by implementing a comprehensive Integrated Public Awareness Program focused on education and awareness. The program would provide awareness and education that encourages use of the state One-Call system before people begin excavating. Keystone's operating staff also would complete regular visual inspections of the ROW and monitor activity in the area.

Keystone's preventative maintenance, inspection, and repair program would monitor the integrity of the pipeline and make repairs if necessary. Keystone is required to prepare an Integrity Management Plan that would describe Keystone's Pipeline Maintenance Program in detail. In compliance with applicable regulations governing the operation of pipelines, periodic inline inspections would be conducted to collect information on the status of pipe for the entire length of the system. Inline inspections would be used to detect internal and external corrosion, a major cause of pipeline spills. From this type of inspection, suspected areas of corrosion or other types of damage (e.g., a scratch in the pipe from third-party excavation damage) can be identified and proactively repaired. Additional types of information collected along the pipeline would include cathodic protection readings, geotechnical investigations, aerial patrol reports, and routine investigative digs. In addition, line patrol, leak detection systems, SCADA, fusion-bond epoxy coating, and construction techniques with associated quality control would be implemented.

In summary, the reliability and safety of the Keystone project can be expected to meet or exceed industry standards. Further, the low probability of large, catastrophic spill events and the routing of the pipeline to avoid most sensitive areas suggest a low probability of impacts to human and natural resources. Still, some potential for construction- and operation-related spills can be expected. Commitments and procedures described for reliability and safety in this section and in Appendixes B and C are intended to mitigate spill effects, particularly when considered in combination with rapid and effective response and clean-up procedures.

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3.14 CUMULATIVE IMPACTS

3.14.1 Methods

As defined in 40 CFR 1508.7, cumulative impacts are the incremental impacts on the environment resulting from adding the proposed action to other past, present, and reasonably foreseeable future actions. Cumulative impacts were assessed by combining the potential environmental impacts of the proposed action with the impacts of projects that have occurred in the past, are currently occurring, or are proposed in the future within the pipeline corridor or in the vicinity of the pipeline ROW.

3.14.2 Past, Present, and Reasonably Foreseeable Projects

3.14.2.1 Past and Present Linear Projects

Several existing pipelines transport natural gas liquids and compressed natural gas across North Dakota, South Dakota, and Nebraska from hubs in Montana to the west or Illinois to the east. For example, the Williston Basin Pipeline carries compressed natural gas and crosses through the southern part of North Dakota (<http://www.wbip.com/wbip/contributed_images/WBI-Map.gif>). A natural gas liquid pipeline owned by Enterprise Product, LP, crosses the southeast corner of Nebraska and continues in a southwest direction through Kansas (<http://www.epplp.com/cp_sm.html>). Portions of this pipeline may parallel the Keystone Project but are likely to be well outside of the Keystone Project ROW. In Oklahoma, Northern Natural Pipeline, NGPL of America, Williams Natural, Duke Energy, Oklahoma Natural Gas, and the Lone Star Gas Company all have lines that may parallel or intersect the Keystone Project but are not necessarily collocated (Oil Week Magazine 2005).

The Express pipeline is an existing 24-inch-diameter pipeline that interconnects with the Platte Pipeline, an existing 20-inch-diameter pipe, at Casper, Wyoming. This 1,700-mile pipeline system transports crude oil from Alberta's oil sands in Hardisty, Alberta to refineries in the U.S. Rocky Mountain and Midwest regions. In the United States, the pipeline crosses Montana, Wyoming, Nebraska, Kansas, and Missouri, and terminates in Wood River, Illinois. The section known as the Platte pipeline was built in 1952; the proposed Keystone Project would be collocated with the existing Platte pipeline from the Nebraska/ Kansas border to the Wood River, Illinois terminal. Additional information on the existing Express and Platte pipelines and their applicability as System Alternatives for the Keystone Project is provided in Section 4.2.1.2.

Along the proposed Keystone Project corridor, multiple existing utility corridors serve local and regional needs. For example, the WEB Water Development Association provides high-quality water service to 7,728 rural hookups, 100 towns and bulk users, and 5 ethanol plants in a 17-county service area, which includes 14 counties in South Dakota and 3 counties in North Dakota. The Keystone Project would cross WEB-owned PVC water pipelines at eight locations in Day and Clark Counties South Dakota. The Keystone Project ROW would cross a 12-inch-diameter PVC mainline near Andover, South Dakota that delivers treated water to 1,022 rural hookups and eight towns in Day County and six rural hookups in southeast Marshall County. Other utility corridors have been set aside for high power and other electrical transmission lines.

Numerous existing transportation projects, such as interstate and state highways and railroads, parallel or intersect the proposed Keystone Project ROW. Section 3.10.7.1 describes these transportation facilities and the locations where they coincide with the Keystone Project.

Reasonably Foreseeable Future Projects

The staff of the FERC has prepared a draft EIS for the natural gas pipeline facilities proposed by Rockies Express Pipeline LLC (Rockies Express), TransColorado Gas Transmission Company (TransColorado), and Questar Overthrust Pipeline Company (Overthrust) (FERC 2006). As currently proposed, the Rockies Express Western Phase Project (REX) would include construction and operation of approximately 795.7 miles of natural gas pipeline that would transport natural gas from the Cheyenne Hub in Colorado to its terminus at the Panhandle Eastern Pipe Line Company interconnect in Audrain County, Missouri. A portion of the proposed REX pipeline would be collocated with the Keystone Project from the Nebraska/Kansas border to Troy, Missouri (approximately 280 miles).

REX proposes to construct the Turney Compressor Station, a large aboveground facility near Plattsburg in Clinton County, Missouri several miles east of the proposed location for Keystone's Pump Station 31, and a compressor station near Steele City Gage County, Nebraska that is along the Keystone Mainline Project ROW.

Enbridge is proposing three expansion projects to help address current and future increases in refinery demand as supply from the WCSB increases. These include the:

- Southern Access, an expansion and extension of Enbridge's existing pipeline system, including new pipeline in Wisconsin and Illinois;
- Southern Lights LsR is a 20 inch crude oil pipeline from the U.S. – Canada border at Cavalier County, North Dakota, to Clearbrook, Minnesota, to increase delivery capacity for existing crude oil sources.
- Alberta Clipper, a proposed new crude oil pipeline from Alberta to Superior, Wisconsin. As presently planned, these pipelines would cross Minnesota and Iowa. The sections supplying Cushing, Oklahoma and Wood River, Illinois do not appear to be collocated with the proposed Keystone Project ROW. Additional information on the proposed Enbridge pipeline expansions and their applicability as System Alternatives for the Keystone Project is provided in Section 4.2.1.2.

Proposed projects collocated with or in a reasonable vicinity of the Keystone Project and for which cumulative impacts were assessed include:

- Rockies Express Western Phase Project (REX),
- An ethanol plant in Audrain County (unknown completion date), and
- A coal-fired power plant in Carroll County (anticipated completion in 2013) (FERC 2006).

3.14.3 Cumulative Impacts by Resource

3.14.3.1 Geology

Construction of the REX pipeline and the Keystone Project would require the commitment of granular borrow resources from areas along the pipeline corridors and areas near appurtenant facilities for the lifetime of the pipelines and related facilities. Construction of these pipelines would prohibit removal of mineral resources along the installed pipeline ROWs following construction. In addition, these projects and the proposed ethanol plant could result in a cumulative impact on clay pits in Audrain County, Missouri. Although gravel and other mineral resources within the permanent ROWs of the proposed pipelines could not be extracted, oil and gas production could still occur by using well pad offsets and directional drilling methods. Where it is collocated with the REX pipeline, the Keystone Project pipeline would be located adjacent to existing utility corridors that preclude mining in the permanent ROWS of the utility corridors. Given the limited areal extent of the Keystone Project in comparison to the potential mineral extraction areas along the corridor, construction of the Keystone Project is not likely to result in cumulative impacts that would affect future exploitation of mineral resources.

Pleistocene-age mammal fossils may be discovered during construction of the Keystone Project and other reasonably foreseeable projects. These fossils are generally found in areas of glacial and glacially-derived surface deposits which occur along the entire length of the proposed Mainline Project except for areas of bedrock outcrop. Along with construction of pipelines, roads, and other surface-disturbing activities, construction of the Keystone Project could contribute to the cumulative exposure and potential loss of scientifically valuable fossils in the project area.

3.14.3.2 Soils and Sediments

Potential cumulative erosion effects could occur where construction disturbance areas overlap, or are located near each other, particularly along the sections of the Keystone Project that are collocated with REX. However, the existing pipelines, utility, and roadway projects have been installed for a number of years and the construction ROWs have been partially or completely restored to pre-existing conditions. Both REX and the Keystone Project would apply best management practices (BMPs) for soil management and protection along the pipelines and at appurtenant facilities. Revegetation mixtures that are appropriate to soil conditions and expected future uses (such as grazing and wildlife habitat) would be applied to the disturbed areas. Consequently, the potential for cumulative erosion effects caused by one or more of these projects is low because consistent erosion control practices would be applied, and structural erosion control measures would be integrated between and among adjacent projects.

3.14.3.3 Water Resources

Groundwater

Groundwater resources may be used for the Keystone Project and REX, and other collocated or nearby construction projects, to control dust generated during construction. Any impacts from the use of groundwater during construction are expected to be localized and short term. Groundwater sources are not expected to be used by the Keystone Project as a source for hydrostatic test water. Inadvertent contaminant spills during construction or operation could also occur from any project in the cumulative impact study area. Each project would be required to implement spill containment and control plans as required by federal and state agencies. No additional cumulative impacts on groundwater volume or quality from the Keystone Project are expected.

Surface Water

Impacts from crossing of surface waters by linear projects, such as highways and pipelines, are generally localized and short term. Cumulative effects would occur only if more than one project was being constructed at the same location at the same time. If construction activities of the Keystone Project and the collocated portion of REX pipeline follow a similar schedule, there could be a short-term cumulative contribution to incremental sedimentation in adjacent surface waters. At present, the project schedules show construction of the two projects separated by at least a year. Each project would be required to follow permit conditions and BMPs to protect water quality during construction and operation.

Hydrostatic Testing

Because Keystone does not propose to use groundwater for hydrostatic testing, no cumulative impacts to groundwater resources are expected as a result of construction or operation of the Keystone Project.

Both the Keystone Project and portions of REX plan to use surface water for hydrostatic testing. REX proposes to withdraw hydrostatic test water from surface water bodies during fall and early winter 2007, which is a different time timeframe from Keystone's planned hydrostatic testing. No cumulative effects on surface water or groundwater due to hydrostatic test water withdrawals are expected to occur.

3.14.3.4 Wetlands

Cumulative impacts on wetlands would occur at locations where any of the Keystone Project, REX pipelines, or other collocated projects cross wetlands. A portion of the REX pipeline would be collocated with the Keystone pipeline for about 280 miles. Within the collocated route, a total of 77.5 acres of wetlands would be disturbed for the REX pipeline (55.0 acres of forested wetland, 1.3 acres of scrub-shrub wetlands, and 21.2 acres of wet meadow and marsh) (FERC 2006). Total acres of wetlands impacted by both projects within the collocation area would increase to 156.0 acres.

Both projects would follow mitigation measures to protect wetlands, and federal agency permits are required whenever a project affects jurisdictional wetlands. Other construction projects, such as town expansions, new roads and highways, and other industrial facilities—both along the section of the Keystone Project collocated with REX and in other areas along the Mainline Project and Cushing Extension—could affect additional wetlands. However, applicants for any projects that would place fill in wetlands classified as waters of the United States would be subject to conditions in the COE's Section 404 permits and to state and local water quality permits. While the proposed Keystone Project route crosses a number of wetlands, none would be permanently filled or drained. Thus the contribution of the Keystone Project to cumulative effects to wetlands in the Project area would be minor.

3.14.3.5 Terrestrial Vegetation

The total amount of vegetation affected by all of the reasonably foreseeable projects, including the Keystone Project, is relatively small compared to the abundance of similar habitat in the Project area. In nonagricultural areas, construction of pipelines and other linear and non-linear projects would result in the long-term and permanent loss of non-herbaceous vegetation and would cause a small incremental increase in fragmentation of forested areas. However, the effects would generally be small relative to the total amount of available habitat in the region. In agricultural areas, impacts would be temporary; agricultural production would be restored following construction. All projects would implement mitigation measures designed to minimize the potential for erosion, revegetate disturbed areas, increase the stabilization of site conditions, and control the spread of noxious weeds—thereby minimizing the degree and duration of the cumulative impact on vegetation from these projects. In Missouri, permanent impacts on vegetation would result from the proposed construction of an ethanol plant and a coal-fired power plant in counties that also would be crossed by the Keystone Project and REX.

Construction and operation of aboveground facilities, including pumping stations for Keystone and compressor stations for REX, would permanently remove vegetation. Keystone would require approximately 61 acres of land along the Mainline Project (for aboveground facilities, including pump stations, delivery facilities, densitometer sites, and mainline valves) and approximately 13 acres for similar facilities along the Cushing Extension. Each of the two compressor stations for the portion of REX that is collocated with the Keystone Project (the Steele City, Nebraska and the Turney, Missouri sites) would affect about 13 acres (FERC 2006). Removal of this amount of terrestrial vegetation, most of which is currently in agricultural production, is not expected to cause a significant cumulative impact to terrestrial vegetation.

3.14.3.6 Wildlife

Construction and operation of the Keystone Project, along with the other reasonably foreseeable projects described in Section 3.14.2, could result in short-term disturbance to wildlife and would result in long-term wildlife habitat modification. Disturbance and removal of vegetation during project construction would incrementally add to the total area of habitat disrupted within the Project region. It may also disturb resident and migrating species and cause associated impacts on these species as they adjust to the changes brought about by the proposed projects. Increased movement or displacement of species dependent on the disturbed habitats could reduce carrying capacities, reproductive effort, or survival. This potential is greater for species for which suitable habitat is limited in the Project area or that are otherwise sensitive to disturbance.

