PROPOSED ACTION AND ALTERNATIVES

CHAPTER 2

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 Proposed Action

Keystone proposes to construct and operate an interstate crude oil transmission system from an oil supply hub near Hardisty, Alberta, in Canada to destinations in the U.S. In the U.S., the Keystone Mainline will consist of 1,078 miles of new pipeline constructed from the U.S./Canadian border in Cavalier County, North Dakota, to existing terminals and refineries in Wood River (Madison County) and Patoka (Marion County), Illinois. The proposed pipeline will consist of 1,023 miles of 30-inch pipe between the Canadian border and Wood River, Illinois and a 55-mile segment of 24-inch pipeline between Wood River and Patoka, Illinois. The Cushing Extension will consist of approximately 292 miles of 36-inch pipeline commencing in Jefferson County near the Nebraska-Kansas border and terminating at existing crude oil terminals in Cushing (Payne County), Oklahoma. **Table 2.1-1** summarizes the mileage by state.

Table 2.1-1 Miles of Pipe per State

	North Dakota	South Dakota	Nebraska	Kansas	Missouri	Illinois	Oklahoma	TOTAL
KEYSTONE MAINLINE								
(miles)	216.9	218.9	213.7	98.8	273.1	56.5	0.0	1,077.9
CUSHING EXTENSION								
(miles)	0.0	0.0	2.4	209.7	0.0	0.0	79.7	291.8
PROJECT TOTAL	**216.9**	**218.9**	**216.1**	**308.5**	**273.1**	**56.5**	**79.7**	**1,369.7**

In addition to the pipeline, Keystone will construct aboveground facilities including pump stations, delivery facilities, mainline valves, and densitometers. Powerlines required for pump stations, remotely activated valves, and densitometers will be constructed and operated by local utility providers, not by Keystone. An overview map of the project location is provided in **Figure 2.1-1**, while **Figures 2.1-2** to **2.1-9** are state-specific maps showing the pipeline route and aboveground facilities.

Keystone proposes to begin construction of the project in early 2008. Construction will occur over an approximately 18-month period. Keystone is proposing an in-service date for the Keystone Mainline of no later than November 2009. Work on the Cushing Extension will begin in late 2009 or early 2010, with a Cushing Extension in-service date of 2010.

The pipeline will be constructed primarily in rural areas, with more populated areas occurring around Troy and the St. Louis area (Missouri) and Wood River and Edwardsville (Illinois). The pipeline will be constructed of high-strength steel pipe (American Petroleum Institute [API] 5L). An external coating (fusion bonded epoxy [FBE]) will be applied to the pipeline and all buried facilities to protect against corrosion. Cathodic protection will be provided by impressed current. All pipe will be manufactured, constructed, and operated in accordance with applicable local, state, and federal regulations.

Aboveground facilities for the Keystone Mainline will include 23 pump stations (certain stations will contain pigging facilities), two delivery sites, and 45 mainline valves and three densitometer sites within the ROW (**Table 2.1-1**). Each pump station will have one additional block valve. These additional valves are not included within the mainline valve totals. The pump stations will enable Keystone to maintain the pressure required to

make crude oil deliveries. Meters within the delivery facilities will measure crude oil deliveries to proposed customer locations Wood River, Illinois and Patoka, Illinois. The Wood River delivery facility site will be constructed outside of the receiving terminal, while the delivery facility in Patoka will be located within the terminal.

Aboveground facilities for the Cushing Extension will include three pump stations, two delivery facilities (with the delivery facilities containing pigging facilities), 12 mainline valves and two densitometer sites within the ROW. The Keystone delivery facility will be located adjacent to operational tanks in Ponca City and Cushing, Oklahoma.

If future market conditions warrant, one to three additional pumps will be added at the existing pump stations along the Keystone Mainline and Cushing Extension to achieve a throughput to 591,000 bpd. Such increased throughput will require one additional pump station (Pump Station Number 38, containing two pumps) to be constructed along the Keystone Mainline in Bond County, Illinois.

As previously mentioned, electric power infrastructure for the Keystone Pipeline Project will be constructed, permitted, and operated by local utility providers, not by Keystone.

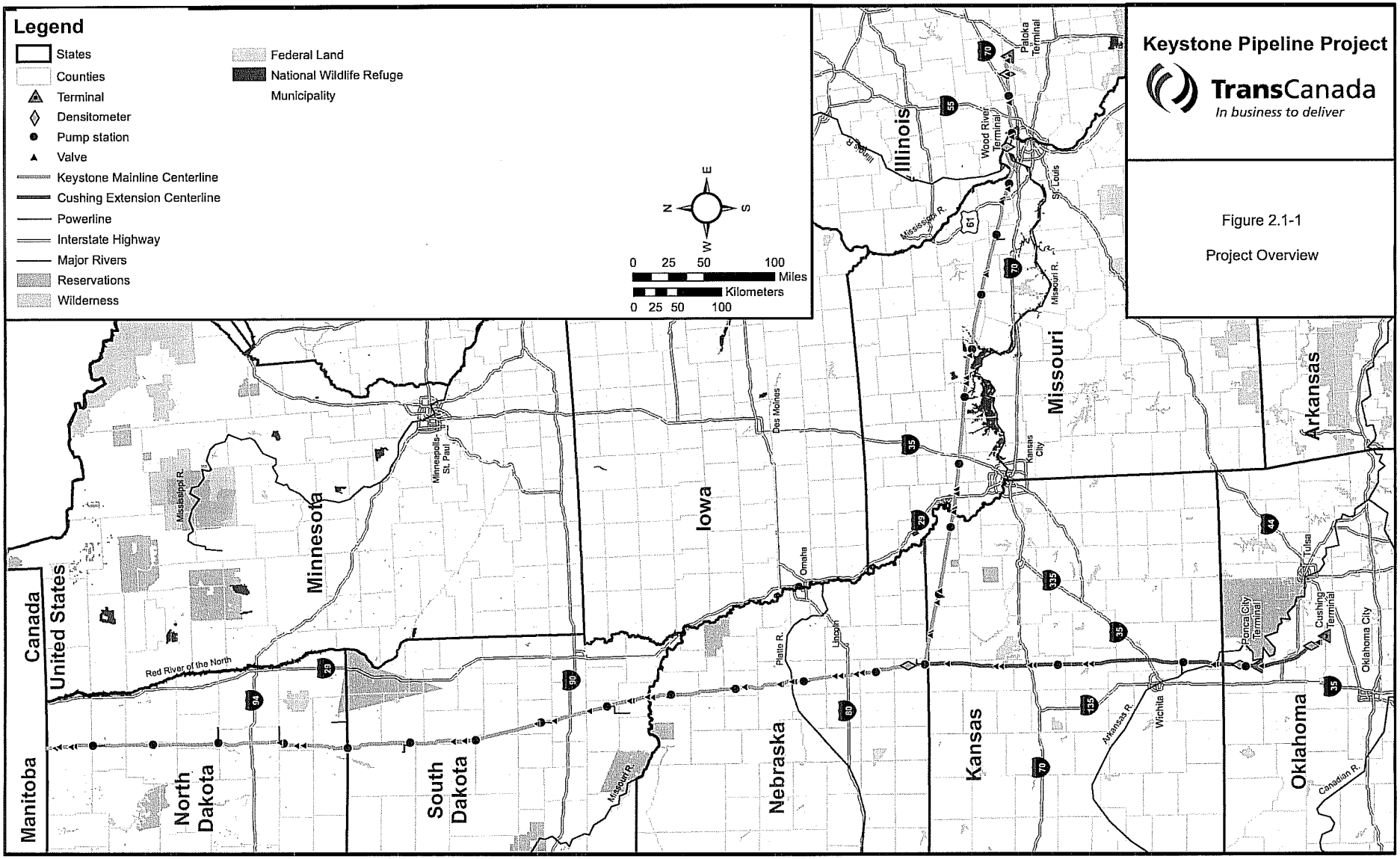
2.1.1 Land Requirements

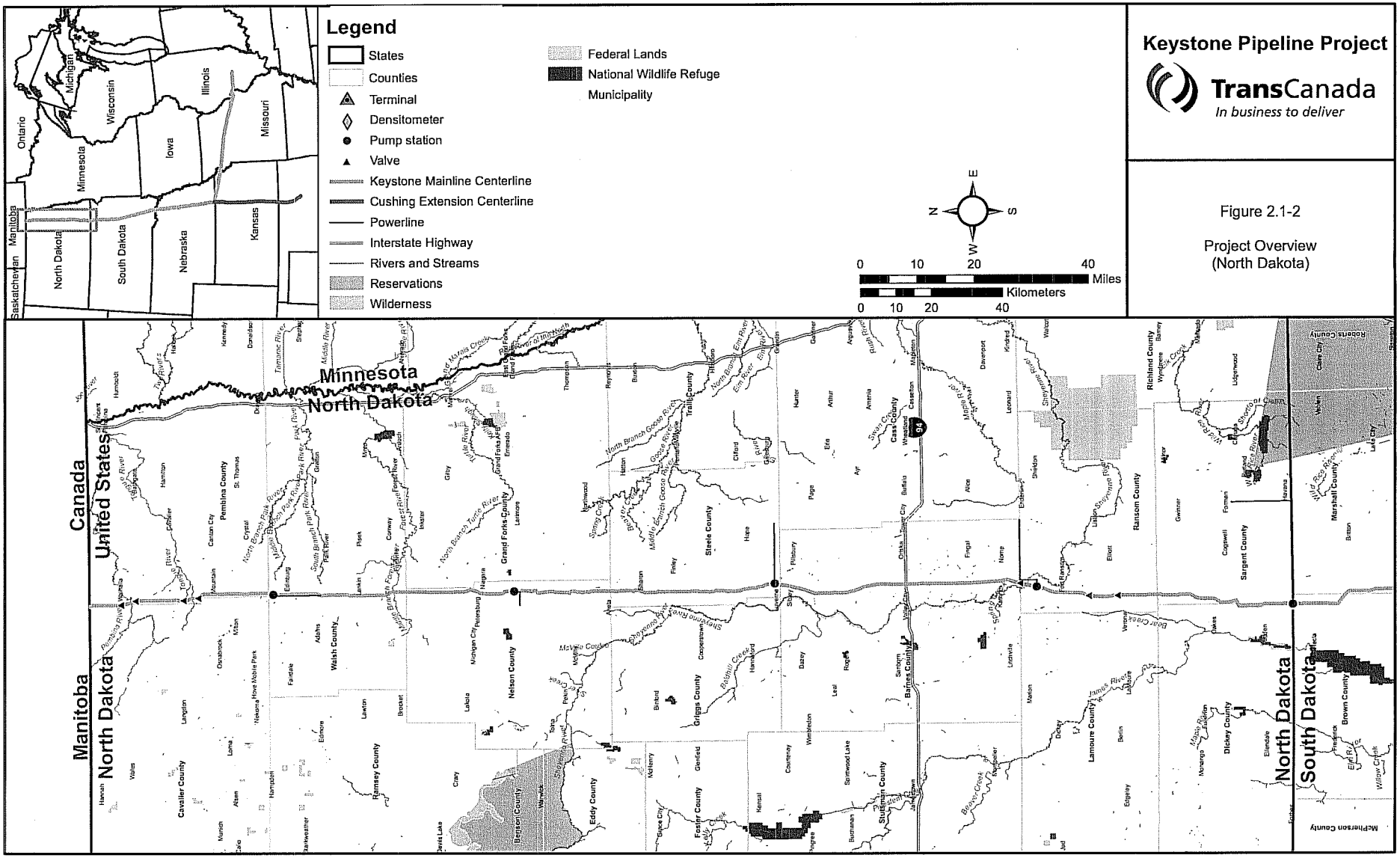
Table 2.1-2 summarizes the land requirements for the proposed Keystone Pipeline Project. Keystone will construct the Keystone Mainline using 30-inch pipe except in Illinois where 24-inch pipe will be used between Wood River and Patoka. The Cushing Extension will consist of 36-inch pipeline. With the exception of Illinois, Keystone will construct both the Mainline and the Cushing Extension within a 110-foot-wide corridor, consisting of both a temporary 60-foot-wide construction ROW and a 50-foot permanent ROW. In Illinois, where a portion of the Keystone Pipeline will be a 24-inch pipeline, the project will be constructed within a 95-foot-wide corridor, consisting of both a temporary 45-foot-wide construction ROW and a 50-foot permanent ROW. **Figures 2.1-10** through **2.1-13** illustrate the typical construction ROW and equipment work locations in areas where the proposed pipeline is not located near an existing pipeline. **Figures 2.1-14** through **2.1-17** illustrate the proposed construction ROW in areas where the pipeline will be located parallel to an existing pipeline. Keystone will reduce the construction ROW width to 85 feet in certain wetlands, shelterbelts, other forested areas, residential areas, and commercial/industrial areas.

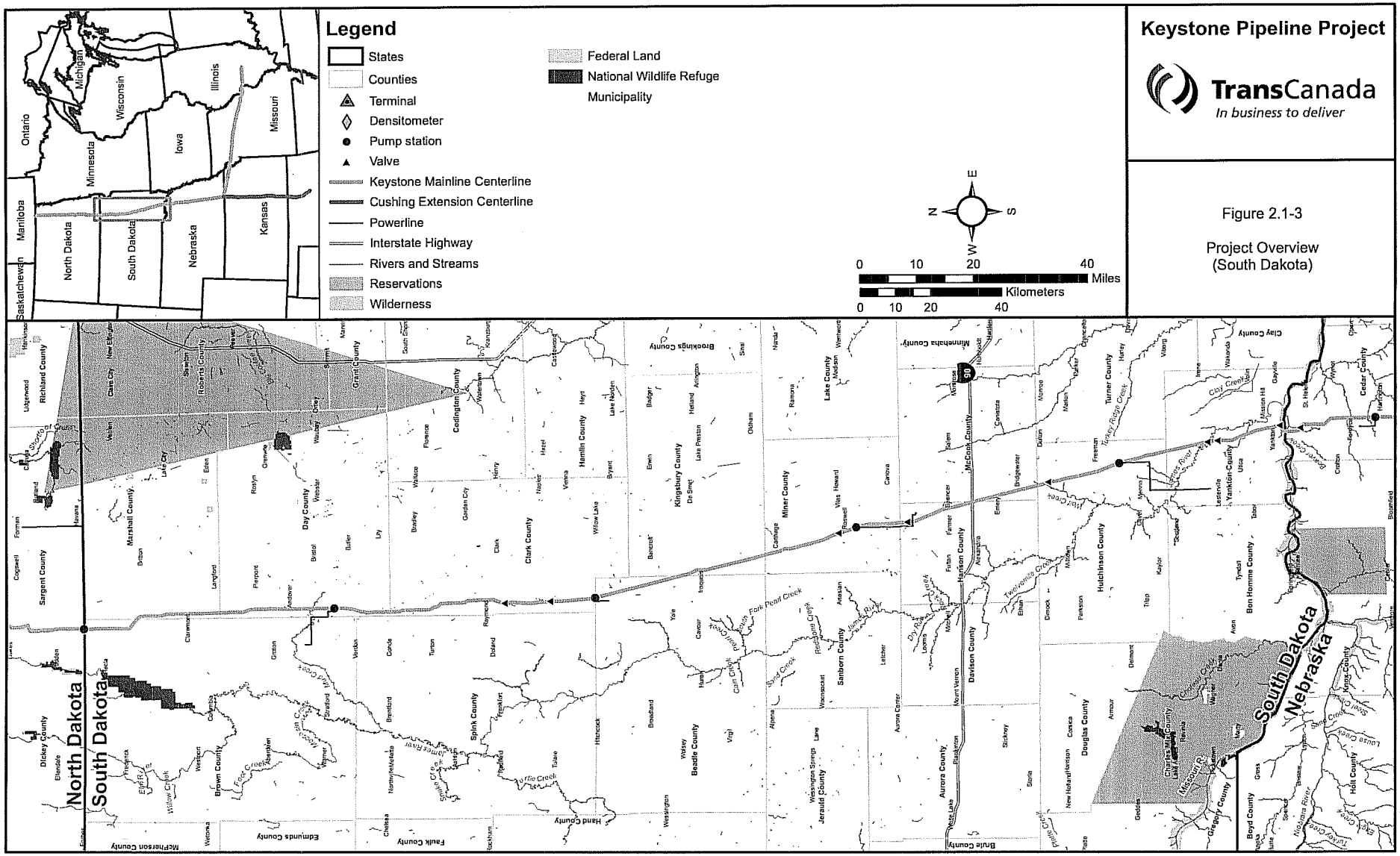
Surface disturbance associated with the construction and operation of the Keystone Pipeline Project is summarized in **Table 2.1-2**. For the Keystone Mainline, approximately 16,648 acres of land will be disturbed during construction. This total includes temporary construction workspace and approximately 6,595 acres, which will be retained as permanent ROW. All disturbed acreage will be restored and returned to its previous aboveground use after construction, except for approximately 61 acres of permanent ROW, which will not be restored but will serve to provide adequate space for aboveground facilities, including pump stations, valving, etc. for the life of the pipeline.

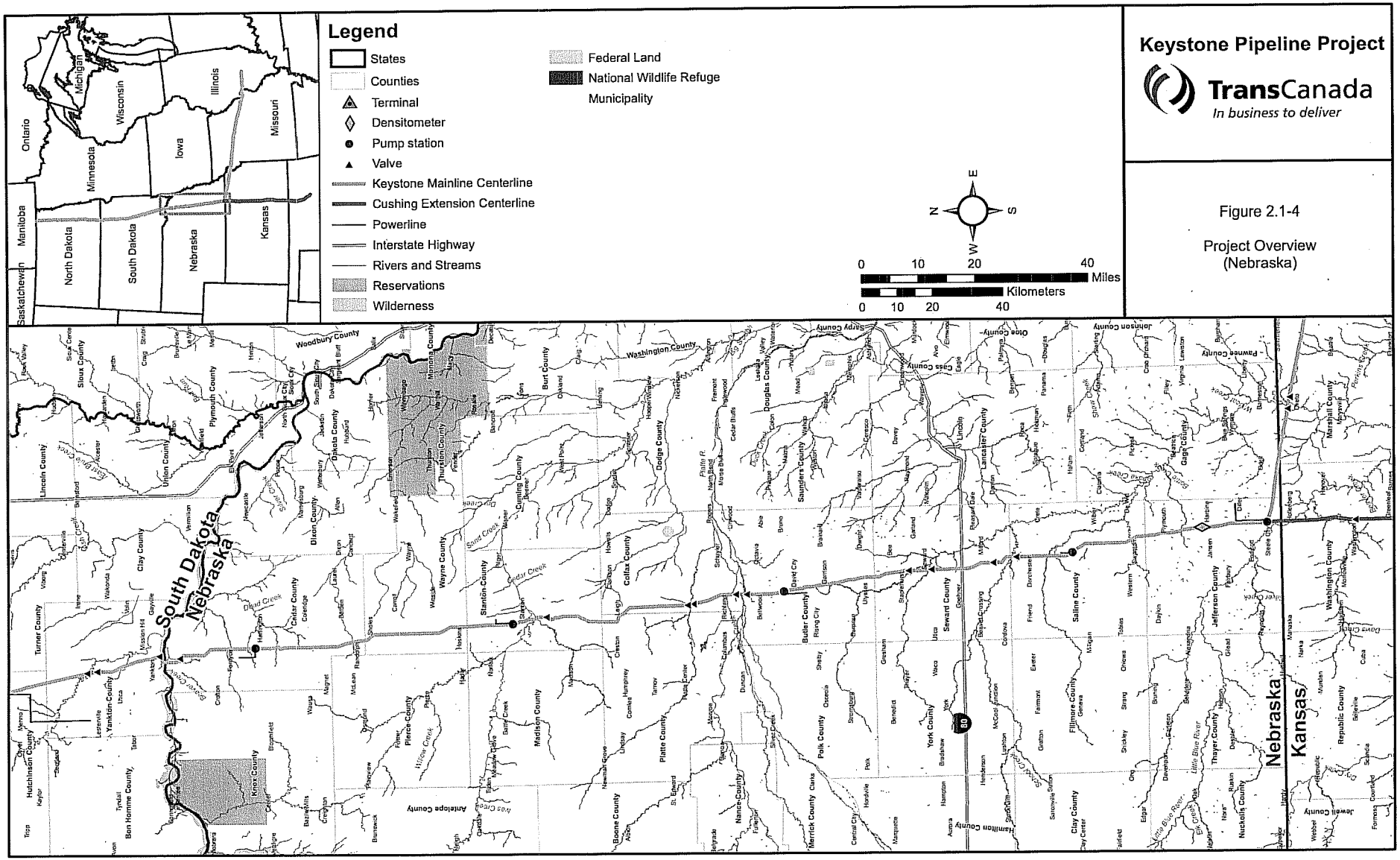
For the Cushing Extension, approximately 4,573 acres of land will be disturbed during construction. This total includes temporary construction workspace and approximately 1,789 acres, which will be retained as permanent ROW. All disturbed acreage will be restored except for approximately 13 acres of permanent ROW, which will not be restored but will serve to provide adequate space for aboveground facilities, such as pump stations and valving, for the life of the pipeline.

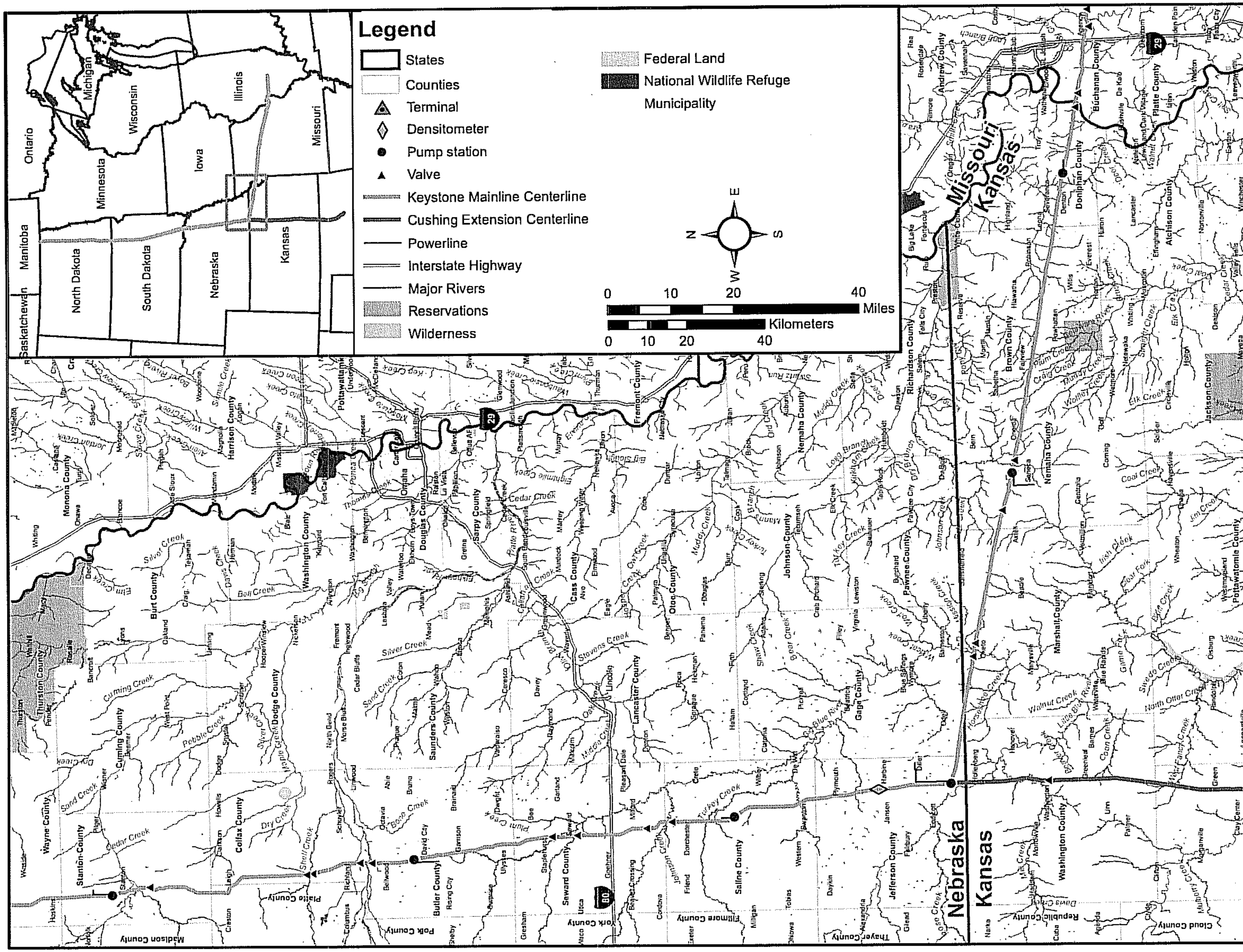
Almost all of the land affected by the construction and operation of the Keystone Pipeline Project will be privately owned; less than one percent will be public lands. A detailed description of land ownership is presented in **Table 1.1-1**.


Legend
States
Counties
Terminal
Densitometer
Pump station
Valve
Keystone Mainline Centerline
Cushing Extension Centerline
Powerline
Interstate Highway
Major Rivers
Reservations
Wilderness
Federal Land
National Wildlife Refuge
Municipality
N
E
S
W
0 25 50 100
Miles
Kilometers
0 25 50 100
Keystone Pipeline Project
TransCanada
In business to deliver
Figure 2.1-1
Project Overview
Canada
United States
Manitoba
North Dakota
South Dakota
Minnesota
Iowa
Nebraska
Kansas
Missouri
Arkansas
Oklahoma
Illinois
Red River of the North
Mississippi R.
Missouri R.
Platte R.
Arkansas R.
Canadian R.
Minneapolis-St. Paul
Des Moines
Omaha
Lincoln
Kansas City
St. Louis
Wood River Terminal
Patoka Terminal
Ponca City Terminal
Cushing Terminal
Tulsa
Oklahoma City
Wichita


Legend
States
Counties
Terminal
Densitometer
Pump station
Valve
Keystone Mainline Centerline
Cushing Extension Centerline
Powerline
Interstate Highway
Rivers and Streams
Reservations
Wilderness
Federal Lands
National Wildlife Refuge
Municipality
N
E
S
W
0 10 20 40 Miles
0 10 20 40 Kilometers
Keystone Pipeline Project
TransCanada
In business to deliver
Figure 2.1-2
Project Overview
(North Dakota)
Canada
United States
Manitoba
North Dakota
Minnesota
North Dakota
South Dakota
Ontario
Saskatchewan
Michigan
Wisconsin
Illinois
Minnesota
Iowa
Missouri
North Dakota
South Dakota
Nebraska
Kansas
Manitoba


Legend
States
Counties
Terminal
Densitometer
Pump station
Valve
Keystone Mainline Centerline
Cushing Extension Centerline
Powerline
Interstate Highway
Rivers and Streams
Reservations
Wilderness
Federal Land
National Wildlife Refuge
Municipality
N
E
S
W
0 10 20 40 Miles
0 10 20 40 Kilometers
Keystone Pipeline Project
TransCanada
In business to deliver
Figure 2.1-3
Project Overview
(South Dakota)
North Dakota
South Dakota
Nebraska
Ontario
Manitoba
Saskatchewan
Minnesota
Wisconsin
Michigan
Illinois
Iowa
Missouri
Kansas


Legend
States
Counties
Terminal
Densitometer
Pump station
Valve
Keystone Mainline Centerline
Cushing Extension Centerline
Powerline
Interstate Highway
Rivers and Streams
Reservations
Wilderness
Federal Land
National Wildlife Refuge
Municipality
Ontario
Manitoba
Saskatchewan
Minnesota
Wisconsin
Michigan
Illinois
Missouri
Iowa
North Dakota
South Dakota
Nebraska
Kansas
0 10 20 40 Miles
0 10 20 40 Kilometers
South Dakota
Nebraska
Kansas
Keystone Pipeline Project
TransCanada
In business to deliver
Figure 2.1-4
Project Overview
(Nebraska)

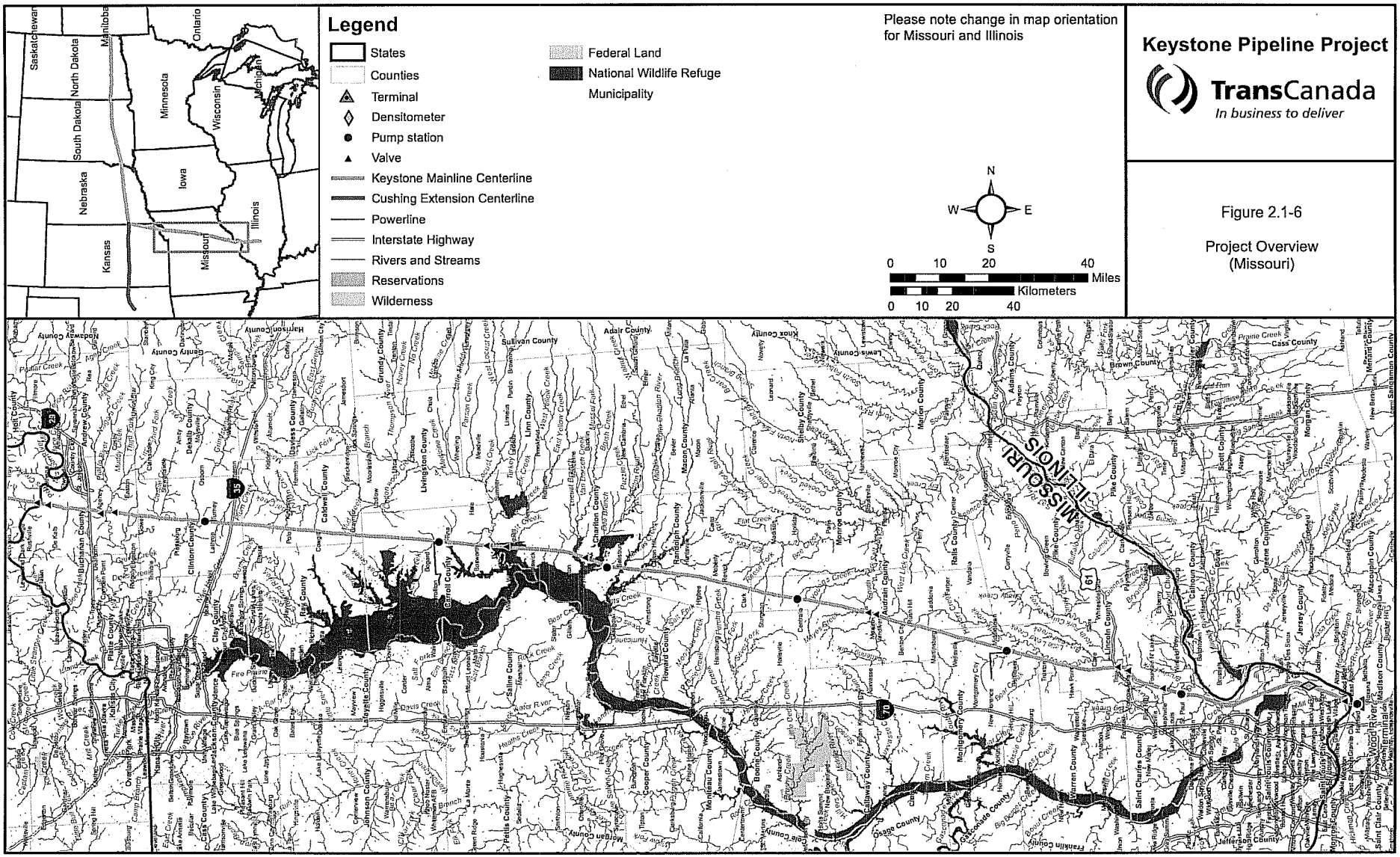


Keystone Pipeline Project

TransCanada
In business to deliver

Figure 2.1-5

Project Overview
(Kansas-Mainline)