Removal of woodlands and shrublands during construction would result in a long-term reduction of wildlife habitat because of the slow rate at which woody species regenerate. However, only a small portion of the Keystone Project (most of the Project area consists of relatively open fields and is presently used for agricultural purposes) would affect undisturbed habitat areas. Thus, the contribution of the Project to cumulative impacts on wildlife would be minor. Habitat types potentially crossed or affected are widely available for wildlife use outside of the immediate area of disturbance. In addition, each proposed project would be required to follow appropriate mitigation measures, including restoration of habitat, to minimize impacts on wildlife.

3.14.3.7 Fisheries

Stream channel disturbance and withdrawal of hydrostatic test water from surface water sources that may affect fisheries would occur throughout the Project area during construction. These impacts would be short term and would be minimized by implementation of mitigation measures required by individual state and federal permits. In areas where the proposed Project is collocated with other pipelines (for example, REX), the construction schedules are not concurrent and therefore, simultaneous impacts from more than one project on surface waters and fisheries would not occur. If future changes to construction schedules occur, such that more than one project is constructing across a water body at the same time, short-term cumulative impacts to fisheries could occur from increased sedimentation, and additional mitigation measures may be required.

No cumulative impacts to fisheries in surface waters are expected to occur during operations.

3.14.3.8 Threatened and Endangered Species

The range and habitat of a number of threatened and endangered species occur in the Project region. Construction of the Keystone Project and other projects in the region, including pipeline projects collocated with the Keystone, would affect species habitat. Construction impacts would largely be short term; 81 percent of the total area disturbed for construction of the proposed Project is currently rangeland, grassland, or cropland that would be restored following construction to its previous condition. Less than 10 percent of the area disturbed is currently forested or scrub lands, which would require a longer period to return to present habitat condition or would remain cleared for pipeline maintenance and inspection. Habitat converted for pump stations and other aboveground facilities is an even smaller proportion of the overall affected Project area. The total area subjected to short-term impacts by the proposed Project, approximately 22,000 acres over a 1,371-mile route, represents less than 1.3 percent of all area within 1 mile of the pipeline route. The amount of area permanently modified represents a much smaller percentage. Most threatened and endangered species found within the Project area range over much larger areas; therefore, the short-term loss of habitat is not likely to cumulatively affect habitat or cause displacement of species. Longer term habitat loss would affect a very small area and also is not expected to be significant when considered in the context of the total Project area.

To the extent that the Keystone Project would be collocated with the REX pipeline, total habitat area affected would increase. This amount still would represent a small area in the context of available habitat in the ecoregion. In addition, each project is required to consult with federal, state, and local agencies to determine which species may occur within each individual project area; evaluate potential impacts on those species as a result of construction and operation; and implement measures to avoid, minimize, or mitigate impacts on special-status species and their habitats.

3.14.3.9 Land Use, Recreation and Special Interest Areas, and Visual Resources

Land Use

Aboveground facilities for Keystone and other reasonably foreseeable projects located on active agricultural lands would permanently displace agricultural production within the footprint of the facility. Approximately 127 acres of land would be required for construction and operation of aboveground facilities for the Keystone Project (109 acres for the Mainline Project and 18 acres for the Cushing Extension). Construction of aboveground facilities associated with the REX pipeline would affect about 29.9 acres of prime farmland soils and 13.5 acres of farmlands of statewide importance; however, much of this land is located west of the area where the REX pipeline would be collocated with Keystone (FERC 2006). Land required along the collocated portion of the REX pipeline would cumulatively add to the acreage of aboveground facilities in the Project area, as would land required for the refinery expansion projects that were identified in Section 3.14.2. Although it is not known to what extent the projects identified in Section 3.14.2 would affect prime farmland soils, farmlands of statewide importance, active agricultural lands, or rangeland, all projects would be required to implement measures to avoid, minimize, or mitigate impacts on agricultural lands and rangeland—in consultation with state and local officials.

Overall, the proposed Keystone Project would contribute to cumulative impacts on agricultural land use and farming practices along the extent of the proposed ROW. While construction of new pipelines parallel to existing corridors would incrementally reduce the area available for future development, use of established utility corridors would concentrate the cumulative land use impacts into a less extensive area.

Recreation and Special Interest Areas

Recreation and special interest areas west of Troy, Missouri would be potentially affected by both the Keystone Project (see Table 3.9.3-8) and REX, including a number of conservation areas that are privately or publicly owned. The Keystone Project would additionally impact private duck clubs in St. Charles County, Missouri that are situated on high-quality wetlands. Hunting access to publicly and privately owned WMAs would be temporarily affected by both the REX and Keystone Project construction schedules. Waterfowl and hunters using these areas could be temporarily displaced during construction of the pipelines. During operations, pipeline maintenance activities occur intermittently and possibly simultaneously for collocated pipeline sections. However, because the disturbances would be temporary and the ROWs would be restored as closely as possible to pre-existing conditions, significant long-term cumulative impacts to recreational hunting are not expected. Implementation of mitigation measures to protect the conservation area and parks would minimize the contribution of the proposed Keystone Project to recreational impacts.

The Jones-Confluence Point State Park, located east of the section of the Keystone Project that would be collocated with the REX pipeline, is not expected to experience cumulative impacts from the combined projects.

Visual Resources

The temporary presence of construction equipment and cleared linear ROW are the primary visual impacts expected from the Keystone Project and other pipeline projects that may occur in the Project area. Both types of impacts would be localized and would not be cumulative except where the Keystone Project is collocated with other pipelines. Because the construction schedule of the collocated portions of the projects is expected to be staggered, cumulative visual impacts from the presence of construction equipment is not expected to occur. However, the duration of the impact would increase. Cumulative impacts would occur along collocated routes from the linear visual feature created by the permanently cleared ROW.

Aboveground facilities for the Keystone Project are small and would be spaced at substantial distances from each other and from the facilities of other collocated pipelines. Because visual impacts would be localized, the spacing of aboveground facilities precludes cumulative visual impacts. To the extent that aboveground pipeline facilities would be located in proximity to the refineries or other industrial facilities identified in Section 3.14.2, the refinery facilities would dominate the landscape and pipeline facilities would contribute a small increment to visual impacts in the viewshed.

Mitigation measures, such as screening with vegetation and use of non-reflective paints that are similar in color to the surrounding terrain, would be implemented to minimize any visual impacts.

3.14.3.10 Socioeconomics

The presence of construction workers and their need for housing and other services are the primary socioeconomic impacts of the proposed Keystone Project. Construction workers are expected to utilize the closest available local rental, motel/hotel, RV and camping facilities during the construction of each spread. The pace of construction and movement of workers along the pipeline route will limit the duration of such impacts to a brief period. To the extent that other activities, including construction of other major projects, occur in a local area at the same time as the Keystone Project, cumulative impacts—including housing shortages—may occur; these potential impacts would be short term.

Pipeline construction activities, which would mainly occur in rural areas, would use local highways and roads for delivery of materials and equipment and for worker access during construction. Existing traffic volumes on rural roads along the pipeline ROW are generally light. Increased traffic volume related to pipeline construction and construction of other pipelines is not expected to cause significant cumulative impacts such as congestion, road closure, or degradation of road surfaces. Traffic management procedures would be implemented during construction to minimize congestion, and damage to roads from construction vehicles would be repaired following construction.

Construction of the collocated portions of the Keystone and REX pipelines currently are scheduled to occur at different times. This offset schedule would increase the duration, but not the intensity, of impacts to housing, services, and traffic flow. If the construction schedules change and the projects are constructed at the same time along the collocated spreads, significant cumulative impacts could occur.

During operations, the number of workers required to maintain pipeline facilities would be minimal, resulting in no additive impact on traffic levels.

During construction of the Keystone Project, the Applicant's expenditures for payroll, local purchases, and related tax revenues would provide a short-term beneficial impact to the affected counties. Similar benefits are likely to be associated with REX and any other non-linear or industrial projects. The increased tax revenue paid to the state and local governments over the life of the projects also may result in a beneficial long-term cumulative impact.

Operation of the proposed facilities would require relatively few permanent employees; thus, there would be no long-term cumulative or additive impacts on population, housing, or municipal services in the Project area.

3.14.3.11 Cultural Resources

The cumulative impact of past, present, and reasonably foreseeable future projects related to the proposed Project include increased soil disturbance from construction of oil distribution and supply facilities and the attendant service roads, construction staging areas, pumping plants, powerplants, and/or refineries. The impacts of these projects would be similar to the proposed Project in that additional soil disturbance could cause adverse effects upon known and undiscovered historic properties. The Keystone pipeline would share ROW with the REX pipeline, and the combined impacts of these projects were considered in the overall impacts analysis. As with the REX and Keystone Projects, many of the past, present, and reasonably foreseeable projects feature a level of federal government involvement that requires compliance with 36 CFR 800, the ACHP's regulations for implementing Section 106 of the NHPA. The lead federal agencies for those projects would be required to consult with the appropriate SHPOs, Indian tribes, and other applicable consulting parties; identify and evaluate cultural resources; and avoid, minimize, or mitigate any effects upon historic properties. For non-federal actions in the Project area, project proponents would be required to comply with any identification and evaluation procedures and mitigation measures required by the state where the action is proposed. Such laws could include inadvertent discoveries of cultural resources, the disposition of discovered human remains, and other resource protection laws. Keystone has mitigated possible effects on potentially eligible cultural and historical properties through avoidance wherever possible. As a result of collocation with existing disturbed alignments for substantial distances along the proposed ROW and avoidance of potentially eligible properties wherever possible, the incremental impact of the Keystone Project to cultural resources is minor.

3.14.3.12 Air and Noise

Air Quality

The primary impact of the proposed Keystone Project to regional and local air quality would occur during construction and would result from dust generated by excavation and materials handling, and emissions from fueling and operation of construction equipment. These impacts would be localized to each construction spread and would occur during the short duration of the construction period for each spread. To the extent that other nearby construction activities are simultaneously underway in a specific locality, cumulative impacts to air quality may occur; but potential impacts would be short term and temporary. If the construction schedule for the collocated portions of the Keystone and REX pipelines are changed so that simultaneous construction of both projects in a collocated portion of the route occurs, such cumulative impacts could occur. Mitigation measures implemented during construction would limit dust and VOC emissions from fuel handling to minimize any localized impacts.

During operations, Project emissions would be limited to the operation of inspection vehicles and annual testing of backup internal combustion engine-generators located at each pump station. All Keystone project pump stations would utilize electric pumps for pipeline operation. Therefore, operation of the pump stations would not cause a cumulative air quality impact in the Project region. Electrical energy for pump operation would be provided by the regional electrical grid, and the specific source of energy (and its related emissions) cannot be identified. In most regions, fossil fuels are the predominant source of electrical energy.

Operation of vehicles for inspection and periodic testing of backup generators are both low-emission, temporary activities and are not expected to cause cumulative impacts on air quality.

Noise

Operation of construction equipment and pump stations would cause the primary noise impacts of the Keystone Project. Construction noise impacts would be localized, temporary, and short term along each construction spread. Cumulative effects on ambient noise levels would occur only if construction on a congruent section of each pipeline occurred simultaneously. This is unlikely, given the proposed construction schedules, but could occur if construction of the REX pipeline was delayed.

No new major sources of noise are expected during operation of the Keystone facilities that would be near or collocated with REX facilities or the other industrial facilities discussed in Section 3.14.2. Noise levels resulting from operation of the pump stations for Keystone and the meter and regulator facilities for REX would be minimal or not noticeable, as the proposed facilities would be located in areas of low population density. Consequently, no cumulative noise impacts are expected. Based on available information, Keystone's Pump Station 31 could be located up to several miles west of REX's proposed Turney Compressor Station in Clinton County, Missouri. Taking into account the geographical locations of the two stations, the noise data available, and preliminary calculations, Keystone's contribution to cumulative noise impacts during operations would not be significant.

3.14.3.13 Reliability and Safety

Landowners have expressed concerns about the safety of collocating multiple pipelines in a common corridor across their property. As described in Section 3.13, Keystone is required to comply with DOT and state and local regulations regarding pipeline safety, leak detection, and spill response. Because REX would transport natural gas rather than any type of liquid material, cumulative effects caused by spills and leaks of crude oil are not expected from the two collocated pipelines. The Platte pipeline (which is collocated with both the REX and Keystone pipelines from the Nebraska/Kansas border to Troy, Missouri and collocated with Keystone to Wood River, Illinois) could contribute to cumulative effects should an incident occur in the same time frame as a similar incident in the same area along the Keystone Project. Large release events are rare however and therefore the likelihood of an event occurring in the same general area within two separate pipeline systems is remote.

3.14.3.14 Greenhouse Gases and Global Warming

At the current time, no rules or regulations have been promulgated by any federal or state agency to define as "significant" any source of greenhouse gas emissions. There are also no currently applicable facility-specific emission limitations or caps for greenhouse gas emissions. Thus, there is no regulatory or guidance mechanism for determining standards of significance for greenhouse gas impacts, including General Conformity Thresholds.

According to the Association of Environmental Professionals, there are currently no published thresholds or recommended methodologies for determining the significance of a project's potential cumulative contribution to global climate change (Hendrix et al. 2007). Even very large individual projects do not generate sufficient greenhouse gas emissions to individually influence global climate change.

Nevertheless, the cumulative effects of greenhouse gases have been determined to have led to climate change on a global scale, which is considered to be a significant cumulative effect. A project contributes to this impact by its incremental contribution, combined with the cumulative increase of all other sources of greenhouse gases.

As discussed in Section 1.2, U.S. consumption of liquid fuels (crude oil and refined products) is projected to total 26.9 million bpd in 2030, an increase of 6.2 million bpd over the 2005 input (EIA 2007). The import share of this domestic consumption is expected to climb to 61 percent in 2030. The proposed Keystone Project would represent a key component in meeting the demand for imported crude oil from a reliable international source. The Keystone Project would not create the market demand for the crude oil. Rather, its construction and operation assists in meeting that demand as it is currently projected. The proposed Keystone Project and other potential crude oil delivery projects provide necessary support to the existing infrastructure of the U.S. economy while concerted national efforts to reduce greenhouse gas emissions continue.