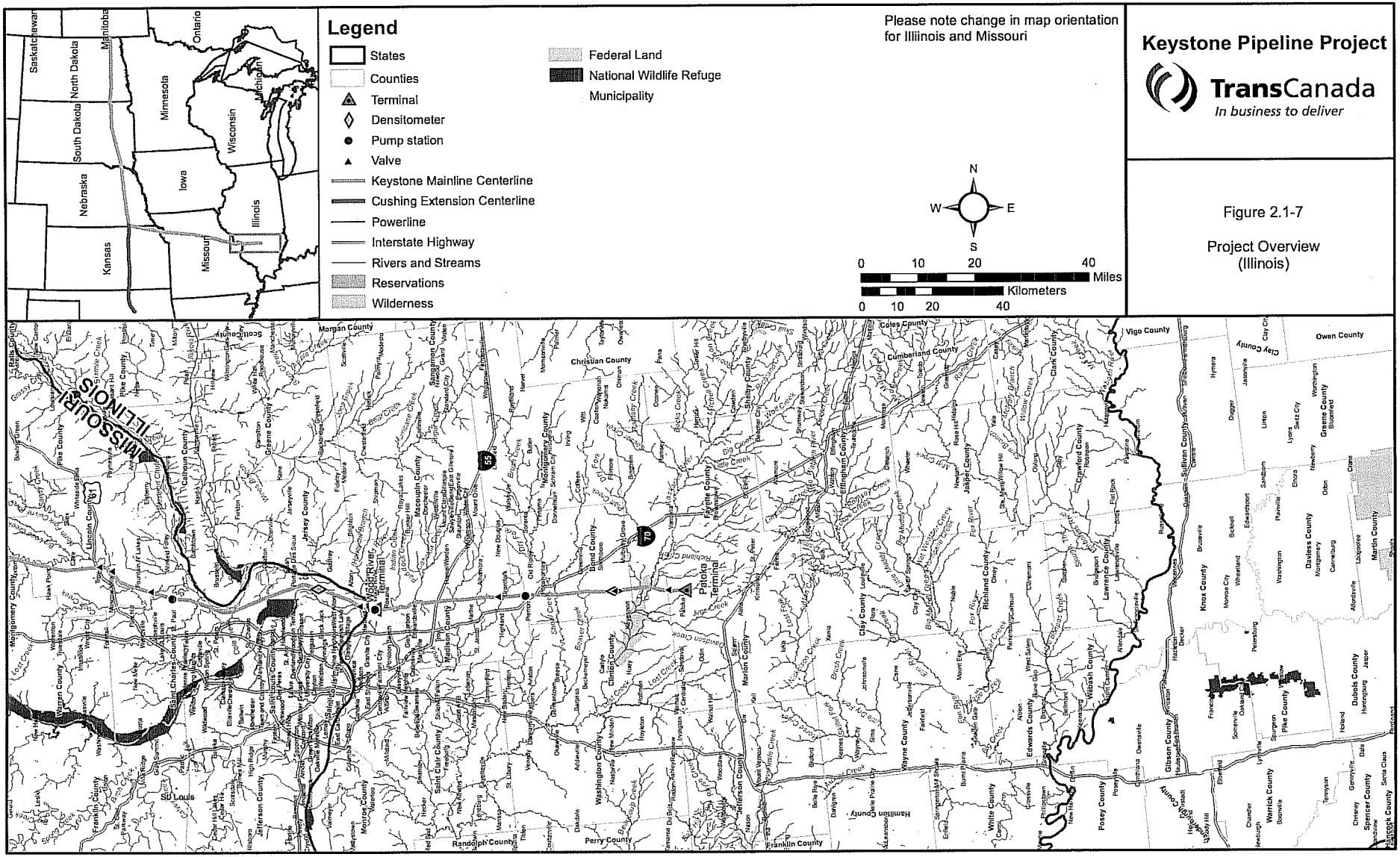


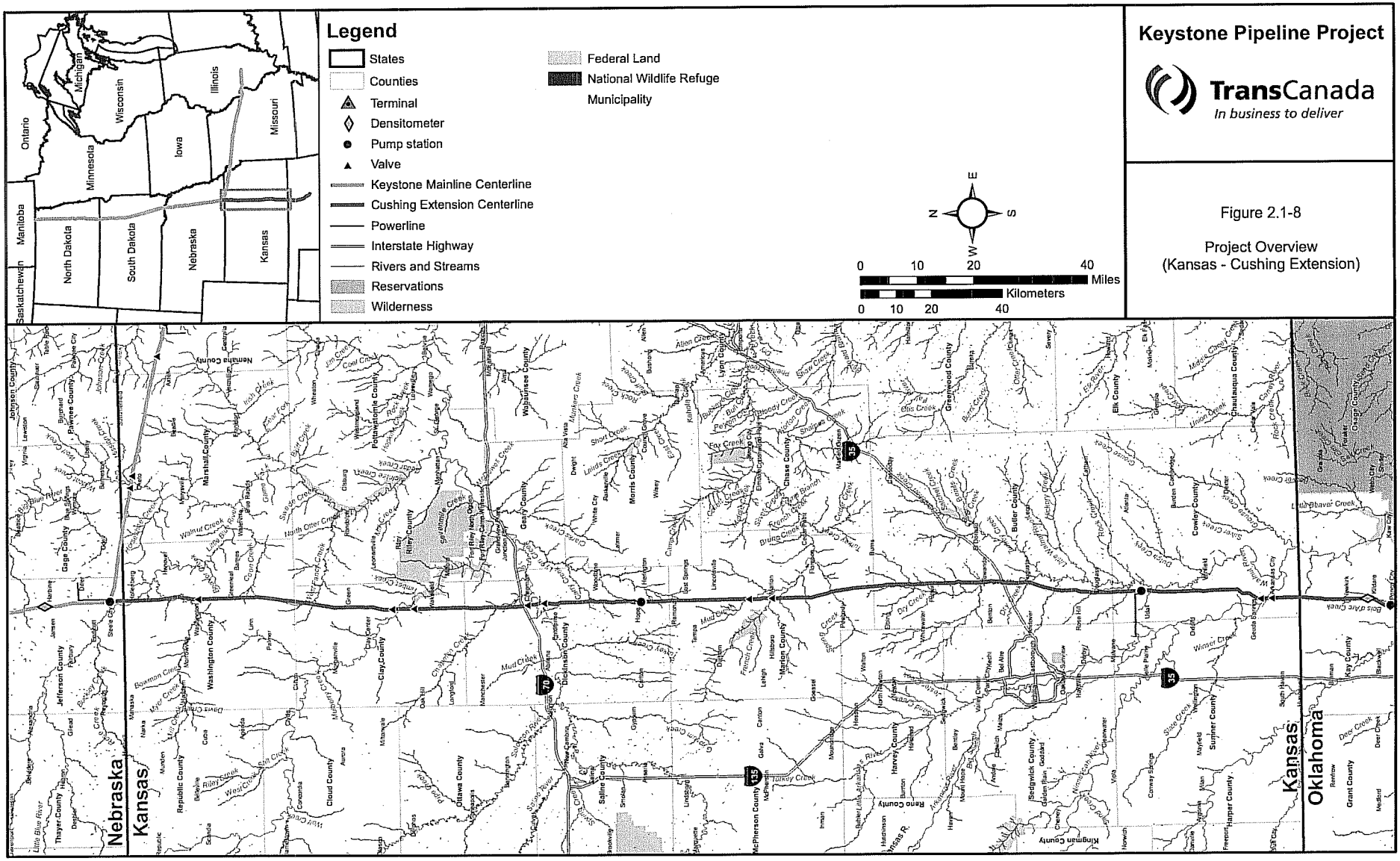
Keystone Pipeline Project

TransCanada
In business to deliver

Figure 2.1-6

Project Overview
(Missouri)


Legend
States
Counties
Terminal
Densitometer
Pump station
Valve
Keystone Mainline Centerline
Cushing Extension Centerline
Powerline
Interstate Highway
Rivers and Streams
Reservations
Wilderness
Federal Land
National Wildlife Refuge
Municipality
Please note change in map orientation for Illiinois and Missouri
N
W
E
S
0 10 20 40 Miles
0 10 20 40 Kilometers
Saskatchewan
Manitoba
Ontario
North Dakota
South Dakota
Nebraska
Kansas
Minnesota
Iowa
Missouri
Wisconsin
Michigan
Illinois
MISSOURI
ILLINOIS
Keystone Pipeline Project
TransCanada
In business to deliver
Figure 2.1-7
Project Overview
(Illinois)

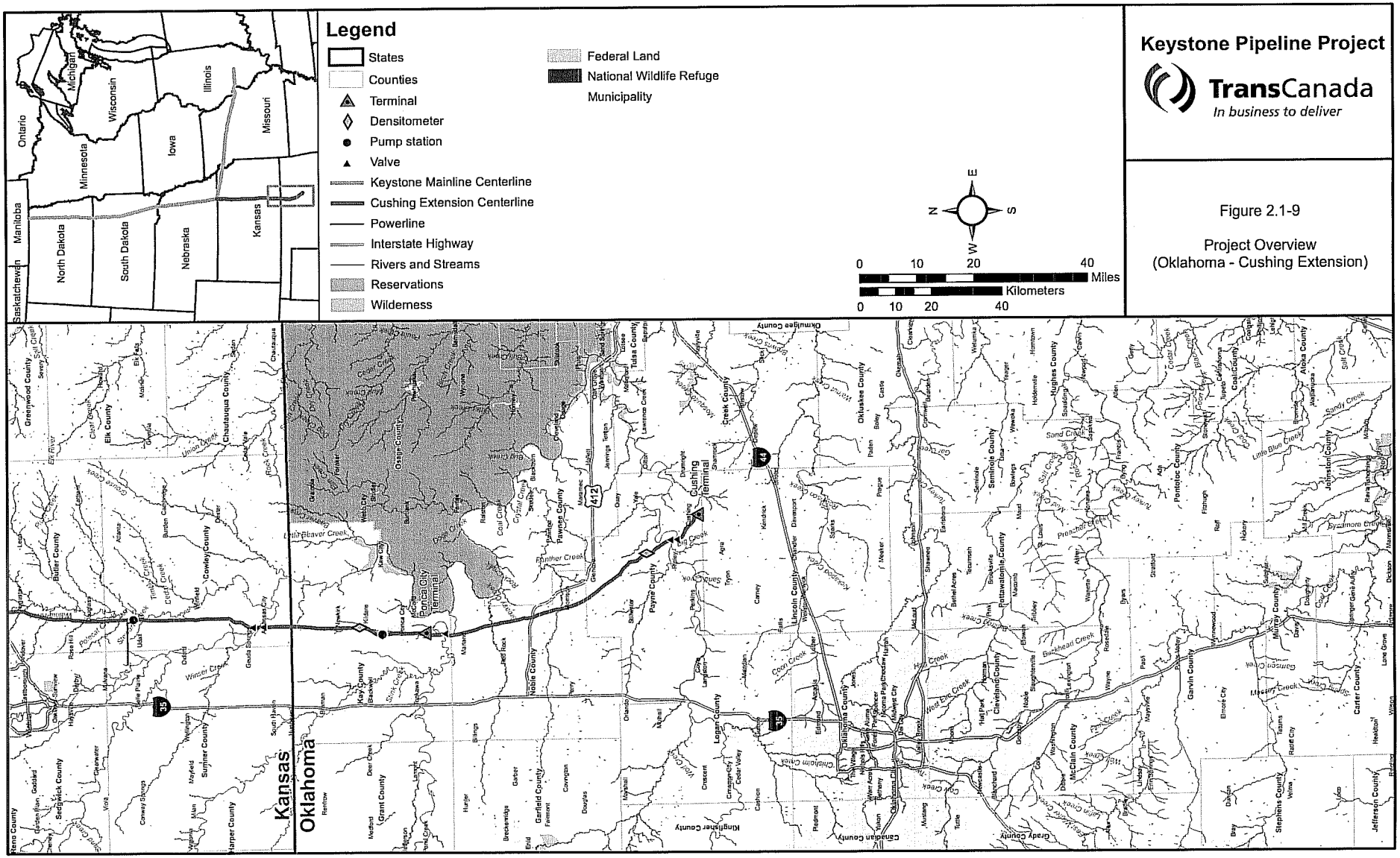


Keystone Pipeline Project

TransCanada
In business to deliver

Figure 2.1-8

Project Overview
(Kansas - Cushing Extension)

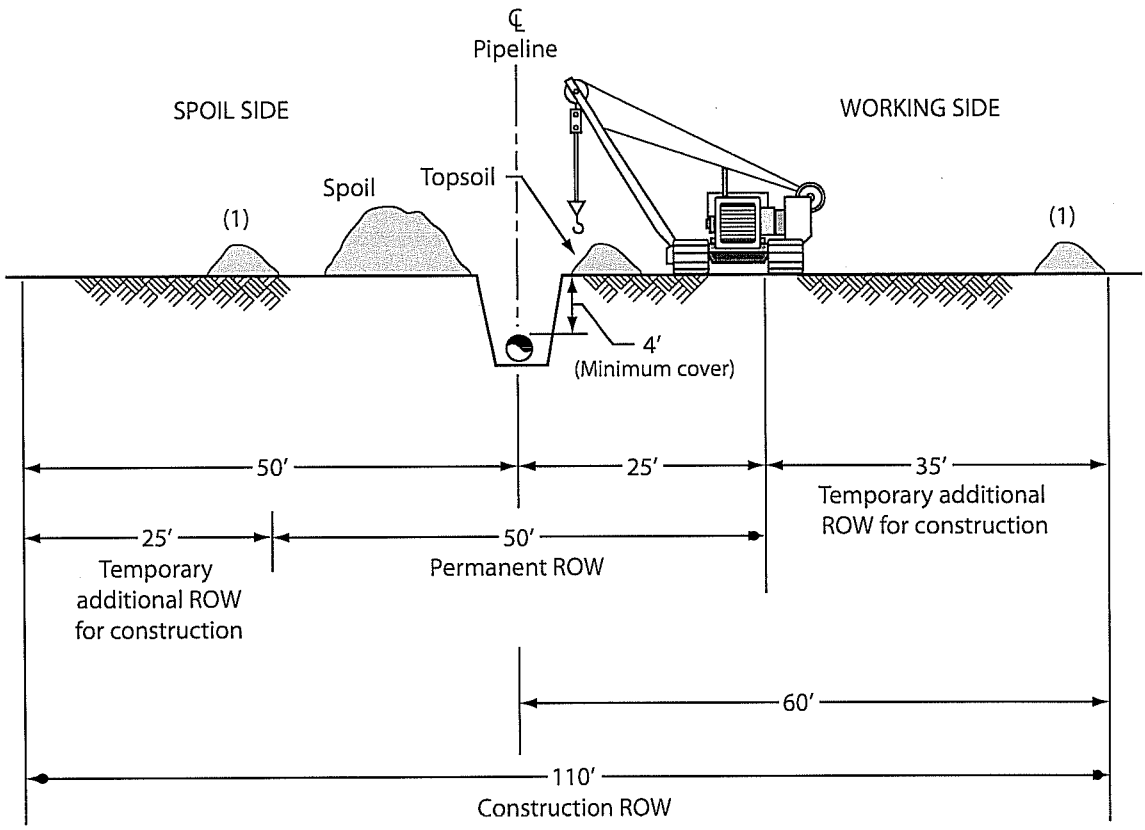


Keystone Pipeline Project

TransCanada
In business to deliver

Figure 2.1-9

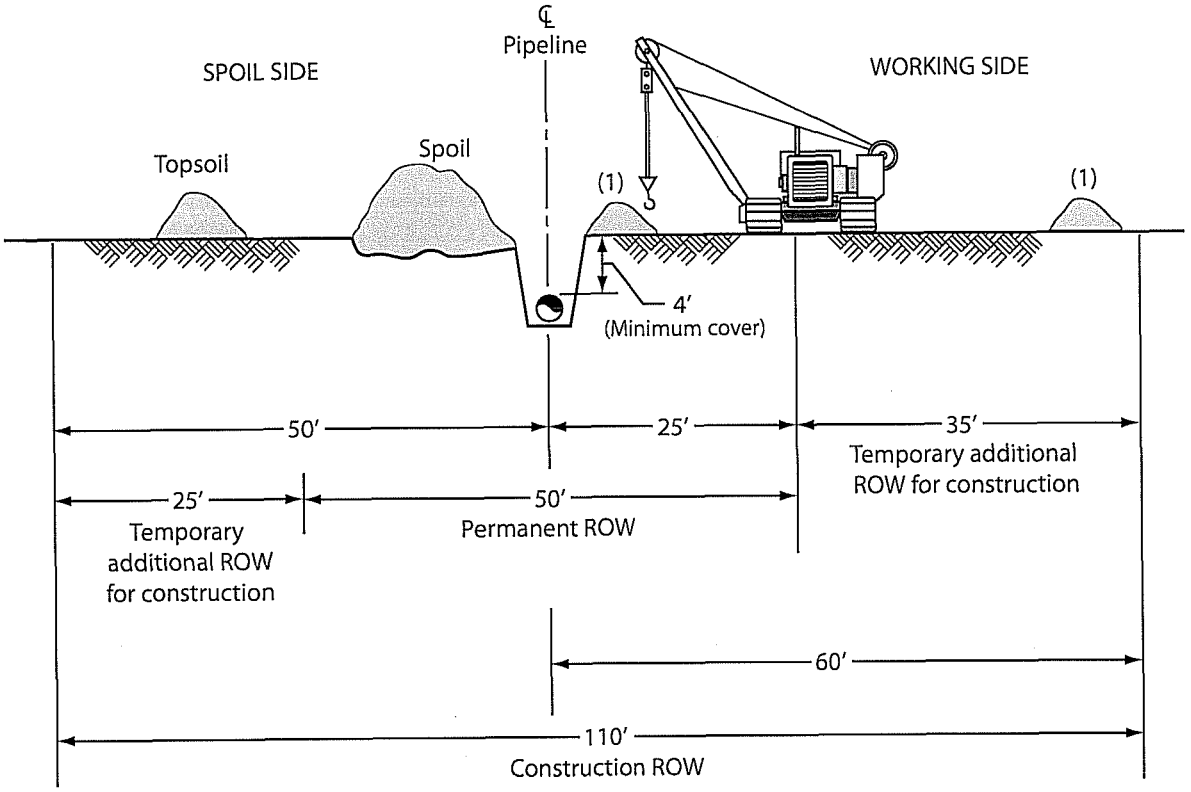
Project Overview
(Oklahoma - Cushing Extension)



(1) Alternate topsoil placement locations

KEYSTONE PIPELINE PROJECT

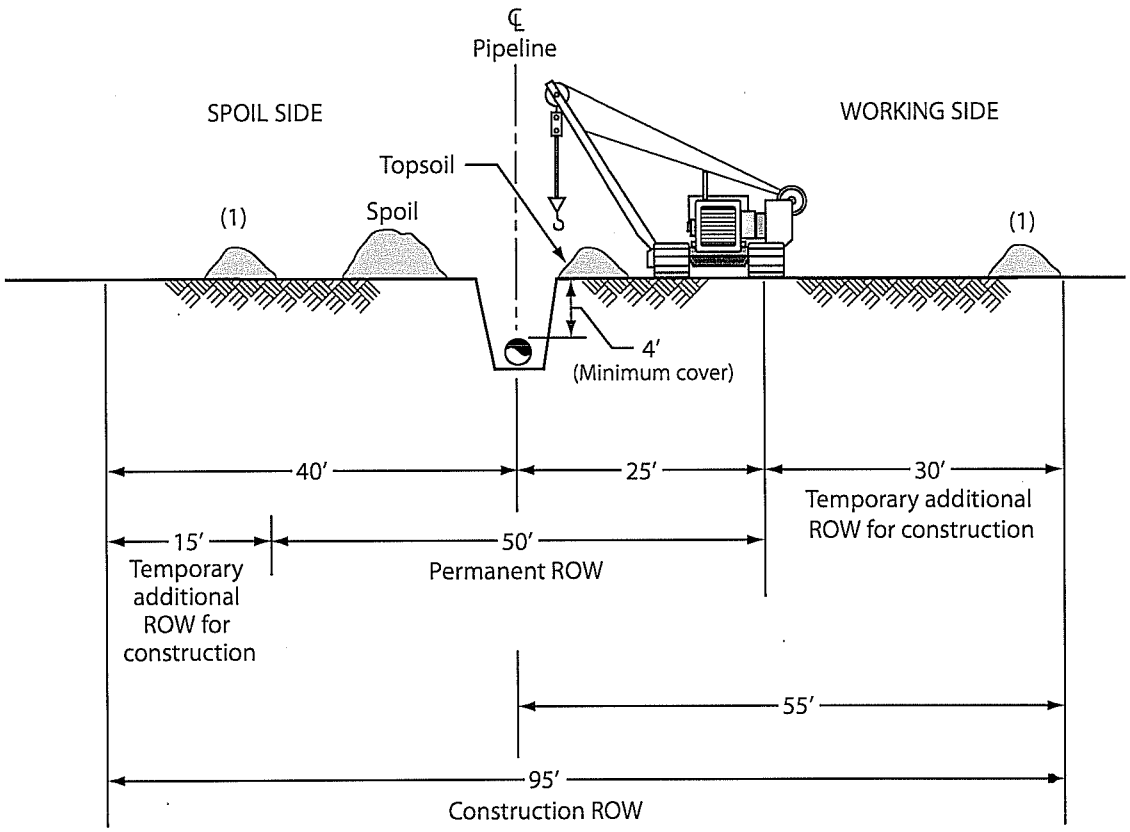
Figure 2.1-10
Typical 110′ Construction Right-of-Way (30- or 36-inch Pipeline) with Topsoil Removal Only over Trench Line



(1) Alternate topsoil placment locations

KEYSTONE PIPELINE PROJECT

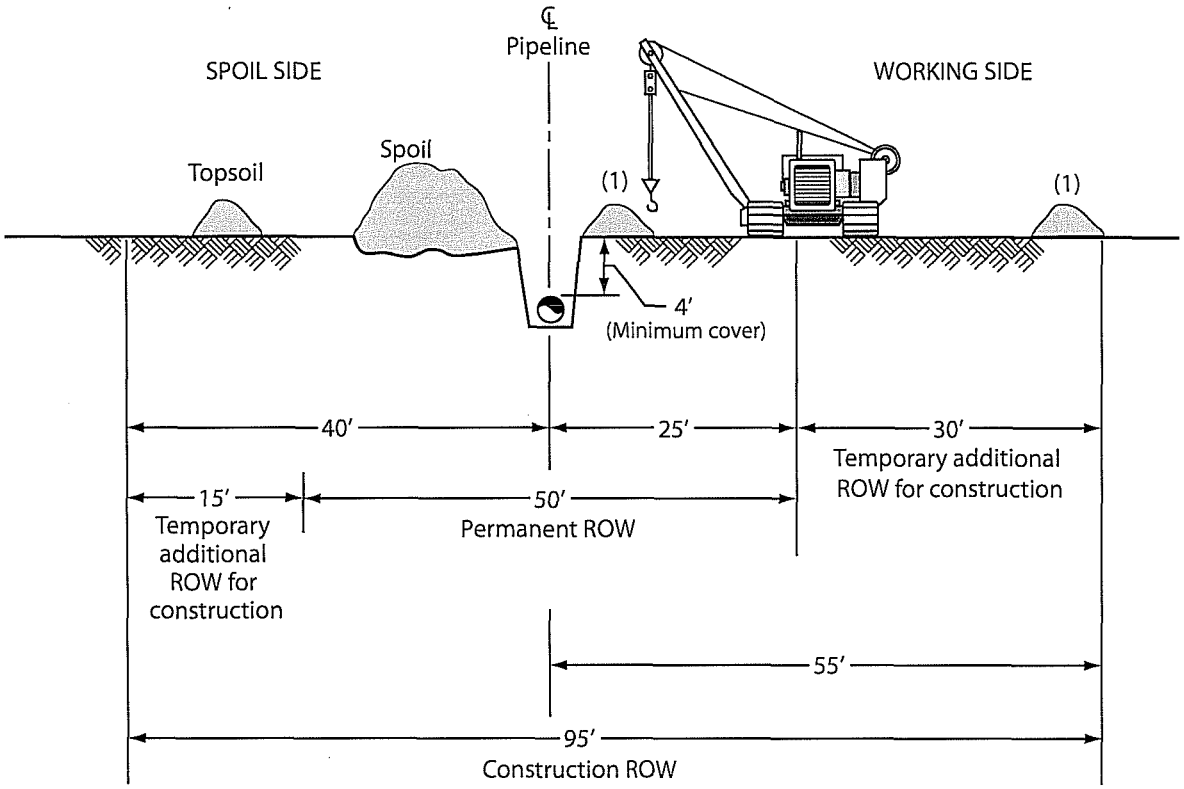
Figure 2.1-11
Typical 110′ Construction Right-of-Way (30- or 36-inch Pipeline) with Topsoil Removal over Trench Line and Spoil Side



(1) Alternate topsoil placement locations

KEYSTONE PIPELINE PROJECT

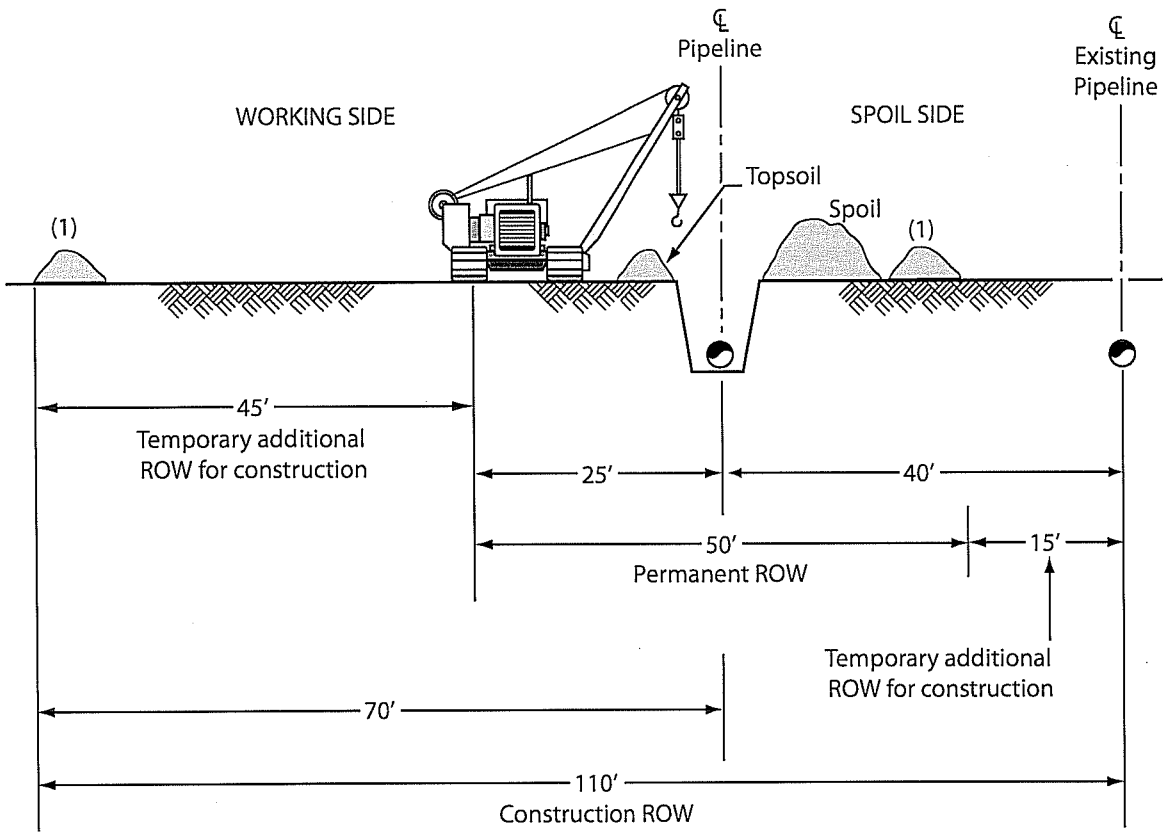
Figure 2.1-12
Typical 95′ Construction
Right-of-Way (24-inch Pipeline)
with Topsoil Removal Only
over Trench Line



(1) Alternate topsoil placement locations

KEYSTONE PIPELINE PROJECT

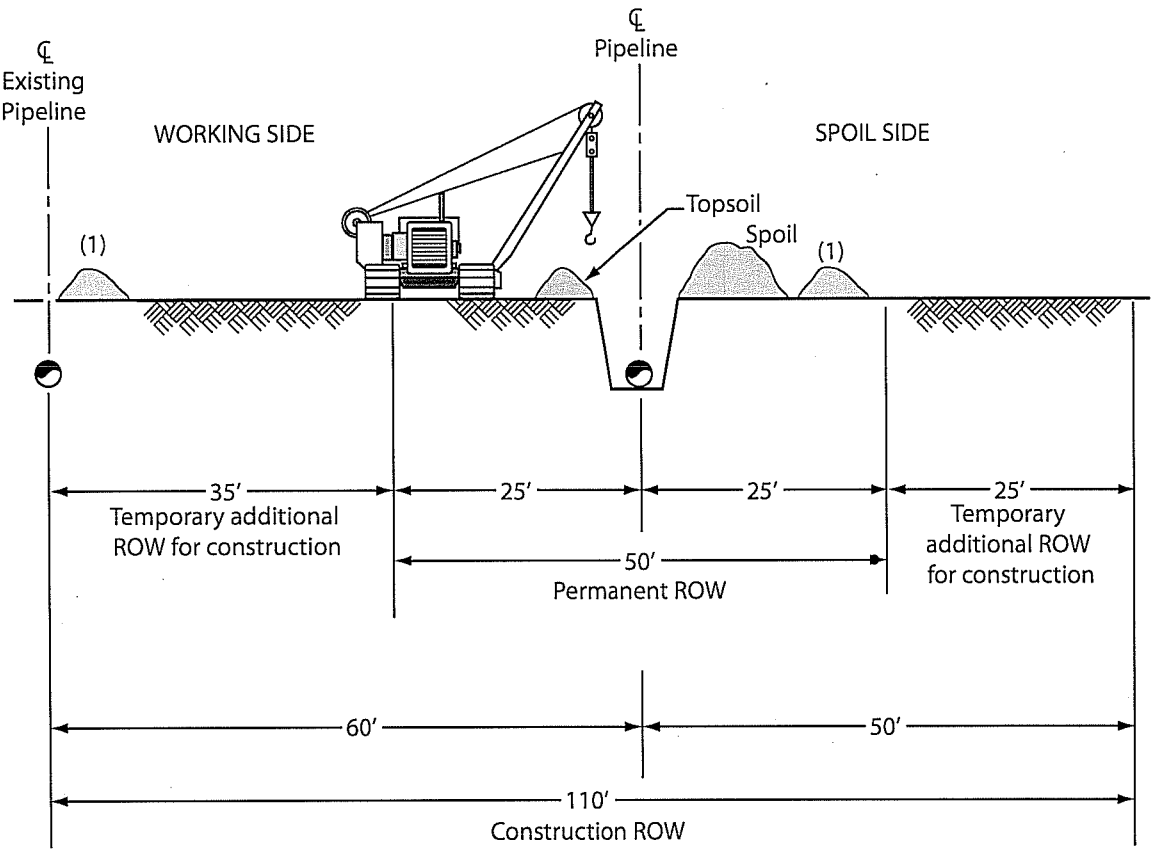
Figure 2.1-13
Typical 95′ Construction Right-of-Way (24-inch Pipeline) with Topsoil Removal over Trench Line and Spoil Side



(1) Alternate topsoil placement locations

KEYSTONE PIPELINE PROJECT

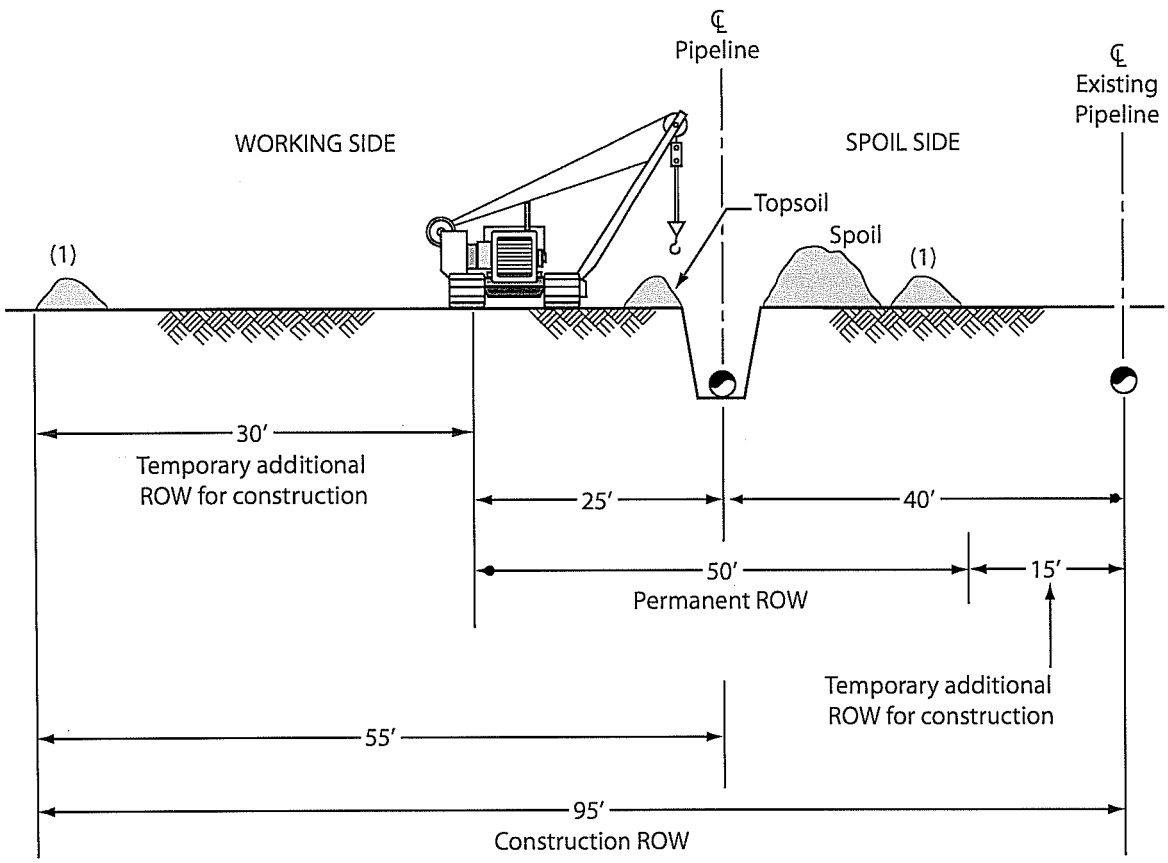
Figure 2.1-14
Typical 110′ Construction
Right-of-Way
(30- or 36-inch Pipeline)
- Spoil Side Adjacent and
Parallel to Existing Pipeline



(1) Alternate topsoil placement locations

KEYSTONE PIPELINE PROJECT

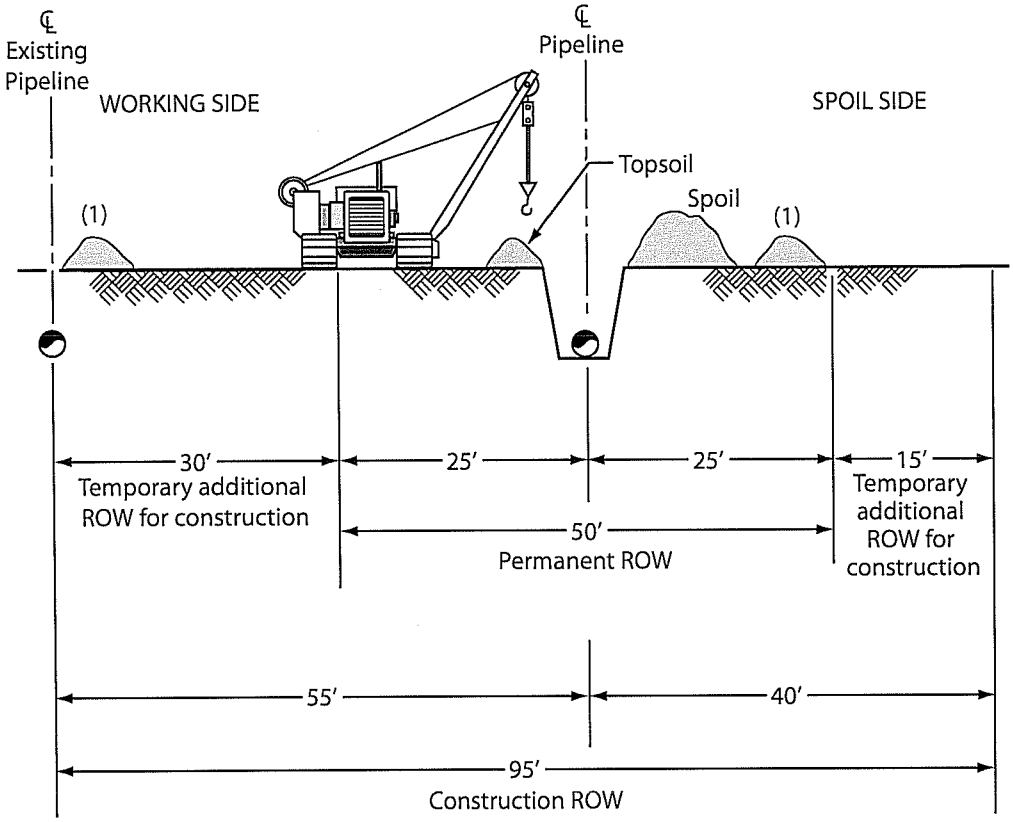
Figure 2.1-15
Typical 110′ Construction
Right-of-Way
(30- or 36-inch Pipeline)
- Working Side Adjacent and
Parallel to Existing Pipeline



(1) Alternate topsoil placement locations

KEYSTONE PIPELINE PROJECT

Figure 2.1-16
Typical 95′ Construction
Right-of-Way (24-inch Pipeline)
- Spoil Side Adjacent and
Parallel to Existing Pipeline



(1) Alternate topsoil placement locations

KEYSTONE PIPELINE PROJECT

Figure 2.1-17
Typical 95′ Construction
Right-of-Way (24-inch Pipeline)
- Working Side Adjacent and
Parallel to Existing Pipeline

Table 2.1-2 Summary of Land Requirements Associated with the Keystone Pipeline Project

Facility	Land Affected During Construction [1] (acres)	Land Affected During Operation[2] (acres)
KEYSTONE MAINLINE		
NORTH DAKOTA		
Pipeline ROW	2,891	1,314
Lateral ROWs	0	0
Additional Temporary Workspace Areas	141	0
Pipe and Contractor Yards	310	0
Pump Stations/Delivery Facilities[3]	11	11
North Dakota Subtotal[4]	*3,353*	*1,325*
SOUTH DAKOTA		
Pipeline ROW	2,919	1,327
Lateral ROWs	0	0
Additional Temporary Workspace Areas	171	0
Pipe and Contractor Yards	400	0
Pump Stations/Delivery Facilities[3]	9	9
South Dakota Subtotal[4]	*3,499*	*1,336*
NEBRASKA		
Pipeline ROW	2,850	1,295
Lateral ROWs	0	0
Additional Temporary Workspace Areas	166	0
Pipe and Contractor Yards	235	0
Pump Stations/Delivery Facilities[3]	11	11
Nebraska Subtotal[4]	*3,262*	*1,306*
KANSAS		
Pipeline ROW	1,317	599
Lateral ROWs	0	0

Table 2.1-2 Summary of Land Requirements Associated with the Keystone Pipeline Project

Facility	Land Affected During Construction [1] (acres)	Land Affected During Operation [2] (acres)
Additional Temporary Workspace Areas	81	0
Pipe and Contractor Yards	95	0
Pump Stations/Delivery Facilities[3]	4	4
Kansas Subtotal[4]	*1,497*	*603*
MISSOURI		
Pipeline ROW	3,641	1,655
Lateral ROWs	0	0
Additional Temporary Workspace Areas	282	0
Pipe and Contractor Yards	275	0
Pump Stations/Delivery Facilities[3]	13	13
Missouri Subtotal[4]	*4,211*	*1,668*
ILLINOIS		
Pipeline ROW	653	343
Lateral ROWs	11	6
Additional Temporary Workspace Areas	64	0
Pipe and Contractor Yards	90	0
Pump Stations/Delivery Facilities[3]	8	8
Illinois Subtotal[4]	*826*	*357*
Keystone Mainline Subtotal[5]	16,648	6,595
CUSHING EXTENSION		
NEBRASKA		
Pipeline ROW	31	14
Lateral ROWs	0	0
Additional Temporary Workspace Areas	4	0
Pipe and Contractor Yards	15	0

Table 2.1-2 Summary of Land Requirements Associated with the Keystone Pipeline Project

Facility	Land Affected During Construction [1] (acres)	Land Affected During Operation [2] (acres)
Pump Stations/Delivery Facilities[3]	0	0
Nebraska Subtotal[4]	50	14
KANSAS		
Pipeline ROW	2,796	1,271
Lateral ROWs	0	0
Additional Temporary Workspace Areas	168	0
Pipe and Contractor Yards	295	0
Pump Stations/Delivery Facilities[3]	4	4
Kansas Subtotal[4]	*3,263*	*1,275*
OKLAHOMA		
Pipeline ROW	1,063	483
Lateral ROWs	22	12
Additional Temporary Workspace Areas	65	0
Pipe and Contractor Yards	105	0
Pump Stations/Delivery Facilities[3]	5	5
Oklahoma Subtotal[4]	*1,260*	*500*
Cushing Extension Subtotal[4]	4,573	1,789
PROJECT TOTAL[4]	**21,221**	**8,384**

[1] Disturbance is based on a total of 110-foot-wide construction ROW for 30- and 36-inch pipe and a 95-foot-wide construction ROW for 24-inch pipe, except in certain wetlands, shelterbelts, and other forested areas, residential areas, and commercial/industrial areas where a 85-foot-wide construction ROW will be used, or in areas requiring extra width for workspace necessitated by site conditions. Disturbance also includes pipe storage and contractor yards.

[2] Operation acreage was estimated based on a 50-foot-wide permanently maintained ROW in all areas. All pigging facilities will be located within either pump stations or delivery facility sites. Mainline valves and densitometers will 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 will 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.

[3] The Wood River delivery facility will be constructed outside of the existing pipeline operational tank facilities. The delivery facility in Patoka will be located within the terminal. Delivery facilities along the Cushing Extension at Ponca City and Cushing will be located within existing tank storage terminals. Additional temporary workspace areas include temporary disturbance for the construction of pump stations and/or delivery facilities.

[4] Discrepancies in total acreages are due to rounding.

2.1.2 Pipeline ROW

Along the Keystone Mainline, approximately 467.5 miles (43.4 percent) of the 1,078 miles of the pipeline route will be located within about 300 feet of existing pipeline, utility, or road ROWs. Approximately 610.4 miles (56.6 percent) will be new ROW.

For the Cushing Extension, approximately 15.6 miles (5.3 percent) of the 292 miles of pipeline route will be within approximately 300 feet of existing pipeline, utility, or road ROWs. Approximately 276.2 miles (94.7 percent) of the route ROW will be new ROW.

In locations where the proposed pipeline route will parallel existing utilities, Keystone's new permanent ROW will be adjacent to the existing permanent ROW. Keystone's pipeline generally will be installed at a 40-foot offset from the nearest existing pipeline centerline (**Figures 2.1-14** and **2.1-16**) except in areas where the working side of the pipeline construction ROW is adjacent to the existing pipeline. In these areas, Keystone's pipeline will be installed at a 60-foot offset from the nearest existing pipeline centerline (**Figures 2.1-15** and **2.1-17**).

2.1.3 Laterals

A lateral will be constructed from the Keystone Mainline to deliver crude oil to the tank storage terminal in Wood River. The Wood River lateral will be approximately 5,213 feet in length. Additional laterals will be required to make deliveries to Ponca City (6,618 feet) and Cushing (3,544 feet) terminals.

Construction and operation of the laterals will be similar to the Keystone Mainline. The laterals will be constructed within a 110-foot-wide corridor, consisting of both a temporary 60-foot-wide temporary construction ROW and a 50-foot-wide permanent ROW. After construction the temporary and permanent ROW will be restored and returned to their previous use.

2.1.4 Additional Temporary Workspace Areas

In addition to the construction ROW, Keystone has identified the types of additional temporary workspace areas that will be required (**Table 2.1-3**) and where these sites will be located. These workspace requirements are indicated graphically on the route sheets provided in Appendix A and B. These preliminary spaces have been used to quantify impacts of the project. Temporary workspaces will be needed for areas requiring special construction techniques (e.g., river, wetland, and road crossings; horizontal directional drill entry and exit points; steep slopes; rocky soils) and construction staging areas.

The location of additional temporary workspaces will be modified as the project continues to be refined. This will involve the adjustment of workspaces as necessary with respect to actual wetland and waterbody locations. Keystone will adjust additional temporary workspace at the prescribed set back distance from waterbody and wetland features unless impractical as determined on a site-specific basis. As a result, wetland impact acreage presented is likely overstated.

2.1.5 Pipe Storage and Contractor Yards

Off-ROW extra workspace areas will be required during the construction phase of the project to serve as pipe storage yards and contractor yards. Keystone estimates that 42 pipe storage yards and 17 contractor yards will be required during construction of the Keystone Mainline and 13 pipe storage and six contractor yards will be required during construction of the Cushing Extension (**Table 2.1-4**). Contractor yards will reduce worker transportation requirements during construction and will occupy approximately 15 to 20 acres. Pipe staging yards will be used to stockpile pipe at approximately 30-mile intervals along the pipeline route and typically are located in proximity to railroad sidings facilities. Pipe yards will occupy approximately 25 acres. 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 will be used to access each yard. Both pipe storage yards and contractor yards will be used on a temporary basis and will be restored upon completion of construction.

Table 2.1-3 Dimensions and Acreage of Typical Additional Temporary Workspace Areas

Feature	Dimensions (length by width in feet at each side of crossing)	Acreage
Directionally drilled waterbodies	350 x 140 plus the length of the drill x 25	1.1+
Waterbodies >50 feet wide	300 x 100	0.7
Waterbodies <50 feet wide	250 x 50	0.3
Bored highways and railroads	50 x length of crossing plus 50 feet	Varies
Open-cut or bored county or private roads	125 x 50	0.1
Foreign pipeline/utility/other buried feature crossings	125 x 50	0.1
Push-pull wetland crossings	50 feet x length of wetland	Varies
Construction spread mobilization and demobilization	300 x 150	1.0
Stringing truck turnaround areas	200 x 80	0.4

Table 2.1-4 Locations and Acreage of Potential Pipe Storage Yards and Contractor Yards

State / Type of Yard	Counties	Combined Acreage[1]
KEYSTONE MAINLINE		
North Dakota		
Contractor Yards	Emerado, Valley City, Lisbon	60
Pipe Storage Yards	Walhalla, Union, Michigan, Oakes, Fordville, Amherst, Sharon, Sibley, Kathryn, Crete	250
South Dakota		
Contractor Yards	Aberdeen, Mitchell, Yankton, Bath, Huron	100
Pipe Storage Yards	Hecla, Ferney, Doland, Iroquois, Fedora, Bridgewater, Utica, Claremont, Groton, Yale, Emery, Yankton	300
Nebraska		
Contractor Yards	Norfolk, Columbus, Seward	60
Pipe Storage Yards	Harington, Hoskins, Leigh, David City, Milford, Lanham	175
Kansas		
Contractor Yards	Hiawatha	20
Pipe Storage Yards	Baileyville, Fairview, Bendena	75

Table 2.1-4 Locations and Acreage of Potential Pipe Storage Yards and Contractor Yards

State / Type of Yard	Counties	Combined Acreage[1]
Missouri		
Contractor Yards	Carrolton, Columbus, Mexico, O'Fallon	75
Pipe Storage Yards	Turney, Braymer, Indian Grove, Salisbury, Clark, Wellsville, Hawk Point, St. Peters	200
Illinois		
Contractor Yards	Edwardsville	15
Pipe Storage Yards	Edwardsville, Tamalco, Patoka	75
CUSHING EXTENSION		
Nebraska		
Contractor Yards	Fairburg	15
Pipe Storage Yards	None	0
Kansas		
Contractor Yards	Waterville, Lionville, Winfield	45
Pipe Storage Yards	Greenleaf, Claycenter, Chapman, Tampa, Peabody, Whitewater, Agusta, Udall, Winfield, Arkansas City	250
Oklahoma		
Contractor Yards	Blackwell, Cushing	30
Pipe Storage Yards	Ponca City, Perry, Cushing	75

[1]Acreages of contractor yards are based on 15 to 20 acres per site, while acreages of pipe storage yards are based on 25 acres per site.

2.1.6 Access Roads

Keystone will use public and preexisting private roads to provide access to most of the construction ROW. Keystone does not anticipate the need to improve and maintain many temporary roads needed 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 will be restricted to the existing road footprint (i.e., the road will not be widened). Private roads and new temporary access roads will be used and maintained only with permission of the landowner or land management agency.

As a part of its permanent aboveground facilities, Keystone also will construct short, permanent access roads from public roads to the proposed pump stations, delivery facilities, and mainline valves. The estimated acres of disturbance associated with proposed permanent access roads are included in the Aboveground Facility discussion (Section 2.2.5). Prior to construction, Keystone will finalize the location of permanent access roads along with any additional temporary access roads. At a minimum, construction of new permanent access roads will require completion of cultural resources and biological surveys, along with the appropriate SHPO and USFWS consultations and approvals. Other state and local permits also may be required prior to construction. In the future, maintenance of newly created access roads will be the responsibility of Keystone.

2.1.7 Aboveground Facilities

Keystone will require a total of about 61 acres of land along the Keystone Mainline for the location of aboveground facilities, including pump stations, delivery facilities, densitometer sites, and mainline valves. Keystone will require 13 acres for similar facilities on the Cushing Extension.

Keystone will initially construct 23 new pump stations for the Mainline and three for the Cushing Extension, which are identified in **Table 2.1-1**. Expansion to 591,000 bpd will require one additional pump station along the Keystone Mainline. Each station will consist of two or three pumps driven by electric motors, an electrical building, electrical substation, two sump tanks, a small maintenance building, and parking area for station personnel. Stations will operate on locally purchased electric power for pumps, lights, and heating in the buildings and will be fully automated for unmanned operation. Remote start/stop, set point controls, unit monitoring equipment, and station information will be installed at each location. The pipe entering and exiting the pump station sites will be located below grade. The pipe within the pump station (after entering and prior to exiting the pump station facilities) will be aboveground.

Keystone will install two delivery facilities along the Keystone Mainline route at Wood River and Patoka and two along the Cushing Extension (Ponca City and Cushing) (**Table 2.1-1**). The delivery facilities will include pressure regulating, heating, sampling, chromatography, tube switching, and crude oil measurement equipment. At Patoka, delivery facilities will be located entirely within the tank storage terminal. At Wood River, a stand-alone property will be obtained for these facilities. Cushing Extension delivery facilities will be located within the Ponca City and Cushing tank storage terminals.

Keystone will construct 45 mainline valves along the Keystone Mainline and 12 mainline valves along the Cushing Extension. Mainline valves will be installed at each pump station and along the ROW. When not located at a pump station, mainline valves will be sectionalizing block valves constructed within a fenced 50-foot-wide by 50-foot-long site located within the pipeline construction ROW and centered on the 50-foot-wide permanently maintained ROW. Remotely activated valves are located at pump stations, upstream of major river crossings, and above sensitive waterbodies. These valves can be quickly activated to shutdown the pipeline in the event of an emergency to minimize environmental impacts in the unlikely event of a spill. Mainline valve intervals will be a maximum of approximately 50 miles, with an average spacing interval of approximately every 15 to 20 miles. The spacing intervals between the mainline valves along the ROW are based upon the location of the pump stations, waterbodies greater than 100 feet in width, high consequence areas, densely populated areas, and other topographic and environmental considerations.

The Keystone Pipeline Project will be designed to permit full pigging of the pipeline with a minimum interruption of service. Pig launchers and/or receivers will be constructed and operated completely within the boundaries of the pump stations or delivery facilities. Launchers and receivers will allow the pipeline to accommodate a high-resolution internal line inspection tool.

2.1.8 Construction Procedures

The proposed facilities will be designed, constructed, tested, and operated in accordance with all applicable requirements included in the USDOT regulations at 49 CFR Part 195, *Transportation of Hazardous Liquids by Pipeline*, and other applicable federal and state regulations. These regulations are intended to ensure adequate protection for the public and to prevent crude oil pipeline accidents and failures. Among other design standards, Part 195 specifies pipeline material and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion.

To manage construction impacts, Keystone will implement Keystone's Construction Mitigation and Reclamation Plan (Keystone's Plan; Appendix E). This Plan contains construction and mitigation procedures that will be used throughout the project, with subsections to address specific environmental conditions.

Keystone will implement its Spill Prevention, Control, and Countermeasure (SPCC) Plan to avoid or minimize the potential for harmful spills and leaks during construction. The plan describes spill prevention practices, emergency response procedures, emergency and personnel protection equipment, release notification procedures, and cleanup procedures. The SPCC Plan is discussed further in Sections 3.2, 3.3, and 3.5.

Keystone will implement its Emergency Response Plan (ERP) to identify its emergency personnel and the logical sequence of actions, which should be taken in the event of an emergency involving the Keystone system facilities during construction or operation. The ERP will meet federal safety requirements (49 CFR Parts 194 and 195). The ERP establishes written emergency shut down procedures, communication coordination, and clean-up responsibilities in the event of a crude oil pipeline emergency. A draft of Keystone's ERP was submitted to the Department of State on July 1, 2006.

Mitigation and other measures contained in this ER will constitute the basic construction design applicable to all lands disturbed by the Keystone Pipeline Project. This approach will enable construction to proceed with a single set of specifications, irrespective of the ownership status (federal versus non-federal) of the land being crossed. On private lands, this basic design may be modified slightly to accommodate specific landowner requests/preferences.

2.1.8.1 General Pipeline Construction Procedures

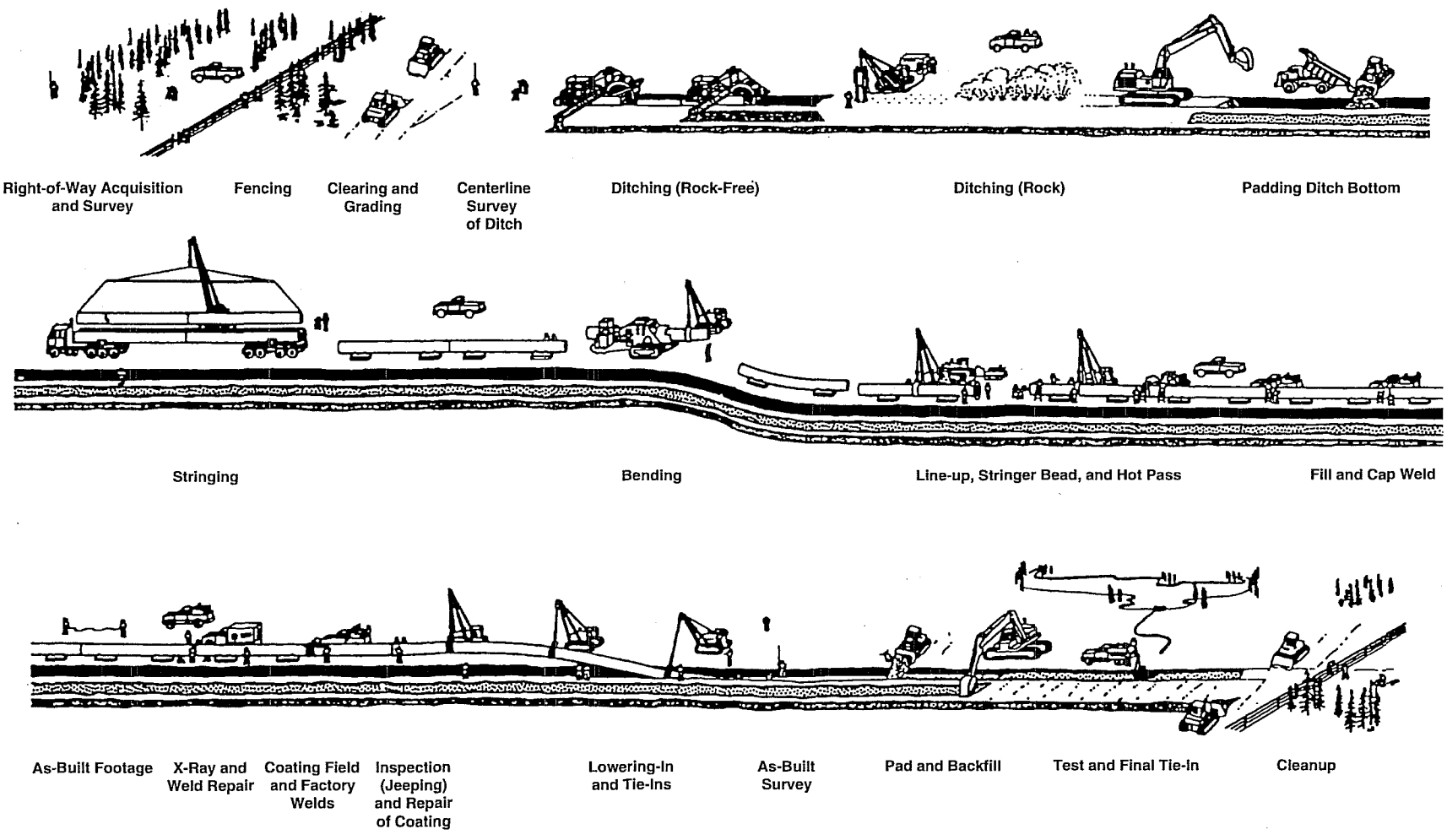
Before starting construction, Keystone will finalize engineering surveys of the ROW centerline and extra workspaces and substantially complete the acquisition of ROW easements and any necessary acquisitions of property in fee.

Overland pipeline construction generally proceeds as a moving assembly line as shown in **Figure 2.1-18** and as summarized below. Keystone currently plans to construct the pipeline in five to seven spreads; four to five spreads along the Keystone Mainline and one to two spreads along the Cushing Extension. Each of the pipeline spreads will consist of approximately 200 to 300 miles of pipeline on the mainline and 125 to 175 miles on the Cushing Extension. Separate crews will be used for construction of the aboveground facilities.

Standard pipeline construction is composed of specific activities including survey and staking of the ROW, clearing and grading, trenching, pipe stringing, bending, welding, lowering-in, backfilling, hydrostatic testing, and cleanup. In addition to standard pipeline construction methods, Keystone will use special construction techniques where warranted by site-specific conditions. These special techniques will be used when constructing across rugged terrain, waterbodies, wetlands, paved roads, highways, and railroads (Section 2.3.2).

Survey and Staking

The first step of construction involves marking the limits of the approved work area (i.e., the construction ROW boundaries and any additional temporary workspace areas) and flagging the location of approved access roads and foreign utility lines. Wetland boundaries and other environmentally sensitive areas also will be marked or fenced for protection at this time. Before the pipeline trench is excavated, a survey crew will stake the centerline of the proposed trench.



Not to Scale

KEYSTONE PIPELINE PROJECT

Figure 2.1-18

Typical Pipeline Construction Sequence

Clearing and Grading

Before clearing and grading activities are conducted, landowner fences will be braced and cut and temporary gates and fences will be installed to contain livestock, if present. A clearing crew will follow the fence crew and will clear the work area of vegetation (including crops) and obstacles (e.g., trees, logs, brush, rocks). Temporary erosion control measures such as silt fences or straw bales will be installed prior to vegetation removal down slopes into wetlands and riparian areas. Grading will be conducted where necessary to provide a reasonably level work surface. Where the ground is relatively flat and does not require grading, rootstock will be left in the ground. More extensive grading will be required in steep side-slopes or vertical areas and where necessary to prevent excessive bending of the pipeline.

Trenching

The trench will be excavated to a depth that provides sufficient cover over the pipeline after backfilling. Typically, the trench will be about seven to eight feet deep and about four to five feet wide in stable soils. In most areas, the USDOT requires a minimum of 36 inches of cover. In rocky areas the USDOT requires a minimum depth of cover of 18 inches. In most locations, the depth of cover for the Keystone pipeline will be a minimum of 48 inches (**Table 2.1-5**). Trenching may precede bending and welding or may follow based on several factors including soil characteristics, water table, existence of drain tiles, and weather conditions at the time of construction.

Table 2.1-5 Minimum Pipeline Cover

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

When rock or rocky formations are encountered, tractor-mounted mechanical rippers or rock trenchers will be used to fracture the rock prior to excavation. In areas where mechanical equipment can not break up or loosen the bedrock, blasting (use of explosives) will be required (Section 2.3.2). Excavated rock will be used to backfill the trench to the top of the existing bedrock profile.

Topsoil will be separated from subsoil over the trench or over the trench and spoil side. In areas of removal of topsoil only over the trench, separated topsoil will be stored on the near side of the trench and in a pile separate from subsoil (which will be stored on the far side of the trench) to allow for proper restoration of the soil during the backfilling process (see **Figures 2.1-10** through **2.1-17**). In areas where topsoil over the trench and spoil side is removed, separated topsoils will be stored on the edge of the spoil side of the construction ROW (or, optionally, on the edge of the working side of the construction ROW) and in a pile separate from subsoil (which will be stored on the spoil side of the trench) to allow for proper restoration of the soil during the backfilling process. In areas where the ROW will be graded to provide a level working surface and where there is a need to separate topsoil from subsoil, the ROW will be graded to collect topsoil before any subsoil is disturbed.

Topsoil will be piled such that the mixing of subsoil and topsoil will not occur. Gaps will be left between the spoil piles to prevent storm water runoff from backing up or flooding. Topsoil will be returned to its original horizon after subsoil is backfilled in the trench.

Pipe Stringing, Bending, and Welding

Prior to or following trenching, sections of externally coated pipe up to 80 feet long (also referred to as "joints") will be transported by truck over public road networks and along authorized private access roads to the ROW and placed or "strung" along the trench in a continuous line.

After the pipe sections are strung along the trench and before joints are welded together, individual sections of the pipe will be bent where necessary to allow for uniform fit of the pipeline with the varying contours of the bottom of the trench. A track-mounted, hydraulic pipe-bending machine will shape the pipe to conform to the contours of the terrain. Where multiple or complex bends are required in a section of pipe, that section of the pipeline will be bent at the factory.

After the pipe sections are bent, the joints will be welded together into long strings and placed on temporary supports. The pipeline joints will be lined up and held in position until securely joined by welding. Keystone will non-destructively inspect 100 percent of the welds using radiographic, ultrasonic, or other USDOT-approved method. Welds that do not meet established specifications will be repaired or removed. Once the welds are approved, a protective epoxy coating will be applied to the welded joints. The pipeline will then be electronically inspected or "jeeped" for faults or voids in the epoxy coating and visually inspected for any faults, scratches, or other coating defects. Damage to the coating will be repaired before the pipeline is lowered into the trench.

In rangeland areas used for grazing and livestock, construction activities potentially can hinder the movement of livestock if the livestock cannot be relocated temporarily by the owner. The movement of wildlife in search of food and water also can be hindered by construction activities. To minimize impact on livestock and wildlife movements during construction, Keystone will leave hard plugs (short lengths of unexcavated trench) or install soft plugs (areas where the trench is excavated and replaced with minimal compaction) to allow livestock and wildlife to cross the open trench safely. Soft plugs will be constructed with a ramp on each side to provide an avenue of escape for animals that fall into the trench.

Prior to lowering-in of the pipe into the trench, multiple sections of pipeline may be welded together above the trench. These welded lengths of pipe may be greater than one mile in length. Keystone will lower these sections of pipeline into the trench expeditiously to minimize impacts to landowners.

Lowering-in and Backfilling

Before the pipeline is lowered in, the trench will be inspected to be sure it is free of livestock or wildlife, as well as rocks and other debris that could damage the pipe or protective coating. In areas where water has accumulated, dewatering may be necessary to permit inspection of the bottom of the trench. The pipeline then will be lowered into the trench. On sloped terrain, trench breakers (stacked sand bags or foam) will be installed in the trench at specified intervals to prevent subsurface water movement along the pipeline. The trench will then be backfilled using the excavated material. In rocky areas, the pipeline will be protected with an abrasion-resistant coating or rock shield (fabric or screen that is wrapped around the pipe to protect the pipe and its coating from damage by rocks, stones, and roots). Alternatively, the trench bottom will be filled with padding material (e.g., finer grain sand, soil, or gravel) to protect the pipeline. No topsoil will be used as padding material.

Hydrostatic Testing

The pipeline will be hydrostatically tested in approximately 30-mile sections (maximum 50-mile sections) to ensure the system is capable of withstanding the operating pressure for which it is designed. This process involves isolating the pipe segment with test manifolds, filling the line with water, pressurizing the section to a pressure at least 1.25 times the maximum allowable operating pressure (MAOP), and maintain that pressure for a period of eight hours. The hydrostatic test will be conducted in accordance with 49 CFR Part 195. Keystone proposes to obtain water for hydrostatic testing from rivers and streams that the pipeline route crosses and in accordance with federal, state, and local regulations. The pipeline will be hydrostatically tested after backfilling and all construction work that will directly affect the pipe has been completed. If leaks are found, they will be repaired and the section of pipe retested until specifications are met. Water used for the testing will then be transferred to another pipe section for subsequent hydrostatic testing. Alternatively, the water will be tested to ensure compliance with the NPDES discharge permit requirements, treated if necessary, and discharged. Hydrostatic testing is discussed further in Sections 3.3.2, 3.5.1, and 3.6.3.

Pipe Geometry Inspection

The pipeline will be inspected prior to final tie-ins utilizing an electronic caliper (geometry) pig to ensure the pipeline does not have any dents or ovality that might be detrimental to the operations of the pipeline.

Final Tie-in

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

Commissioning

After final tie-ins are complete and inspected, the pipeline will be cleaned and dried. If the pipeline is not ready for commissioning after the drying phase, the pipeline will be filled with 10 pounds per square inch, gauge (psig) of dry air until ready for commissioning. Commissioning involves verifying that equipment has been properly installed and is working, the controls and communications systems are functional, and the pipeline is ready for service. In the final step, the pipeline is prepared for service by purging the line of air and filling the line with crude oil.

Cleanup and Restoration

During cleanup, construction debris on the ROW will be disposed of and work areas will be final graded. Preconstruction contours will be restored as closely as possible. Segregated topsoil will be spread over the surface of the ROW and permanent erosion controls will be installed. After backfilling, final cleanup will begin as soon as weather and site conditions permit. Every reasonable effort will be made to complete final cleanup (including final grading and installation of erosion control devices) within approximately 20 days after backfilling the trench (approximately 10 days in residential areas). Construction debris will be cleaned up and taken to a disposal facility.

After permanent erosion control devices are installed and final grading has occurred, all disturbed work areas except annually cultivated fields will be seeded as soon as possible. Seeding is intended to stabilize the soil, revegetate areas disturbed by construction, and, depending upon land use, restore native flora. Timing of the reseeding efforts will depend upon weather and soil conditions and will be subject to the prescribed dates and seed mixes specified by the landowner, land-managing agency, or Natural Resource Conservation Service (NRCS) recommendations. On agricultural lands, seeding will be conducted only as agreed upon with the landowner.

Keystone will restrict access along the ROW using gates, boulders, or other barriers to minimize unauthorized access by all-terrain vehicles in wooded areas if requested by the landowner. Pipeline markers will be installed

at road and railroad crossings and other locations (as required by 49 CFR Part 195) to show the location of the pipeline. Markers will identify the owner of the pipeline and convey emergency information. Special markers providing information and guidance to aerial patrol pilots also will be installed.

2.1.8.2 Special Construction Procedures

In addition to standard pipeline construction methods, Keystone will use special construction techniques where warranted by site-specific conditions. These special techniques will be used when constructing across paved roads, highways, railroads, steep terrain, waterbodies, wetlands, and when blasting through rock. These special techniques are described below.

Road, Highway, and Railroad Crossings

Construction across paved roads, highways, and railroads will be in accordance with the requirements of the road and railroad crossing permits and approvals obtained by Keystone. In general, all major paved roads, all primary gravel roads, highways, and railroads will be crossed by boring beneath the road or railroad. **Figure 2.1-19** illustrates a typical bored road or railroad crossing. Boring requires the excavation of a pit on each side of the feature, the placement of boring equipment in the pit, and boring a hole under the road at least equal to the diameter of the pipe. Once the hole is bored, a prefabricated pipe section will be pulled through the borehole. For long crossings, sections can be welded onto the pipe string just before being pulled through the borehole. Boring will result in minimal or no disruption to traffic at road, highway, or railroad crossings. Each boring will be expected to take one to two days for most roads and railroads and up to 10 days for long crossings such as interstate or four-lane highways.