The principal greenhouse gas of concern related to crude oil pipeline construction and operation is carbon dioxide (CO_2), which enters the atmosphere through the burning of fossil fuels (oil, natural gas, and coal), solid waste, and trees and wood products, and as a result of other chemical reactions (e.g., manufacture of cement). CO_2 is removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle. Other greenhouse gases include methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

As stated in a recent report by McKinsey & Company (McKinsey 2007):

> The United States could reduce greenhouse gas emissions in 2030 by 3.0 to 4.5 gigatons of CO_2 using tested approaches and high-potential emerging technologies. These reductions would involve pursuing a wide array of abatement options available at marginal costs less than $50 per ton, with the average net cost to the economy being far lower if the nation can capture sizable gains from energy efficiency. Achieving these reductions at the lowest cost to the economy, however, will require strong, coordinated, economy-wide action that begins in the near future.

As energy prices, a desire to contribute to a national effort to reduce greenhouse gas emissions, and other factors influence consumer behavior and fossil fuel demand, reliable supply that allows the economy time to adjust would be provided by the proposed Keystone Project and other similar projects. Thus, the proposed Keystone Project would help provide the "bridging" necessary to allow a national program addressing greenhouse gas emission reductions to be instituted and implemented.

In attempting to meet the purpose and need for the Keystone Project, construction and operation of the proposed Project would incrementally increase the cumulative impact of greenhouse gas emissions. The carbon emissions associated with construction and operation would occur irrespective of the routing of the pipeline. However, the ultimate construction and operation of the pipeline would offset potential emissions associated with other methodologies for meeting the demand for imported crude oil, such as delivery of crude oil by tanker from alternative international sources. Keystone has committed to restoration and replanting of vegetative cover along the proposed pipeline corridor to the extent compatible with safety and operational requirements. This commitment would allow any advantages associated with carbon sinks along the proposed corridor to be reestablished after temporary disruption during the construction phase. Therefore, the incremental contribution to greenhouse gas emissions associated with construction and operation of the proposed Keystone is likely to be relatively small compared to the nationwide production of greenhouse gases on an annual basis.

3.14.4 Summary of Cumulative Impacts

The majority of cumulative impacts associated with construction and operation of the Keystone Project would be localized, temporary, and minor. Long-term cumulative impacts on vegetation and land uses could occur if other reasonably foreseeable future projects (see Section 3.14.2) are constructed, particularly construction of the portion of the REX pipeline that is collocated with the Keystone Project. Long-term cumulative benefits would be realized along the pipeline route from the tax base increment to local tax revenues. Short-term cumulative benefits also would be realized through jobs and wages and purchases of goods and materials during construction.

3.14.5 References

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4.0 ALTERNATIVES

Alternatives to the Keystone Project were analyzed to determine whether they would be reasonable and environmentally preferable to the proposed action. A No Action Alternative, system alternatives, major route alternatives, route variations, and aboveground facility site alternatives are considered in the following sections. Identification and evaluation of alternatives to the proposed project considered public comments and input received from federal, state, and local regulatory agencies.

The following criteria were used to determine whether alternatives would be environmentally preferable to the proposed action:

- Significant environmental advantage over the proposed Keystone Project,
- Ability to meet the proposed Keystone Project objectives, and
- Technical and economic feasibility and practicability.

Keystone participated in the process during the preliminary design stage for the Project. The process emphasized identification of potential stakeholder issues through open houses; scoping meetings held early in the development of the Project emphasized identification and evaluation of alternatives that may avoid or minimize these issues. As the preliminary analyses of possible routes were conducted, issues of concern were identified, and multiple stakeholders provided DOS with comments as route planning progressed. These early routes and analyses are described in detail in ENSR (2006a).

The DOS alternatives development process began by considering several objectives identified for the Keystone Project:

- Gas pipeline conversion: Converting an underutilized natural gas pipeline in Canada to crude oil. Use of this pipeline fixes the border crossing at Pembina County, North Dakota and constitutes a control point.
- Market endpoints at (a) Salisbury, Missouri; (b) a refinery at Wood River, Illinois; and (c) an interconnection point with other crude oil pipelines, as well as tank storage at Patoka, Illinois.
- An additional market endpoint at Cushing, Oklahoma to serve Gulf Coast refineries.

This section describes several types of alternatives (no action, system, and major route alternatives) and assesses whether they would meet the stated purpose and need for the project and the above objectives.

4.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, the Keystone Project would not be constructed and operated as described in Section 2.0. Therefore, selection of the No Action Alternative would not require issuance of a DOS Presidential Permit for the specific action of building and operating the Keystone pipeline (the proposed action).

Denial of the proposed action would mean that the environmental impacts discussed in this EIS would not occur. While this alternative would eliminate the environmental impacts directly associated with the Keystone Project, it would not meet the purpose and need for the proposed action stated in Section 1.0 of the EIS. The purpose and need for the project involves both supply and demand components.

Without the Keystone Project, the increasing supply of crude oil from the WCSB would not have a ready conduit for export to available refineries and markets in the United States. Additional export pipeline capacity above supply requirements also is required to avoid potential situations where short-term supply exceeds export pipeline capacity.

U.S. demand for petroleum products has increased, while domestic U.S. crude oil supplies continue to decline. The No Action Alternative would not provide the United States with a relatively stable and secure source of North American crude oil for Midwest and Gulf Coast markets, thereby continuing U.S. dependence on Middle Eastern oil supplies.

Although the Keystone Project would not be constructed and operated under this alternative, other reasonably foreseeable oil transportation projects may continue. Thus, the No Action Alternative would not necessarily result in an overall reduction in impacts to physical, biological, and human resources because crude oil likely would continue to be transported by other yet-to-be built pipelines, existing pipelines and routes, or alternative transportation methods (such as tank trucks or barges) to markets in the Midwest and Eastern United States.

While the increasing demand for refined crude oil products could be met by other projects or alternatives, it is purely speculative to predict the resulting effects and actions that could be taken by local governments and other suppliers or refineries in the region, as well as any associated direct and indirect environmental impacts of these actions. In addition, each of these actions may result in environmental impacts that are less than, equal to, or greater than those of the currently proposed Keystone Project. The No Action Alternative also could result in more expensive and less reliable crude oil supplies for Midwestern refineries, increasing costs and availability of the refined products for end-users. Because of these factors, the No Action Alternative is not considered preferable to the proposed action.

4.2 SYSTEM ALTERNATIVES

System alternatives are alternatives to the proposed action that would make use of other existing, modified, or proposed pipeline systems to meet the stated objectives of the proposed Project. A system alternative would make it unnecessary to construct all or part of the proposed Keystone Project, although some modifications or additions to other existing pipeline systems may be required to increase their capacity. These modifications or additions would result in environmental impacts that may be less than, similar to, or greater than those associated with construction of the proposed Project. The purpose of identifying and evaluating system alternatives is to determine whether potential environmental impacts associated with construction and operation of the proposed facilities would be avoided or reduced by using another pipeline system while still meeting the objectives of the proposed Keystone Project.

The analysis below examines several existing and proposed crude oil pipeline systems that currently or would eventually serve the markets targeted by the proposed Keystone Project. The analysis considers whether those systems would meet the proposed Project objectives while offering an environmental advantage over the proposed Project. Specifically, the system alternatives considered include:

- Expansion of existing pipeline systems (Express and Platte Pipeline System); and
- Construction of other pipeline systems (Southern Access, Southern Lights, Alberta Clipper, and the Spearhead Cushing Expansion).

4.2.1 Existing Pipeline System - Express and Platte Pipeline System

Kinder Morgan operates the Express pipeline (an existing 24-inch-diameter pipe), which interconnects with the Platte pipeline (an existing 20-inch-diameter pipe) at Casper, Wyoming (http://www.terasenpipelines.com/bins/nosidebar_page.asp?cid=38-69-94). This 1,700-mile pipeline system transports crude oil from Alberta's oil sands in Hardisty, Alberta to refineries in the U.S. Rocky Mountain and Midwest regions. In the United States, the pipeline crosses Montana, Wyoming, Nebraska, Kansas, and Missouri and terminates in Wood River, Illinois. The Express system has been in operation from 1997, with a current capacity of 280,000 bpd. The Platte pipeline was built in 1952, and its current capacity is 164,000 bpd. As operated today, neither of these existing systems would be able to provide the incremental capacity available from the proposed Keystone pipeline (435,000 bpd, with a potential increase to 591,000 bpd); therefore, they are not practicable alternatives to the proposed action. No further review of these alternatives was conducted.

4.2.2 New Pipeline System Alternative – Enbridge Projects

Four pipeline expansion projects are currently proposed by Enbridge in order to provide incremental pipeline capacity to supply future increases in refinery demand through transporting western Canada's increasing production from oil sands (http://www.enbridge-expansion.com/expansion). These expansion projects include:

- Southern Access, an expansion and extension of Enbridge's existing pipeline system, including new pipeline in Wisconsin and Illinois, to increase crude oil capacity to Midwest refineries and beyond.
- Southern Lights LsR is a 20 inch crude oil pipeline from the U.S. – Canada border at Cavalier County, North Dakota, to Clearbrook, Minnesota, to increase delivery capacity for existing crude oil sources.
- Alberta Clipper, a proposed new 36- inch crude oil pipeline from Alberta to Superior, Wisconsin that would, if approved, increase capacity of the Enbridge system by 450,000 bpd and later be expandable up to 800,000 bpd.
- Enbridge's existing Spearhead oil pipeline that extends southwest from Chicago, through Missouri, to Cushing, Oklahoma. The pipeline currently has a capacity of approximately 125,000 bpd and would require approximately 655 miles of new 30-inch-diameter pipeline to provide equal capacity to the Cushing Oklahoma area refineries (see Table 4.2-1.)

The Southern Access and Alberta Clipper projects propose to deliver crude oil directly to Midwestern markets. The proposed Enbridge pipelines would take a longer route to the Cushing refineries compared to the Cushing Extension portion of the Keystone Project, and the greater pipeline length would likely increase impacts to environmental resources. In addition, these projects are configured to serve different market demands and would not meet the market need and in-service date proposed by the Keystone Project. Market demand and supply needs for WCSB crude oil are expected to support both the Keystone Project and the proposed Enbridge projects.

TABLE 4.2-1
Comparison of the Keystone Pipeline System with the Enbridge Projects

Comparative Category	Keystone Project	Enbridge Projects and Spearhead-Cushing Expansion
Delivery points	Midwestern United States and Cushing, Oklahoma	Midwestern United States and Cushing, Oklahoma
Miles of pipe to Midwestern markets (Canada and United States)	1,082	955
Additional miles of pipe to Cushing, Oklahoma	296	655
Total miles of pipe	1,378	1,610

4.3 MAJOR ROUTE ALTERNATIVES

Major route alternatives were considered to determine whether they would avoid or reduce impacts on environmentally sensitive resources that would be crossed by the proposed pipeline and in response to suggestions by the public. The origin and delivery points of a major route alternative are the same as for the corresponding portion of the proposed pipeline (i.e., a border crossing at Pembina County, North Dakota and main delivery points at Wood River and Cushing). However, the alternatives would follow significantly different routes from the proposed pipeline. Major route alternatives would not modify or make use of other existing or new pipeline systems.

In addition to the objectives that dictate the border crossing and delivery point locations, primary and secondary constraints to route location were recognized early during the route development process. Route development attempted to avoid the following primary constraints as much as possible:

- Federal, state, Native American, and military lands;
- Large water bodies and wetland complexes;
- Extreme terrain;
- Urban areas; and
- Wildlife refuges.

Route development attempted to minimize the extent of crossings and impacts related to secondary constraints, which included:

- Water and wetland crossings;
- Waterfowl production areas;
- Irrigated croplands;
- Bedrock;
- Rural communities;
- Aquifers;

- Extensive forested areas; and
- Residences and associated features, such as driveways, outbuildings, and windbreaks.

The process also considered features (opportunities) that are favorable for pipeline routing and generally simplify construction and decrease disturbance, including:

- Existing ROWs for linear features, such as pipelines, power lines, and roadways; (pipelines typically are preferred);
- Flat or gently rolling terrain;
- Easily excavated soils; and
- Non-forested areas.

Control points at specific locations along the pipeline route serve to anchor the route at beginning, end, and midpoints, thereby defining specific portions of the final route. They were considered in the route development process together with primary and secondary constraints. Initial control points were identified at the U.S./Canada border crossing near Gretna, Manitoba a delivery point at Wood River, Illinois; and a delivery point at Patoka, Illinois. The desire to transport crude oil to Cushing, Oklahoma also was considered as a control point.

This EIS considers three major route alternatives that would meet the objectives of the Keystone Project: the Iowa Route Alternative, the Proposed Route Alternative, and the Direct Alternative.

4.3.1 Iowa Route Alternative

Initial route development identified a ROW that avoided Nebraska and crossed Iowa into northern Missouri (Figure 4.3-1). Desktop data analysis and limited aerial and ground reconnaissance were used to identify this route. The Iowa Route entered the United States in Pembina County, North Dakota, just north of Walhalla, and ran due south to the North Dakota/South Dakota border. In South Dakota, the route ran generally south to the Spink County border before turning southeast toward Plymouth County, Iowa. From there, it crossed the South Dakota/Iowa border north of Sioux City, Iowa and continued in a southeasterly direction through Iowa and Missouri. Here, the Iowa Route was collocated with the existing Platte pipeline to Troy, Missouri. North of Troy, the route was moved to a power line ROW to avoid areas where the city has expanded. East of Troy, the route again collocated with the Platte pipeline, running east to the Missouri/Illinois border—where it deviated from the Platte pipeline and crossed the Mississippi River south of Wood River, Illinois. From Wood River, the route ran eastward through the Carlyle Lake WMA into Patoka, Illinois.

While the Iowa Route would meet the objectives of crude oil delivery to the refineries in Illinois, it would not efficiently deliver crude oil to Cushing, Oklahoma and therefore would not completely meet the Keystone Project purpose and need. Therefore, the Iowa Route Alternative is not considered further in the environmental consequences analysis for this EIS.

4.3.2 Proposed Route Alternative – DOS Preferred Alternative

The proposed route was developed because of shipper interest in providing crude oil transportation to storage terminals and pipeline interconnections in Cushing, Oklahoma as well as the original Project objective of delivering crude oil to Wood River and Patoka, Illinois.

Several key control points were considered during development of the proposed route:

- U.S./Canada border – Pipeline entry into the United States was at Pembina County, North Dakota.
- Delivery and interconnect points at Wood River and Patoka, Illinois.
- Final delivery point at Cushing, Oklahoma.
- Missouri River – To economically serve Cushing, the proposed route would cross the Missouri river in South Dakota/Nebraska. Much of the Missouri River in this area is designated as recreational under the Wild and Scenic Rivers Act. A number of technical issues also dictated effective crossing locations. Crossing locations for the Missouri River that are technically appropriate and permittable were strongly considered in the overall routing process.

To accomplish the objective of delivering crude oil to Wood River and Patoka, and eventually to Cushing, the proposed route follows the shortest route possible between the Canadian border and Cushing. The route crosses the U.S./Canada border at Pembina County North Dakota, and follows a southerly track through North Dakota, South Dakota, and Nebraska (see Figure 2.1-1). At Steele City on the Nebraska/ Kansas border, the Mainline Project of the proposed route turns east through the northeast corner of Kansas and crosses Missouri to terminals at Wood River and Patoka, Illinois. The Cushing Extension continues south from Steele City through Kansas to Ponca City and Cushing, Oklahoma. This route would facilitate access to Cushing while preserving access to the original markets in Illinois, and would provide collocation opportunities along the existing Platte pipeline. It also meets the key control points outlined above. Specifically, the proposed route would:

- Allow an HDD crossing of the Missouri River that could be approved and completed at a technically feasible location near Yankton, South Dakota;
- Provide the shortest route of the three alternatives and consequently would represent the least amount of potential disturbance; and
- Require generally fewer water body, railroad, and road crossings.

Therefore, the proposed route would allow the economical extension of the pipeline into Oklahoma (Cushing Extension) and would provide for a feasible crossing of the Missouri River in South Dakota. In addition, the Mainline Project would be collocated with existing and proposed pipeline alignments through Missouri. Due to its ability to meet shipper demand in Oklahoma and its collocation with other previously permitted ROWs and developed utility alignments, the proposed route has been analyzed for environmental consequences as described in Section 3.0 of this EIS. Further localized route variations on the proposed route are described in Section 4.4.

4.3.3 Direct Alternative

As part of the environmental analysis, DOS assessed a potential alignment that is named herein The Direct Alternative. The Direct Alternative was assessed to compare the proposed route to the shortest feasible route between the U.S./Canada border crossing and the delivery points at Patoka and Wood River, Illinois, and from there to the delivery point at Cushing, Oklahoma (Figure 4.3-2). The objective was to determine if there was an overall environmental advantage to the straight-line path was modified to skirt populated areas and to minimize the number of stream crossings by routing along drainage divides whenever possible. Between Wood River and Patoka, the Direct Alternative follows the same alignment as Keystone's proposed route.

Between Wood River and Cushing, the Direct Alternative generally parallels Enbridge's Ozark pipeline corridor, but was not collocated with it.

A reconnaissance-level GIS analysis and comparison of the Direct Alternative and Keystone's Proposed Route was performed (see Table 4.3-1). Based on this analysis, there is no clear environmental advantage associated with the Direct Alternative. The pipeline miles are very close, as are the approximate number of acres required for the pipeline ROW (acres required for ancillary facilities, access roads, work pads, etc. were not included in this assessment). The Direct Alternative would require an additional 48 water body crossings, and may require additional pump stations. It does not take advantage of collocation with other pipeline corridors. While slightly fewer miles of wetlands (based on available wetlands inventory mapping) and federal lands (based on available GIS coverage) may be crossed by the Direct Alternative, in a general sense this alternative would likely lead to more environmental impact than would construction of the Proposed Route.

TABLE 4.3-1
Comparison of the Proposed Route and Direct Alternative for the Keystone Project

Comparative Category	Unit	Proposed Route	Direct Alternative
Facility Requirements			
Pipeline length	Miles	1,378	1,380
Pump station requirements	Number	24	29
Land Requirements [a]			
Construction ROW	Acres	18,300	18,303
Permanent ROW	Acres	8,350	8,362
Environmental Considerations			
Water body crossings [b]	Number	213	261
Wetlands crossed [c]	Miles	44.4	40.0
Federal lands crossed	Miles	4.9	2.2

Notes:

The Iowa Route described in Section 4.3.1 is not included in this table because the route does note meet the purpose and need for the Project and was rejected for further analysis.

[a] Assumes a 110-foot-wide construction right-of-way (ROW) for the entire proposed route, except for the segment between Wood River and Patoka, Illinois, where it is 95 feet wide. The permanent ROW is 50 feet wide.

[b] Perennial streams only no intermittent streams or man-made ditches..

[b] National Wetland Inventory (NWI) data are not available for all areas in Nebraska, Kansas, and Oklahoma. For 240 miles of the proposed route, no NWI data are available; for 66 miles of the Direct Alternative route, no NWI data are available

Sources: NWI: USFWS May 2006; water bodies: ESRI & USGS 2006; tribal lands: USGS 2005; federal lands: USGS 2005.

Collocation of the pipeline reduces the cumulative impacts of pipeline construction, an advantage not available with the Direct Alternative. Keystone's proposed alignment is also predominantly oriented north-south and east-west, while the Direct Alternative is oriented northwest-southeast and northeast-southwest (see

Figure 4.3-2). Alignment with the cardinal directions allows the proposed route to run parallel to section lines, property lines, and the boundaries of agricultural fields rather than cutting diagonally across them as would the Direct Alternative. The Direct Alternative would likely result in a greater disruption to existing land uses during construction than the proposed route.

4.4 ROUTE VARIATIONS – PROPOSED ROUTE ALTERNATIVE

Route variations differ from system or major route alternatives in that they are identified to resolve or reduce construction impacts to localized, specific resources such as cultural resource sites, wetlands, recreational lands, residences, landowner requests, and terrain conditions. While route variations may be a few miles in length, most are relatively short and in proximity to the proposed route. Because route variations are identified in response to specific local concerns, they are usually the result of landowner comments. A variety of factors are considered in identifying and evaluating route variations, including length, land requirements, and the potential for reducing or minimizing impacts to natural resources.

4.4.1 Proposed Route Variations

As part of the proposed route development and selection process, a number of route variations to the initial Mainline Project route and the Cushing Extension route were identified and evaluated; see Environmental Report filed on November 17, 2006 (ENSR 2006a) and subsequent filings (TransCanada 2006, 2007a, 2007b, and 2007d). These variations were developed based on discussions with landowners, resource stewards, and project engineers to avoid or minimize impacts to natural or cultural resources, reduce or eliminate engineering and constructability concerns, and avoid or minimize conflicts with existing or proposed residential and agricultural land uses. Each of these route variations, which are summarized in Table 4.4-1, has been incorporated into the Proposed Route Alternative.

In addition to the route variations described above, the scoping process identified public concerns related to route location. Many of these comments addressed specific route variations related to avoiding shelterbelts and aesthetic features, such as bike paths and parks. The Scoping Report is provided as Appendix A for reference. The final design alignment would, where feasible, consider these minor route variations and would attempt to address additional landowner requirements.

Additional minor alignment shifts would be required prior to and during construction to accommodate unforeseeable site-specific constraints related to other engineering, landowner, and environmental concerns.

TABLE 4.4-1
Proposed Mainline Project Route Variations for the Keystone Project

Proposed Route Mileposts	Route Variation	Reason for Route Variation
Milepost (MP) 0 to 263	The current alignment is located west of the Option B alignment and continues on in a southerly direction.	Avoids aquifers in North Dakota, Coteau Des Prairie, and the Sisseton-Wahpeton Indian Lands. The southerly route reduces length. The reroute also avoids drainage ditches, woodlots, grain bins, shelter belts, wetland easements, and the Tongue River tributaries.
MP 192.3 to 247.5 *(Hecla Sandhills Alternative)*	In the November 2006 filing, the original option B alignment was shifted west from MP 0 to 263. In the January 2007 filing, the November route was shifted back east, near the original Option B route.	Avoids U.S. Fish and Wildlife Service (USFWS) wetlands and grassland easements; also avoids shallow aquifers and an extensive area of wetlands in sandy substrates. The January route results in less surface disturbance in sensitive habitats.
MP 266 to 274.5	The current alignment is located west of the Option B alignment.	Avoids impact to the USFWS Day County Grasslands easement.
MP 279.3 to 295	The current alignment is located approximately 1 mile east of the Option B alignment.	Reduces impacts to the USFWS Raymond Prairie Chicken Leks grassland.
MP 309 to 433	Several inflections were eliminated from the Option B alignment.	Reduces the overall length and provide a more direct path from MP 309 to the Missouri River crossing at Yankton, South Dakota.
MP 437 to 469	The current alignment is east of the Option B alignment.	Avoids high bluffs on the south side of the Missouri River, as well as general congestion.
MP 473 to 491	Several minor route refinements to Option B have occurred in this area.	Addresses engineering and construction concerns.
MP 495 to 501.5	The current alignment is west of the Option B alignment.	Avoids native grasslands per landowner request; also avoids a feedlot.
MP 501.5 to 512.5	The Option B alignment was moved approximately 1 mile east. The overall shift continues south to approximate MP 511.	Facilitates a better Elkhorn River crossing location; also reduces length and avoids the Nebraska Game and Parks Commission Lands.
MP 512.5 to 521	The current alignment was moved westward from the Option B alignment	Avoids the future site of Leigh Lake, as well as terraced farmlands.
MP 527 to 532	The current alignment is located west of the Option B alignment	Avoids future construction of a hotel.
MP 536 to 546	The current alignment is east of the Option B alignment.	Provides a better alignment for the Platte River crossing.

TABLE 4.4-1
(Continued)

Proposed Route Mileposts	Route Variation	Reason for Route Variation
MP 571.5 to 575.5	The current alignment is west of the Option B alignment.	Avoids two archeological areas.
MP 575.5 to 590	The current alignment shows minor reroutes from the Option B alignment.	Addresses engineering and construction concerns.
MP 590 to 605	The Option B alignment was shifted west.	Avoids flood irrigated agricultural lands in Saline County, Nebraska.
MP 637.5 to 920.5	The Option B alignment followed the existing Platte pipeline. The current alignment follows the proposed Rockies Express pipeline alignment.	Several reroutes deviate from the Rockies Express pipeline to avoid features such as residences and other buildings. Included is a reroute around Agency, Missouri.
MP 920.5 to 1018	The Rockies Express pipeline deviates to the north while the current (Keystone) alignment remains generally collocated with the Platte pipeline. Minor deviations exist in some areas. A major deviation is located at MP 964 to 975. In this area, a more northern route was taken along an existing power line.	Route deviations from the Platte pipeline from MP 964 to 975 avoid congestion associated with Troy, Missouri.
MP 976 to 987.5 *(Chain of Rocks Alternative)*	The route filed in November 2006 is parallel to the Platte pipeline in this area. The January 2007 filing moves the pipeline to the north.	Avoids residential developments adjacent to the Platte pipeline; the subsequent realignment provides a better location for crossing the Cuivre River. Also avoids a county road bridge and two archaeological sites near the river.
MP 1020.6 to 1024.4 *(Wood River Alternative)*	The January 2007 filing moves the November 2006 route to the north.	Improves pullback for horizontal directional drilling of the Mississippi River and allows for relocation of Pump Station 37 adjacent to the Wood River Refinery. Also provides for less disturbance at a state park near the confluence of the Mississippi and Missouri Rivers.
MP 1022 to 1081.9	The current alignment is located south of the Option B alignment.	Collocation with the existing Two Rivers and Marathon pipelines until terminating at Patoka, Illinois. Includes a more optimum location for the tie-in to the Patoka Terminal.

TABLE 4.4-1 (Continued)		
Proposed Route Mileposts	**Route Variation**	**Reason for Route Variation**
Cushing Extension		
MP 208.2 to 296	The original alignment crossed Native American tribal and allotted lands between these mileposts.	Avoids crossing these lands.
MP 204 to 208	The original alignment crossed the Wichita Audubon Society's Chaplin Nature Center near Arkansas City, Kansas. The current alignment is northwest of the original alignment.	Avoids crossing the Nature Center.

4.4.2 Seward Route Variations

Citizens of Seward, Nebraska, suggested two alternative route variations (Seward Alternatives #1 and #2) that would relocate the pipeline to the east of Seward (see Figure 4.4-1). The purpose of the suggested relocation would be to avoid routing the pipeline near the city's water supply well fields, avoid crossing a water main that connects Seward to its water treatment plant, avoid wetland and floodplain areas, and move the pipeline beyond the western boundary of the High Plains aquifer. The Draft EIS incorporated a reconnaissance-level GIS-based comparison of Seward Alternative #1 and the proposed Project alignment in the vicinity of Seward, Nebraska. Subsequent to the release of the Draft EIS, Keystone provided a more detailed comparison of both Seward Alternative routes with the proposed Project alignment.

A summary of the comparison of the Seward Alternatives and the proposed route follows:

- Seward Alternative #1 or #2 would be approximately 1.5 or 1.4 miles longer, respectively, than the proposed route (Table 4.4-2) and would thus require 19 or 17 additional acres of permanent ROW and 27 or 25 additional acres of construction ROW, respectively.

- The land east of Seward is generally steeper and more dissected than it is to the west (Figure 4.4-1), and the maximum slope crossed by either Seward Alternative is greater than that crossed by the Proposed Alternative. Nevertheless, none of the alignments traverse overly-steep slopes.

- Seward Alternative #1 impacts 103 landowners, significantly more than the Proposed Alternative (60 landowners) in the Seward area or Seward Alternative #2 (61 landowners). Twelve residential areas are within 500 feet of the Proposed Alternative, 22 are within 500 feet of Seward Alternative #1, and six are within 500 feet of Seward Alternative #2.