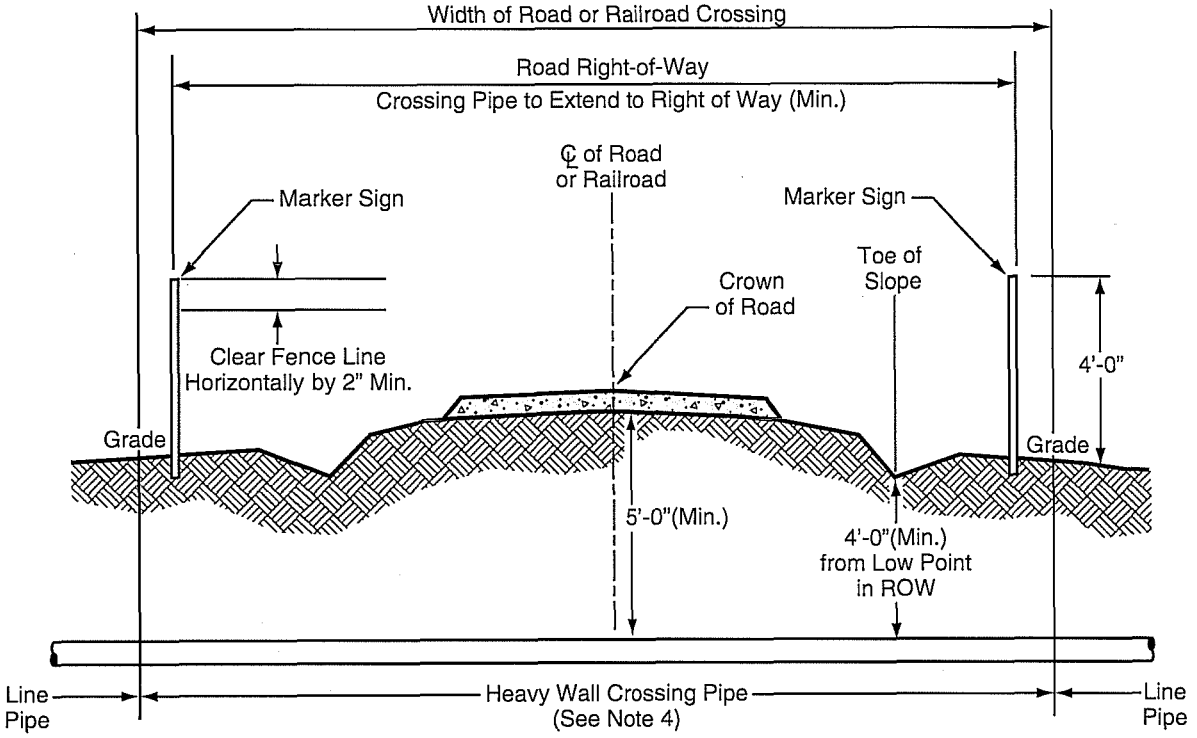
Most smaller, unpaved roads and driveways will be crossed using the open-cut method where permitted by local authorities or private owners. The open-cut method will require temporary closure of the road to traffic and establishment of detours. If no reasonable detour is feasible, at least one lane of traffic will be kept open, except during brief periods when it is essential to close the road to install the pipeline. Most open-cut road crossings will be completed and the road resurfaced in one or two days. Keystone will take measures, such as posting signs at open-cut road crossings, to ensure safety and minimize traffic disruptions.

Steep Terrain

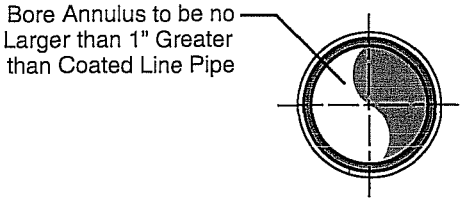
Additional grading may be required in areas where the proposed pipeline route will cross steep slopes. Steep slopes often need to be graded down to a gentler slope for safe operation of construction equipment and to accommodate pipe-bending limitations. In such areas, the slopes will be excavated prior to pipeline installation and reconstructed to their original contours during restoration.

In areas where the proposed pipeline route crosses laterally along the side of a slope, cut and fill grading may be required to obtain a safe, flat work terrace. Topsoil will be stripped from the entire ROW and stockpiled prior to cut and fill grading on steep terrain. Generally, on steep side-slopes, soil from the high side of the ROW will be excavated and moved to the low side of the ROW to create a safe and level work terrace. After the pipeline is installed, the soil from the low side of the ROW will be returned to the high side and the slope's original contours will be restored. Topsoil from the stockpile will be spread over the surface, erosion control features installed, and seeding implemented.

In steep terrain, temporary sediment barriers such as silt fence and straw bales will be installed during clearing to prevent the movement of disturbed soil into wetland, waterbody, or other environmentally sensitive areas. Temporary slope breakers consisting of mounded and compacted soil will be installed across the ROW during grading and permanent slope breakers will be installed during cleanup. Following construction, seed will be applied to steep slopes and the ROW will be mulched with hay or non-brittle straw or covered with erosion control fabric. Sediment barriers will be maintained across the ROW until permanent vegetation is established.



TYPICAL UNCASED ROAD CROSSING - BORED



Notes:

1. Crossings shall be in accordance with applicable permit.
2. Road crossing pipe shall extend at minimum to right-of-way line.
3. The type and minimum required length of pipe for crossings of roads shall be as specified on alignment sheets.
4. Pipe for bored crossings to include abrasion-resistant (ARB) coating.
5. Pipeline marker and test stations to be installed on ROW line next to fence if possible.
6. The crossing pipe shall be straight with no vertical or horizontal bends within the road right-of-way.

KEYSTONE PIPELINE PROJECT

Figure 2.1-19
Typical Uncased
Road or Railroad
Crossing - Bored

Waterbody Crossings

A total of 272 perennial streams and rivers will occur during the construction of the Keystone Mainline and 58 perennial waterbody crossings will occur on the Cushing Extension. Perennial waterbodies will be crossed using one of four techniques: the open-cut wet method (Keystone's preferred method), open-cut flume method, open-cut dam-and-pump method, or horizontal directional drill (HDD) method as described below.

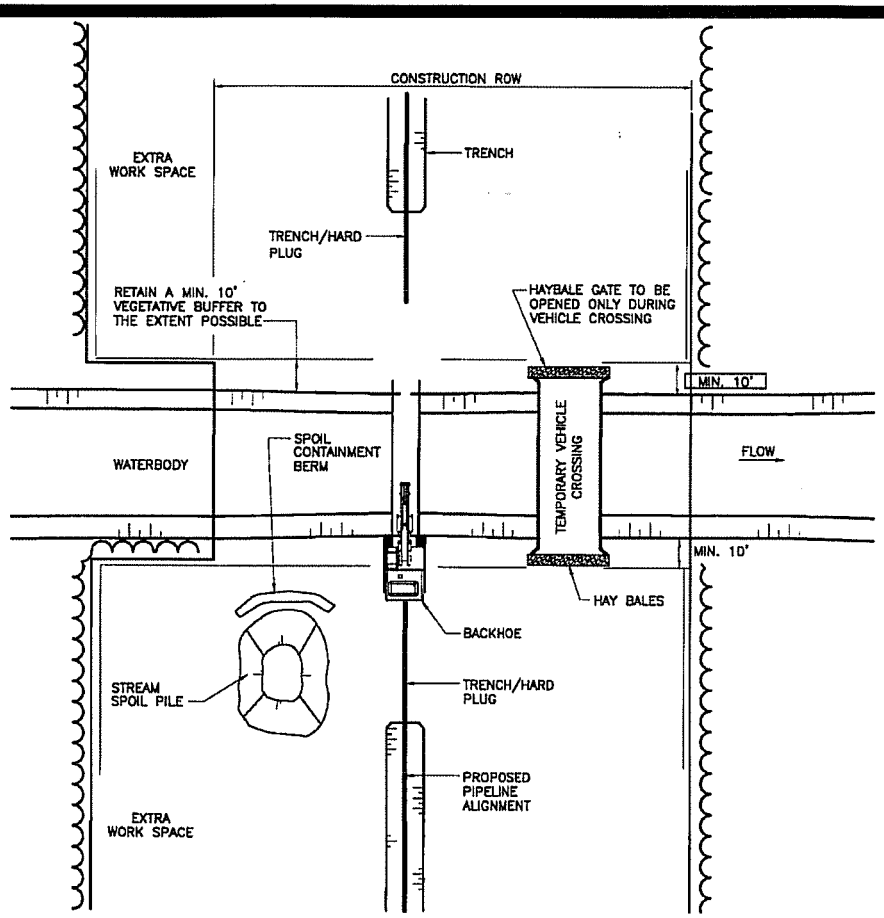
Keystone's preferred crossing method will be to use an open-cut wet crossing. The open-cut wet method involves trenching through the waterbody while water continues to flow through the construction work area (**Figure 2.1-20**). Pipe segments for the crossing will be fabricated adjacent to the waterbody. Generally, backhoes operating from one or both banks will excavate the trench within the streambed. In wider rivers, in-stream operation of equipment may be necessary. Trench plugs consisting of a hard or soft plug will be placed to prevent the flow of water into the upland portions of the trench. Trench spoil excavated from the streambed generally will be placed at least 10 feet away from the water's edge unless stream width is great enough to require placement in the stream bed. Sediment barriers will be installed where necessary to control sediment and to prevent excavated spoil from entering the water. After the trench is dug, the prefabricated pipeline segment will be carried, pushed, or pulled across the waterbody and positioned in the trench. When crossing saturated wetlands and flowing waterbodies using the open-cut method, the pipe coating will be covered with reinforced concrete or concrete weights to provide negative bouyancy. The trench will then be backfilled with native material or with imported material if required by applicable permits. Following backfilling, the banks will be restored and stabilized.

Keystone will utilize dam and pump or dry flume crossings where technically feasible on environmentally sensitive waterbodies as warranted by resource-specific sensitivities. The flume crossing method involves diverting the flow of water across the trenching area through one or more flume pipes placed in the waterbody. The dam-and-pump method is similar to the flume method except that pumps and hoses will be used instead of flumes to move water around the construction work area. In both methods, trenching, pipe installation, and backfilling are done in isolation from the live stream while water flow is maintained for all but a short reach of the waterbody at the actual crossing. Once backfilling is completed, the flume or pump hoses are removed and the streambanks restored and stabilized.

At the Missouri River (two crossings), Platte River, Chariton River, Cuivre River (two crossings), Mississippi River, Hurricane Creek, and Kaskaskia River, Keystone plans to use the HDD method of construction. The HDD method involves drilling a pilot hole under the waterbody and banks, then enlarging the hole through successive reamings until the hole is large enough to accommodate a prefabricated segment of pipe. Throughout the process of drilling and enlarging the hole, a slurry consisting mainly of water and bentonite clay will be circulated to power and lubricate the down-hole tools, remove drill cuttings, and hold the hole open. Pipe sections long enough to span the entire crossing will be staged and welded along the construction work area on the opposite side of the waterbody and then pulled through the drilled hole. Ideally, use of the HDD method results in no impact on the banks, bed, or water quality of the waterbody being crossed. **Figure 2.1-21** shows a conceptual HDD waterbody crossing.

Approximately 840 intermittent waterbody crossings will occur on the Keystone Mainline and about 133 intermittent waterbody crossings on the Cushing Extension. If these intermittent waterbodies are dry at the time of crossing, Keystone proposes to use conventional upland cross-country construction techniques. If an intermittent waterbody is flowing when crossed, Keystone will install the pipeline using the open cut wet crossing method discussed above. When crossing waterbodies, Keystone will adhere to the guidelines outlined in its Site-Specific Waterbody Crossing Plans (Appendix D), Keystone's Plan (Appendix E) and the requirements of its waterbody crossing permits.

Additional temporary workspace areas will be required on both sides of all waterbodies to stage construction, fabricate the pipeline, and store materials. These workspaces will be located at least 50 feet away from the water's edge, except where the adjacent upland consists of actively cultivated or rotated cropland or other



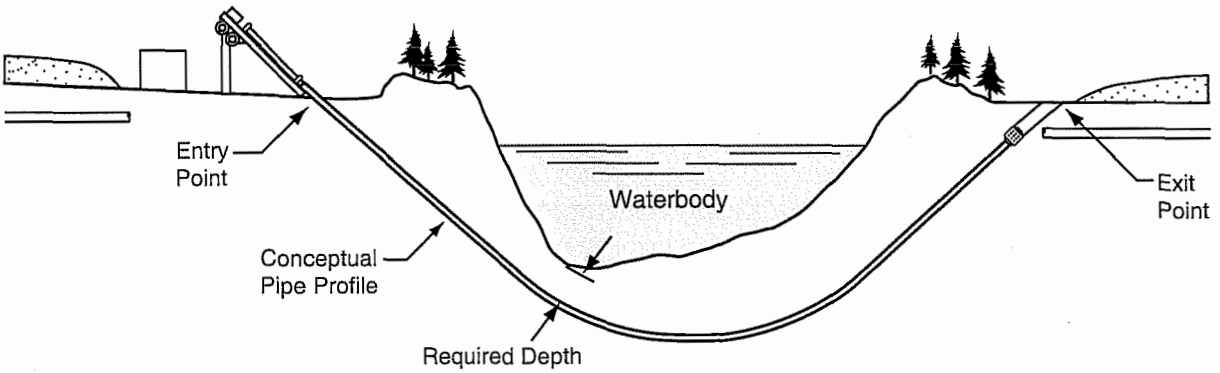
PLAN VIEW

CONSTRUCTION PROCEDURES:

1. RIGHT-OF-WAY BOUNDARIES AND WORK SPACE LIMITS SHALL BE CLEARLY DELINEATED. STAGING FOR MAKEUP SHALL BE LOCATED A MINIMUM OF 10 FEET FROM WATERBODY.
2. CLEARING LIMITS WILL BE CLEARLY DELINEATED AND A 10 FOOT VEGETATIVE BUFFER STRIP BETWEEN DISTURBED AREA AND THE WATERBODY SHALL BE MAINTAINED TO THE EXTENT POSSIBLE. ALL CLEARING SHALL BE MINIMIZED TO THE EXTENT POSSIBLE AND TO ONLY THAT NECESSARY FOR CONSTRUCTION. WOODY VEGETATION SHALL BE CUT AT GROUND LEVEL AND THE STUMPS/ROOTS LEFT IN PLACE TO THE EXTENT POSSIBLE.
3. TOPSOIL SHALL BE STRIPPED FROM THE DITCH LINE IN ALL WETLANDS RIPARIAN.
4. CONTRACTOR SHALL INSTALL SIGNS APPROXIMATELY 100 FEET MINIMUM FROM EACH WATERBODY AND WETLAND TO IDENTIFY THE HAZARDOUS MATERIALS EXCLUSION AREA.
5. EROSION AND SEDIMENT CONTROL
   A. CONTRACTOR SHALL SUPPLY, INSTALL AND MAINTAIN SEDIMENT CONTROL STRUCTURES, AS DEPICTED OR ALONG DOWN GRADIENT SIDES OF WORK AREAS AND STAGING AREAS SUCH THAT NO HEAVILY SILT LADEN WATER ENTERS WATERBODY OR WETLAND.
   B. NO HEAVILY SILT LADEN WATER SHALL BE DISCHARGED DIRECTLY OR INDIRECTLY INTO THE WATERBODY. ALL EROSION AND SEDIMENT CONTROL STRUCTURE LOCATIONS AS DEPICTED ARE APPROXIMATE AND MAY BE ADJUSTED AS DIRECTED BY THE COMPANY INSPECTOR TO SUIT ACTUAL SITE CONDITIONS. SILT FENCE OR STRAW BALE INSTALLATIONS SHALL INCLUDE REMOVABLE SECTIONS TO FACILITATE ACCESS DURING CONSTRUCTION.
   C. SEDIMENT LADEN WATER FROM TRENCH DEWATERING SHALL BE DISCHARGED TO A WELL VEGETATED UPLAND AREA, INTO A STRAW BALE DEWATERING STRUCTURE OR GEOTEXTILE FILTER BAG. SEDIMENT CONTROL STRUCTURES MUST BE IN PLACE AT ALL TIMES ACROSS THE DISTURBED CONSTRUCTION RIGHT OF WAY EXCEPT DURING EXCAVATION/INSTALLATION OF THE CROSSING PIPE.
   D. SOFT DITCH PLUGS MUST REMAIN IN PLACE AT CONVENIENT LOCATIONS TO SEPARATE MAINLINE DITCH FROM THE WATERBODY CROSSING UNTIL THE WATER CROSSING IS INSTALLED AND BACKFILLED.
   E. TRENCH BREAKERS ARE TO BE INSTALLED AT THE SAME SPACING AND IMMEDIATELY UPSLOPE OF PERMANENT SLOPE BREAKERS, OR AS DIRECTED BY THE COMPANY.
6. CONTRACTOR SHALL MAINTAIN HARD PLUGS IN THE DITCH AT THE WATERBODY UNTIL JUST PRIOR TO PIPE INSTALLATION. CONTRACTOR SHALL EXCAVATE TRENCH AND INSTALL PIPE AS EXPEDIENTLY AS PRACTICAL TO REDUCE THE DURATION OF WORK ACTIVITIES IN THE WATERBODY BED.
7. CONTRACTOR SHALL PLACE TRENCH SPOIL ONLY IN CERTIFICATED WORK SPACE AND A MINIMUM OF 10 FEET FROM THE WATERBODY BANKS TO PREVENT ENTRY OF SPOIL INTO THE WATERBODY. SPOIL SHALL BE CONTAINED AS NECESSARY USING EITHER A STRAW BALE BARRIER OR AN EARTH/ROCK BERM.
8. CONTRACTOR SHALL RESTORE THE WATERBODY AND BANKS TO APPROXIMATE PRECONSTRUCTION CONTOURS, UNLESS OTHERWISE APPROVED BY THE COMPANY. CONTRACTOR SHALL INSTALL PERMANENT EROSION AND SEDIMENT CONTROL STRUCTURES AS INDICATED. ANY MATERIALS PLACED IN THE WATERBODY TO FACILITATE CONSTRUCTION SHALL BE REMOVED DURING RESTORATION. BANKS SHALL BE STABILIZED AND TEMPORARY SEDIMENT BARRIERS INSTALLED AS SOON AS POSSIBLE AFTER CROSSING, BUT WITHIN 24 HOURS OF COMPLETING THE CROSSING. MAINTAIN A SILT FENCE OR STRAW BALE BARRIER ALONG THE WATERBODY AND WETLAND BOUNDARIES UNTIL VEGETATION IS ESTABLISHED IN ADJACENT DISTURBED AREAS.
9. VEHICLE CROSSING CAN BE CONSTRUCTED USING EITHER A FLUME CROSSING OR A TEMPORARY BRIDGE. VEHICLE CROSSING ONLY REQUIRED IF STREAM SUPPORTS A STATE DESIGNATED FISHERY.

KEYSTONE PIPELINE PROJECT

Figure 2.1-20
Typical Waterbody Crossing
Open Cut Trench



PROFILE

Notes:

1. Set up drilling equipment a minimum of 100 feet from the edge of the watercourse. Limit clearing between drill entry and exit point to brush clearing of a 10-foot wide strip as necessary to monitor drilling activities and obtain water for hydrostatic testing and drilling mud.
2. Ensure that only bentonite-based drilling mud is used.
3. Install suitable drilling mud tanks or sumps to prevent contamination of watercourse.
4. Install berms downslope from the drill entry and anticipated exit points to contain any release of drilling mud.
5. Dispose of drilling mud in accordance with the appropriate regulatory authority requirements.

KEYSTONE PIPELINE PROJECT

Figure 2.1-21
Waterbody Crossing
Typical Horizontal
Directional Drill

disturbed land. Before construction, temporary bridges (e.g., subsoil fill over culverts, timber mats supported by flumes, railcar flatbeds, flexi-float apparatus) will be installed across all perennial waterbodies to allow construction equipment to cross. Construction equipment will be required to use the bridges, except the clearing crew, which will be allowed one pass through the waterbodies before the bridges are installed.

During clearing, sediment barriers such as silt fence and staked straw bales will be installed and maintained on drainages across the ROW adjacent to waterbodies and within additional temporary workspace areas to minimize the potential for sediment runoff. Silt fence and/or straw bales located across the working side of the ROW will be removed during the day when vehicle traffic is present and will be replaced each night. Alternatively, drivable berms could be installed and maintained across the ROW in lieu of silt fence and/or straw bales.

In general, equipment refueling and lubricating at waterbodies will take place in upland areas that are 100 feet or more from the edges of the water. When circumstances dictate that equipment refueling and lubricating will be necessary in or near waterbodies, Keystone will follow its SPCC Plan to address the handling of fuel and other hazardous materials.

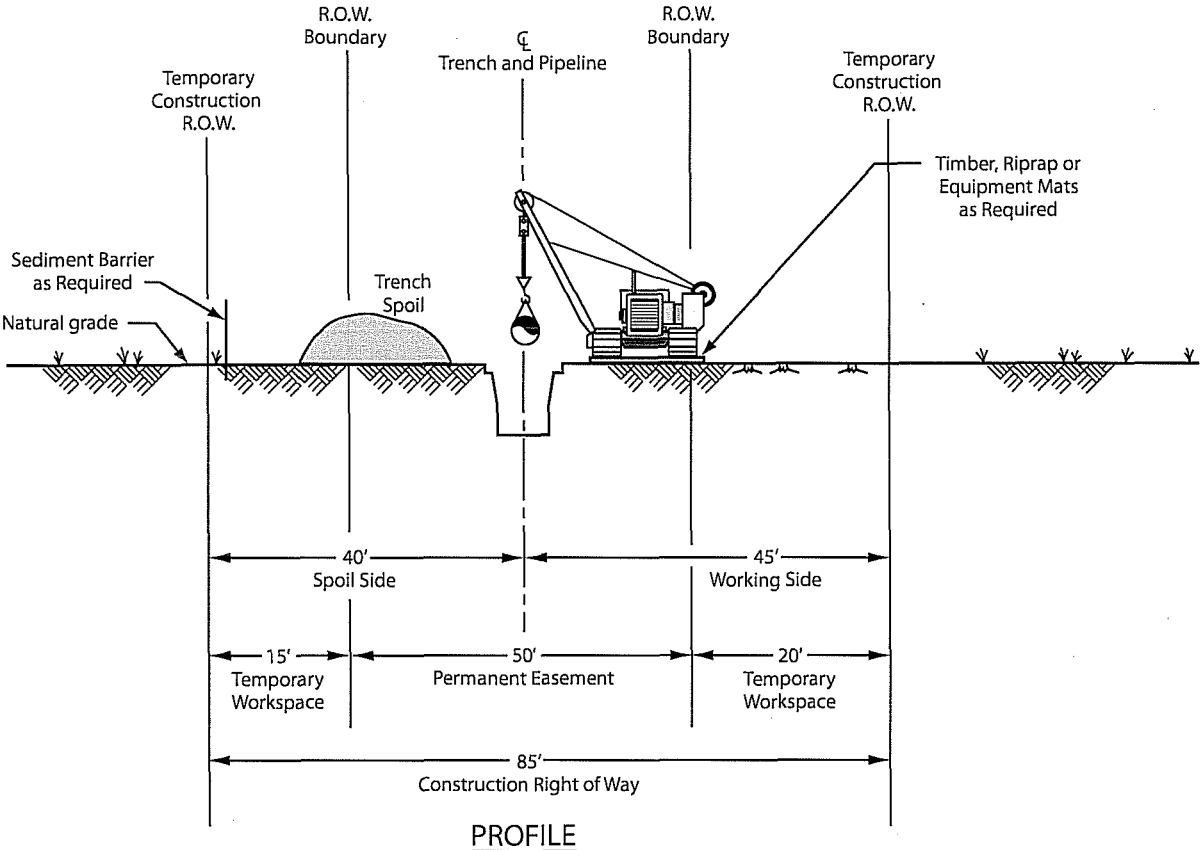
After the pipeline is installed beneath the waterbody, restoration will begin. Waterbody banks will be restored to preconstruction contours or to a stable configuration. Appropriate erosion control measures such as rock riprap or gabion baskets (rock enclosed in wire bins), log walls, vegetated geogrids, willow cuttings, etc.) will be installed as necessary on steep waterbody banks in accordance with permit requirements. More stable banks will be seeded with native grasses and mulched or covered with erosion control fabric. Waterbody banks will be temporarily stabilized within 24 hours of completing in-stream construction. Sediment barriers, such as silt fence and/or straw bales or drivable berms will be maintained across the ROW at all waterbody approaches until permanent vegetation is established. Temporary equipment bridges will be removed following construction.

Wetland Crossings

Data from wetland delineation field surveys, aerial photography, and National Wetland Inventory (NWI) map data were used to identify wetlands crossed by the proposed Keystone Mainline and Cushing Extension. Pipeline construction across wetlands will be similar to typical conventional upland cross-country construction procedures, with several modifications where necessary to reduce the potential for pipeline construction to affect wetland hydrology and soil structure.

The wetland crossing method used will depend largely on the stability of the soils at the time of construction. If wetland soils are not excessively saturated at the time of construction and can support construction equipment without equipment mats, construction will occur in a manner similar to conventional upland cross-country construction techniques (**Figure 2.1-22**). Topsoil will be salvaged over the trenchline. In saturated soils, topsoil segregation generally will not be possible. Keystone typically will use an 85-foot-wide construction ROW through saturated wetlands unless non-cohesive soils are present that will require a wider construction ROW. Additional temporary workspace areas will be required on both sides of particularly wide saturated wetlands to stage construction, fabricate the pipeline, and store materials. These additional temporary workspace areas will be located in upland areas a minimum of 10 feet from the wetland edge.

Construction equipment working in saturated wetlands will be limited to that area essential for ROW clearing, excavating the trench, fabricating and installing the pipeline, backfilling the trench, and restoring the ROW. In areas where there is no reasonable access to the ROW except through wetlands, non-essential equipment will be allowed to travel through wetlands only if the ground is firm enough or has been stabilized to avoid rutting.



PROFILE

Notes:

1. Flag wetland boundaries prior to clearing.
2. No refueling of mobile equipment is allowed within 100 feet of wetland. Place "No Fueling" sign posts 100 feet back from wetland boundary. Refuel stationary equipment as per Keystone's spill prevention procedures.
3. Install temporary slope breaker upslope within 100 feet of wetland boundary if directed by Keystone.
4. Install timber mats/riprap through entire wetland area. Equipment necessary for right-of-way clearing may make one (1) pass through the wetland before mats are installed.
5. Aviod adjacent wetlands. Install sediment barriers (straw bales and/or silt fence) at downslope edge of right-of-way and along wetland edge as required.
6. Restrict root grubbing to only that area over the ditchline and ditch spoil areas and remove from wetland for disposal.
7. Topsoil stripping shall not be required in saturated soil conditions
8. Leave hard plugs at edge of wetland until just prior to trenching.
9. Pipe section may be fabricated within the wetland and adjacent to alignment, or in staging area outside the wetland and walked in.
10. Trench through wetland.
11. Lower-in pipe, install trench plugs at wetland edges as required and backfill immediately.
12. Remove timber mats or prefabricated mats from wetland upon completion.
13. Restore grade to near pre-construction topography, replace topsoil, and install permanent erosion control.

KEYSTONE PIPELINE PROJECT

Figure 2.1-22
Typical Standard
Wetland Crossing

Clearing of vegetation in wetlands will be limited to trees and shrubs, which will be cut flush with the surface of the ground and removed from the wetland. To avoid excessive disruption of wetland soils and the native seed and rootstock within the wetland soils, stump removal, grading, topsoil segregation, and excavation will be limited to the area immediately over the trenchline. During clearing, sediment barriers, such as silt fence and staked straw bales, will be installed and maintained on downslopes adjacent to saturated wetlands and within additional temporary workspace areas as necessary to minimize the potential for sediment runoff.

Where wetland soils are saturated and/or inundated, the pipeline can be installed using the push-pull technique. The push-pull technique will involve stringing and welding the pipeline outside of the wetland and excavating and backfilling the trench using a backhoe supported by equipment mats or timber riprap. 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 pipe installed in saturated wetlands will be coated with concrete or equipped with set-on weights to provide negative buoyancy. Because little or no grading will occur in wetlands, restoration of contours will be accomplished during backfilling. Prior to backfilling, trench breakers will be installed where necessary to prevent the subsurface drainage of water from wetlands. Where topsoil has been segregated from subsoil, the subsoil will be backfilled first, followed by the topsoil. Topsoil will be replaced to the original ground level leaving no crown over the trenchline. In some areas where wetlands overlie rocky soils, the pipe will be padded with rock-free soil or sand before backfilling with native bedrock and soil. Equipment mats, timber riprap, gravel fill, geotextile fabric, and/or straw mats will be removed from wetlands following backfilling.

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

In wetlands where no standing water is present, the construction ROW will be seeded in accordance with the recommendations of the local soil conservation authorities or land management agency.

Blasting

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

Residential and Commercial Construction

Keystone used 2005 aerial photography to identify areas containing buildings within 25 feet of the construction ROW. These areas are summarized in **Table 2.1-6**. Prior to construction, Keystone will verify the proximity of buildings to the pipeline and determine if the structures are occupied residences or commercial businesses. Keystone will develop site-specific construction plans to mitigate the impacts of construction on residential and commercial structures.

Fences and Grazing

Fences will be crossed or paralleled by the construction ROW. Before cutting any fences for pipeline construction, each fence crossed by the ROW will be braced and secured to prevent the slacking of the fence.

Table 2.1-6 Areas with Buildings Located Within 25 Feet of the Construction ROW

	County	MP	Structures
KEYSTONE MAINLINE			
North Dakota	Barnes	126.8	single
	Sargent	204.9	single
South Dakota	Marshall	240.3	single
	Hanson	377.9	single
	Hutchinson	403.7	single
	Yankton	429.3	single
	Yankton	433.8	single
Nebraska	Seward	570.9	single
	Seward	585.3	single
	Jefferson	627.1	single
	Gage	647.0	single
Kansas	Nemaha	684.8	several
	Nemaha	687.1	single
	Nemaha	693.8	single
	Brown	703.6	single
	Brown	708.7	single
	Doniphan	728.1	several
	Doniphan	733.7	development
	Doniphan	734.4	several
Missouri	Buchanan	753.4	several
	Buchanan	754.4	several
	Buchanan	756.4	development
	Buchanan	757.2	single
	Clinton	771.8	single
	Clinton	773.3	single
	Clinton	777.1	several
	Clinton	785.6	several
	Clinton	789.2	single
	Caldwell	794.0	single
	Caldwell	796.4	single
	Caldwell	802.9	single
	Caldwell	807.7	single
	Caldwell	810.5	single
	Carroll	823.3	single
	Carroll	823.9	single
	Carroll	824.6	several
	Carroll	827.8	single

Table 2.1-6 Areas with Buildings Located Within 25 Feet of the Construction ROW

	County	MP	Structures
	Carroll	830.8	several
	Carroll	832.9	single
	Chariton	842.7	single
	Chariton	848.5	several
	Chariton	858.4	single
	Chariton	859.5	several
	Chariton	859.7	single
	Chariton	867.4	several
	Chariton	871.9	single
	Randolph	877.6	several
	Randolph	881.2	single
	Audrain	905.1	development
	Audrain	908.8	single
	Audrain	914.4	several
	Audrain	926.4	single
	Montgomery	943.7	single
	Montgomery	945.8	single
	Montgomery	947.6	single
	Montgomery	948.6	several
	Montgomery	950.9	development
	Montgomery	952.3	several
	Lincoln	956.1	single
	Lincoln	956.7	single
	Lincoln	961.3	several
	Lincoln	965.9	several
	Lincoln	968.4	development
	Lincoln	972.2	several
	Lincoln	975.8	single
	Lincoln	978.7	several
	St. Charles	982.3	several
	St. Charles	983.3	single
	St. Charles	1007.9	single
	St. Charles	1013.6	single
Illinois	Madison	1024.5	single
CUSHING EXTENSION			
Nebraska	N/A	N/A	None
Kansas	Marion	124.6	single
	Butler	156.4	development

Table 2.1-6 Areas with Buildings Located Within 25 Feet of the Construction ROW

	County	MP	Structures
	Cowley	180.3	single
	Cowley	188.2	single
	Cowley	200.5	several
	Cowley	208.1	several
	Cowley	209.1	several
Oklahoma	Kay	233.2	development
	Kay	234.3	several
	Kay	235.3	single
	Noble	254.1	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

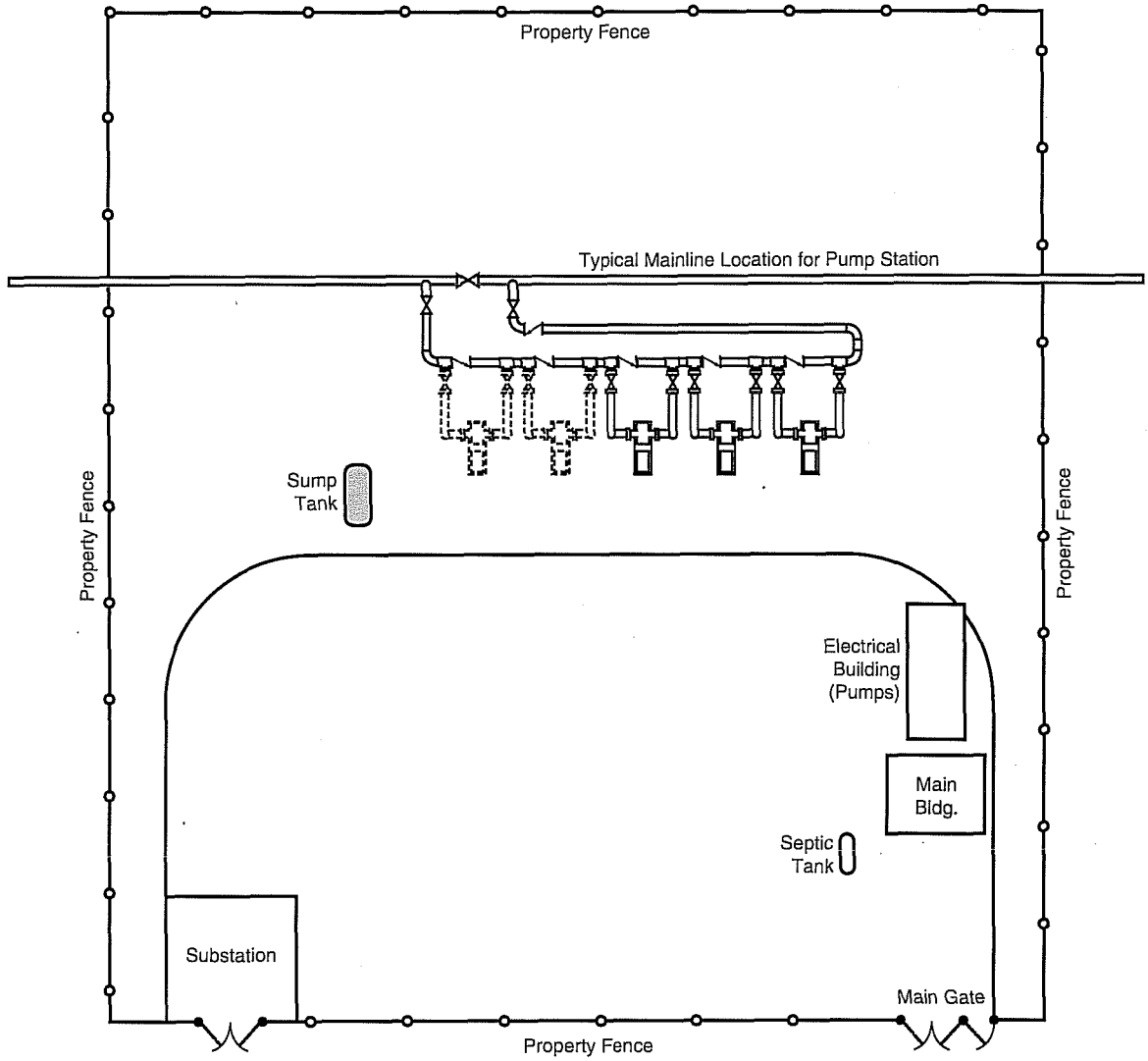
To prevent the passage of livestock, the opening in the fenceline will be temporarily closed when construction crews leave the area. If gaps in natural barriers used for livestock control are created by the pipeline construction, the gaps will be fenced according to the landowner's requirements. All existing improvements, such as fences, gates, irrigation ditches, cattle guards, and reservoirs will be maintained during construction and repaired to pre-construction conditions or better.