- Both Seward Alternatives would require one railroad crossing, while the Proposed Alternative would require two. Seward Alternative #1 would require nine more crossings of paved roads than the Proposed Alternative (33, as opposed to 24), but Seward Alternative #2 would require only four such crossings.

- The number of perennial stream crossings would be the same for all alternatives. Seward Alternative #1 would require 29 intermittent stream crossings, and Seward Alternative #2 would require five such crossings, compared to 12 for the proposed route. Seward Alternative #2 would require only five crossing of intermittent streams.

- Both Seward Alternatives would cross a greater length of wetlands than the Proposed Alternative.. Despite their greater overall length, the Seward Alternatives would cross fewer miles of cultivated cropland than the proposed route. The Seward Alternatives would instead cross greater lengths of developed land, grassland and pasture, and upland forest.

- Both Seward Alternatives would avoid the city's water-supply well fields and water main, and would locate the pipeline beyond the eastern boundary of the High Plains aquifer (see Figure 4.4-1). By doing so, however, the Seward Alternatives would cross a greater length of shallow and vulnerable glacial-drift aquifers. South of the Big Blue River crossing, both the Seward Alternative and the Proposed Alternative are within the boundary of the High Plains aquifer; consequently, the environmental benefit of reduced risk to that aquifer is limited to the immediate vicinity of Seward.

- Keystone's assessment of the potential impacts of a crude oil spill in the Seward area found that, in the unlikely event of a local spill or leak, it would take at least 3.6 years for any potential contamination to migrate to the nearest well, allowing a significant period for any contamination to be detected and remedial action to be taken in order to protect the water supply.

The Seward Alternatives would reduce a very minimal risk to the High Plains aquifer and water supply infrastructure in the vicinity of Seward. The reduction in risk would involve greater pipeline length, additional required ROW area, greater total length of wetlands crossed, and increased number of landowners and residences impacted. The proposed route was found to maintain a more favorable balance of reduced impacts versus reduced potential contamination risks. The Proposed Alternative was therefore not modified to incorporate either of the Seward Alternatives.

4.4.3 Western Fordville Route Variation

At the request of the North Dakota Public Service Commission, Keystone considered a proposed route variation in the vicinity of Fordville, North Dakota. The proposed route had previously been modified in this area following consultation with the North Dakota Department of Health, Division of Water Quality. The Western Fordville Conceptual Route (WFCR) was designed to locate the pipeline farther away from the Fordville Aquifer in order to reduce risk to groundwater resources.

The environmental impacts associated with the WFCR and risks to groundwater associated with both the WFCR and the Proposed Alternative were analyzed by Keystone and reviewed by DOS. This analysis found that the WFCR route variation would slightly reduce the potential that a spill could reach the Fordville Aquifer. Adoption of the WFCR variation would, however, increase overall environmental impacts and would require construction on steeper slopes with highly erodible soils. Because the likelihood that a crude oil release along the Proposed Alternative would reach and contaminate the Fordville Aquifer is low, increased impacts associated with the WCFR did not balance the reduction in risk, and the WFCR variation was not included in the Proposed Route Alternative.

TABLE 4.4-2
Comparison of the Proposed Route Alternative and Seward Alternatives #1 and #2

Comparative Category	Unit	Proposed Route Alternative	Seward Alternative #1	Seward Alternative #2
Facility Requirements				
Pipeline length	Miles	22.2	23.7	23.6
Land Ownership				
Federal	Miles	0	0	0
State	Miles	0	0	0
Private	Miles	22.2	23.7	23.6
Landowners	Number	60	103	61
Water Resources Affected				
Perennial streams	Number	2	2	2
Intermittent streams	Number	12	29	5
Vulnerable aquifers[a]	Miles	1.5	3.0	3.6
Shallow groundwater[b]	Miles	7.6	15.8	11.0
Public water supply wells within 1 mile of centerline	Number	2	0	0
Wellhead protection areas	Number (Miles)	4 (5.4)	1 (2.0)	1 (1.5)
Land Cover				
Wetlands: palustrine emergent	Miles	0.04	0.14	0.16
Wetlands: palustrine forested	Miles	0.06	0	0.11
Cropland	Miles	21.3	18.8	20.0
Developed (right-of-way)	Miles	0.3	0.4	0.4
Developed (residential)	Miles	0	0.7	0.09
Grassland/pasture	Miles	0.4	2.7	2.1
Upland forest	Miles	0.1	0.9	0.6
Streams	Miles	0.08	0.06	0.10
Utility Crossings				
Railroad crossings	Number	2	1	1
Paved road crossings	Number	24	33	4
Public Safety				
Potential residences/residential areas within 500 feet	Number	12	22	6
Public assembly locations (schools, churches) within 500 feet	Number	0	0	0
High consequence areas	Miles	0	0	0
Drinking water (ground or surface water)	Miles	0	0	0
Populated areas	Miles	0	0	0
Ecologically sensitive areas	Miles	0	0	0

Notes:

[a] U.S. Environmental Protection Agency DRASTIC Index 5 or higher.

[b] Top of aquifer within 50 feet of ground surface.

4.4.4 Hecla Sandhills Variation

The original Presidential Permit application included an alignment in the Hecla Sandhills area east of the current alignment position (ENSR 2006a). In the Keystone Pipeline project Environmental Report updated in November 2006, the proposed alignment was moved west. The western alignment created concerns from USFWS, landowners, and local officials related to surface disturbances and potential groundwater contamination. In response to these concerns, Keystone conducted an alternatives analysis in the Hecla Sandhills area (TransCanada, 2007b). Based on that analysis, a new alignment in the Hecla Sandhills area was submitted and included in the Proposed Alternative. This new Hecla Sandhills alignment crosses 11 fewer miles of palustrine emergent wetlands, avoids USFWS grassland easements, crosses three miles fewer wetland easements, crosses three less miles of high quality native prairie, 5 fewer miles of sandy and gravelly soils, and 15 fewer miles of mapped shallow water supply aquifers.

4.5 ABOVEGROUND FACILITY ALTERNATIVES – PROPOSED ALTERNATIVE

Pump stations, valve sites, temporary worksites, and pipe and contractor yards are identified in the Environmental Report filed on November 17, 2006 (ENSR 2006a). The filing identified 23 (possibly 24) new pump stations, 44 pipe storage yards, 36 contractor yards, and 57 MLVs along the Mainline Project and 3 pump stations, 10 pipe storage yards, 6 contractor yards, and 15 MLVs along the Cushing Extension. Although the preferred locations for these facilities were chosen based on Project need, the proximity of public access, habitats, dwellings, and other land and ROW issues also were considered. Of the pump station locations identified in the November 17, 2006 filing (ENSR 2006a), alternative locations were evaluated for three stations and documented in the January 24 filing (TransCanada 2007a). These locations are described in the following sections and have been incorporated into the proposed Project.

4.5.1 Pump Station 19 – Hecla Sandhills

Pump Station 19 would be moved about 5 miles east of its initial location (Figure 4.5 1). As discussed in Section 4.4 and shown in Table 4.4-1, a route variation for the Hecla Sandhills Alternative (MP 192.3 to 247.5) has been adopted to reduce impacts in this area. Pump Station 19 falls within this variation and would be relocated. The previously filed location was situated over a mapped shallow aquifer; the new location avoids the aquifer, and the power line required by the alternative location is 5 miles shorter. A shift in local property tax benefits from Dicky County to Sargent County, North Dakota would result.

4.5.2 Pump Station 36 – Chain of Rocks

Pump Station 36 has been relocated northwest of its previously proposed location (Figure 4.5-2). As shown in Table 4.4-1, a route variation for the Chain of Rocks area (MP 976 to 987.5) has been adopted. The new location for the pump station is situated in an upland area; the old location was close to a large wetland complex (Horseshoe Lake). The pump station alternative would be collocated with a utility substation, and no additional power lines would be required.

4.5.3 Pump Station 37 – Wood River

Pump Station 37 would be moved northeast of its previously proposed location (Figure 4.5-3). As shown in Table 4.4-1, a route variation for the tie-in to the Wood River Terminal area (MP 1020.6 to 1024.4) has been adopted. As the route into the terminal was further refined, an opportunity to site Pump Station 37 adjacent to the Wood River Refinery became apparent. This would eliminate the need to construct an 0.8-mile lateral extension from the pump station to the terminus at the refinery.

The locations of this pump station in both the November 2006 and January 2007 filings are situated on cropland near industrially developed areas. While it appears that the alternative pump station location may be sited on a farmed wetland, it is likely that it could be oriented such that it is outside the wetlands but still close to the point of refinery storage. The exact orientation and location of Pump Station 37 would be refined following completion of site-specific wetland surveys.

While both the original and alternative locations for Pump Station 37 are located in an area with industrial development, the alternative location presented in the January 2007 filing is located within 1 mile of a larger number of residences, compared to the originally filed location. This pump station would represent a small addition to an existing refinery complex and, because additional laterals would not be needed, the overall footprint would be smaller. The incremental effect of Pump Station 37 on the residences would be minor based on the existing refinery setting.

4.6 REFERENCES

ENSR. 2006a. Keystone Pipeline Project Environmental Report. Prepared for the U.S. Department of State. April. Updated November 15, 2006.

TransCanada Keystone Pipeline, L.P. 2006. Cushing Extension Reroute in Oklahoma. Supplemental Filing December 15. Submitted to the U.S. Department of State by TransCanada Keystone Pipeline, L.P. Updated information from Application for Presidential Permit.

TransCanada Keystone Pipeline, L.P. 2007a. Cushing Extension Environmental Report Tables. Supplemental Filing. Submitted to U.S. Department of State by TransCanada Keystone Pipeline, L.P. Updated Tables from Application for Presidential Permit. January 24.

TransCanada Keystone Pipeline, L.P. 2007b. Response to Data Request #1. Submitted to U.S. Department of State by TransCanada Keystone Pipeline, L.P. Application for Presidential Permit. January 29.

TransCanada Keystone Pipeline, L.P. 2007d. Supplemental Filing #9. Submitted to U.S. Department of State by TransCanada Keystone Pipeline, L.P. Application for Presidential Permit. September 10.

Verstraeten, I. M., V. L. McGuire, and K. L. Heckman. 1998. Hydrogeology and Subsurface Nitrate in the Upper Big Blue Natural Resources District, Central Nebraska, July 1995 through September 1997. (U.S. Geological Survey Water-Resources Investigations Report 98-4207.) Denver, CO.

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5.0 CONCLUSIONS AND ADDITIONAL MITIGATION

The analysis presented in this Final EIS is based on information provided in 10 filings by TransCanada and was further developed from data requests; public and agency scoping; literature research; alternatives analysis; consultations with consulting parties under Section 106 of NHPA; government to government consultation with Indian tribes; and contacts with federal, state, and local agencies. Based on the information provided in Section 3.0 of this Final EIS and summarized below for each resource category, DOS concludes that the proposed Keystone Mainline Project and Cushing Extension, if designed, constructed, and operated in accordance with the Project Description in Section 2 of this Final EIS as amended by additional approaches and mitigations agreed to by Keystone as a result of this environmental analysis and as further amended by specific permit conditions to be assigned by the state and federal agencies with permit jurisdiction along the pipeline corridor would result in limited adverse environmental impacts. This conclusion assumes that the Keystone Mainline Project and Cushing Extension would be constructed and operated in accordance with applicable laws and regulations, and with Keystone's proposed CMR Plan (Appendix B) as amended prior to construction to include additional mitigation measures either agreed to by Keystone or included as permit conditions by regulatory agencies. Additional mitigation measures have been recommended through scoping and consultations with agency representatives, stakeholders, and the public that are not presently included in the CMR Plan (Appendix B). Keystone has agreed to many of these recommended measures, and they are summarized in the following subsections for each resource category.

5.1 GEOLOGY

5.1.1 Conclusions

The proposed project would not involve substantial topographical alteration and would not disturb any geological features protected by federal or state laws. Seismic activity is not expected to pose an unacceptable risk to the project.

The proposed pipeline route does not cross any active surface mines or quarries; however, it does cross 40 miles of underlying coal seams between Wood River and Patoka, Illinois, where coal is mined with underground methods (ENSR 2006a). The proposed route does not cross the well pads of any active oil and gas wells. Extraction of oil and gas resources would not be affected by routing operations because any new wells would be located outside of the pipeline ROW. The proposed pipeline would pass through deposits of sand, gravel, clay, and stone in North Dakota, South Dakota, and Nebraska but would restrict access to comparatively small areas of these deposits. In Kansas, Missouri, and Illinois, the proposed route lies adjacent to an existing pipeline, limiting impacts to potentially exploitable geologic resources.

A minimal risk of localized subsidence or collapse exists where the pipeline crosses karst formations or passes above historic coal mines. It is also possible that land clearing would increase the risk of erosion and localized landslides. Most of the proposed Keystone Project route is not located in landslide-prone terrain, but the proposed route does cross areas of high landslide potential, as described by NPMS at the Yankton and Mississippi River crossings. Keystone has considered landslide potential in its routing work and has selected crossings of these areas where the landslide potential is reduced.

Additional measures to protect geological resources are described in Section 5.1.2.

5.1.2 Additional Mitigation

(1) Keystone would prepare a blasting plan that is applicable to any locations where blasting would be necessary. Prior to construction, Keystone would file its blasting plan with applicable state or local jurisdictions, where required.

(2) Excavation and blasting along the ROW may uncover paleontological resources that may be of scientific value. Keystone would consult with the appropriate regulatory agencies in each state on the applicability and requirements for Paleontological Resource Protection Plans. Keystone would prepare and file plans addressing vertebrate fossils with any respective states, as may be required.

(3) There is a potential for rock slope instability in the vicinity of the Whitewater River crossing in Kansas. Keystone would complete site-specific crossing plans for this water body if required by the applicable regulatory agencies during federal or state permitting processes.

(4) Because national-scale karst maps may not be sufficiently detailed to identify all karst terrains along the pipeline corridor, Keystone would consult with the respective state geological survey departments to identify the most up-to-date sources of data on karst-related subsidence hazards along the proposed route.

(5) Because the proposed route does cross areas of high landslide potential, Keystone would follow TransCanada's Integrated Public Awareness (IPA) Plan. TransCanada's IPA Plan is consistent with the recommendations of API RP-1162; it includes distribution of educational materials to inform landowners of potential threats and information on how to identify threats to the pipeline. TransCanada has a toll-free telephone number (1-888-982-7222) in place for landowners to report potential threats to the integrity of the pipeline and other emergencies.

5.2 SOILS

5.2.1 Conclusions

Temporary or short term increases in soil erosion could occur during construction, particularly in areas classified as highly erosive. Receiving water bodies could be affected, and agricultural soils containing agrochemical products could be eroded. During construction, soil compaction is likely, increasing the possibility of runoff.

Approximately 17,000 acres of farmland or rangeland within the ROW would be taken out of production during the 18-month construction period. Some short- or long-term decreases in agricultural productivity are possible. In addition, tile drainage systems would be disturbed during construction. Keystone has proposed to avoid, replace, and/or repair any tile drainage system within the ROW.

There could be compaction-related decreases in productivity from non-agricultural vegetated land, particularly where soils are classified as hydric. It is also possible that boulders and rocks unearthed during construction would be concentrated near the surface at completion. There are also concerns that spills or leakage from equipment could contaminate soils. Keystone has proposed construction methods and mitigation measures to address these concerns.

In terms of operations impacts, differential settling around the proposed pipeline likely would be minor and would be addressed by mitigation measures. Soil temperature impacts would be limited to within

3 feet of the pipeline and would not result in serious soil moisture loss; mitigation would be adequately addressed through the additional measures included below.

5.2.2 Additional Mitigation

(1) In the CMR Plan (Appendix B), Keystone has proposed construction methods that are designed to minimize impacts resulting from soil erosion. The CMR plan does not include provisions for independent environmental inspection during construction. In areas where federal, state, and local authorities have jurisdiction, these authorities would provide oversight to ensure compliance with relevant permits. As a result of discussions with DOS and agency personnel during this environmental analysis, Keystone has agreed to designate at least one Environmental Inspector (EI) per construction spread, who would have the authority to stop work and/or order corrective action in the event that construction activities violate the provisions of the CMR Plan, landowner requirements, or any applicable permit. Prior to construction, the CMR Plan would be revised to include a description of the duties and authorities of the EIs. The CMR Plan would be further revised to include other additional mitigation measures agreed to by Keystone as a result of this environmental analysis and would also include any additional stipulations resulting from individual agency permitting procedures.

(2) Although as described in the CMR Plan, Keystone plans to minimize impacts on soil productivity that may result from construction activities, some short- to long-term decreases in agricultural productivity are possible. Keystone recognizes its responsibility to restore agricultural productivity on the pipeline ROW and to compensate landowners for demonstrated decreases in productivity that may result from any degradation of agricultural soils along the ROW. Keystone's easement agreements with landowners require Keystone to restore the productivity of the ROW and to compensate landowners for demonstrated losses from decreased productivity resulting from pipeline construction. Keystone has contacted each of the affected states' Departments of Agriculture. Only Illinois has requested that such a plan be prepared. An Agricultural Mitigation Plan has been developed and approved by the Illinois Department of Agriculture.

(3) Hydric and otherwise compaction-prone soils are particularly sensitive to the impact of construction activities during wet weather. Section 2.18 of the CMR Plan addresses the methodology to be utilized to determine when to restrict or stop work for wet weather and the methods to mitigate impacts of construction activities in wet conditions. Section 2.18 takes into account the depth of rutting by reference to whether rutting may cause mixing of topsoil and subsoil, on a location-specific basis. "Stop work" authority would be designated to the Chief Inspector but would be implemented when recommended by the EI. Section 2.18 also addresses construction procedures and mitigative measures to minimize compaction in wet conditions.

(4) Procedures to alleviate soil compaction as described in the CMR Plan may result in relatively excessive soil aeration and subsequent settling of soils within the ROW. Therefore, in the first year after construction, Keystone would 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 landowner reporting. Landowner reporting would be facilitated through use of Keystone's toll-free telephone number, which will be made available to all landowners on the ROW. Landowner reporting also may be facilitated through contact with Keystone's regional offices.

5.3 WATER RESOURCES

5.3.1 Conclusions

Overall, it is not anticipated that surface water or groundwater quality would be significantly affected by pipeline construction and normal operations, including disposal activities (such as disposal of hydrostatic test water), non-catastrophic spills, or minor leaks This conclusion assumes that Best Management Practices (BMP) as defined in the CMR Plan (Appendix B) as amended by additional measures agreed to by Keystone and any additional conditions on all applicable permits are conducted during pipeline construction and normal operations. Hydrostatic testing, which would involve the uptake and discharge of water, should not cause significant adverse impacts if Keystone's CMR Plan (Appendix B) is followed and if the discharges occur consistent with discharge permit conditions as determined by applicable regulatory authorities.

Many of the aquifers present beneath or in the vicinity of the proposed route are isolated by the presence of glacial till, which characteristically inhibits downward migration of water and contaminants into these aquifers. Although the pipeline has been routed to avoid most near-surface aquifers, in several areas shallow or near-surface aquifers are present beneath the proposed route. For these areas, measures have been proposed (such as containment structures) to reduce the potential impact of leaks and spills during construction. Keystone's CMR Plan (Appendix B) outlines procedures for contractor preparedness and emergency spill response to reduce the potential for contaminants to migrate into the aquifer during construction activities. Additionally, the risk of dewatering shallow groundwater aquifers or reducing groundwater quality through an increase in TSS during construction likely would be temporary, and these aquifers are expected to recover quickly following construction activities. Construction and normal operations therefore are not expected to result in a long-term significant impact on groundwater.

Keystone has proposed three construction methods for crossing surface water bodies: dry-cut methods, open cut wet crossings, and HDD. The HDD method would avoid any impacts on water bodies. The open cut wet method, involving trenching while water continues to flow, would entail a high risk of temporary siltation to streams and other water bodies. Dry-cut methods are not feasible for wider streams. The risks of open-cut trenching could be temporary (for the duration of construction) or longer term (where compromised stream bank stability or bank erosion occurs). Keystone's CMR Plan (Appendix B) includes several measures to reduce siltation and erosion. Additional measures are described in Section 5.3.2.

5.3.2 Additional Mitigation

(1) To ensure that groundwater resources are not negatively affected due to necessary blasting activities, Keystone's blasting plan would include provisions to avoid impacts to groundwater and to incorporate post-blasting testing for water wells within 150 feet of the centerline, to ensure that water wells are not negatively affected by blasting activities.

(2) To reduce impacts at crossings of larger water bodies where the HDD method is not proposed, Keystone would submit a site-specific Construction Mitigation and Restoration Plan for the following water body crossings: , Tongue River-North Dakota (MP 18), Sheyenne River-North Dakota (MP 167), James River-South Dakota (MP 424),, Shell Creek-Nebraska (MP 533), West Fork of the Big Blue River-Nebraska (MP 593), Turkey Creek-Nebraska (MP 600), Big Blue River-Kansas (MP 665), Platte River-Missouri (MP 765), Grand River-Missouri (MP 843), Little Blue River-Kansas (MP 4 Cushing Ext.), Smoky Hill River-Kansas (MP 77 Cushing Ext.),).

(3) Because the open-cut wet crossing method necessarily involves substantial disturbance and transport of sediments, these methods may not be appropriate to cross impaired or contaminated water bodies, water bodies upstream of HCAs, or sensitive or protected water bodies. Keystone would develop specific construction and crossing methods for open cuts in conjunction with COE permitting and USFWS consultation. Open-cut wet crossings can be an acceptable method at some of these water bodies. The appropriate method of crossing would be determined during permit consultation with COE and resource agencies as applicable.

(4) The implementation of appropriate measures to protect pipeline crossings from channel incision and channel migration can reduce the likelihood of washout-related emergencies, reduce maintenance frequency, limit adverse environmental impacts, and—in some cases—improve stream conditions. All water body crossings would be assessed by qualified personnel in the design phase of the Project with respect to the potential for vertical channel degradation and lateral channel migration. The level of assessment for each crossing would vary based on the professional judgment of the qualified design personnel. The pipeline would be installed as determined to be necessary to address any hazards identified by the assessment. The pipeline would be installed at the design crossing depth for at least 15 feet beyond the design lateral migration zone, as determined by qualified personnel. The design of the crossings also would include the specification of appropriate stabilization and restoration measures.

(5) Bank erosion rates can exceed several meters per year. Maintaining an adequate burial depth for pipelines 15 feet (5 meters) beyond either side of the active stream channel may necessitate bank protection measures that would increase both maintenance costs and environmental impacts. All water body crossings would be assessed by qualified personnel in the design phase of the Project with respect to the potential for vertical channel degradation and lateral channel migration. The level of assessment for each crossing would vary based on the professional judgment of the qualified design personnel. The pipeline would be installed as determined to be necessary to address any hazards identified by the assessment. The pipeline would be installed at the design crossing depth for at least 15 feet beyond the design lateral migration zone, as determined by qualified personnel. The design of the crossings also would include the specification of appropriate stabilization and restoration measures.

5.4 WETLANDS

5.4.1 Conclusions

Wetlands that would be affected within the ROW include emergent wetlands (403 acres), forested wetlands (80 acres), perennial riverine wetlands (37 acres), intermittent riverine wetlands (107 acres), and scrub-shrub wetlands (37 acres). While emergent wetlands would regenerate quickly after disturbance (within 3–5 years generally), forested and scrub-shrub wetlands would potentially experience long-term effects. Wetlands in parks or reserves have significant conservation value. Keystone would implement mitigation measures described in its CMR Plan (Appendix B), including restoration efforts in some cases. These are described in further detail in Section 3.4.3. Additional mitigation is described in Section 5.4.2.

5.4.2 Additional Mitigation

(1) In addition to the mitigation measures committed to by Keystone in the CMR Plan (Appendix B), all wetland areas within conservation lands or easements would be restored to a level consistent with any additional criteria established by the relevant managing agency.

(2) Implementation of the measures identified in Keystone's CMR Plan (Appendix B) would reduce impacts on wetlands. In addition, several other recommendations were made by USFWS staff during consultation. These recommendations are described in detail in Section 3.4.3 and include replacing topsoil and spreading to original contours with no crown over the trench, removing excess spoil and stabilizing wetland edges and adjacent upland areas in shallow-farmed easement wetlands, leaving a gap in the spoil so that no fill material is left in the wetlands, establishing 100-foot minimum buffer zones around wetland mitigation areas, monitoring wetland restoration areas for noxious and invasive species, and developing a plan to compensate for permanent wetland losses. The appropriate level of authorization and mitigation ultimately would be determined by COE regulatory offices, with input from USFWS Environmental Services field offices and state fish and wildlife agencies.

(3) Many state and federal agencies have expressed concerns and recommendations for compensatory mitigation of wetland losses. The requirements for compensatory mitigation would depend on final COE decisions on jurisdictional delineations. The appropriate level of authorization and mitigation ultimately would be determined by COE regulatory offices, with input from USFWS Environmental Services field offices and state fish and wildlife agencies.

5.5 TERRESTRIAL VEGETATION

5.5.1 Conclusions

Terrestrial vegetation classes include all the wetland classes in addition to grasslands, upland forest, and developed land. Grassland impacts due to pipeline construction are expected to be minimal, and affected vegetative communities generally are expected to reestablish within 2 years. Construction through 29 miles of previously untilled prairie could produce irreversible impacts, as prairie sod can take up to 100 years to recover. Impacts on upland forest and shrubland would be longer term than those anticipated for grassland because of the time required for these plant communities to reestablish and reach mature pre-construction conditions.

As described in Section 3.5.5, Keystone has identified several measures in its CMR Plan (Appendix B) to limit impacts on vegetation, and additional measures are summarized below in Section 5.5.2.

5.5.2 Additional Mitigation

(1) Keystone would consult with pertinent local, state, and federal regulatory agencies to (1) evaluate terrestrial vegetation impacts and habitat fragmentation impacts to COE lands in the Riverlands Management Area in St. Charles County, Missouri, and in the Carlyle Lake WMA in Fayette County, Illinois; and (2) determine with COE the required level of compensatory mitigation for impacts to these specific habitats.

(2) Prior to construction, Keystone would develop a Project-wide general Noxious Weed Management Plan, which would address pre-construction noxious weed infestation surveys,

control methods, herbicide application, equipment washing, and post-construction monitoring. The Plan would provide for cleaning or washing of clear and grade equipment at an appropriate location to avoid transfer of noxious weeds across the Kansas/Oklahoma state line.

(3) Keystone would implement BMPs for conducting vegetation control. Typical agricultural herbicides, developed in consultation with county or state regulatory agencies, would be used. Herbicides types would be determined based on the weed species requiring control.

5.6 WILDLIFE

5.6.1 Conclusions

Pipeline construction would result in short-term disturbance and long-term modification to wildlife habitats. Increased habitat fragmentation would be experienced by white-tailed deer and other large mammals. Although disturbance of dens during winter hibernation could be potentially fatal for newborn black bears cubs, the probability of this event is extremely low, as black bear habitat minimally overlaps the ROW. Small game birds and rodents would be affected through destruction of nests and burrows, death of young or loss of eggs, and loss of foraging areas and cover. However, the total habitat loss is expected to be small in the context of total available habitat.

In addition, the following recommendations relating to impacts associated with proposed transmission lines providing power to the pipeline pump stations should be implemented. Recommendations related to power lines are summarized herein because, while not being constructed by Keystone, they are considered to be connected actions.

5.6.2 Additional Mitigation

(1) Standard safe designs, as outlined in Suggested Practice for Avian Protection on Power Lines (APLIC 2006), should be included in the design of electrical distribution lines in areas of identified avian concern, to reduce collision and electrocution impacts on birds.

(2) Transmission line visibility should be increased using proven marking techniques, such as attached balls or flappers.

(3) Provide for a minimum 60-inch separation between conductors and/or grounded hardware and use recommended insulation materials and other applicable avian protection measures, depending on line configuration.