2.1.8.3 Aboveground Facility Construction Procedures

Construction activities at each of the pump stations will follow a standard sequence of activities: clearing and grading, installing foundations for the electrical building and support buildings, and erecting the structures to support the pumps and associated facilities. A block valve is installed in the mainline with two side block valves, one to the suction piping of the pumps and one from the discharge piping of the pumps. Construction activities and the storage of building materials will be confined to the pump station construction sites. **Figures 2.1-23** and **2.1-24** illustrates a typical plot plan for a pump station.

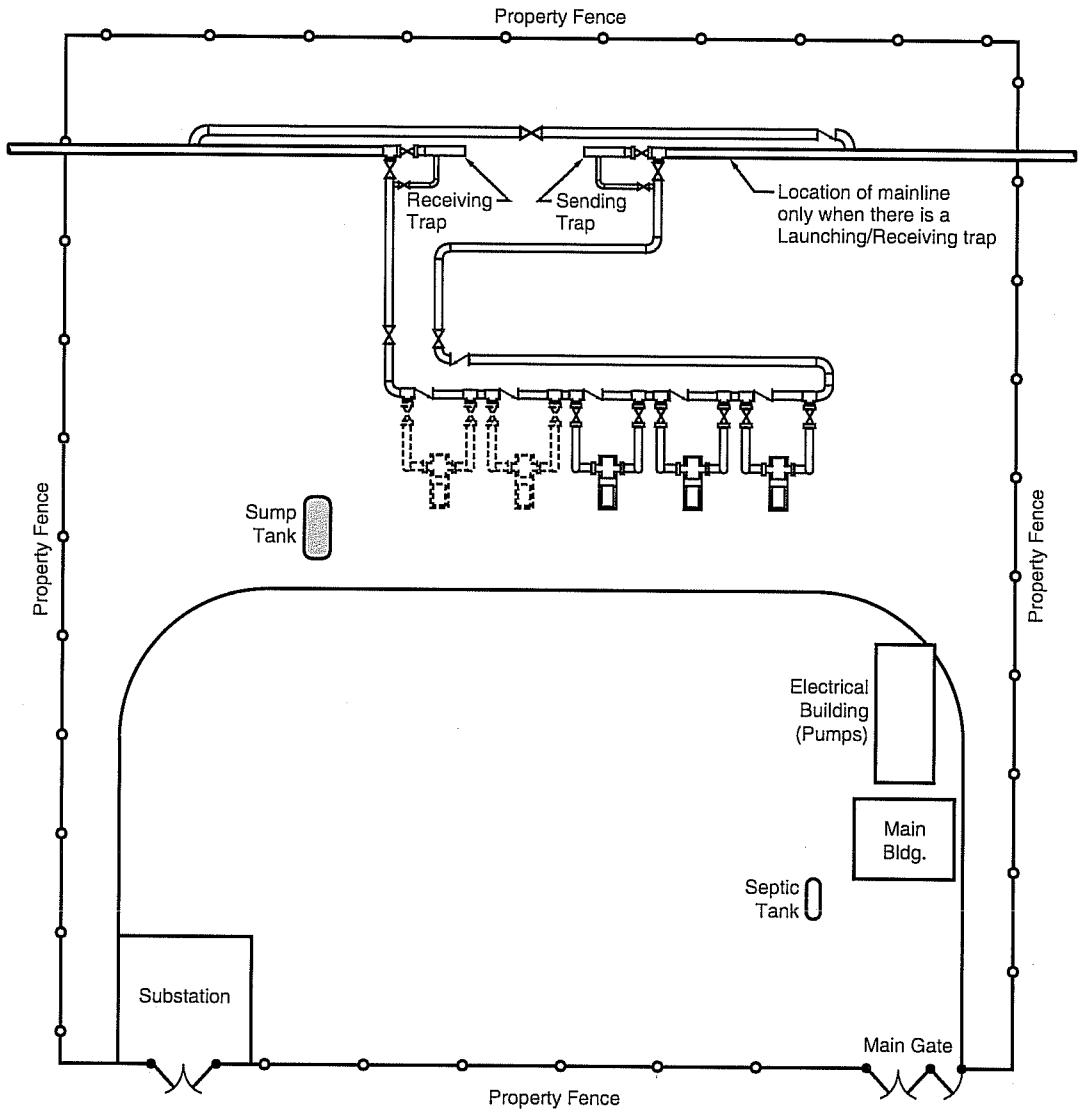
The sites for the pump stations will be cleared of vegetation and graded as necessary to create a level surface for the movement of construction vehicles and to prepare the area for the building foundations. Foundations will be constructed for the pumps and buildings and soil will be stripped from the area of the building foundations.

Each pump station will include one electrical building and one support building. The electrical building will include electrical systems, communications, and control equipment. The second building houses a small office and washroom. The crude oil piping, both aboveground and belowground, will be installed and pressure-tested



KEYSTONE PIPELINE PROJECT

Figure 2.1-23
Typical Pump Station without Pigging Facilities



KEYSTONE PIPELINE PROJECT

Figure 2.1-24
Typical Pump Station with Pigging Facilities

using methods similar to those used for the main pipeline. After testing is successfully completed, the piping will be tied in to the main pipeline. Piping installed below grade will be coated for corrosion protection prior to backfilling. In addition, all below grade facilities will be protected by a cathodic protection system. Before being put into service, pumps, controls, and safety devices will be checked and tested to ensure proper system operation and activation of safety mechanisms.

Each pump station will require electricity and telephone facilities, which will be obtained from local utilities. **Table 2.1-7** summarizes electrical power and distribution lines requirements.

Table 2.1-7 Summary of Electrical Power Supply Requirements for Pump Stations

Station	Local Utility	Service Description
KEYSTONE MAINLINE		
North Dakota		
Pump Station ML#15	NODAK Electric Cooperative	Approximately 8 miles of new 69-kilovolt (kV) transmission line from existing 69-kV line to main substation at pump station site. Approximately 25 miles of existing 69-kV line upgrades. 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 11.5 miles of 69-kV transmission line from existing 69-kV line to main substation at pump station site. Approximately 17 miles of existing 69-kV line upgrades. Main pump station substation with 15 MVA 69/4.16-kV transformer.
Pump Station ML#18	Ottertail Power Company	Approximately 18 miles of 115-kV transmission line 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#19	Dakota Valley Electric Cooperative	Approximately 29 miles of 115-kV transmission line from Foreman substation to main substation at pump station site. Remote end upgrades. Main pump station substation with 12/16 MVA 115/4.16-kV transformer.
South Dakota		
Pump Station ML#20	Lake Region Electric Association, Inc.	Approximately 13 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 3 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 a 15 MVA 69/4.16-kV transformer.
Pump Station ML#22	Central Electric Cooperative Inc.	Approximately 12 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.

Table 2.1-7 Summary of Electrical Power Supply Requirements for Pump Stations

Station	Local Utility	Service Description
Pump Station ML#23	Southeastern Electric Service Cooperative Inc.	Approximately 19 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	Nebraska Public Power District	Approximately 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 a 15 MVA 69/4.16-kV transformer.
Pump Station ML#25	Nebraska Public Power District	Approximately 3 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	Nebraska Public Power District	Approximately 4 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 10 MVA 34.5/4.16-kV transformer.
Pump Station ML#27	Nebraska Public Power District	Approximately 2 miles of 115-kV transmission line tapping an existing 115-kV line 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#28	Nebraska Public Power District	Approximately 9 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 4.5 miles of 115-kV transmission line tapping an existing line to main substation at pump station site. Remote end upgrades. Main pump station substation with 10 MVA 115/4.16-kV transformer.
Pump Station ML#30	Doniphan Electric Cooperative	Approximately 2 miles of 34.5-kV transmission line tapping an existing line to main substation at pump station site. Main pump station substation with 15 MVA 34.5/4.16-kV transformer.
Missouri		
Pump Station ML#31	Platte-Clay Electric Cooperative	Approximately 2 miles of 161-kV line from an existing substation to main substation at pump station site. Remote end upgrades. Main pump station substation with 15 MVA 161/4.16-kV transformer.
Pump Station ML#32	Kansas City Power & Light	Approximately 6 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 0.5 mile 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	Ameren UE	Approximately 0.5 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.

Table 2.1-7 Summary of Electrical Power Supply Requirements for Pump Stations

Station	Local Utility	Service Description
Pump Station ML#35	Central Electric Power Cooperative	Approximately 3.5 miles 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	Ameren UE	Approximately 0.5 mile of 34.5-kV transmission line tapping an existing line 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 0.5 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 5 MVA 34.5/4.16-kV transformer.
Pump Station ML#38	To Be Determined	Assuming 4.3 miles of 115-kV line to a 115/4.16-kV substation. This pump station will be installed if the project meets the 591,000 bpd capacity.
		CUSHING EXTENSION
Kansas		
Pump Station CE#30	To be determined by utility contacts	Approximately 2.5 miles of 230-kV transmission line tapped off an existing 230-kV line. Main pump station substation with a 15 MVA transformer. Remote end upgrades as required.
Pump Station CE#32	To be determined by utility contacts	Approximately 9 miles of 138-kV transmission line tapped off an existing 138-kV line. Main pump station substation with a 10 MVA transformer. Remote end upgrades as required.
OKLAHOMA		
Pump Station CE#33	To be determined by utility contacts	Approximately 0.8 mile of 138-kV transmission line tapped off an existing 138-kV line. Main pump station substation with a 12 MVA transformer. Remote end upgrades as required.

After the completion of startup and testing, the pump station sites will be graded. A permanent security fence will be installed around each pump station site.

Where delivery and pigging facilities are co-located with pump stations, the delivery and pigging facilities will be located entirely within the pump station sites. Construction activities will include clearing, grading, trenching, installing piping, erecting buildings, fencing the facilities, cleanup, and restoration. The delivery facilities will operate on locally provided power (**Table 2.1-7**).

Mainline valve construction will be carried out concurrent with the construction of the pipeline. Where practical, mainline valves typically will be located near public roads to allow year-round access. If necessary, permanent access roads or approaches will be constructed within the permanent ROW to each mainline valve site.

The construction of pig launchers and receivers will be carried out concurrent with the construction of the pump stations and delivery facilities. Activities such as clearing, grading, trenching, and clean-up will occur simultaneously with construction activities associated with the pump stations and delivery facilities.

2.1.8.4 Construction Workforce and Schedule

Keystone proposes to begin construction in early 2008. Construction is expected to last 18 months, ending in September 2009. Keystone proposes to commence service by November 30, 2009. Work on the Cushing Extension will begin in late 2009 or early 2010, with an in-service date for the Cushing Extension of 2010. Keystone anticipates a peak workforce of approximately 2,500 to 3,000 construction personnel. Construction personnel will consist of Keystone employees, contractor employees, construction inspection staff, and environmental inspection staff.

Keystone is planning to build the Keystone Mainline in four or five spreads and the Cushing Extension in one or two spreads (**Table 2.1-8**). Construction activity will occur simultaneously on the four or five Keystone Mainline spreads.

Table 2.1-8 Construction Spreads Associated with the Keystone Pipeline Project

Spread Number	Location	Approximate Distance within Construction Spread (miles)
KEYSTONE MAINLINE		
Spread 1	Cavalier, ND to Spink, SD	300 miles
Spread 2	Beadle, SD to Gage, NE	330 miles
Spread 3	Marshall, NE to Chariton, MO	215 miles
Spread 4	Chariton, MO to Patoka, IL	220 miles
CUSHING EXTENSION		
Spread 5	Jefferson, NE to Cushing, OK	300 miles

Keystone anticipates 500 to 600 construction and inspection personnel associated with each spread. Each spread will require 15 months to complete. All construction work is expected to be completed by the end of September 2009. Currently, Keystone proposes construction of the aboveground facilities in the spring of 2008. Construction of each pump station will require approximately 20 to 30 additional workers. Construction of pump stations will be completed in 18 months.

Keystone, through its construction contractors and subcontractors, will attempt to hire temporary construction staff from the local population. At peak workforce, Keystone anticipates that an average of 10 to 15 percent of the total construction workforce may be hired locally, with the remaining portion of the workforce (85 to 90 percent or more) consisting of non-local personnel.

Only work vehicles will be allowed on the construction ROW or additional temporary workspace areas during construction.

2.1.8.5 Future Plans and Abandonment

Future Plans

As discussed in Chapter 1.0, the Keystone Pipeline system initially will be capable of transporting 435,000 bpd and is expandable up to a capacity of approximately 591,000 bpd. While there is no certainty that the project will reach its full potential, all of the additional pumps and one additional pump station that will be required to achieve maximum capacity have been addressed in this ER.

Keystone is evaluating the potential construction of the Cushing Extension. In November of 2005, TransCanada conducted an Expression of Interest for the Cushing Extension during the Keystone Pipeline Project's Open Season. Sufficient interest was received to warrant further development of the Cushing Extension project. A subsequent Open Season is necessary to solicit binding contract commitments to support the project. TransCanada anticipates conducting an Open Season for the Cushing Extension in late 2006 to early 2007. If sufficient shipper support is received during the Open Season, Keystone would likely proceed with construction activities necessary to meet an estimated in-service timeframe of late 2010.

If Keystone receives the additional contractual commitments required to support construction of the Cushing Extension, additional pumping units at pump stations upstream of Mainline MP 632 will be required. Additional upstream stations and additional upstream pipeline construction will not be required.

Abandonment

The proposed Keystone pipeline is expected to operate for 50 or more years. Keystone has not identified plans for abandonment of these facilities at this time. If abandonment of any facilities is proposed in the future, the abandonment will be subject to approvals by state and/or federal agencies having jurisdiction. Abandonment will be implemented in accordance with then-applicable permits, approvals, codes, and regulations.

2.1.9 Operation and Maintenance

Keystone will operate and maintain the project facilities in accordance with the USDOT regulations in 49 CFR Parts 194 and 195 and other applicable federal and state regulations. Operation and maintenance of the pipeline system in most cases will be accomplished by Keystone personnel. Keystone estimates that operation of the pipeline will require approximately 20 employees in the U.S.

2.1.9.1 Normal Operations and Routine Maintenance

The pipeline will be inspected periodically from the air and on foot as operating conditions permit but no less frequently than as required by 49 CFR Part 195. These surveillance activities will provide information on possible encroachments and nearby construction activities, erosion, exposed pipe, and other potential concerns that may affect the safety and operation of the pipeline. Evidence of population changes will be monitored and High Consequence Areas identified as necessary. Mainline valves also will be inspected annually and the results documented.

In order to maintain accessibility of the ROW and to accommodate pipeline integrity surveys, woody vegetation along the pipeline ROW periodically will be cleared over the pipeline. Cultivated croplands (such as wheat and corn) will be allowed to grow in the permanent ROW. Large trees will be removed from the permanent ROW. Keystone will use mechanical mowing or cutting along its ROW for normal vegetation maintenance.

During operations, Keystone will monitor the pipeline and conduct pipeline integrity surveys to identify any potential integrity concerns. Plans related to waterbodies, wetlands, and upland areas are discussed in Keystone's Plan (Appendix E). Operation and maintenance procedures, including record keeping, will be performed in accordance with the USDOT requirements. Keystone will survey the ROW to identify areas where permanent erosion control devices require repair or additional erosion control devices are necessary to prevent future degradation.

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

Supervisory Control and Data Acquisition (SCADA) facilities will be located at all pump stations and delivery facilities. The pipeline SCADA system will be capable of the following functions:

- Mainline valve position remote indication;
- Mainline valve remote closing and opening control from a control center;
- Remote indication of line pressure and temperature; and
- Remote indication of delivery flow and total flow.

The Keystone pipeline will have a control center manned by an experienced and highly trained crew 24 hours per day for 365 days per year. A backup control center also will be constructed.

Communications systems will provide up-to-date information from the pump stations to the control center plus the capability to contact field personnel. A backup communications system will be included within the system design and installation. The control center has state-of-the-art pipeline monitoring systems including a leak detection system that will indicate out-of-normal conditions (see Section 2.1.8.2, Abnormal Operations) and initiate visual and audible alarms if they detect an operating condition that warrant operator investigation. Serious abnormal situations that are not investigated will initiate automatic pipeline shutdown systems.

Crude oil moves along the pipeline at approximately three miles per hour, similar to the pace of an individual walking. The movement of crude oil within a pipeline results in friction between the crude oil and the pipe, so pump stations are installed to generate pressure, up to 1,440 pounds per square inch (psi), to push the crude oil down the pipeline.

2.1.9.2 Abnormal Operations

Abnormal operating procedures will be implemented whenever appropriate in accordance with 49 CFR Section 195.402(d). In the event of any unusual situation, the operations manager on duty will alter the pipeline's operation. In the event pressure indications show a change, higher or lower, the pipeline controller will immediately make an evaluation. If a leak is suspected, Keystone will initiate its Emergency Response Plan (ERP) (submitted to the Department of State on July 1, 2006).

If a leak is suspected and the pipe is shutdown, the operation of the segment will not be resumed until the cause of the alarm (e.g., false alarm by instrumentation) or the leak is identified and repaired. If a reportable leak were to occur, USDOT approval will be required to resume operation of the affected segment.

Keystone will perform aerial surveillance of the pipeline ROW at least 26 times a year, in accordance with 49 CFR Part 195. In addition to visual surveillance and operator diligence, Keystone will employ two technology-based leak detection systems to facilitate the early detection of pipeline leaks. These systems include:

- Leak detection software associated with the SCADA monitoring system; and
- Volumetric balancing.

As described above, Keystone's SCADA system will constantly monitor pipeline operation to quickly detect abnormal operation, including the detection of leaks. The SCADA system and leak detection software will 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 will check pipeline conditions (e.g., flow rates, pressure, temperature, and fluid density) every three to five seconds while the pipeline is actively transporting crude oil. Pressure transducers and other monitoring equipment will be located at pump stations and data from these locations will be transmitted via satellite to the centralized SCADA

location. The SCADA system will acquire and accumulate these data, which will then be fed into a leak detection model for analysis and trending. Real-time measurements will be analyzed against predetermined thresholds; if a predetermined threshold is exceeded, the information will be sent to the SCADA system, and the operator will be informed to take corrective actions. Compared to older leak detection programs, line-pack compensated volume-balancing represents an improved method for volume accounting that calculates changes in fluid volume within the pipeline.

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

Emergency Response Procedures

Potential system emergencies include leaks or fires located near or directly involving a pipeline or pipeline facility and pipeline or pipeline facility damage from natural and human causes. If an emergency were to occur, pipeline flow will be stopped and will not resume until the cause of the problem (e.g., instrumentation failure or leak) is detected and repaired.

Keystone will be required to prepare site-specific ERPs for the system, which will be submitted to and approved by the OPS prior to operation. A preliminary draft ERP has been submitted to the Department of State (July 1, 2006). The ERP will: 1) establish guidelines and procedures to be followed in emergencies and to minimize hazards resulting from pipeline emergencies, 2) establish procedures for training Keystone's employees on emergency procedures, and 3) establish 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 a spill were to occur, Keystone will be required to immediately notify the National Response Center (NRC) in the event of a release of crude oil that: 1) violates water quality standards, 2) creates a sheen on water, or 3) causes a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines (40 CFR Part 112). In addition to the NRC, Keystone will make timely notifications to other agencies, including the appropriate Local Emergency Planning Committees (LEPCs), sheriff's departments, the applicable state's DEQ, USEPA, and affected landowners.

In many cases, oil spill responses could be handled by Keystone. However, some spills may require assistance from local, state, or federal agencies. Under the National Contingency Plan, USEPA is the lead federal response agency for oil spills occurring on land and in inland waters. USEPA will evaluate the size and nature of a spill, its potential hazards, the resources needed to contain and clean it up, and the ability of the responsible party or local authorities to handle the incident. The USEPA will monitor all activities to ensure that the spill is being contained and cleaned up appropriately. All spills meeting legally defined criteria (see criteria above per 40 CFR Part 112) must be monitored by the USEPA, even though most spills may be small and cleaned up by the responsible party. In the unlikely event of a large spill, Keystone and its contractors will be expected to take the lead in recovery and cleanup. The role of local emergency responders is typically to notify community members, direct people away from the hazard area, and address potential impacts to the community such as temporary road closings.

A fire associated with a spill is relatively rare. According to historical data (OPS 2005), only about four percent of reportable liquid spills are ignited. In the event of a fire, local emergency responders will execute the roles listed above and firefighters will take actions to prevent the crude oil fire from spreading to adjacent foliage or structures. Fire departments might choose to extinguish a small- or moderate-sized crude oil fire, but in many cases the best course of action may be to let the fire burn itself out. Local emergency responders typically are trained and able to execute the roles described above without any additional training or specialized equipment. Keystone also will work with emergency response agencies to provide pipeline awareness education and other support.

Remediation

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

In the event of a spill, several federal regulatory programs define the notification requirements and required response actions, including the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300), the CWA, and the Oil Pollution Act. At the most fundamental level, these interlocking programs mandate notification and initiation of response actions in a timeframe and on a scale commensurate with the threats posed. They also establish a required endpoint for response actions: the mitigation of any unacceptable threat to human health or the environment. The cumulative result of these regulatory constraints is that the adverse impacts of a release event will be temporary and baseline conditions ultimately will be restored.

2.2 No Action Alternative

If the No Action Alternative were selected, the Department of State would not issue a Presidential Permit to Keystone. The Keystone Pipeline Project would not provide needed pipeline capacity to transport WCSB crude oil supplies. The Keystone Pipeline Project would not provide the U.S. with a source of relatively stable and secure North American crude oil supplies to the Midwest and Gulf Coast markets, thereby continuing the U.S. dependence of foreign offshore oil supply.

While the No Action Alternative would eliminate the environmental impacts directly associated with the Keystone Pipeline Project, it will not necessarily result in an overall reduction in impacts to the public because crude oil likely will continue to be transported to these markets by other pipeline routes or alternative transportation methods (see System Alternatives).

2.3 System Alternatives

Two alternatives could potentially provide most of the proposed crude transportation services to Midwest U.S. markets.

Enbridge's Alberta Clipper, Southern Access Expansion, Southern Access Extension and Hypothetical Spearhead Expansion Projects

In 2006, Enbridge announced a proposal to develop the Alberta Clipper project. Alberta Clipper, and previously announced Southern Access Expansion (the "Enbridge Projects") are proposals to construct new pipelines that would parallel Enbridge's mainline oil pipeline between Alberta, Canada and northern Illinois. The Southern Access Extension proposal is new pipeline construction extending Enbridge's pipeline system from Flanagan, Illinois to Patoka, Illinois and the Spearhead expansion proposal is a hypothetical looping of the existing Spearhead pipeline from Chicago to Cushing.

Enbridge proposes that the pipelines would provide additional capacity of approximately 400,000 bpd and could be in operation by the end of the decade. If constructed, the Enbridge Projects could represent a $2.4-billion expansion (U.S. portion only) of Enbridge's mainline.

Enbridge's mainline oil pipeline follows a south-east route from Edmonton, Alberta, Canada across the Canada-United States border near Neche, North Dakota and continues through Minnesota to Superior, Wisconsin and then south to Chicago, Illinois.

Enbridge's Alberta Clipper project proposes construction of a new oil pipeline commencing in Alberta, Canada terminating at their Superior, Wisconsin terminal.

Enbridge's Southern Access Expansion project proposes construction of a new oil pipeline from Superior, Wisconsin to Flanagan, Illinois.

Enbridge's Southern Access Extension project proposes construction of new oil pipeline from Flanagan, Illinois south to Patoka, Illinois.

In total, the Enbridge Projects would require construction of approximately 955 miles of new pipeline, consisting of 501 miles of 36-inch pipe and 454 miles of 42-inch pipe.

Enbridge's Spearhead oil pipeline follows a route south-west from Chicago, Illinois through Missouri to Cushing, Oklahoma, and currently has a capacity of approximately 125,000 bpd. Keystone evaluated the existing Spearhead system and determined that additional facilities, in the order of an estimated 655 miles of new 30-inch pipeline, would be needed in order for Spearhead to provide a volume of crude oil delivery to Cushing, Oklahoma equivalent to that proposed by Keystone.

The hypothetical "Spearhead-Cushing Expansion" pipeline would likely be constructed adjacent to the existing Spearhead pipeline at an estimated capital cost of approximately $900 million.

Hypothetical Kinder Morgan Express – Platte Pipeline System Expansion and Cushing Extension

The Express Pipeline (existing 24-inch pipe) interconnects with the Platte Pipeline (existing 20-inch pipe) at Casper, Wyoming. This 1,700-mile pipeline system transports oil sands crude oil from Alberta's oil sands in Hardisty, Alberta to refineries in the U.S. Rocky Mountain and Midwest regions. In the U.S., the pipeline crosses Montana, Wyoming, Nebraska, Kansas, Missouri, and terminates in Wood River, Illinois.

Kinder Morgan has not announced any proposals to expand this system. Nevertheless, the construction of a parallel pipeline is evaluated by Keystone as a system alternative in this ER.

The hypothetical construction of a new pipeline that would parallel the Express-Platte Pipeline system would consist of 1,282 miles pipeline in the U.S. To transport a volume of crude oil similar to Keystone, the pipeline likely would consist of a 30-inch-diameter pipeline and would require 27 pump stations. Keystone evaluated the Express-Platte Pipeline system to determine the additional facilities needed in order to provide an equivalent level of crude oil delivery to Cushing, Oklahoma, as that proposed by Keystone. It is estimated that an additional 292 miles of new 30-inch pipeline would be required. This pipeline mileage requirement would be same as that required for Keystone (an extension could be constructed from the existing Platte Pipeline to Cushing along the same route proposed by Keystone). Keystone estimated capital cost for 1,574 miles of new 30-inch pipeline and pumping facilities would be approximately $2.1 billion.

System Alternatives Comparisons

Table 2.3-1 compares the Keystone Pipeline Project with the Enbridge Projects and hypothetical Spearhead-Cushing Expansion, and with the hypothetical Express-Platte to Cushing Extension. The U.S. portion of the proposed Keystone Mainline is similar in length to the Enbridge Projects, but is substantially shorter than the Express-Platte Pipeline System (not including the additional miles of hypothetical pipeline necessary for each to deliver equivalent volumes of crude to Cushing, Oklahoma) (**Table 2.3-1**). The Enbridge Projects propose to deliver crude oil directly to Midwestern markets, but will provide a less direct route to provide crude oil deliveries to the Cushing refineries compared with the Cushing Extension portion of the Keystone Pipeline Project and cannot meet the market need proposed to be met by the Keystone Project.

Table 2.3-1 Comparison of the Keystone Pipeline System with Two Other System Alternatives

	Keystone Pipeline Project	Enbridge Projects and Spearhead-Cushing Expansion	Hypothetical Kinder Morgan Express-Platte Pipeline System Expansion and Cushing Extension
Delivery Points	Midwestern, U.S. and Cushing, Oklahoma	Midwestern, U.S. and Cushing, Oklahoma	Midwestern, U.S. and Cushing, Oklahoma
Miles of Pipe to Midwestern markets (Canada and U.S.)	1,078	955	1,282
Additional Miles of Pipe to Cushing	292	655	292
Total Miles	1,370	1,610	1,574
Project Cost (U.S. portion only)	$2.0 billion	$3.3 billion	$2.1 billion
Project Status	• Regulatory application submitted – April 2006 • Secured contracts for 340,000 bpd	• Southern Access-approved • Southern Access Extension – proposed • Alberta Clipper-proposed • Spearhead Loop – not proposed	Not Proposed
In-Service Date	November 2009	Unknown	N/A

The Keystone Pipeline Project is proposed to transport incremental crude oil production from the WCSB to meet growing demand by refineries and markets in the U.S. for stable, secure, on-shore crude oil supplies. Demand in the U.S. is forecast to grow by 17 percent, or 3 million bpd by 2015 (Section 1.2, Purpose and Need of Project). According to forecasts of crude production based on approved and planned projects, crude production volume in Alberta will exceed pipeline export capacity by 2009 if major expansion or new pipeline systems are not built. Keystone's analysis of this same date supports this conclusion and has led Keystone to target completion of the pipeline by 2009. This conclusion has been confirmed by the fact that shipper commitments to utilize the pipeline have indicated that service on the Mainline is required by 2009.

Keystone is the only identified system alternative in a position to meet the increased demand for crude oil within the timeframe required. At this time, no expansion of the Express-Platte System has been proposed. Also at this time, the proposed expansions and extension of the Enbridge mainline will not meet the market need for deliveries to Cushing proposed to be met by Keystone. Keystone is the only identified alternative that has secured contractual commitments from customers to ship crude oil on the Keystone Pipeline. Keystone has secured long-term transportation contracts with customers totalling 340,000 bpd with an average term of 18 years.

Keystone proposes the least cost and most direct route to deliver to Cushing, OK and proposes an in-service date for deliveries to the Midwestern U.S. that meets the forecast increased demand for crude oil. All

identified alternatives involve the construction of substantial lengths of new pipelines, all with sections of new pipeline construction located to some degree adjacent to existing pipelines and other previously-disturbed linear right of ways, and all involving attendant environmental impacts and disturbance.

In the end, Keystone is the only identified system alternative in a position to meet the increased demand for crude oil within the timeframe required.

The No Action Alternative for the Keystone Pipeline Project will likely result in the implementation of Enbridge's Projects, the hypothetical Kinder Morgan Express-Platte Pipeline System Expansion and Cushing Extension, and/or other pipeline system alternatives to transport the increasing WCSB crude oil supply. These system alternatives also will have environmental impacts specific to their routes, which could be less than or greater than the Keystone Pipeline Project.

2.4 Alternatives

2.4.1 Pipeline Route Alternatives

2.4.1.1 General

The proposed route for the Keystone Pipeline Project was developed through an iterative, multidisciplinary route selection process. This process involved the systematic identification of objectives, control points, collection of data, review of alternatives and continual reassessment of these factors as refinement occurred. Additionally, the process unfolded in two distinct phases given modifications to basic project objectives which had significant impacts on suitable routing alternatives.

The process followed by Keystone is shown graphically shown in **Figure 2.4-1** and is described in the following text.

2.4.1.2 Phase I Route Selection and Alternatives Analysis

Objectives

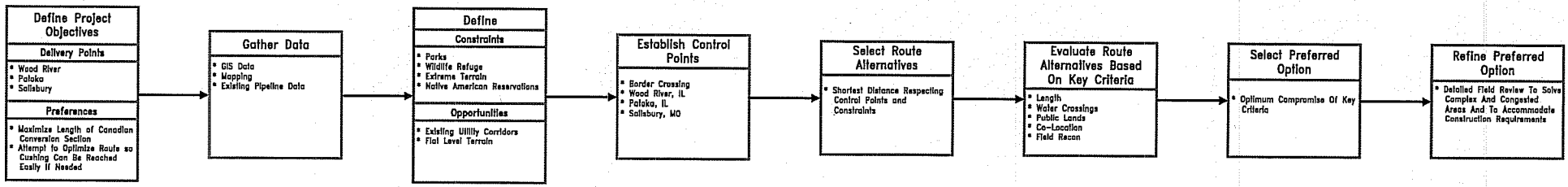
Several high level objectives were established for the Keystone Pipeline Project which serve to define the project. These include the following:

1. Gas Pipeline Conversion: Converting an underutilized natural gas pipeline in Canada to crude oil service will result in Keystone pipeline crossing into U.S. generally in the vicinity of Gretna, Manitoba at the Manitoba/North Dakota border. **Figure 2.4-2** illustrates the Keystone natural gas pipeline segment in Canada between Alberta and Ontario that would be converted.

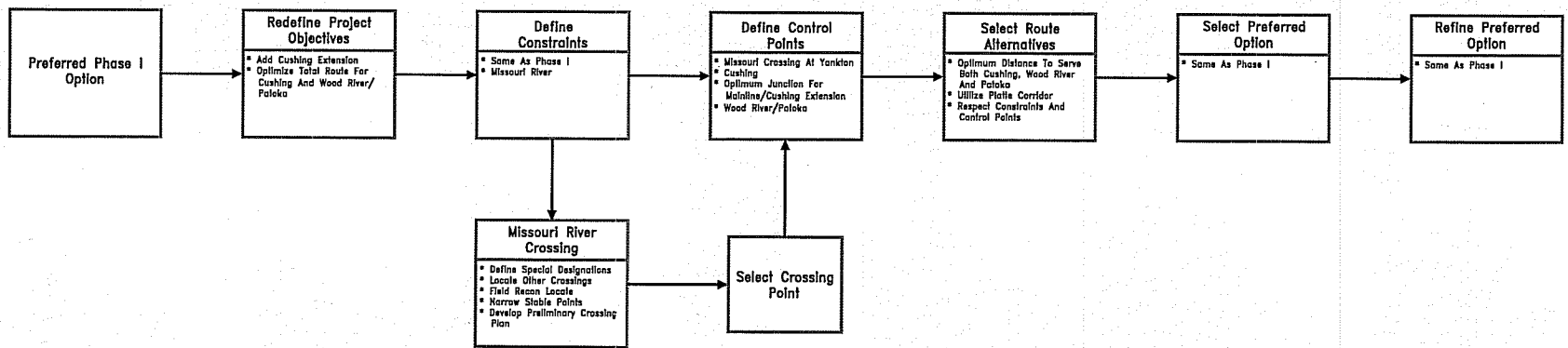
2. Market endpoints: Based on shipper requests, the primary market endpoints are: 1) Salisbury, Missouri (an interconnection point with other crude oil pipelines as well as tank storage); 2) the Conoco Phillips refinery at Wood River, Illinois; and 3) Patoka, Illinois (an interconnection point with other crude oil pipelines as well as tank storage).