(4) Use standard raptor-proof transmission line designs, as outlined in Avian Protection Plan Guidelines, to prevent collision by foraging and migrating raptors in the Keystone Project area.

(5) Keystone would implement BMPs in the use of pesticides and herbicides along the pipeline corridor to reduce potential impacts to avian species.

5.7 FISHERIES

5.7.1 Conclusions

Possible impacts to fisheries could occur through siltation and disturbance of streams crossed by the proposed pipeline. Following the proposed mitigation procedures during construction would result in minor short-term impacts to aquatic habitats and organisms. Any short-term disturbance caused by instream activities likely would resemble natural high-flow events in the stream. To mitigate impacts, construction would involve dry-ditch techniques at crossings where the timing of construction does not adequately protect environmentally sensitive water bodies, as determined by the appropriate regulatory authority. HDD would be used at selected major and sensitive water bodies (ENSR 2006a 2007i).

There is a risk that non-native species could be introduced into receiving waters during the disposal of hydrostatic testing water. Keystone has proposed to undertake hydrostatic testing during the spring, summer, and autumn months, overlapping with key spawning months of April to July. This overlap could affect some sensitive species during breeding. Additional mitigation measures agreed to by Keystone are provided in Section 5.7.2.

5.7.2 Additional Mitigation

(1) To avoid breeding periods when fish and invertebrate larvae are present, Keystone would consult with state fisheries agencies with respect to applicable construction windows for each crossing. In the event that a construction window cannot be accommodated, Keystone would consult with the applicable regulatory agency with respect to alternative mitigation measures.

(2) Keystone would develop specific crossing plans for water bodies that contain recreationally or commercially important fisheries, or are classified as special use, in conjunction with the appropriate jurisdictional agency.

(3) Keystone would obtain all required permits to withdraw water from water bodies for hydrostatic testing and for the discharge of hydrostatic test waters. Keystone would comply with all applicable permit conditions regarding water withdrawal from water bodies and water discharges associated with hydrostatic testing activities. Withdrawals for hydrostatic testing from sensitive water bodies would generally be avoided until after August 1, unless permission is granted from the proper agencies.

(4) To avoid impacts from introduced species, Keystone plans to return hydrostatic test water directly back to the source water body or to a location in the immediate vicinity of the water body at the conclusion of the hydrostatic testing operation. No inter-basin transfers (discharge) of hydrostatic test water would occur.

5.8 THREATENED AND ENDANGERED SPECIES

5.8.1 Conclusions

Preliminary data identified 55 federally or state-listed threatened, endangered, or candidate species potentially occurring in or near the Keystone Project ROW. These include mammals, reptiles, insects, birds, fish, mollusks, and plants. Most affected habitat would include croplands (13,594 acres) and grasslands (4,112 acres), followed by wetlands and open water (845 acres), and upland and riparian forests (1,078 acres). Loss of shrublands and wooded habitats would be long term (5–20 years) in reclaimed areas of the construction ROW.

Potential impacts on individual species are described in detail in Sections 3.8.1.6 and 3.8.2.6. These impacts include:

- Habitat loss, alteration, and fragmentation;
- Decreased breeding success due to disturbance from construction and operations noise and increased human activity;
- Direct mortality from project construction and operation and/or collision with or electrocution by power lines;
- Loss of individuals and habitats due to exposure to toxic materials or crude oil releases (addressed in Section 3.13);
- Reduced survival or reproduction due to decreased abundance of forage species; and
- Interruption of foraging activities due to exposure to construction and operations noise and increased human activity.

Additional mitigation measures for each of the federally or state-listed threatened, endangered, or candidate species have been suggested by agency reviewers during consultation and review activities. These recommendations are described in detail in Sections 3.8.1.6 (federally listed species) and 3.8.2.6 (state-listed species). Specific recommendations for certain notable listed species are included below.

5.8.2 Additional Mitigation

(1) Based on consultation with USFWS and applicable state wildlife agencies, Keystone proposes the following mitigation measures to avoid impacts on nesting or winter roosting bald eagles:

(a) Conducting aerial and/or ground surveys prior to construction to locate any newly constructed nests and to determine the status of nests from February 1 through August 15. For the active nests, no construction (i.e., ground-disturbing activities) would occur within 1.0 mile of the nest between February 1 and August 15 (January 1 and July 15 for Missouri), unless permitted by USFWS. The 1-mile restriction would end when the young have fledged or the nest is not being used. The protection zones would not preclude travel through an area; a travel lane would be established that protects nests from direct short-term impact.

(b) Training construction personnel to minimize disturbance to the birds.

(c) Developing measures for identified communal winter bald eagle roosts within 1 mile of the construction ROW that may include avoidance of construction activities from 3 p.m. to 10 a.m. between November 1 and April 1, unless otherwise permitted by USFWS or other resource agencies. If warranted, additional mitigation measures would be developed through ESA Section 7 consultation.

(2) Keystone would conduct a search for gray bats prior to any activity that would affect caves in Madison County, Illinois or in Lincoln County, Missouri.

(3) If cutting of identified potential roost trees in woodlands with a habitat suitability index of more than 0.6 for Indiana bats is necessary, Keystone would schedule this cutting prior to April 1, their expected arrival date. Also Keystone would not clear trees from April 1 to September 30 in woodlands that have not been surveyed to determine habitat suitability for this species. If any Indiana bat maternity roost trees are located, applicable mitigation for these trees would be developed in consultation with USFWS and state wildlife agency personnel. Keystone would implement conservation measures to address the loss of Indiana bat summer habitat by working with USFWS, MDC, Missouri Department of Natural Resources, IDNR, and other potential cooperators in development of conservation. Mitigation ratios would be determined by USFWS giving consideration to actual habitat assessment and loss.

(4) Based on consultation with the IDNR, Keystone is currently developing an Incidental Take Permit (ITA) for the Massasauga and Kirtland's snake (see February 6, 2007 IDNR/ COE meeting summary in the March 2007 Supplemental Filing). Also, Keystone would place biological monitors in areas of appropriate native prairie/wet prairie habitats to locate and remove snakes ahead of construction.

(5) To avoid impacts on pallid sturgeon, Keystone would consult with individual states concerning potential water withdrawal from the Platte River drainage. According to USFWS, there would be no timing restriction for which water cannot be withdrawn from the lower Platte River drainage as long as water is returned to the source within the same calendar month. Keystone would work with Nebraska DNR to resolve timing concerns, particularly during the irrigation season.

(6) As described in Keystone's Biological Assessment, Keystone would implement mitigation measures for Topeka shiner streams, including:

(a) In-stream construction activities would be prohibited during the spawning period (May 15 through July 31) at specific stream crossings identified in consultation with USFWS, unless HDD methods are used. Outside of the spawning season, if construction would disturb streams with pool depths of 3 feet or greater, those pools would be seined at least 1 week prior to construction, and fish would be relocated upstream to a pool or location of similar depth.

(b) Erosion control measures would be implemented as described in Keystone's CMR Plan (Appendix B). Erosion and sediment controls would be monitored daily during construction to ensure their effectiveness, particularly after storm events.

(c) Banks and beds of streams would be restored using erosion control and revegetation measures, as described in Keystone's CMR Plan (Appendix B).

(7) As described in Keystone's draft Hydrostatic Test Plan (subject to approval by USFWS), additional measures would be implemented to avoid impacts on federally protected species in the lower Platte River basin, including:

(a) Cleaning of the pipeline with a brush pig prior to testing. Chemicals would not be added to the test water. Test water discharges would not contain oils or other substances in sufficient amounts to create a visible sheen on the surface of the receiving waters.

(b) Discharging test water back to the withdrawal location or to the vicinity of the withdrawal (same watershed). Keystone would consult with individual states and would acquire all necessary permits needed for water withdrawal from the Platte River.

5.9 LAND USE, RECREATION AND SPECIAL INTEREST AREAS, AND VISUAL RESOURCES

5.9.1 Conclusions

Agricultural, rangeland, forestland, recreational/special use, commercial, and residential land use classes would be affected in areas intersected by the proposed ROW. The largest amount of acreage that would be affected by the Keystone Project would be agricultural land, followed by rangeland.

Keystone is planning to undertake construction over an 18-month period, during which agricultural lands in the ROW would not be farmed. Keystone has agreed to compensate landowners for crop and other losses on a case-by-case basis. Keystone also has developed mitigation plans for limiting impacts on soil drainage mechanisms, compaction, irrigation systems, farm access areas, windbreaks and living fences, and CRP lands. After construction, nearly all agricultural land along the ROW would be allowed to return to production, and productivity is not expected to be reduced significantly over the long term. Approximately 109 acres would be necessary for construction of aboveground facilities; these acres would be permanently removed from farming production. Keystone has further sought to minimize impacts on rangelands by developing range-specific mitigation measures.

Although it is unclear at present exactly how many CRP acres would be affected by pipeline construction and operation, FSA has estimated that, in a worst-case scenario, over 16,000 acres of CRP land would be affected during construction, with over 6,500 acres remaining affected due to pipeline operation. It is likely that total affected CRP acreage would be less than these estimates. Impacts on CRP lands would include tilling of grasslands and clearance and tillage of forested lands; if within the operational ROW, these lands would not be allowed to regenerate during the life of the Project. Thus, impacts on these lands would be localized but long term. Keystone would address these impacts, and any impacts to Farmable Wetland Program Lands and WRP lands, with landowners on a case-by-case basis. Overall impacts on residential and commercial land uses are expected to be minor and would be addressed by Keystone through landowner negotiations on a case-by-case basis.

Recreational lands potentially affected include bike trails, sightseeing areas, hiking trails, and wildlife viewing areas; public lands are limited along the ROW. Construction activities are anticipated to cause only temporary impacts. Keystone would coordinate with agency and land use managers to reduce conflicts between construction activities and recreational uses. Additional measures are described in Section 5.9.2.

5.9.2 Additional Mitigation

(1) Keystone understands that FSA rules require that individual landowners contact their local FSA offices with regard to construction across lands covered by CRP contracts. For all verified enrolled acreage in CRP and other FSA conservation program areas intersected by the ROW, Keystone would assist all appropriate landowners with this effort. Keystone would confer with all appropriate FSA offices to ensure that these consultations meet FSA requirements. Keystone would comply with remediation and restoration requirements required by FSA.

(2) Keystone would utilize the state-specific NRCS Field Office Technical Guide (Appendix M) for mitigation and revegetation of areas damaged by construction. Keystone would consult with the local NRCS representatives to determine the adequacy of Keystone's CMR Plan and would supplement the plan as needed during construction and reclamation.

(3) Keystone would address mitigation, reclamation, and remediation measures, including the possible use of non-vegetative remediation pertaining to impacts to windbreaks, shelterbelts, and living snow fences, with individual landowners and would comply with any applicable state requirements.

(4) To further decrease the impact of forest clearance on recreation, Keystone would consult with land managers on state and federal lands regarding any necessary construction and maintenance restrictions consistent with management and use of such lands. Damages from disruption of recreational uses of private lands would be the subject of compensation negotiations with individual landowners. Where the pipeline follows an existing ROW in forested areas, Keystone would attempt to route the pipeline as close as practical to the existing ROW.

(5) To mitigate potential impacts on recreational resources in privately owned conservation areas, Keystone would consult with the owners of private conservation areas regarding any concerns related to disruption of recreational uses of such areas. Damages from disruption of recreational uses of private lands would be the subject of compensation negotiations with individual landowners. Where the pipeline follows an existing ROW in privately owned conservation areas, Keystone would attempt to route the pipeline as close as practical to the existing ROW.

(6) To decrease possible conflicts with hunting and other recreational activities in wildlife management and public conservation areas, Keystone would negotiate with individual land managers. Where the pipeline follows an existing ROW in privately owned conservation areas, Keystone would attempt to route the pipeline as close as practical to the existing ROW.

(7) To further reduce visual impacts from aboveground pipeline facilities and structures, Keystone would comply with standard industry painting practices with respect to aboveground facilities. Keystone would address any visual aesthetics issues with landowners in individual consultations.

(8) For the Milford Wildlife Area, the primary concerns are limited access and conflicts with hunters during construction. Therefore, Keystone would develop a site-specific crossing plan for the Milford Wildlife Area.

5.10 SOCIOECONOMICS

5.10.1 Conclusions

The proposed pipeline construction has the potential to generate substantial direct and indirect economic benefits. Keystone is expected to utilize temporary local construction labor where possible; it is estimated that from 10 to 15 percent of the total construction work force could be hired from local communities. Likewise, it is estimated that from 2,800 to 3,600 non-local residents would temporarily move into the area of influence. This would translate into 2,900 housing units, 14,400 rental units, and 34,100 hotel rooms. Keystone estimates that, at the local level, construction income benefits are expected to total from

$28 to $48 million. Approximately 40 percent of the cost of construction goods and services, or from $44 to $52 million, would be spent locally.

Potentially negative impacts include agricultural losses, which would be compensated by Keystone during the easement procurement process, and increased demands on local highways and emergency services. Keystone does not anticipate any other increased public expenditure. Some disruption of traffic flows would be expected; Keystone would use public and preexisting private roads to access most of the ROW. Any impacts on local roads would be repaired by Keystone.

Operations impacts also are expected to be positive. The cost of operational goods and services is estimated at $1.3 million per year, plus an additional $46.5 million for electricity. About 90 percent of this ($43 million) would be spent locally in the Project area. Approximately 26 permanent full-time jobs would be associated with operation of the pipeline, representing an annual payroll of $5.5 million. The project would generate additional property tax revenues of approximately $46.7 million throughout the Project area.

Agricultural losses along the pipeline corridor would likely be relatively low; however, in a very unlikely "worst case" scenario, over 16,000 acres of CRP enrolled lands could be affected. This scenario assumes that all acreage enrolled in the program along the corridor would be sufficiently affected that the land would need to be removed from the program according to the rules of the CRP program. In reality, the actual acreage that would be removed is likely to be a fraction of the overall enrolled acreage. Nonetheless, if all of the acreage were removed, affected landowners would lose $802,000 in annual rental income payments. Keystone has agreed to address the actual economic impacts resulting from crossing CRP lands on a case-by-case basis with the individuals potentially affected. Property value effects at the community or regional scale would likely be negligible for two reasons: (1) land uses on parcels adjacent to the pipeline would not be affected, and land could continue to be used in its highest and best use; and (2) the proposed pipeline would be underground and therefore would not adversely affect the regional amenity values that contribute to property values. In addition, as part of the ROW procurement process, Keystone would negotiate with the affected landowners to obtain an easement, compensating for any losses, including potential decreases in property values.