3. Cushing and Gulf Coast Refineries: While not considered an initial market point, the ability to economically access Cushing, Oklahoma, and, therefore, Gulf Coast refineries, was a desired objective of the system.

PHASE I



PHASE II

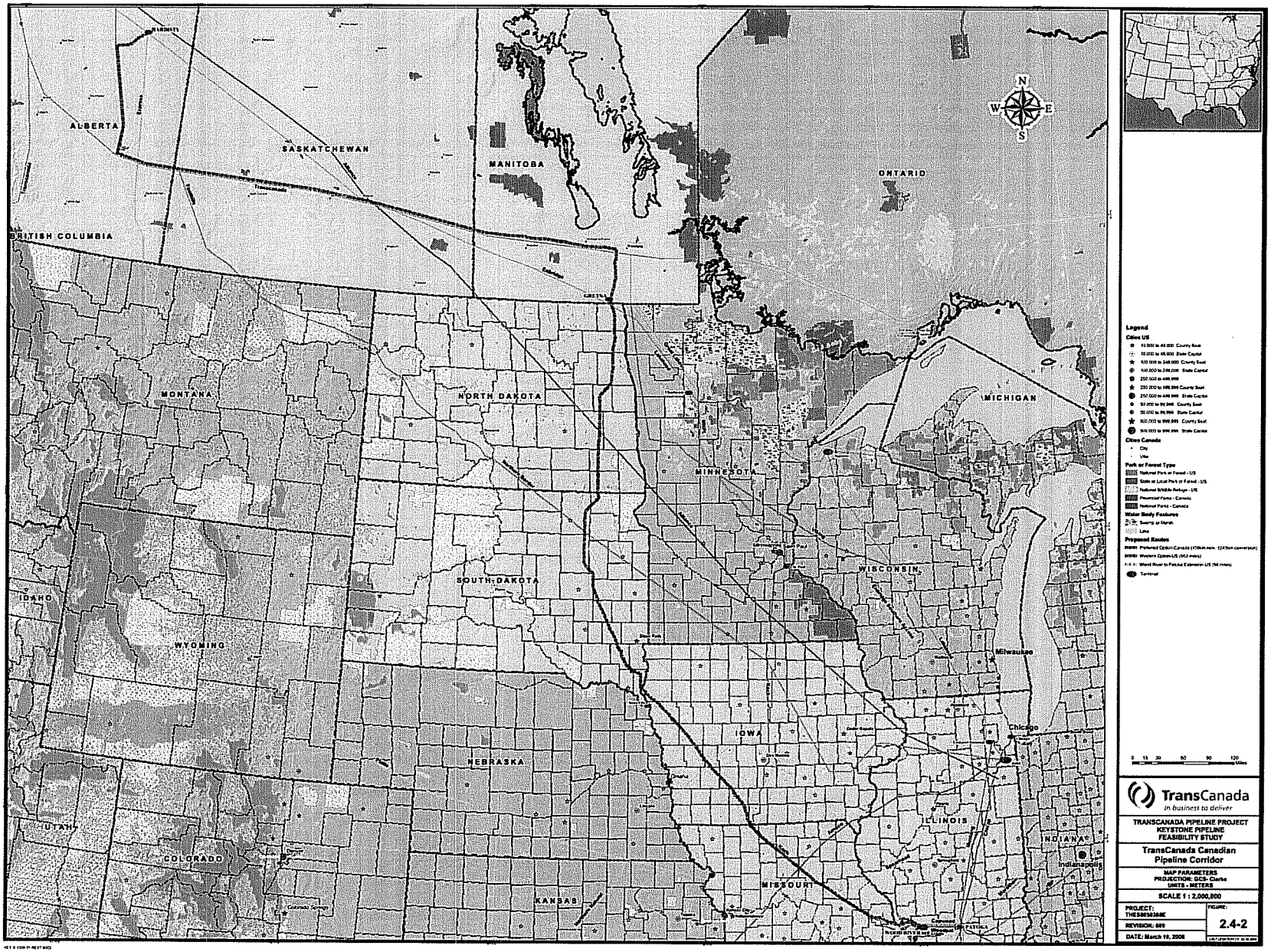


TransCanada
In business to deliver

KEYSTONE PIPELINE PROJECT
ROUTE ALTERNATIVES ANALYSIS PROCESS

PROJECT: THEBOOKDRIVE
REVISION: 001
DATE: MAR. 17, 2006

FIGURE: 2.4-1


ALBERTA
SASKATCHEWAN
MANITOBA
ONTARIO
BRITISH COLUMBIA
MONTANA
NORTH DAKOTA
MINNESOTA
MICHIGAN
SOUTH DAKOTA
WISCONSIN
IDAHO
WYOMING
Milwaukee
Chicago
IOWA
NEBRASKA
ILLINOIS
INDIANA
UTAH
COLORADO
Indianapolis
MISSOURI
KANSAS
N
S
E
W
Legend
Cities US
Cities Canada
Path or Forest Type
Water Body Features
Proposed Routes
Terminal
TransCanada
In business to deliver
TRANSCANADA PIPELINE PROJECT
KEYSTONE PIPELINE
FEASIBILITY STUDY
TransCanada Canadian
Pipeline Corridor
MAP PARAMETERS
PROJECTION: GCS- Clarke
UNITS - METERS
SCALE 1 : 2,000,000
PROJECT:
REVISION: 000
FIGURE:
2.4-2
DATE: March 19, 2008

Data Gathering

Based on these basic objectives, a general geographic region of interest was established. Data was then gathered for this region. These data included the following:

- Topographic Quadrangle Maps (1:250,000 Scale)
- Topographic Quadrangle Maps (1:24,000 Scale)
- Delorme State Atlas Gazetteer Data
- Aerial Photography from various sources
- Geographic Information System (GIS) layers containing federal and state environmental and land use data

All these data were compiled into a GIS-based constraint data set of the area to support the identification and evaluation of route options.

Constraints and Opportunities

A number of primary and secondary constraints were identified to guide the route selection process. With respect to Primary constraints it is the general objective to avoid these features. Where this is not possible, the objective is to minimize them to the extent possible. With respect to Secondary constraints, the objective generally is to avoid, if possible, or otherwise minimize. These include:

Primary

- Federal and State lands
- Large waterbodies
- Native American and military lands
- Extreme terrain
- Large wetland complexes
- Urban areas
- Wildlife refuges

Secondary

- Water crossings
- Wetland crossings
- Waterfowl production areas
- Irrigated croplands
- Bedrock
- Rural communities
- Aquifers

- Extensive forested areas
- Residences and associated features such as driveways, outbuildings and wind breaks

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

- Existing linear features such as pipelines, power lines and roadways. Pipelines are typically preferred.
- Flat or gently rolling terrain
- Soils which can be readily excavated
- Non-forested areas

Definition of Control Points

The following control points served to define the route:

- U.S./Canada border crossing near Gretna, Manitoba
- Desire to pass near Salisbury, Missouri
- Delivery point at Wood River, Illinois
- Delivery point at Patoka, Illinois
- Desire to remain competitive to serve Cushing, Oklahoma

Route Alternatives Identification

Based on the above information and objectives, a number of route alternatives and alternative route segments were developed. These routes and route segments met the basic project objectives. These routes and route segments respected the constraints and opportunities to varying degrees.

The following paragraphs provide an overview of the characteristics of each of the major route alternatives and alternative route segments. These alternatives are illustrated on **Figure 2.4-3**.

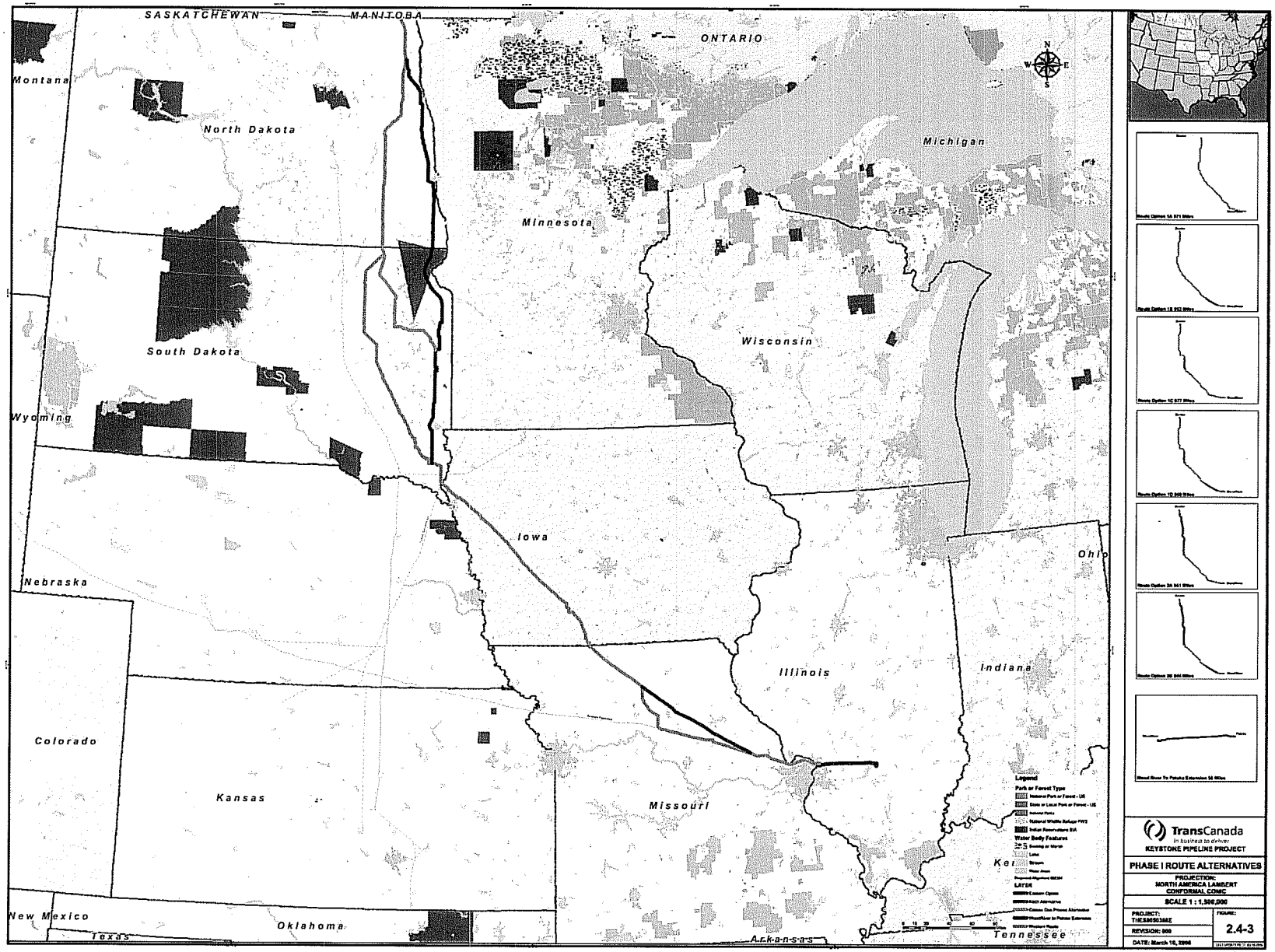
Western Alternative

The Western Alternative (Route 1A) begins at the Canada/North Dakota border due south of Gretna, Manitoba and runs along a westerly route to the Conoco Phillips refinery in Wood River, Illinois. The Lake Traverse Indian Reservation in South Dakota is avoided. The Western Alternative maximizes co-location with railroads, highways and roads and utility corridors. The total length of Western Alternative is approximately 971 miles.

From the Canada/North Dakota border, the Western Alternative runs due south, co-locating along the Burlington Northern Railroad and the Northern Pacific Railroad through northern North Dakota. The line then co-locates along a utility corridor, veering just to the north of Golden Lake State WMA, and continuing along Highway 32 through southern North Dakota.

In South Dakota, the line extends to the southwest along the Burlington Northern Railroad, avoiding the Lake Traverse Indian Reservation and then due south along Highway 27. South of Doland, the line turns towards the southeast and follows an old railroad corridor to Iowa.

Entering Iowa just north of Sioux City, South Dakota, the line co-locates along a utility corridor to the southeast. North of Creston, Iowa, the line turns to the south around Creston and co-locates along county roads to Missouri.


SASKATCHEWAN
MANITOBA
ONTARIO
Montana
North Dakota
Minnesota
Michigan
South Dakota
Wisconsin
Wyoming
Iowa
Nebraska
Illinois
Indiana
Ohio
Colorado
Kansas
Missouri
New Mexico
Oklahoma
Texas
Arkansas
Tennessee
Legend
Park or Forest Type
Water Body Features
LAYER
TransCanada
In business to deliver
KEYSTONE PIPELINE PROJECT
PHASE I ROUTE ALTERNATIVES
PROJECTION:
NORTH AMERICA LAMBERT
CONFORMAL CONIC
SCALE 1 : 1,500,000
PROJECT:
THES50304E
REVISION: 000
DATE: March 19, 2008
FIGURE:
2.4-3

In Missouri, the line co-locates with the Koch petroleum pipeline to just north of Brookfield, Missouri. The line co-locates with Highway 11 and utility corridors to the south through Salisbury, Missouri, a possible delivery point. From Salisbury, the line co-locates with the Platte petroleum pipeline system. West of Troy, Missouri, the line runs north following a power line corridor around Troy, avoiding anticipated commercial and residential expansion from the city. The line then turns to the south crossing the Cuivre River and co-locates with the Platte pipeline. Then the line co-locates with the Platte pipeline to the Mississippi River.

The line then crosses the Mississippi River into Illinois and continues into Wood River, Illinois. The segment between Wood River and Patoka, Illinois, will parallel the existing Buckeye Pipeline.

Eastern Alternative Segment

The Eastern Alternative provides an alternative to part of the Western Alternative. The Eastern Alternative parallels the North Dakota-Minnesota border, on the North Dakota side. The Eastern Alternative reduces the pipeline length by approximately nine miles relative to the Western Alternative.

The Eastern Alternative deviation from the Western Alternative begins north of Grafton, North Dakota, and co-locates with Interstate 29 south to South Dakota. In South Dakota, the line crosses into the Lake Traverse Indian Reservation. The line then co-locates with the Northern Pacific Railroad. This routing minimizes the route through the reservation and avoids the Coteau des Praires wetlands. Outside Milbank, South Dakota, the line turns south along Highway 15 to Interstate 29. The line then co-locates along Interstate 29 south to south of Beresford, South Dakota, where it then follows the Western Option to Wood River.

Coteau des Praires Alternative Segment

The Coteau des Praires Alternative provides an alternative to part of the Eastern Alternative in South Dakota. This segment deviates from the Western Option just south of the North Dakota-South Dakota border and merges with the Eastern Option east of Lake Poinsett at the intersection of Highway 28 and Interstate 29 in South Dakota. The Coteau des Praires Alternative runs through the Coteau des Praires of South Dakota and is approximately 126 miles. The line then co-locates with Interstate 29, continuing southeast for 20 miles, where it joins the Eastern Alternative.

Koch Alternative Segment

The Koch Alternative deviates from the Western Alternative after the line crosses into Missouri from Iowa. The Koch Alternative co-locates with the Koch petroleum pipeline for approximately 136 miles to the southeast through the state of Missouri to the Western Alternative along the Platte pipeline system west of St Louis, Missouri. The Koch alternative does not pass through Salisbury, Missouri.

Combined Route Alternatives

The above routes and route segments can be combined to form a matrix of complete route alternatives. The combined route alternatives are illustrated on **Figure 2.4-3**. The relative lengths of the different alternatives are presented in **Table 2.4-1**.

Route Alternative Evaluation

Each route alternative was evaluated with respect to the key criteria noted below:

- Length
- Percentage of co-location with existing linear facilities
- Waterbody crossings

- Road crossings
- Rail crossings
- Utility crossings
- National parks
- Conservation areas
- Wildlife areas
- Native American and Military Lands

Table 2.4-1 Lengths of Keystone Route Options (Canadian Border to Wood River/Patoka)

Route Option	Route and the Corresponding Alternative	Total Mileage (to Wood River, IL)	Total Mileage (to Patoka, IL)
1A	Western Alternative	971	1,026
1B	Western + Koch Alternative	953	1,009
1C	Western + Coteau des Praires Alternative	977	1,033
1D	Western + Coteau des Praires + Koch Alternative	960	1,016
2A	Western + Eastern Option	961	1,017
2B	Western + Eastern + Koch Alternative	944	1,000

The evaluation of each route alterative with respect to these features is provided in **Table 2.4-2** below.

The following sections provide a summary of the conditions and potential issues associated with each route alternative.

Route 1A

- Nearly the entire route crosses privately owned cropland. As a consequence, the primary land use issue will be obtaining private land easements and establishing appropriate construction practices for these lands. Considerations for construction on croplands will be: duration of construction, topsoil stripping and segregation, drain tile repair, depth of soil cover, soil replacement and de-compaction, and rehabilitation of surface features (farm access roads, windbreaks, fences, and terraces on slopes. floodway berms in drainages, erosion control plantings in waterways. Livestock management is not a common land use, so issues such as fence management for livestock, grazing deferment, dairy operations and confined pig and chicken operations are not expected to be as relevant as those associated with cultivated lands.
- The route avoids developed water features (flood control dams, reservoirs) and there is no apparent interference with significant pivot irrigation systems. Small farm ponds may be avoided with future alignment adjustments. Small berms and levees on the smaller Missouri River tributaries will require repairs. Crossings of the large levees at the Mississippi-Missouri River confluences will be crossed with a method acceptable to the COE.
- This route avoids cities and towns, unincorporated rural communities and farmsteads. A reroute may be required near Troy, Missouri, where recent new residential and commercial development has encroached on the Koch Pipeline ROW. Route 1A parallels the Platte Pipeline between Troy and Wood River. A favorable characteristic is the lack of substantial residential or commercial development near the Mississippi River crossing.

Table 2.4-2 Phase I Route Alternatives – Length, Utility Co-location, and Crossing Comparisons

Route Option	Co-Location Percentage						Waterbody		Road Crossings		Rail Crossings	Utility Crossings	Land Use Crossings				
	Length (miles)	Railroad (%)	Powerline (%)	Road (%)	Pipeline (%)	Total (%)	Minor	Major	Minor	Major			National State Parks	National Forest Lands	Conservation Areas	Wildlife Areas	Indian/ Military Reserves
1A	1,024	15.5	17.6	22.1	7.1	62.3	1,038	90	1,351	18	115	91	2	0	0	6	0
1B	1,008	15.7	16.1	22.5	7.6	61.9	970	92	1,275	14	97	76	2	0	0	6	0
1C	1,031	8.9	17.5	29.8	7.3	63.5	1,135	110	1,304	20	113	94	2	0	0	6	0
1D	1,015	9.0	16.0	30.4	7.8	63.2	1,067	112	1,228	16	95	79	2	0	0	6	0
2A	1,015	9.8	18.1	35.1	7.4	70.4	1,139	69	1,272	25	105	101	2	0	0	5	1
2B	999	10.0	16.6	35.8	7.9	70.3	1,071	71	1,196	21	87	86	2	0	0	5	1

Notes:

Waterbody Crossing Classifications: Minor < 100 feet > Major width.

"Road Crossing Classifications: Minor = unpaved and paved local streets and two lane highways.

Major = four lane highways and interstates"

All of the route options above include the Wood River to Patoka Extension.

This crossing list was completed in greater detail than the assessment table illustrated in the respective routing report.

- Many utility crossings (roadways, railroads, and other pipelines) will be required for this project. The rural road network is well developed across all the states.
- Federal special management areas are avoided by this route. The route intersects two state wildlife management areas and one state park. WMAs could be avoided by minor reroutes.
- The primary environmental issue is related to agricultural fields and will involve soil management and productivity maintenance, erosion and sedimentation control during construction, and cropland rehabilitation. Because the land is farmed right up to stream channels that usually lack riparian woodland buffers, there is a potential for soil erosion and increased sedimentation into stream channels during high precipitation events.
- Throughout the length of the route, the perennial stream channels and adjacent floodplains have been highly modified by adjacent agricultural practices. As a consequence, the quality of any fisheries in these streams is anticipated to be very low and none of the stream crossings are located within public access areas designated for recreational use.
- The route avoids large wetland complexes, particularly in North and South Dakota. This routing reduces the need for extensive application of wetland crossing methods (i.e., mats and pipe pull-ins) and reduces potential issues with disturbance of nesting or resting waterfowl. The route does cross many small linear wetland features (primarily stream channels) that will require delineation.
- The entire route has been highly modified by agricultural land uses, and nearly the entire length has been plowed for crops since settlement. A few small areas (some pastureland in North Dakota, the Missouri River bluffs southeast of Sioux Falls, and small patches of forest on steep slopes in Missouri) may contain a high percentage of native vegetation.

Route 1B

- Route 1B is shorter than Route 1A. Route 1B follows an existing pipeline, which results in reduced new construction impact. It appears that Route 1B crosses a greater length of forest than Route 1A, but the forests are along existing ROW, which will minimize the amount of tree clearing. Residential and commercial areas exist near Troy, which may require rerouting. The environmental issues are substantially the same as Route 1A.

Route 1C

- Compared to Route 1A, Route 1C crosses a greater length of water and wetland crossings west of Watertown, South Dakota. Route 1C co-locates with Interstate 29 from Watertown to the Western Route near the Iowa state line. Impacts to croplands may be reduced by co-locating in the highway ROW, depending on the offsets required by USDOT.
- This route alternative will require open-water construction work in pothole ponds and lakes in South Dakota. The route also will require more wetland crossings than the equivalent segment of Route 1A. The level of disturbance to cropland soils will depend on where the USDOT will allow the pipeline to be constructed near the interstate highway. No wildlife management areas will be crossed by the alternative route segment.

Route 1D

- Route 1D consists of the Western Alternative and the Koch Pipeline Alternative (see Route 1B above) and includes the Coteau des Pierres Alternative. See the discussion for these two alternatives above.

Route 2A

- Route 2A parallels Interstate 29 in North and South Dakota from near the Canadian border to where it reconnects with the Western Route near the Iowa border. Adjacent land uses are cropland. Wet areas (pothole lakes and emergent wetlands) are the least extensive in North and South Dakota. Impacts to croplands may be reduced by co-locating in the existing highway ROWs, depending on the offsets required by USDOT. Co-location with the Interstate will require route deviations at interchanges and possible conflicts with commercial developments located adjacent to the interchanges. Route 2A crosses about 35 miles of the Traverse Lake Indian Reservation, parallel to Interstate 29. Land uses on the Reservation (cropland, pastureland, and residential) are comparable to those adjacent to the Reservation.

Route 2B

- Route 2B is the same as Route 2A except for the inclusion of the Koch Pipeline Alternative in Missouri. See the discussion of Route 2A and 1B above.

Wood River to Patoka

- Except the Carlyle Lake State Wildlife Management Area (CLSWMA), nearly the entire route crosses privately owned cropland and residential land. As a consequence, the land use issues include the need for private land easements and determining the construction practices for these lands. Major elements of the construction plans on croplands will be similar to that in Section Route 1A.
- The primary environmental issues will be agricultural soil management and productivity maintenance, erosion and sedimentation control during construction, and cropland rehabilitation. Because some of this land is farmed in close proximity to stream channels, there is high potential for soils to erode and for accelerated sedimentation to occur into stream channels during high precipitation events. Trench dewatering will require considerable planning and attention during construction.
- Throughout Illinois, perennial stream channels and adjacent floodplains have been highly modified by adjacent agricultural practices. As a consequence, the quality of any fisheries in these agricultural streams is anticipated to be very low. However, state-designated Wildlife Areas are likely to contain higher quality streams and organisms.
- The entire route has been highly modified by agricultural land uses and nearly the entire length has been plowed for crops since settlement.

Preferred Route Selection

After consideration of pipeline length, land use and other environmental factors, the Western Alternative (1A) was selected as the preferred initial pipeline route. The primary factors in this decision were:

1. Avoids the Traverse Lake Indian reservation.

2. Preserves a market desire to pass through Salisbury due to pipeline interconnection possibilities and the presence of tank storage.

3. Minimizes the number of waterbody, railroad and roadway crossings while preserving the above attributes.

2.4.1.3 Phase 2 Addition of Cushing Extension

Objectives

Because of shipper interest in delivering crude oil to storage terminals and pipeline interconnections at Cushing, Oklahoma, a pipeline routing exercise was undertaken to meet the original project objective of delivering crude oil to Wood River and Patoka, as well as delivering oil to Cushing. To accomplish this goal, the Phase I pipeline route was shifted westward to provide the opportunity to develop the shortest route possible between the Canadian border and Cushing. A route that will parallel the existing Platte Pipeline from southern Nebraska to Wood River was established as the best overall option to deliver oil to Wood River and Patoka.

Data Gathering

Data gathered for Phase II was as described for Phase I.

Constraints and Opportunities

Constraints and opportunities were as described for Phase I.

Definition of Control Points

Several key control points were considered in the assessment which affected the overall routing options for the project as follows:

- Canada/U.S. Border – the pipeline entry into the U.S. was as described for Phase I.
- Delivery Point at Cushing, Oklahoma, as well as the delivery and interconnect points required for Phase I.
- Missouri River: In order to economically serve Cushing, the primary route alternatives shift westward and now involve a crossing of the Missouri river in South Dakota/Nebraska. Much of the Missouri River in this area possesses special designation under the Wild and Scenic Rivers act. Additionally, a number of technical issues severely restrict where a crossing can be effectively installed. A technically appropriate and permittable crossing location heavily influenced the overall routing process.

Route Alternatives

Based on the above objectives, constraints, opportunities, and control points, a number of route alternatives and alternative segments were developed.

The following paragraphs provide an overview of the characteristics of each of the major route alternatives. These route alternatives and alternative segments are illustrated on **Figure 2.4-4**.

Missouri River Alternative Segments

Since the Missouri River crossing is a major control point, crossing location options serve to define key route alternatives.

The proposed pipeline will cross the Missouri River within a segment designated as a recreational river under the WSRA. A gap in this designation is located at Lewis and Clark Lake near Yankton, South Dakota. The Recreational River Segment extends approximately 53 miles downstream of Yankton to Ponca State Park, Nebraska.

Three options exist for crossing the Missouri River:

- Cross at the existing Kaneb Pipeline crossing within the special designation area.
- Cross at the gap between the two special areas at the Lewis and Clark Lake.
- Cross at an area outside of the special designated areas (downstream of the end of the Recreational River segment.

The crossing of the pipeline at the gap between the two special areas at the Lewis and Clark Lake was not pursued because the distance across the lake is too far for the preferred HDD method and the approaches to the lake involve considerable relief in the form of high ridges and steep slopes.

Accordingly, the remaining two options entail a crossing within the special designation near Yankton, South Dakota, and a crossing downstream of the designation which terminates at Ponca State Park.

The crossing at Yankton, South Dakota, is co-located with two existing pipeline crossings and is near a highway bridge. The crossing occurs at a relatively stable portion of the Missouri River where lateral migration is not expected to be significant.

The crossing downstream of the designated portion of the river occurs in a reach of the Missouri which is less laterally constrained but still possible technically.

Based on these two Missouri River crossing locations, two main route alternatives were selected and designated as the Western Alternative and the Eastern Alternative. These alternative routes are shown on **Figure 2.4-4**.

Western Route Alternative

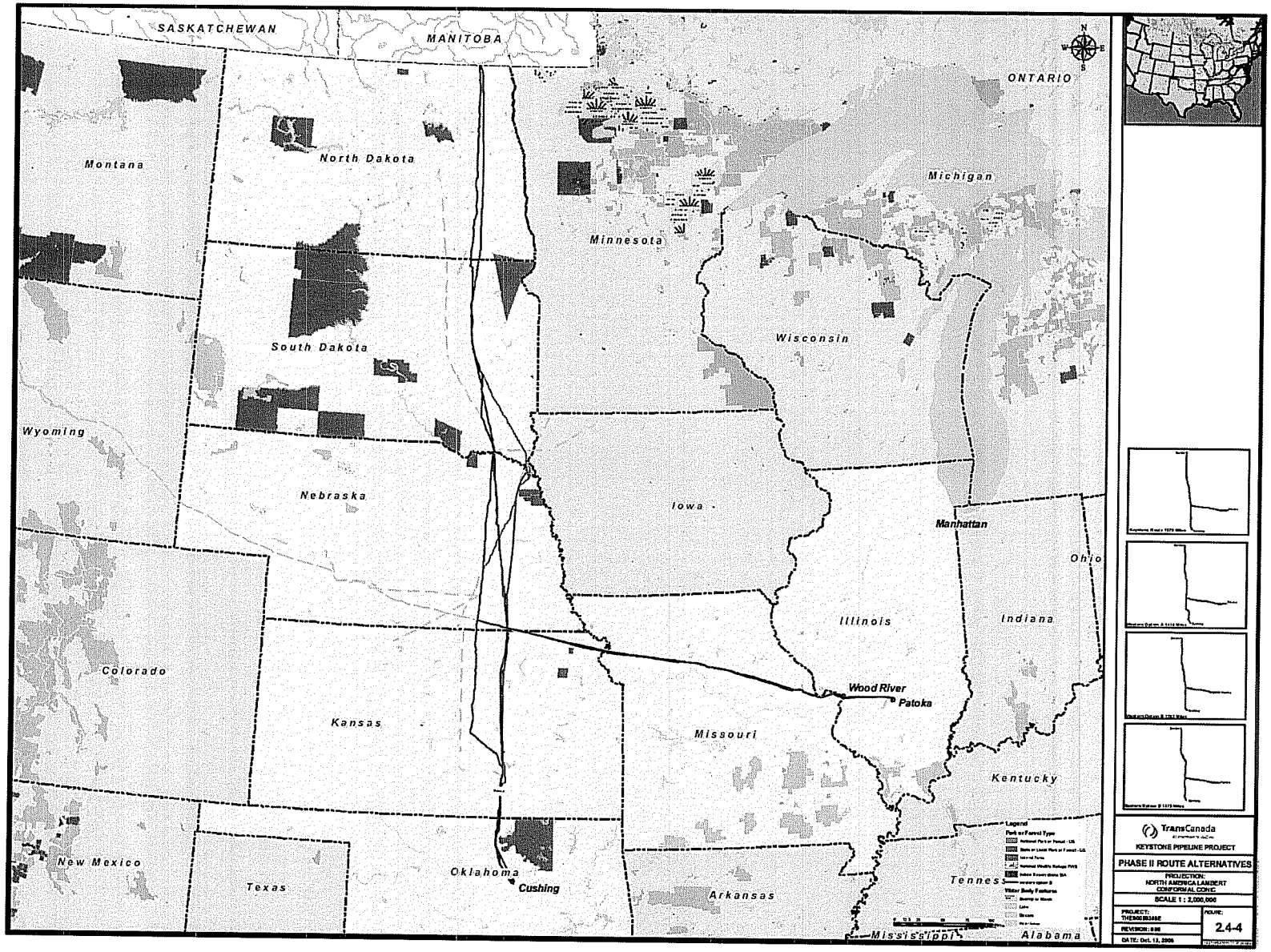
The Western Alternative consists of two sub alternatives, A and B.

Western Route Alternative A

Western Alternative A follows the Phase I Keystone Pipeline routing to a point just south of Carthage, South Dakota. From there, the route heads south along State Road 25 and begins its co-location with the existing Kaneb pipeline system. The pipeline will cross the Missouri River parallel to the existing Kaneb pipeline in an area managed by the NPS and designated as a Recreational River segment under the WSRA. The pipeline will be installed as a horizontal directional drill to minimize surface impacts. The route continues south into Kansas where the Kaneb pipeline terminates. From this point the route continues southeasterly along a new route segment that is not parallel to an existing pipeline into Cushing, Oklahoma. South of Hebron, Nebraska, the Platte pipeline crosses the Kaneb pipeline. It is at this point where the mainline will branch off and continue in a southeasterly direction to Salisbury, Missouri. From Salisbury, the mainline will continue along the Phase I Keystone route into Wood River and Patoka, Illinois.

Western Route Alternative B

Western route Alternative B will be the same as the Western Alternative A route from the U.S./Canada border to Yankton, South Dakota. At Yankton, the pipeline will be installed via a HDD across the Missouri River. The pipeline route will then diverge from western route Alternative B and extend directly south to Ponca City, Oklahoma, and turn southeasterly to the terminus at Cushing. The route between the Missouri River and Cushing will be in new ROW that is not co-located with an existing pipeline or other utility.


SASKATCHEWAN
MANITOBA
ONTARIO
Montana
North Dakota
Minnesota
Michigan
South Dakota
Wisconsin
Wyoming
Nebraska
Iowa
Manhattan
Ohio
Illinois
Indiana
Colorado
Wood River
Patoka
Kansas
Missouri
Kentucky
New Mexico
Texas
Oklahoma
Cushing
Arkansas
Tennessee
Mississippi
Alabama
TransCanada
KEYSTONE PIPELINE PROJECT
PHASE II ROUTE ALTERNATIVES
PROJECTION:
NORTH AMERICA LAMBERT
CONFORMAL CONIC
SCALE 1 : 2,000,000
FIGURE:
2.4-4
DATE: Oct. 13, 2006

Eastern Route Alternative

The Eastern Alternative follows the Phase I Keystone Pipeline routing from the U.S./Canada border to the vicinity of the South Dakota/Iowa border. The route then crosses the Missouri River at the downstream end of the designated Recreational River at Ponca State Park, Nebraska. From Ponca State Park, the route extends directly south across Nebraska and Kansas to Ponca City, Oklahoma. From Ponca City to Cushing, the route will be the same as the Western Alternatives.

The lengths of the route alternatives are shown in **Table 2.4-3**. The mileages shown for each option begin at the Canada/U.S. border and include the routing to Cushing, Oklahoma, and to Wood River and Patoka, Illinois.