Expansion of the Wood River Refinery in response to increased crude oil deliveries from the Keystone pipeline is expected to generate both positive and adverse socioeconomic effects. Expansion of the Wood River Refinery is estimated to cost approximately $1 billion, which likely would include expenditures on capital equipment, other goods and materials, services, and labor. To the extent that these expenditures are made in the local region, for example Madison County, and industries are present to meet Project demands, the Project would result in substantial regional economic benefits. Within an input-output model framework, these benefits would include increases in direct, indirect, and induced economic output; value added (i.e., labor income, other property income, and indirect business taxes); and employment in the region.

In the long term, expansion of the Wood River Refinery would result in greater refining capacity and increased production/output in the refined petroleum industry. Based on an estimated 340,000 bpd in increased crude oil shipments and an approximate crude oil contract price of $60 per barrel, the estimated value of refinery inputs is $20.4 million per day, or $744.6 million annually. Other socioeconomic parameters that could be affected by expansion of the Wood River Refinery include increases in fiscal revenues and increased demands for public services and other local resources.

Potentially adverse socioeconomic effects could occur—particularly during construction—as a result of increased demand for a range of public services, including law enforcement, fire protection, and medical aid. This could disproportionately affect lower income areas. Depending on the characteristics of the construction workforce, demands may increase for short-term housing in the region, such as hotels/motels and rental units, driving rents up and affecting lower income or minority populations. Other environmental justice concerns, such as disproportionate air and water quality impacts to communities, would not be expected.

Mitigation to address impacts on CRP lands is summarized in Section 5.9.2. No additional mitigation measures have been recommended, other than those proposed by Keystone in Sections 3.9 and 3.10.

5.11 CULTURAL RESOURCES

5.11.1 Conclusions

Section 106 of the NHPA, as amended, requires the lead federal agency with jurisdiction over a federal undertaking (i.e., a project, activity, or program that is funded by a federal agency or that requires a federal permit, license, or approval) to assess effects to historic properties within the project's area of potential effect before that undertaking occurs. A historic property is defined as a cultural resource, such as a district, archeological site, building, structure, or object (including a traditional cultural property and/or sites of cultural and religious importance) that is listed, or eligible for listing, in the NRHP. Keystone, through its contractors, has examined those portions of the Keystone Mainline Project and Cushing Extension pipeline for which survey permission was obtained. Keystone also has purchased the rights to use cultural resources survey results for overlapping portions of the proposed REX natural gas pipeline in Nebraska, Kansas, and Missouri. The potential environmental impacts of the REX pipeline were assessed by FERC as part of FERC Docket No. CP06-354-000. DOS, the Nebraska SHPO, the Kansas SHPO, and the Missouri SHPO have approved Keystone's use of the REX survey results for the Keystone Project.

Reports filed by Keystone indicate that the combined Keystone Mainline Project, Keystone Cushing Extension, and REX cultural resources field inventory studies have identified 347 cultural resources within the Project APE as of November 2007. DOS, in consultation with the SHPOs and other consulting parties, have made the following determinations regarding eligibility of these resources for listing in the NRHP, based on the NRHP criteria of significance (36 CFR 60.4 [a-d]):

- One site identified within the Project APE, the 101 Ranch District in Kay County, Oklahoma is a National Historic Landmark that is listed in the NRHP.
- Three sites listed in Section 3.11.2 of the EIS have been determined Eligible for listing in the NRHP under 36 CFR 60.4(d) (the ability to yield information important to history or prehistory) and thus are considered historic properties under Section 106 guidelines.
- Ninety-five of the identified cultural resources listed in Section 3.11.2 of the EIS have been designated as "Unevaluated," meaning that insufficient data are available for DOS to state definitively that the cultural resource does, or does not, meet the criteria of significance for listing in the NRHP. They are thus considered potential historic properties.
- Two hundred forty-eight cultural resources listed in Section 3.11.2of the EIS have been determined Not Eligible for listing in the NRHP and thus are not considered historic properties under Section 106 guidelines.

An additional eight cultural resources were discussed within the documents filed by Keystone; however, their contractors determined through field investigations that these cultural resources did not extend into the Project APE or had been destroyed by previous land activities. No determination of eligibility of effect is required for these cultural resources.

All of the cultural resources identified to date have resulted from field studies conducted by Keystone's contractors. DOS continues its consultation with federally recognized Indian tribes to determine whether any TCPs or properties of cultural or religious significance are located within the Mainline Project or Cushing Extension APEs.

A Programmatic Agreement (PA), as permitted under 36 CFR 800, is being used to conclude Section 106 review. The PA is a binding protocol for its parties regarding the identification, evaluation, and treatment of historic properties during construction of the Mainline Project and Cushing Extension. The text of the PA can be found in Appendix R. If there is any disagreement between parties that have signed a PA and these recommendations, the process for resolving disagreements outlined in the PA shall be followed.

Keystone has stated that its preferred option will be to avoid adverse effects to all historic properties (Eligible properties) and potential historic properties (Unevaluated properties) that are identified within the APE of the Mainline Project and the Cushing Extension. Additional mitigation measures are listed in Section 5.11.2.

5.11.2 Additional Mitigation

(1) Keystone would file the evaluation, avoidance, and/or treatment plans necessary to make a determination of effect for all Eligible and Unevaluated properties that have been identified within the Project APE, using the format and list of properties presented in Section 3.11.2 of the EIS. Construction in these areas should not occur until DOS, in consultation with the SHPO and other relevant consulting parties, reviews and approves all plans and notifies Keystone in writing that it may proceed with the treatment plan or construction.

(2) Keystone has not yet completed cultural resources inventory and geoarcheological testing studies for portions of the Mainline Project and Cushing Extension, as described in Section 3.11.2 of the EIS. Keystone shall defer construction and use of each area until:

- (a) Keystone files the additional required cultural resources inventory and geomorphological reports with DOS and the relevant SHPO (or federal agency, if federally managed lands are involved);
- (b) DOS has had the opportunity to consult with Indian tribes, SHPOs, federal and state agencies, and the public; to assess all report findings; and make determinations of eligibility for all cultural resources identified within the currently unreported areas;
- (c) DOS has consulted with Indian tribes, SHPOs, or other interested and consulting parties, where applicable, to ensure that newly proposed project areas do not conflict with TCPs and/or properties of cultural or religious importance;
- (d) DOS has provided the evaluation, avoidance, and/or treatment plans necessary to make a determination of effect for all cultural resources within the Project APE that are determined by DOS to be Eligible historic properties or Unevaluated properties, using the format described in Section 3.11.2 of the EIS;
- (e) DOS, along with the Indian tribes, SHPOs, ACHP, and other federal and state agencies, have been provided an opportunity to review and comment on any mitigation or treatment plans that are filed for historic or potential historic properties that would be adversely affected by Project construction; and

(f) DOS has notified Keystone in writing that it may proceed with the treatment plan or construction.

All material filed with DOS that contains location, character, and ownership information about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering:
"CONTAINS PRIVILEGED INFORMATION- DO NOT RELEASE."

(3) The South Dakota SHPO, upon reviewing the filed technical reports, has recommended that Keystone conduct some additional cultural resource surveys and has indicated to DOS that subsurface testing may be warranted in some areas that are still undergoing SHPO review. Keystone would conduct the additional survey requested by the South Dakota SHPO and report these findings to both the SHPO and DOS for evaluation, prior to construction commencing.

5.12 AIR AND NOISE

5.12.1 Conclusions

Construction of the proposed Keystone Project would be similar to other pipeline projects in terms of schedule, equipment used, and types of activities. Because pipeline construction would move through an area relatively quickly, air emissions typically would be localized, intermittent, and short term. Emissions from fugitive dust, construction equipment combustion, open burning, and temporary fuel transfer systems and associated tanks would be controlled to the extent required by state and local agencies, as explained above. Because Keystone would be required to comply with applicable regulations, emissions from construction-related activities would not significantly affect local or regional air quality. Project operations would not produce significant air quality impacts, and only minor emissions from the backup gasoline generator and fugitive emissions from valves, tanks, and pumping equipment would occur. Because operating emissions are expected to be minimal, no operational permits would be required.

Construction would increase noise levels in the vicinity of Project activities; noise levels would vary during the construction period, depending on the construction phase. Residential, agricultural, and commercial areas within 500 feet of the Mainline Project and the Cushing Extension ROW would experience short-term inconvenience from construction equipment noise. Noise impacts from construction would be mitigated in accordance with Keystone's CMR Plan (Appendix B) to reduce effects on individuals, sensitive areas, and livestock. To limit disturbance of residential and commercial areas within 500 feet of construction activities by increased noise levels, Keystone would give advanced notice to landowners prior to construction, limit the hours during which construction activities with high-decibel noise levels are conducted, and ensure that construction proceeds quickly through such areas. Additional recommendations are summarized in Section 5.12.2.

During operation of the pipeline, the noise associated with the electric pump stations would be limited to the immediate vicinity of the facilities. Although noise impacts from the electric pump stations are projected to be minor, Keystone would perform a noise assessment survey during operations to confirm the level of noise at each listed noise-sensitive area. Project-related operations therefore are not expected to result in a significant effect on the noise environment. Additional mitigation is described in Section 5.12.2.

5.12.2 Additional Mitigation

(1) Dust control measures in addition to those described in the CMR Plan (Appendix B) may be required by state or local ordinances. Keystone would comply with all applicable state and local regulations with respect to truck transportation and fugitive dust emissions.

(2) Keystone would set up a toll-free telephone line for landowners to report any construction noise-related issues.

(3) It is understood that during occasional, short-term intervals, noise levels would exceed 55 dBa. There are no regulations in rural areas along the pipeline route applicable to construction noise. In municipal areas, pipeline construction noise levels would comply with any applicable municipal regulations. In areas near residences and businesses where construction activities or noise levels may be considered disruptive, Keystone would coordinate work schedules to minimize disruption.

5.13 RELIABILITY AND SAFETY

5.13.1 Conclusions

The Keystone pipeline system would be designed, constructed, and maintained in a manner that meets or exceeds industry standards and regulatory requirements. The proposed Keystone Project would be built within an approved ROW. Signage would be installed at all road, railway, and water crossings—indicating that a pipeline is located in the area—to help prevent third-party damage or impact to the pipeline. Keystone would manage a crossing and encroachment approval system for all other operators. Keystone would ensure safety near its facilities through a combination of programs encompassing engineering design, construction, and operations; public awareness and incident prevention programs; and emergency response programs.

The reliability and safety of the Keystone project can be expected to be well within industry standards. Further, the low probability of large, catastrophic spill events and the routing of the pipeline to avoid most sensitive areas suggest a low probability of impacts to human and natural resources. Nevertheless, some potential for construction- and operations-related spills can be expected. Commitments and procedures described for reliability and safety in this section and in Appendices B and C are intended to mitigate spill effects, particularly when considered in combination with rapid and effective response and clean-up procedures.

To prevent or mitigate potential oil spills during pipeline construction, measures would be implemented at each construction or staging area where fuel, oil, or other liquid hazardous materials are stored, dispensed, or used. In addition to the mitigation included in the CMR Plan (Appendix B), Keystone has agreed to the mitigation measures in Section 5.13.2.

5.13.2 Additional Mitigation

(1) For all locations subject to CWA Section 311, Keystone would prepare a site-specific oil SPCC Plan that contains all requirements of 40 CFR Part 112 for every location used for staging fuel or oil storage tanks and for every location used for fuel or oil transfer—even if the site-specific oil capacity is below the threshold stated in that rule to require such a plan.

Each SPCC Plan would be prepared and submitted prior to introducing the subject fuel, oil, or hazardous material to the subject location.

(2) Prior to construction, all project personnel would be given an orientation outlining the environmental permit requirements and environmental specifications, including the requirement that fuel or oil storage tanks cannot be placed closer than 100 feet to wetlands or water bodies.

(3) Environmental inspectors would place signs a minimum of 100 feet from the boundaries of all wetlands and water bodies prior to construction. The construction contractor would not be allowed to place a fuel or oil storage tank without first getting the EI to inspect the tank site for compliance with the 100-foot setback requirement and receiving approval of the tank site from the EI.

(4) During construction, no fuel or storage tank would be allowed to be relocated within or to a new construction yard by the contractor without first getting the EI to inspect the tank site for compliance with the 100-foot setback requirement and receiving approval of the tank site from the EI.

(5) Fuel and storage tanks would be placed only at contractor yards. No fuel and storage tanks would be placed on the construction ROW.

(6) No oil or hazardous material storage, staging, or transfer other than refueling would occur within 50 feet of any surface water body, surface drainage, storm drain drop inlet, or HCA.

(7) Any fuel truck that transports and dispenses fuel to construction equipment or Keystone Project-related vehicles along the construction ROW or within equipment staging and material areas would carry an oil spill response kit and spill response equipment onboard at all times. In the event that response materials are depleted through use, or their condition is deteriorated through age, the materials would be replenished prior to placing the fueling vehicle back into service.

(8) Oil and other hazardous materials stored in 350-gallon totes, 55-gallon drums, 5-gallon pails, smaller retail-sized containers or other portable containers would be staged or stored in areas with a secondary means of containment.

(9) Fixed-fuel dispensing locations would be provided, with a means of secondary containment to capture fuel from leaks, drips, and overfills.

5.14 REFERENCES

APLIC. See Avian Power Line Interaction Committee.

Avian Power Line Interaction Committee. 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, DC and Sacramento, CA. Available online at: <http://www.aplic.org/>. Accessed on December 6, 2006.

ENSR. 2006a. Keystone Pipeline Project Environmental Report. Updated November 15, 2006.

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