Table 2.4-3 Route Alternative Length Comparisons

Route	Mileage
Western Alternative A	1,414
Western Alternative B	1,363
Eastern Alternative	1,373

Route Alternative Evaluation

Each route alternative was evaluated with respect to the key criteria noted below:

- Length
- Percentage of co-location with existing linear facilities
- Waterbody crossings
- Road crossings
- Rail crossings
- Utility crossings
- National parks
- Conservation areas
- Wildlife areas
- Native American and Military Lands

The evaluation of each route alterative with respect to these features is provided in **Table 2.4-4** below.

The following sections provide a summary of the environmental conditions and potential issues associated with each route option. The following are the primary land use and environmental issues identified, and relative similarities/differences among route options.

Western Alternative A

- As seen in **Table 2.4-3**. Western Alternative A is the longest of the three alternatives (1,414 miles), requiring the greatest surface disturbance.
- This Alternative crosses the Missouri River in the special designated area (Recreational River). This crossing will be an HDD, which will avoid channel disturbance within the river. This crossing method

will have to be technically feasible (underlying geologic conditions must be suitable for such a crossing method) and a crossing agreement will have to be reached with the NPS.

- The crossing location appears to be highly stable since the crossing is located approximately five miles downstream of the Gavins Point dam, which regulates river flows. The river also is directly adjacent to the City of Yankton and is near a highway bridge across the river.
- This alternative will parallel the existing Kaneb pipeline over the majority of its length.
- Approximately 30 more miles of pipe will be required to construct the Keystone Mainline pipeline to Wood River and Patoka than either Western Alternative B or the Eastern Alternative.

Western Alternative B

- As seen in **Table 2.4-3**. Western Alternative B is the shortest of the three alternatives (1,363 miles), requiring the least surface disturbance.
- This alternative will be constructed across the Missouri River at the same location as Western Alternative A, with the same construction and permitting issues.
- The segment between the Missouri River and Cushing will be new ROW, resulting in the establishment of a new utility corridor.
- Approximately 30 fewer miles of pipe will be required to construct the Keystone Mainline pipeline to Wood River and Patoka, as compared to Western Alternative A.

Eastern Alternative

- As seen in **Table 2.4-3** the Eastern Alternative is the second shortest of the three alternatives (1,373 miles), requiring the second least surface disturbance.
- This Alternative crosses the Missouri River outside the special designated area (Recreational River). This crossing will be a HDD, which will avoid channel disturbance within the river. This crossing method will have to be technically feasible (underlying geologic conditions must be suitable for such a crossing method).
- The crossing location channel cross section appears to be in a more active floodplain than the Yankton crossing, because the crossing is located approximately 58 miles downstream of the Gavins Point dam, which regulates river flows. At least one major tributary (James River) discharges into the Missouri River upstream of the alternative crossing. Greater seasonal flood volumes will increase the likelihood of lateral channel migration. This potential extent of lateral migration may be too extensive to be accommodated by a single HDD. There are extensive riparian woodlands at this crossing location, which also will require a longer HDD crossing than the Yankton crossing location.

The segment between the Missouri River and Cushing will be new ROW, resulting in the establishment of a new utility corridor.

- Approximately 30 fewer miles of pipe will be required to construct the Mainline pipeline to Wood River and Patoka, as compared to Western Alternative A.

Preferred Route Selection

After consideration of pipeline length, land use and other environmental factors, the Western Alternative B was selected as the preferred initial pipeline route. The primary factors in this decision were:

1. There is a high potential that an HDD could be approved and completed at the relatively stable Yankton Missouri River channel crossing location.

Table 2.4-4 Phase 2 Route Alternatives – Length, Utility Co-location, and Crossing Comparisons

Phase II Route Alternatives																
		Co-location Percentage				Waterbody Crossings		Road Crossings				Land Use Crossings				
Route Option	Length (miles)	Railroad (%)	Powerline (%)	Road (%)	Pipeline (%)	minor	major	minor	major	Rail Crossings	Utility Crossings	National/ State Parks	National Forest Lands	Conservation Areas	Wildlife Areas	Indian/Military Reserves
Western A	1414	1.2	0.6	11.7	14.1	1600	96	1729	21	131	109	1	0	0	1	0
Western B	1363	1.3	0.7	8.1	9.9	1474	81	1635	18	122	102	1	0	0	1	0
Eastern	1373	2.8	0.6	4.3	7.9	1560	73	1710	20	137	85	0	0	0	1	0

Notes: Waterbody Crossing Classifactions: Minor < 100ft > Major width.

Road Crossing Classifactions: Minor = unpaved and paved local streets and two lane highways,

Major = four lane highways and interstates

This crossing list was completed in greater detail than the assessment table illustrated in the respective routing report

2. This alternative is the shortest of the three alternatives and represents less overall disturbance.

3. Other types of crossings (e.g., waterbody, railroad, and road crossings) generally will be fewer than the other alternatives (**Table 2.4-4**).

2.4.1.4 Previous Route Refinements

North Dakota Aquifer Reroute

During open house meetings and subsequent meetings and through correspondence from multiple North Dakota agencies, including the North Dakota Department of Health, Walsh Rural Water District, and the City of Park River, Keystone was advised that its proposed pipeline route would cross surficial drinking water aquifers in Pembina and Walsh counties, North Dakota.

To avoid the surficial drinking water aquifers, the pipeline route was shifted at its maximum deviation approximately 10.5 miles to the west of the original pipeline route. This reroute was incorporated into the original route filed with the Department of State in the April 2006 ER. No major modification to this reroute has occurred since that time.

Edwardsville Reroute

During open house meetings, landowners requested that Keystone's proposed pipeline route be relocated to follow the existing Two Rivers Pipeline to avoid pipeline construction through residential development areas just north and northwest of the city of Edwardsville, Illinois

After meeting with the landowners, Keystone agreed to reroute the pipeline. This reroute was incorporated into the original route filed with the Department of State in the April 2006 ER. No major modification to this reroute has occurred since that time.

2.4.1.5 Additional Route Refinement

Since the April submittal of the ER, Keystone has continued to refine its pipeline alignment based on agency, landowner, environmental, and engineering considerations. To date, Keystone has conducted 32 open house meetings with the public, conducted numerous meetings with the key federal and state agencies, initiated cultural resource and environmental surveys, and initiated engineering and construction assessments along the proposed pipeline route in the spring and summer of 2006. This work resulted in identification of landowner, environmental, engineering, and construction issues at various locations along the proposed pipeline route. These issues have resulted in 111 route adjustments and refinements (47 Keystone Mainline and 64 Cushing Extension), resulting in an increase of 5.0 miles to the length of the proposed pipeline. It also resulted in the relocation of 11 pump stations and 38 mainline valves.

The majority of route adjustments and refinements were minor in nature. However, 13 reroutes shifted portions of the proposed route substantially and are described as follows:

Pembina/Cavalier County Reroute (MP 0.4 to MP 6.9)

Field route engineering identified construction issues related to the proposed Keystone pipeline route in Cavalier County, North Dakota that are eliminated by rerouting the proposed pipeline as follows:

- Avoid a north-south drainage ditch between MP 3.7 and MP 4.0
- Avoid a "wood lot" between MP 4.9 and MP 5.3
- Avoid a "shelter belt" between MP 6.2 to MP 6.7

- Avoid three grain bins at MP 6.2
- Minimize the length of wetlands crossed

The Cavalier County reroute is approximately 6.5 miles in length and approximately 0.25 mile west of the originally proposed pipeline route as depicted on **Figure 2.4-5**. This reroute reduces the length of the proposed pipeline route by approximately 0.1 mile.

Tongue River Reroute (MP 16.2 to MP 19.6)

Field route engineering identified construction issues related to the proposed Keystone pipeline route that are eliminated by rerouting the proposed pipeline at the Tongue River in North Dakota as follows:

- Avoid pond at MP 16.7
- Reduce the number of Tongue River branches or tributaries that are crossed from 2 to 1
- Avoid "shelter belt" and drainage from MP 18.8 to MP 19.2

The Tongue River reroute is approximately 3.4 miles in length and approximately 0.4 mile west of the originally proposed pipeline route (**Figure 2.4-6**). This reroute reduces the length of the proposed pipeline route by approximately 0.1 mile.

USFWS Nelson and Steele County Wetlands Reroute (MP 69.3 to MP 121.5)

In a letter dated June 8, 2006, the USFWS requested Keystone minimize impacts to certain wetlands in Nelson and Steele counties, North Dakota. This is an area with numerous wetland easements held by the USFWS.

To minimize impacts to these USFWS wetland easements and their associated wetlands, the proposed pipeline route was shifted in many locations to avoid wetlands and wetland easements. The Nelson and Steele County reroute is approximately 52.2 miles in length and approximately 0.4 mile west of the originally proposed pipeline route (**Figure 2.4-7**). This reroute increases the length of the proposed pipeline route by approximately 0.6 mile.

USFWS Hecla Sandhills Reroute (MP 190.0 to MP 225.2)

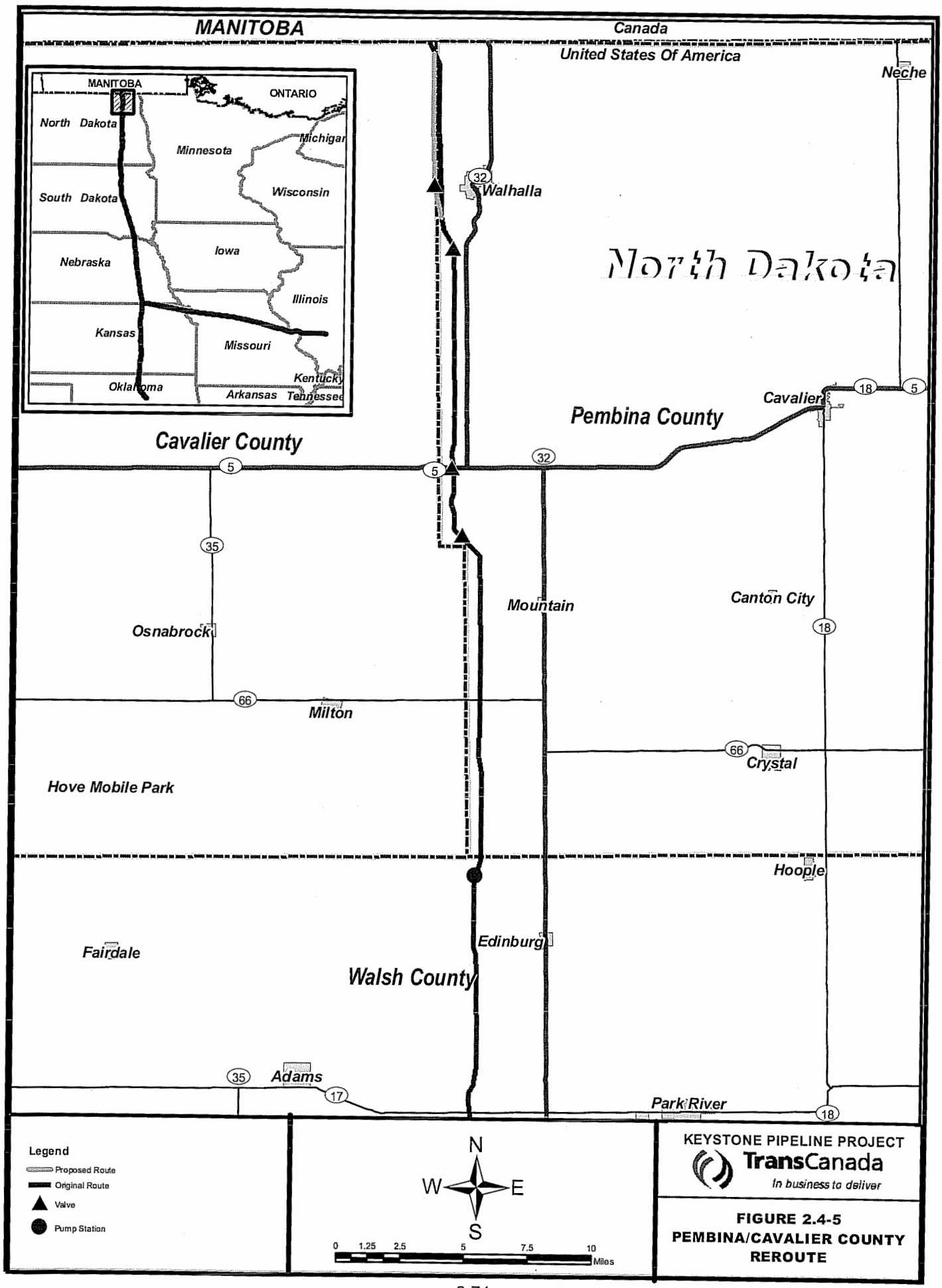
In a letter dated June 8, 2006, the USFWS requested Keystone minimize impacts to the Hecla Sandhills in North Dakota, an area characterized by sand dunes with numerous USFWS wetland and grassland easements.

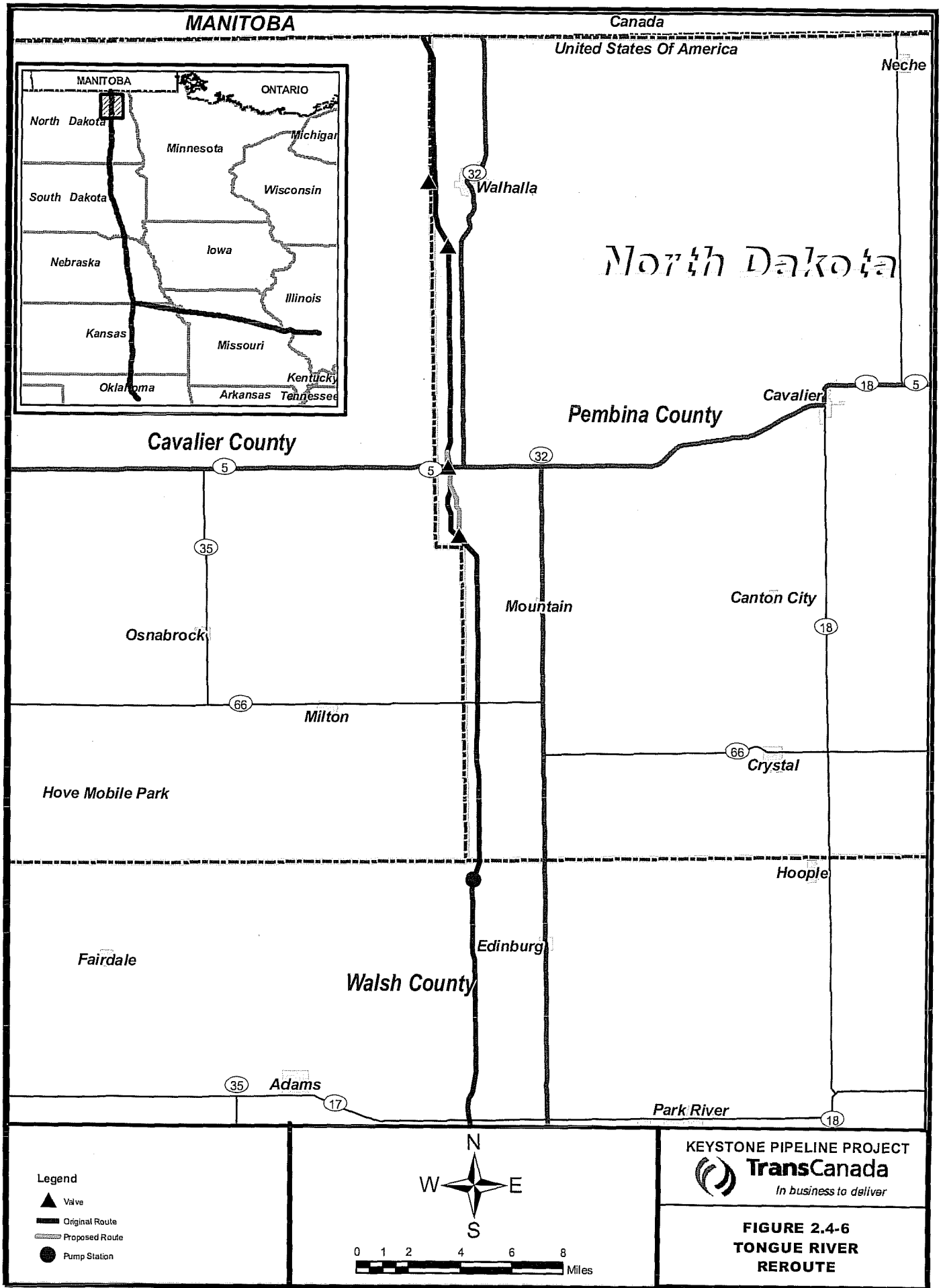
To minimize impacts to the Hecla Sandhills and their associated USFWS easements, the proposed pipeline route was rerouted approximately 2.6 miles west of the originally proposed pipeline route (**Figure 2.4-8**). The Hecla Sandhills reroute is approximately 35.2 miles in length and increases the length of the proposed pipeline route by approximately 1.2 miles. Keystone continues to assess the route in this area through field reconnaissance and consultation with agencies and landowners.

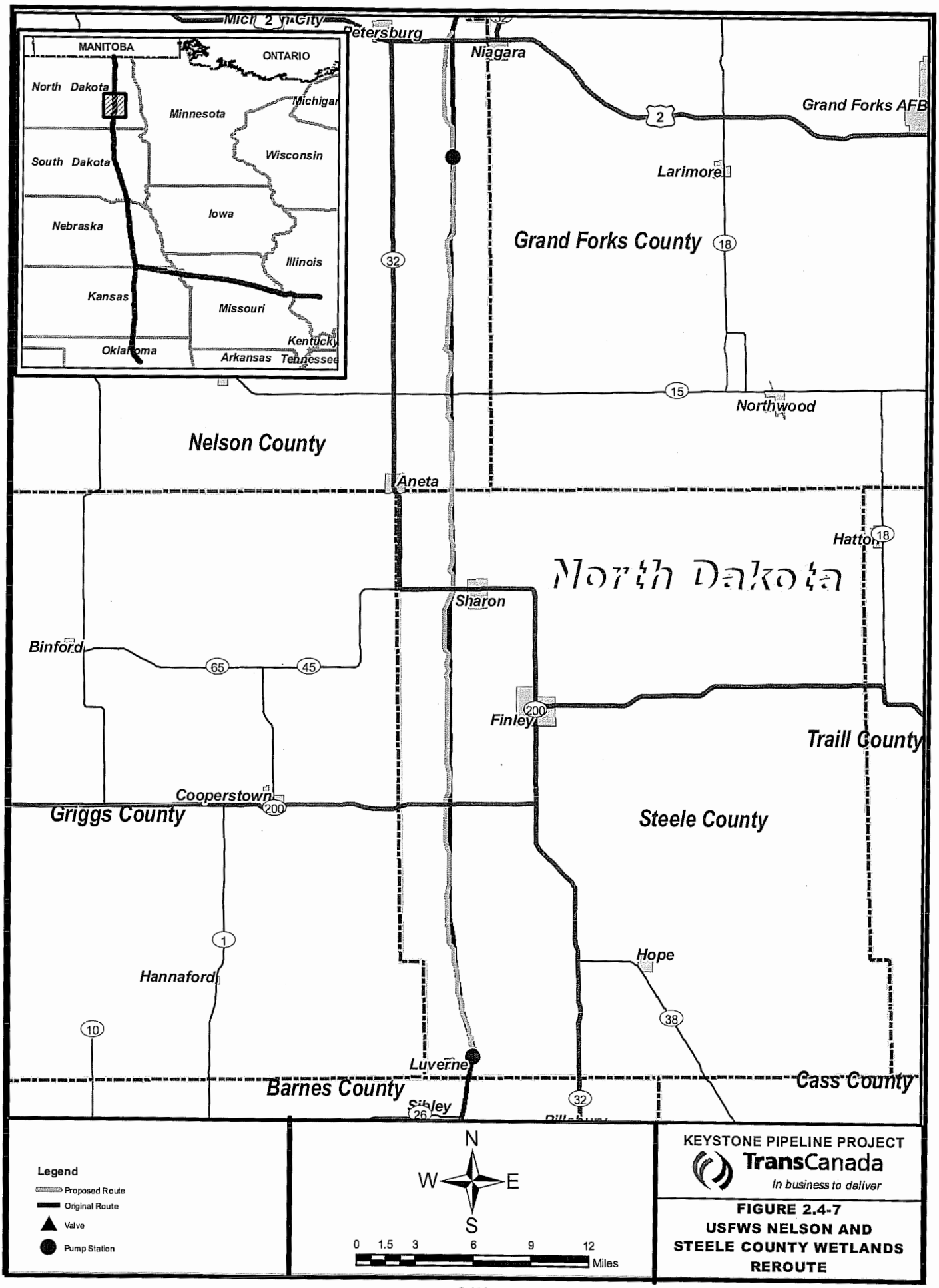
USFWS Day County Grasslands Reroute (MP 262.5 to MP 271.1)

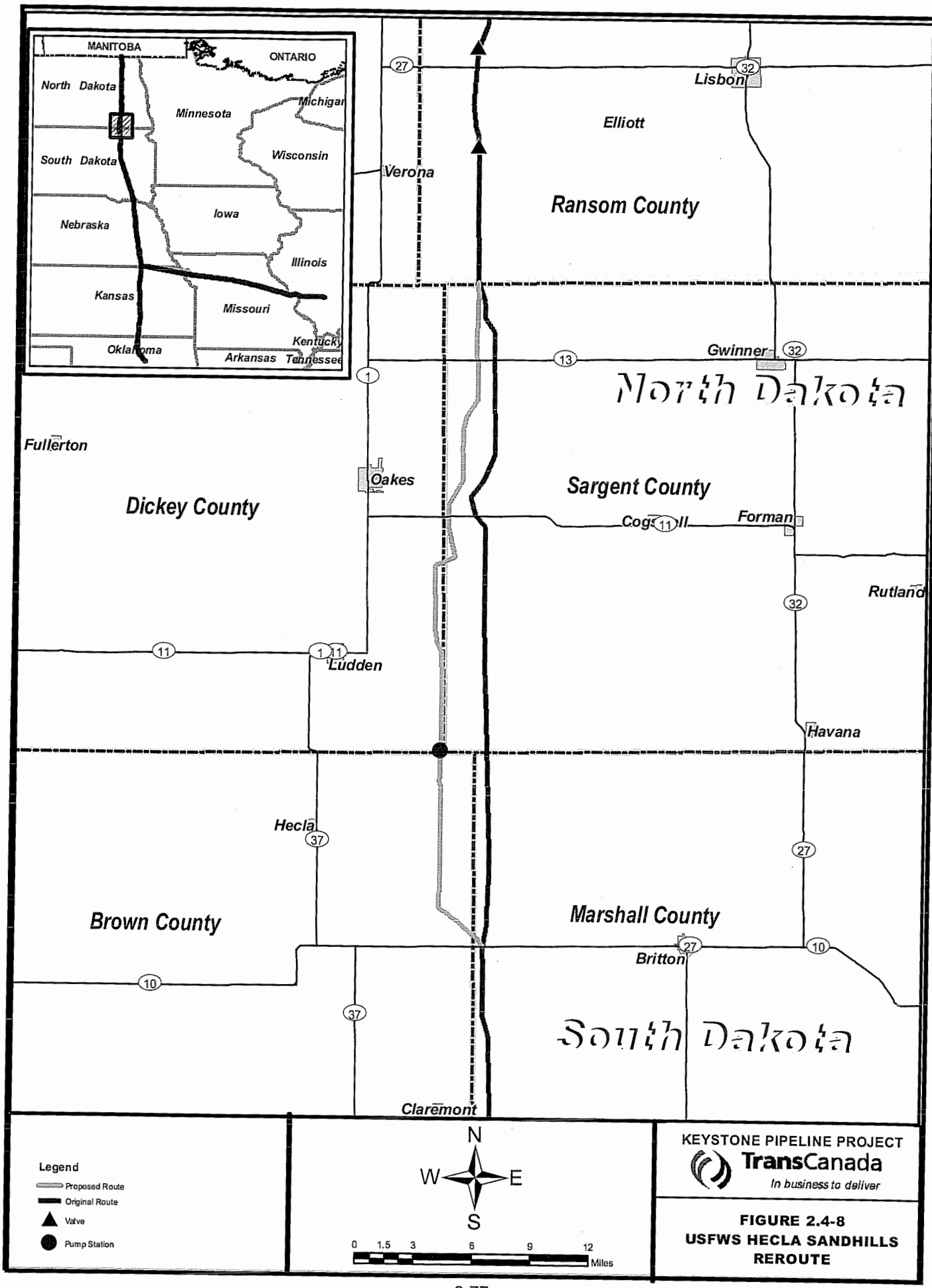
In a letter dated June 8, 2006, the USFWS requested Keystone minimize impacts to Day County Grassland Easements, an area of native prairie protected by USFWS grassland easements.

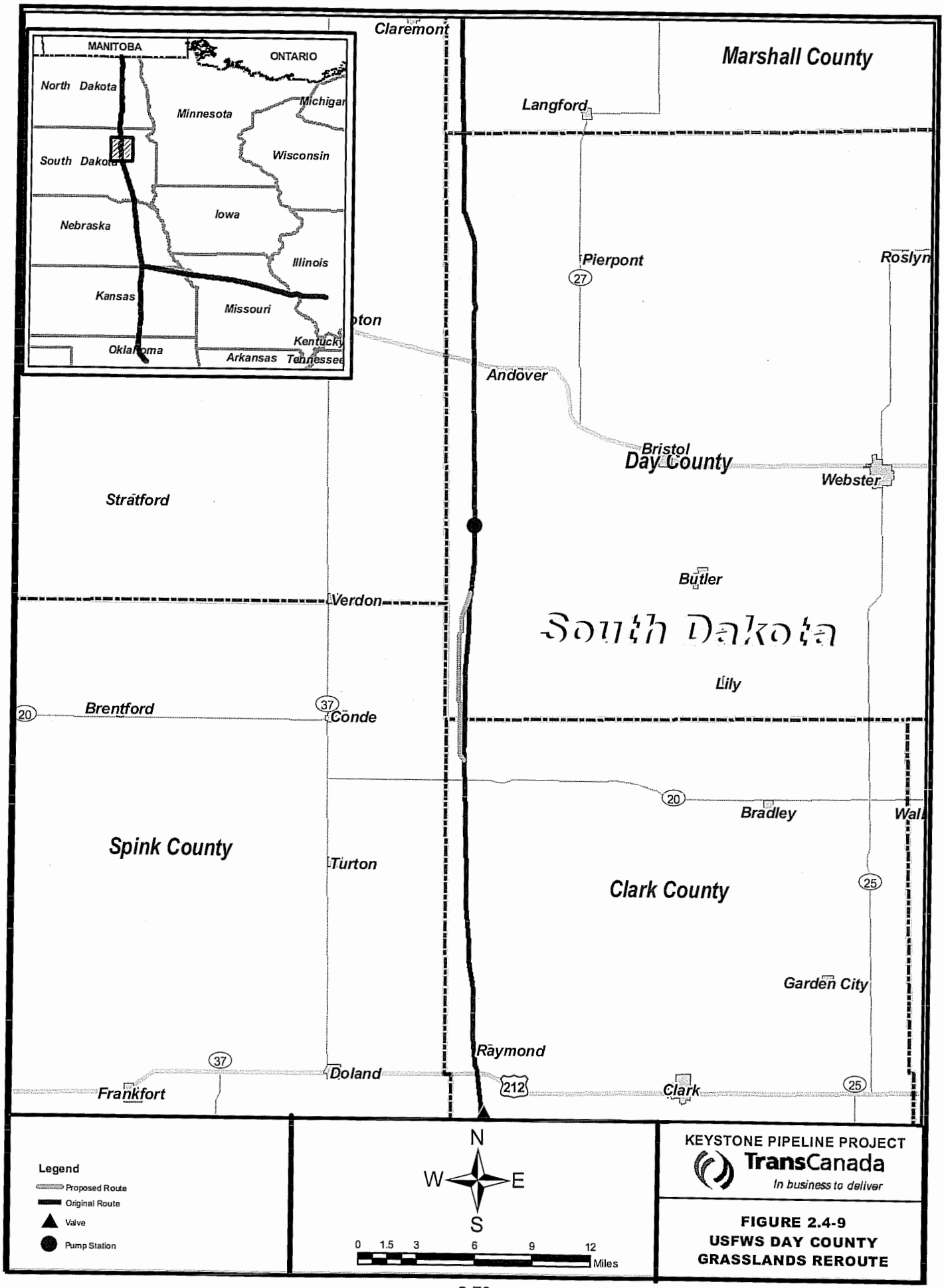
To minimize impacts to these grassland easements, the route was shifted to a maximum deviation of approximately 0.5 mile to the west of the original pipeline route (**Figure 2.4-9**). The reroute is approximately 8.6 miles in length and increases the length of the original pipeline route by approximately 0.2 mile.


MANITOBA
Canada
United States Of America
Neche
MANITOBA
ONTARIO
North Dakota
Minnesota
Michigan
South Dakota
Wisconsin
Nebraska
Iowa
Illinois
Kansas
Missouri
Kentucky
Oklahoma
Arkansas
Tennessee
32
Walhalla
North Dakota
Cavalier
18
5
Pembina County
Cavalier County
5
5
32
35
Mountain
Canton City
Osnabrock
18
66
Milton
66
Crystal
Hove Mobile Park
Hoople
Edinburg
Fairdale
Walsh County
35
Adams
17
Park River
18
Legend
Proposed Route
Original Route
Valve
Pump Station
N
W
E
S
0
1.25
2.5
5
7.5
10
Miles
KEYSTONE PIPELINE PROJECT
TransCanada
In business to deliver
FIGURE 2.4-5
PEMBINA/CAVALIER COUNTY
REROUTE


MANITOBA
Canada
United States Of America
Neche
MANITOBA
ONTARIO
North Dakota
Minnesota
Michigan
South Dakota
Wisconsin
Nebraska
Iowa
Illinois
Kansas
Missouri
Kentucky
Oklahoma
Arkansas
Tennessee
32
Walhalla
North Dakota
Cavalier
18
5
Pembina County
Cavalier County
5
5
32
35
Mountain
Canton City
18
Osnabrock
66
Milton
66
Crystal
Hove Mobile Park
Hoople
Edinburg
Fairdale
Walsh County
35
Adams
17
Park River
18
Legend
Valve
Original Route
Proposed Route
Pump Station
N
W
E
S
0 1 2 4 6 8
Miles
KEYSTONE PIPELINE PROJECT
TransCanada
In business to deliver
FIGURE 2.4-6
TONGUE RIVER
REROUTE


MANITOBA
ONTARIO
North Dakota
Minnesota
Michigan
Wisconsin
South Dakota
Iowa
Nebraska
Illinois
Kansas
Missouri
Kentucky
Oklahoma
Arkansas
Tennessee
Petersburg
Niagara
Grand Forks AFB
Larimore
Grand Forks County
Northwood
Nelson County
Aneta
Hatton
North Dakota
Sharon
Binford
Finley
Traill County
Cooperstown
Griggs County
Steele County
Hannaford
Hope
Luverne
Barnes County
Cass County
Sibley
Legend
Proposed Route
Original Route
Valve
Pump Station
N
W
E
S
0 1.5 3 6 9 12
Miles
KEYSTONE PIPELINE PROJECT
TransCanada
In business to deliver
FIGURE 2.4-7
USFWS NELSON AND
STEELE COUNTY WETLANDS
REROUTE


MANITOBA
ONTARIO
North Dakota
Minnesota
Michigan
South Dakota
Wisconsin
Nebraska
Iowa
Illinois
Kansas
Missouri
Oklahoma
Arkansas
Kentucky
Tennessee
Verona
Lisbon
Elliott
Ransom County
Gwinner
North Dakota
Fullerton
Oakes
Dickey County
Sargent County
Cogswell
Forman
Rutland
Ludden
Havana
Hecla
Brown County
Marshall County
Britton
South Dakota
Claremont
Legend
Proposed Route
Original Route
Valve
Pump Station
N
W
E
S
0 1.5 3 6 9 12
Miles
KEYSTONE PIPELINE PROJECT
TransCanada
In business to deliver
FIGURE 2.4-8
USFWS HECLA SANDHILLS
REROUTE


MANITOBA
ONTARIO
North Dakota
Minnesota
Michigan
South Dakota
Wisconsin
Nebraska
Iowa
Illinois
Kansas
Missouri
Kentucky
Oklahoma
Arkansas
Tennessee
Claremont
Marshall County
Langford
Pierpont
Roslyn
27
Andover
Bristol
Day County
Webster
Stratford
Butler
Verdon
South Dakota
Lily
20
Brentford
37
Conde
Bradley
Spink County
Turton
Clark County
25
Garden City
Raymond
37
Doland
Frankfort
212
Clark
25
Legend
Proposed Route
Original Route
Valve
Pump Station
N
W
E
S
0 1.5 3 6 9 12
Miles
KEYSTONE PIPELINE PROJECT
TransCanada
In business to deliver
FIGURE 2.4-9
USFWS DAY COUNTY
GRASSLANDS REROUTE

USFWS Raymond Prairie Chicken Leks Reroute (MP 276.0 to MP 293.0)

In a letter dated June 8, 2006, the USFWS requested Keystone minimize impacts to habitat of the Raymond Prairie Chicken Leks, an area of tall grass prairie surrounded by intensively farmed cropland. The USFWS noted that these grasslands provide habitat for one of the few stable populations of greater prairie chicken leks in the eastern Dakotas.

To minimize impacts to the tall grass prairie, the route was shifted to a maximum deviation approximately 1 mile to the east of the original pipeline route (**Figure 2.4-10**). The USFWS Raymond Prairie Chicken Leks Reroute is approximately 17.0 miles in length and increases the length of the original pipeline route by approximately 0.5 mile.

Elkhorn River Reroute (MP 497.2 to MP 508.3)

The Nebraska Game and Parks Commission owns and manages lands on the north side of the Elkhorn River along the original pipeline route. The agency requested that Keystone reroute the pipeline to avoid side hill construction and an erosive area along the Elkhorn River.

Per the Nebraska Game and Parks Commission's request, the pipeline was rerouted to avoid the state owned and managed lands. The route was shifted at its maximum deviation approximately 1.4 miles to the east of the original route (**Figure 2.4-11**). It should be noted that this reroute was extended south to connect with the northern limit of the Leigh Lake reroute described in the following section to minimize side hill construction on the original pipeline route. The Elkhorn River reroute is a approximately 11.1 miles in length and increases the length of the proposed pipeline by approximately 0.6 mile.

Leigh Lake Reroute (MP 508.1 to MP 515.1)

During open house meetings, Keystone was advised that its proposed pipeline route would cross the project boundaries of a future lake to be constructed on the west side of Leigh, Nebraska, by the Lower Elkhorn Natural Resources District.

To avoid future operations of the proposed pipeline beneath Leigh Lake, the pipeline route was shifted at its maximum deviation approximately 1.1 miles to the west of the original pipeline route (**Figure 2.4-12**). The Leigh Lake reroute is approximately 7.0 miles in length and increases the length of the original pipeline route by approximately 0.8 mile.

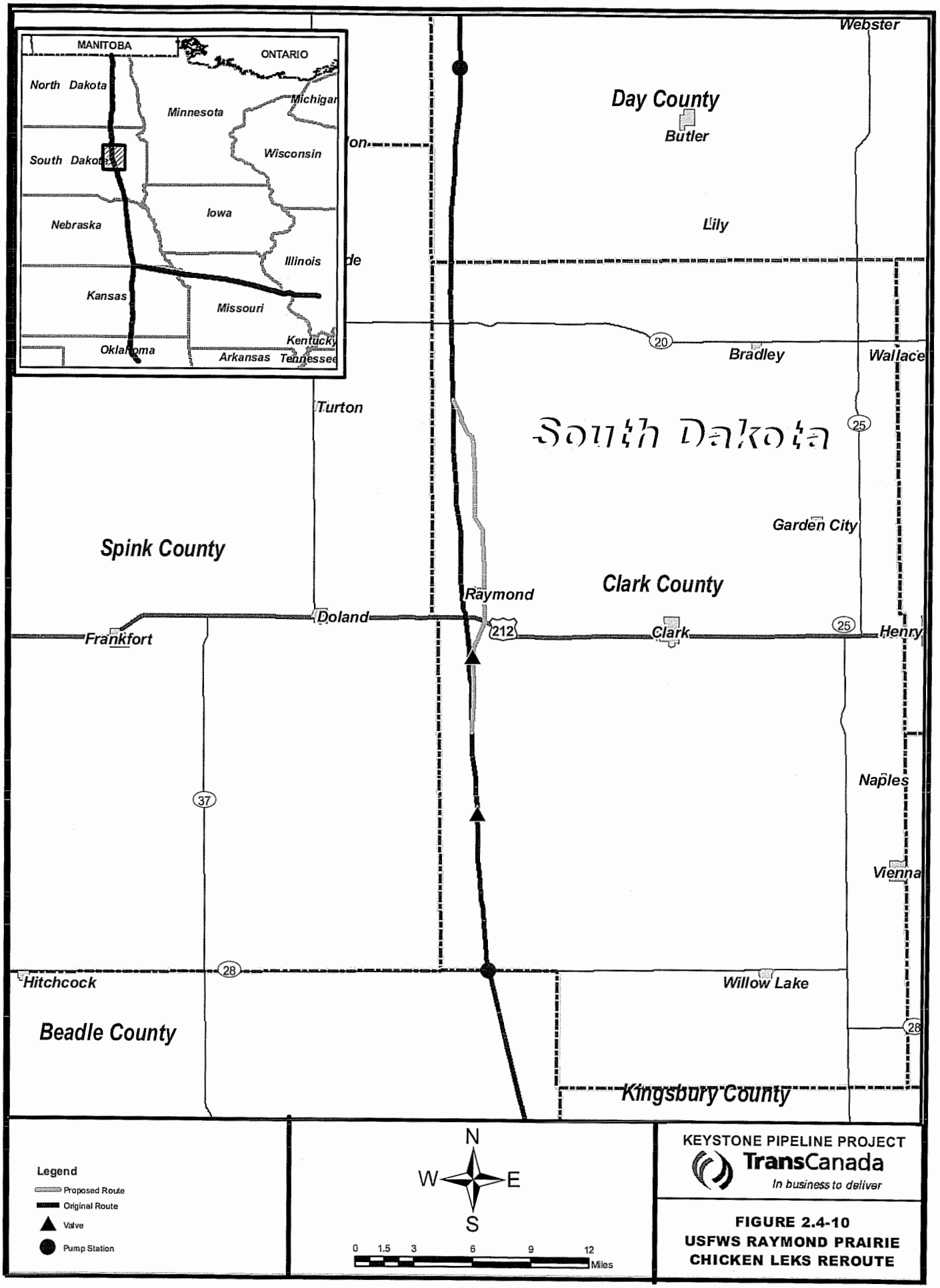
Saline County Reroute (MP 585.0 to MP 599.7)

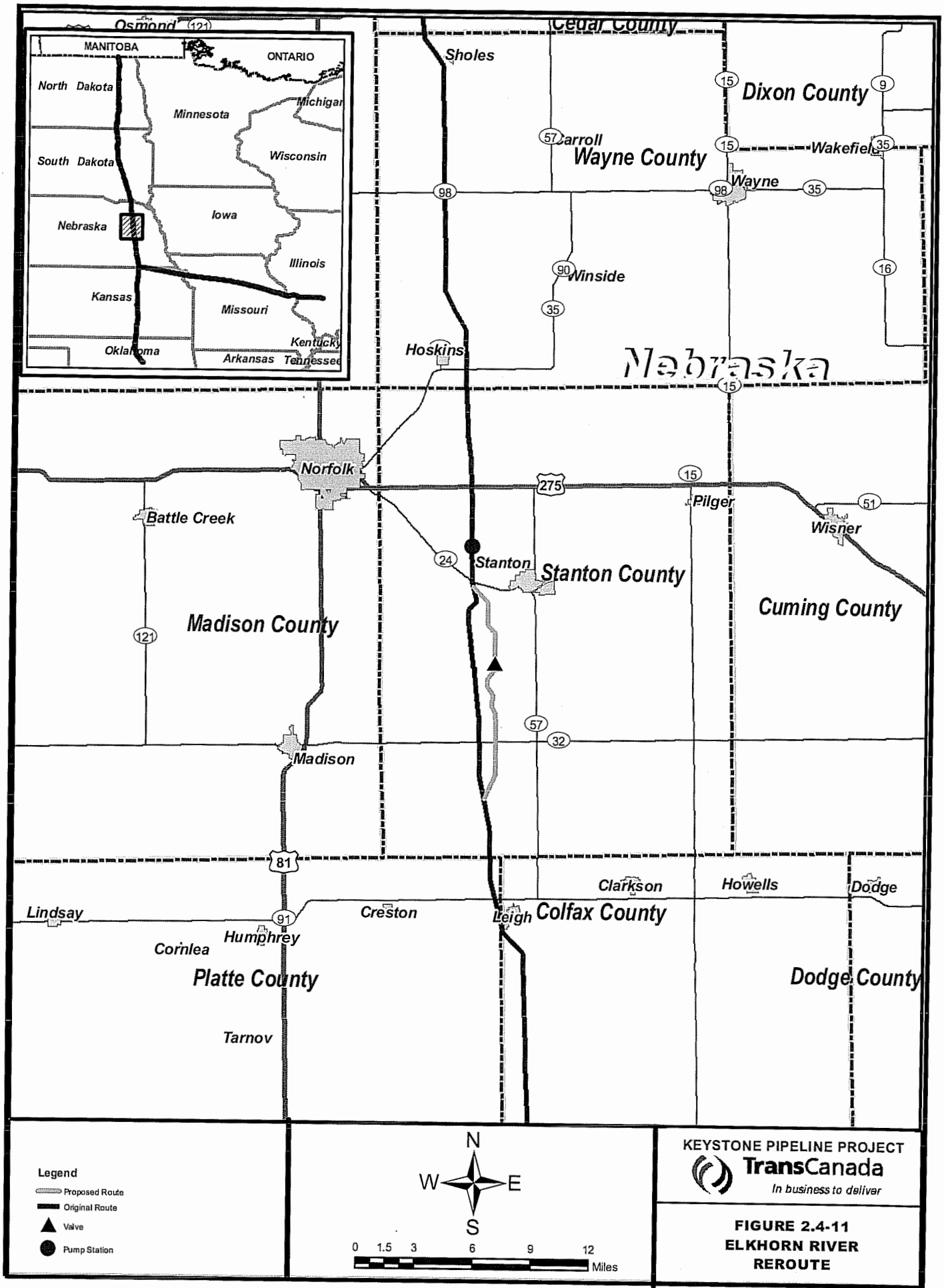
During open house meetings, local landowners advised Keystone's that the proposed pipeline route crossed an area of flood irrigation agricultural land. Flood irrigated land is typically flat with a gradual slope to allow for irrigation water to flow along the ground surface from one end of a field to the other. It is very difficult to restore flood irrigation fields to their original productivity after pipeline construction.

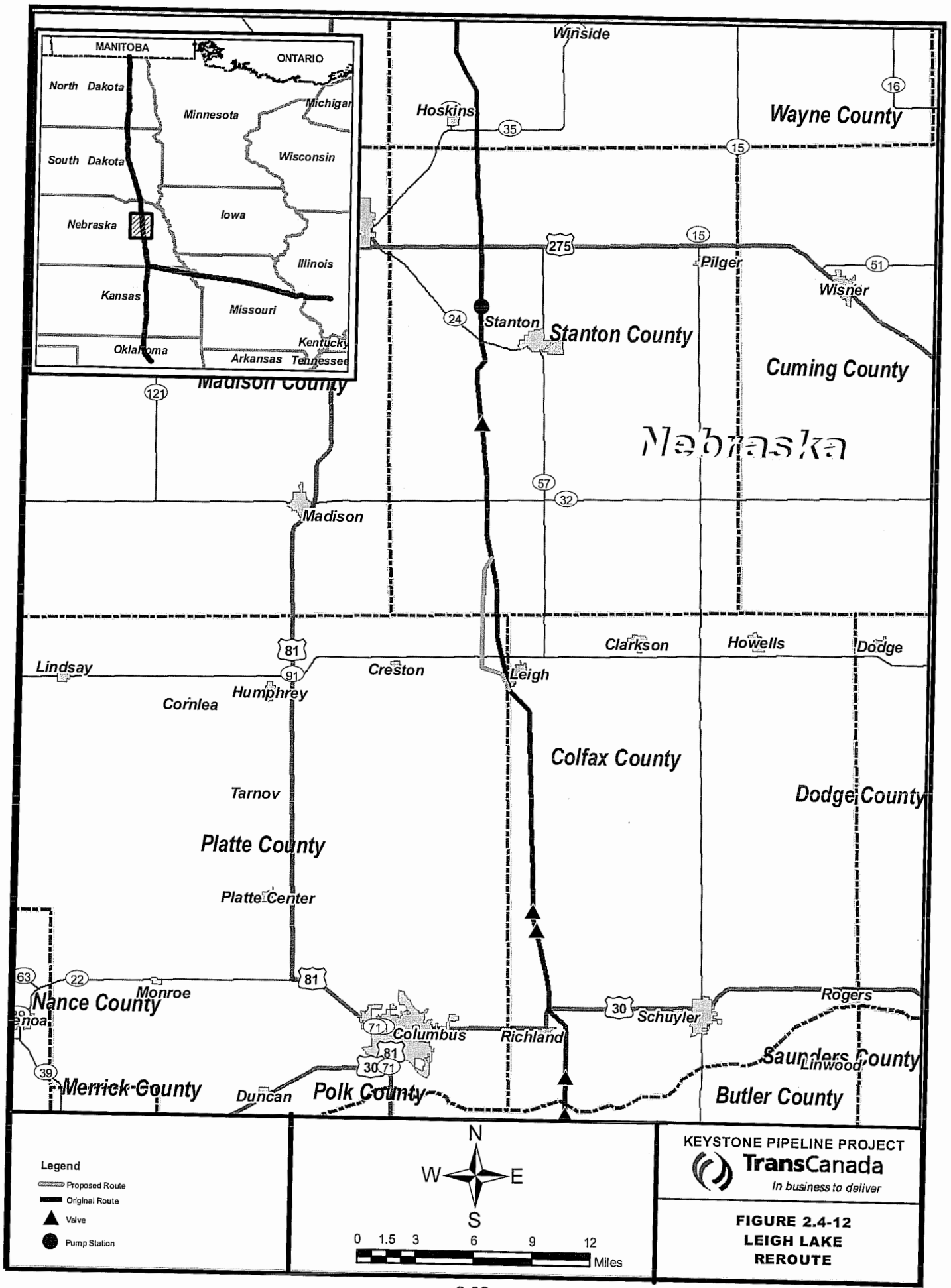
Landowners at the open house meeting recommended Keystone re-locate its pipeline westerly approximately 1 to 2 miles in order to avoid flood irrigation lands. After meeting with the landowners, Keystone agreed to reroute the pipeline (**Figure 2.4-13**). This reroute reduces the overall length of the pipeline by approximately 0.1 mile and eliminates crossing flood irrigated agricultural lands.

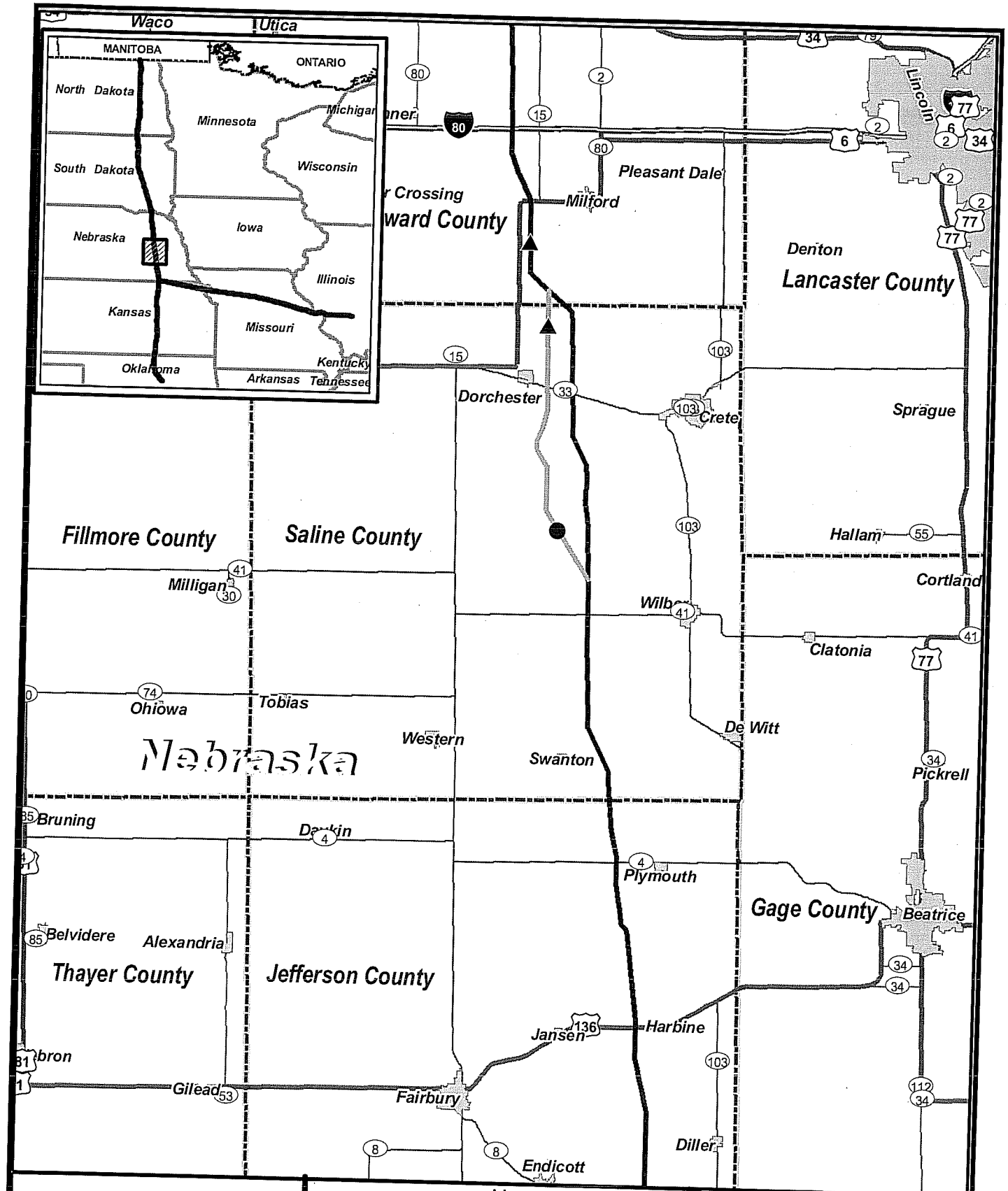
Agency Reroute (MP 753.8 to MP 757.0)

During open house meetings, citizens and the Mayor of Agency, Missouri, requested that Keystone's proposed pipeline route that followed the existing Platte Pipeline be relocated to avoid pipeline construction through a residential area of the town of Agency, Missouri. This is an area where the Kinder Morgan's proposed Rockies


MANITOBA
ONTARIO
North Dakota
Minnesota
Michigan
South Dakota
Wisconsin
Nebraska
Iowa
Illinois
Kansas
Missouri
Kentucky
Oklahoma
Arkansas
Tennessee
Webster
Day County
Butler
Lily
Bradley
Wallace
Turton
South Dakota
Garden City
Spink County
Clark County
Raymond
Doland
Frankfort
Clark
Henry
Naples
Vienna
Hitchcock
Willow Lake
Beadle County
Kingsbury County
20
25
212
37
28
Legend
Proposed Route
Original Route
Valve
Pump Station
N
W
E
S
0 1.5 3 6 9 12
Miles
KEYSTONE PIPELINE PROJECT
TransCanada
In business to deliver
FIGURE 2.4-10
USFWS RAYMOND PRAIRIE
CHICKEN LEKS REROUTE


Osmond
Cedar County
Sholes
Dixon County
Carroll
Wayne County
Wakefield
Wayne
Winside
Hoskins
Nebraska
Norfolk
Pilger
Wisner
Battle Creek
Stanton
Stanton County
Cuming County
Madison County
Madison
Clarkson
Howells
Dodge
Lindsay
Creston
Leigh
Colfax County
Humphrey
Cornlea
Platte County
Dodge County
Tarnov
MANITOBA
ONTARIO
North Dakota
Minnesota
Michigan
South Dakota
Wisconsin
Nebraska
Iowa
Illinois
Kansas
Missouri
Oklahoma
Arkansas
Kentucky
Tennessee
Legend
Proposed Route
Original Route
Valve
Pump Station
N
W
E
S
0 1.5 3 6 9 12
Miles
KEYSTONE PIPELINE PROJECT
TransCanada
In business to deliver
FIGURE 2.4-11
ELKHORN RIVER
REROUTE


MANITOBA
ONTARIO
North Dakota
Minnesota
Michigan
South Dakota
Wisconsin
Nebraska
Iowa
Illinois
Kansas
Missouri
Oklahoma
Arkansas
Kentucky
Tennessee
Winside
Hoskins
Wayne County
Pilger
Wisner
Stanton
Stanton County
Cuming County
Madison County
Nebraska
Madison
Clarkson
Howells
Dodge
Lindsay
Creston
Leigh
Humphrey
Cornlea
Colfax County
Tarnov
Dodge County
Platte County
Platte Center
Nance County
Monroe
Rogers
Columbus
Richland
Schuyler
Saunders County
Linwood
Merrick County
Duncan
Polk County
Butler County
Legend
Proposed Route
Original Route
Valve
Pump Station
N
W
E
S
0 1.5 3 6 9 12
Miles
KEYSTONE PIPELINE PROJECT
TransCanada
In business to deliver
FIGURE 2.4-12
LEIGH LAKE
REROUTE


Waco
Utica
MANITOBA
ONTARIO
North Dakota
Minnesota
Michigan
South Dakota
Wisconsin
Nebraska
Iowa
Illinois
Kansas
Missouri
Oklahoma
Kentucky
Arkansas
Tennessee
Crossing
ward County
Milford
Pleasant Dale
Lincoln
Denton
Lancaster County
Dorchester
Crete
Sprague
Hallam
Cortland
Fillmore County
Saline County
Milligan
Wilb
Clatonia
Ohiowa
Tobias
Western
Swanton
De Witt
Pickrell
Nebraska
Bruning
Plymouth
Gage County
Beatrice
Belvidere
Alexandria
Thayer County
Jefferson County
Jansen
Harbine
Gilead
Fairbury
Diller
Endicott
Legend
Proposed Route
Original Route
Valve
Pump Station
N
W
E
S
0 1.5 3 6 9 12
Miles
KEYSTONE PIPELINE PROJECT
TransCanada
In business to deliver
FIGURE 2.4-13
SALINE COUNTY
REROUTE

Express Pipeline (REX) is proposed to be constructed in 2007 and Kinder Morgan has agreed to a reroute south of the residential area. REX also has opted to reroute south of a recreational shooting range to the west of Agency.

Landowners at the open house meeting recommended Keystone relocate its pipeline southerly approximately 0.4 mile in order to avoid the residential area of Agency, Missouri. After meeting with the landowners, Keystone agreed to reroute the pipeline (**Figure 2.4-14**). The reroute begins at MP 753.8 and ends at MP 757.0 based on the original pipeline route. The reroute is 3.4 miles long and adds 0.2 mile to the original pipeline route.

Troy Reroute (MP 958.7 to MP 973.4)

During open house meetings, landowners near Troy, Missouri, requested Keystone relocate the proposed pipeline alignment to follow an existing Central Electric Power Coop powerline through the northern edge of the city. Additionally, another landowner requested that the route across his sod farm be avoided or minimized to the extent possible.

After meeting with the landowners and Central Electric Coop, Keystone agreed to reroute the pipeline (**Figure 2.4-15**). The reroute begins at MP 958.7 and ends at MP 973.4, is 14.7 miles in length and reduces the length of the original pipeline route by approximately 0.6 mile.

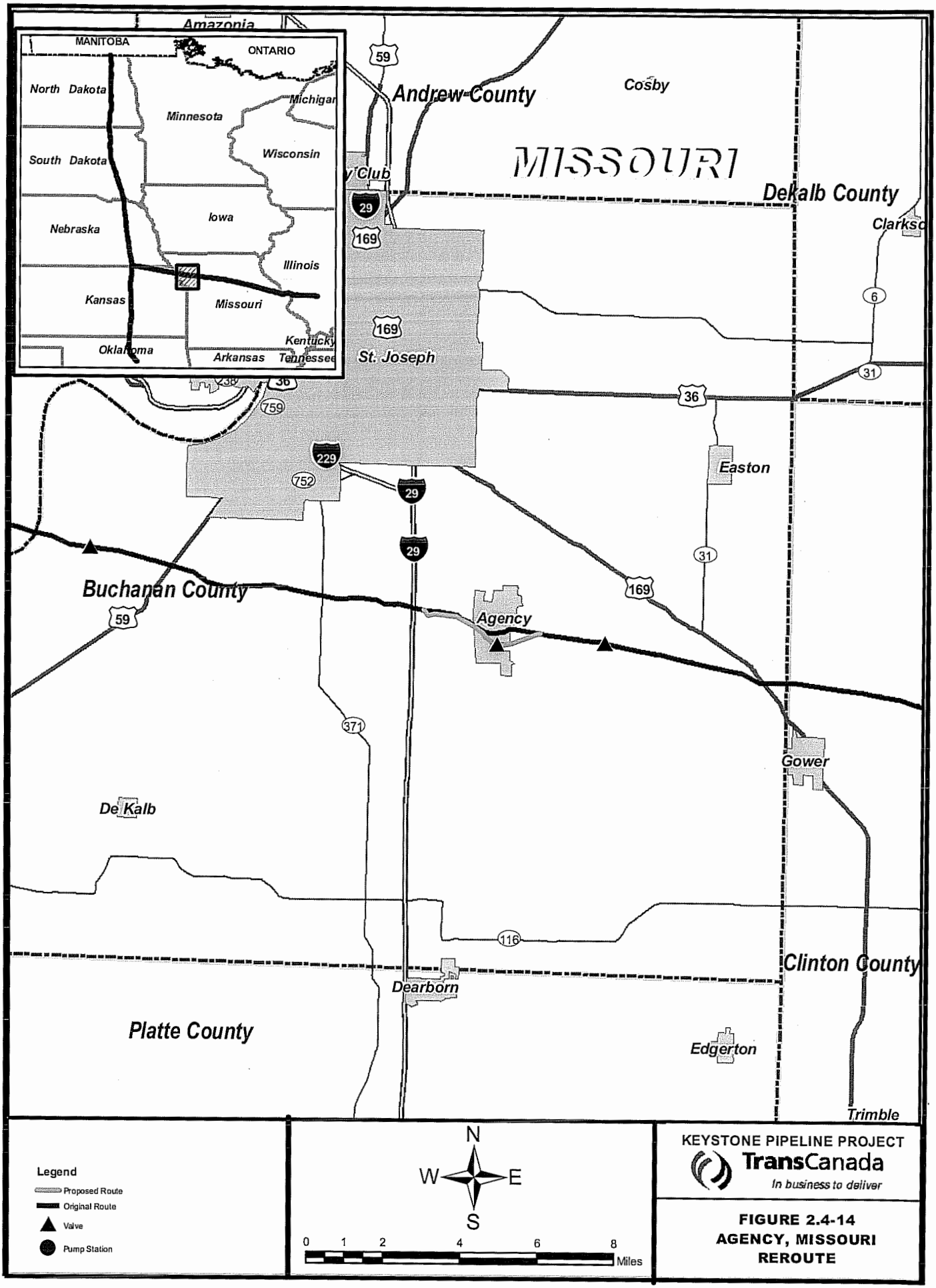
Patoka Reroute (MP 1068.3 to MP 1073.3)

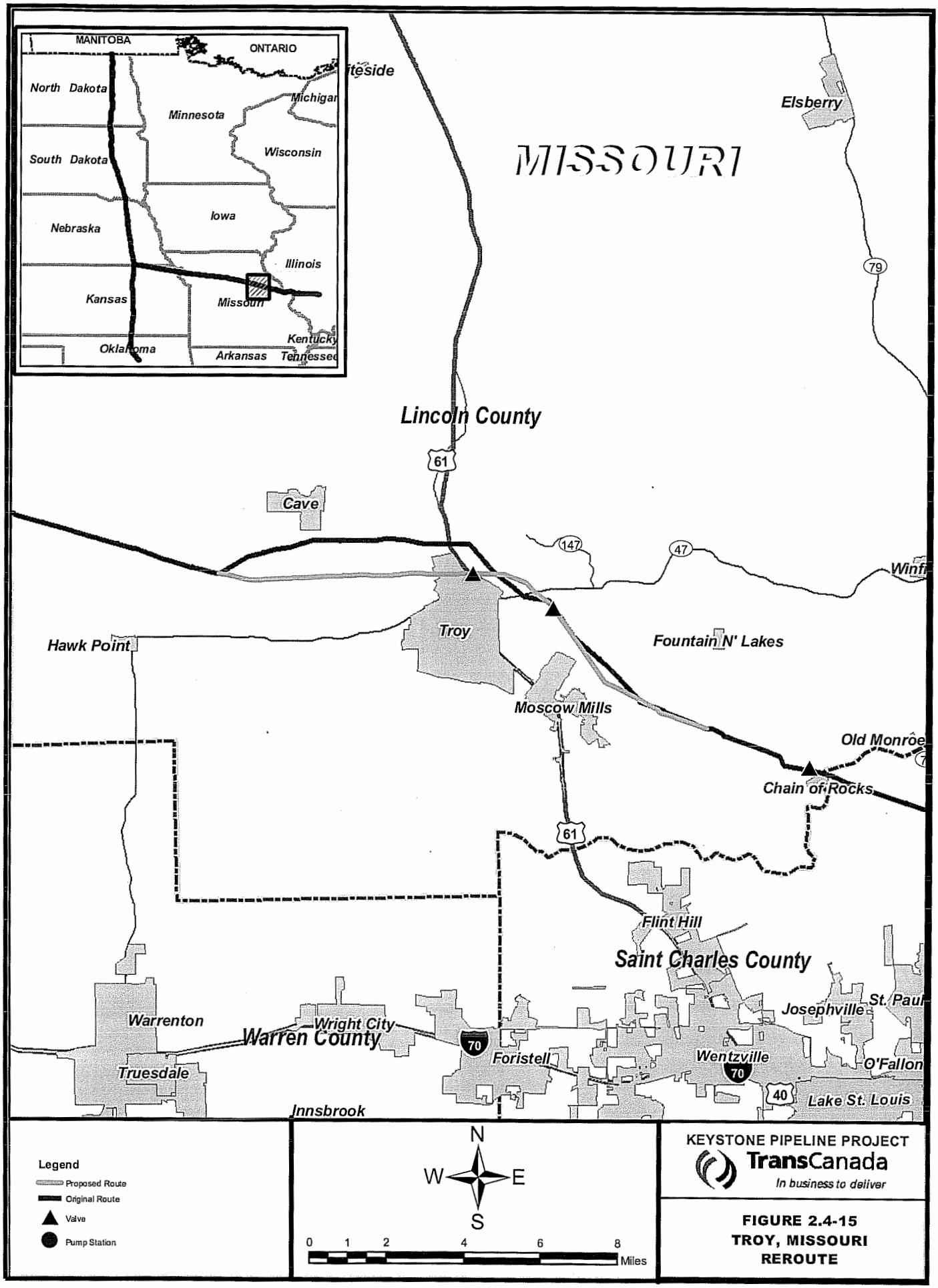
Keystone's original pipeline route followed existing pipelines into the northern area of the Patoka Terminal. During meetings with Patoka Terminal companies, it was determined that the more optimum location for the proposed pipeline to tie into the Terminal's tank manifolds was into the southern area of the Patoka Terminal. It also was determined that there are two existing pipelines that currently enter the southern area of the Patoka Terminal.

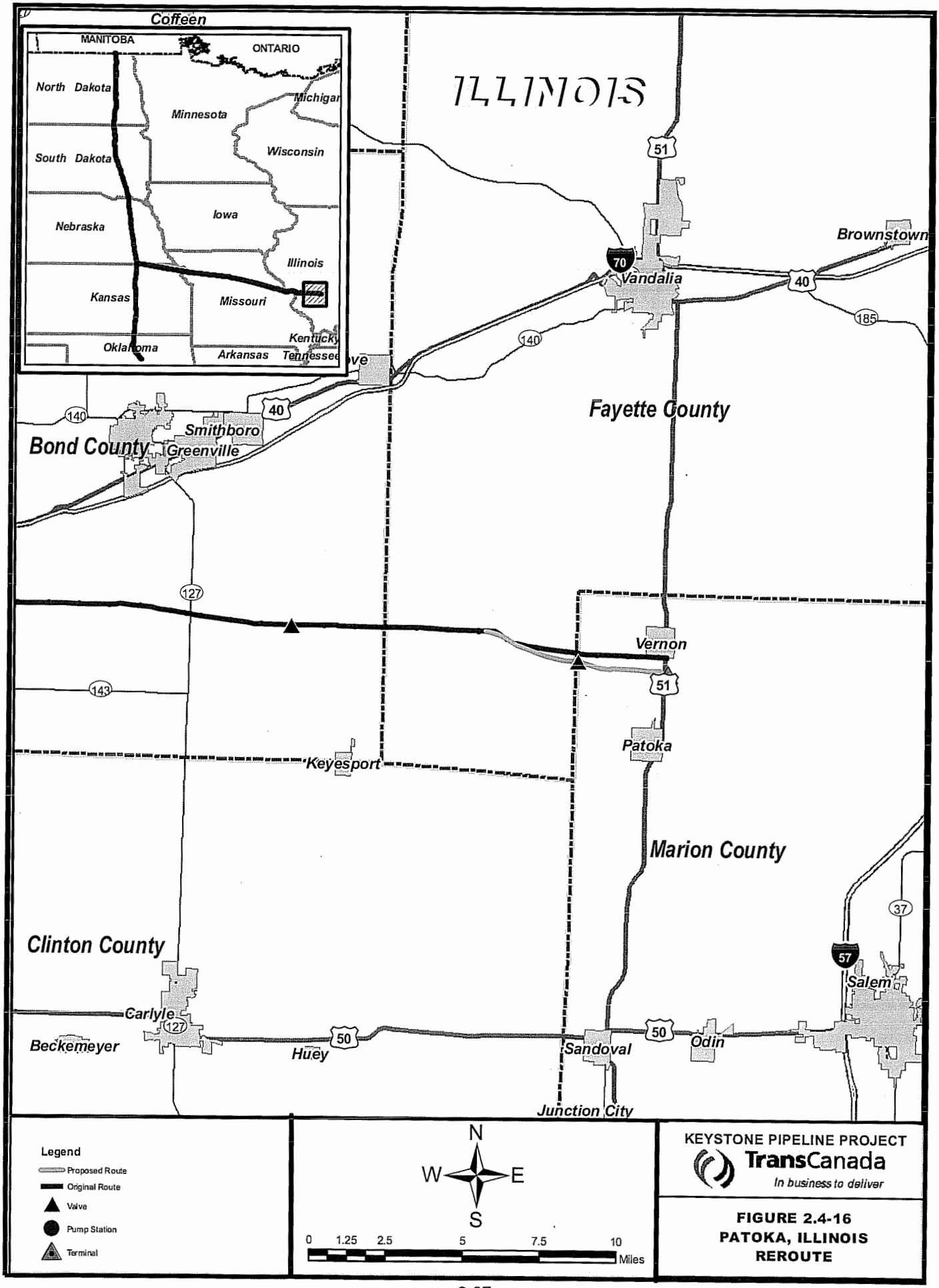
To facilitate terminating the pipeline in the preferred southern area of the Patoka Terminal, the pipeline was rerouted parallel with the two existing pipelines (**Figure 2.4-16**). The reroute begins at MP 1068.3 and ends at MP 1073.3. The reroute is 5.0 miles in length and increases the length of the original pipeline route by approximately 0.1 mile.

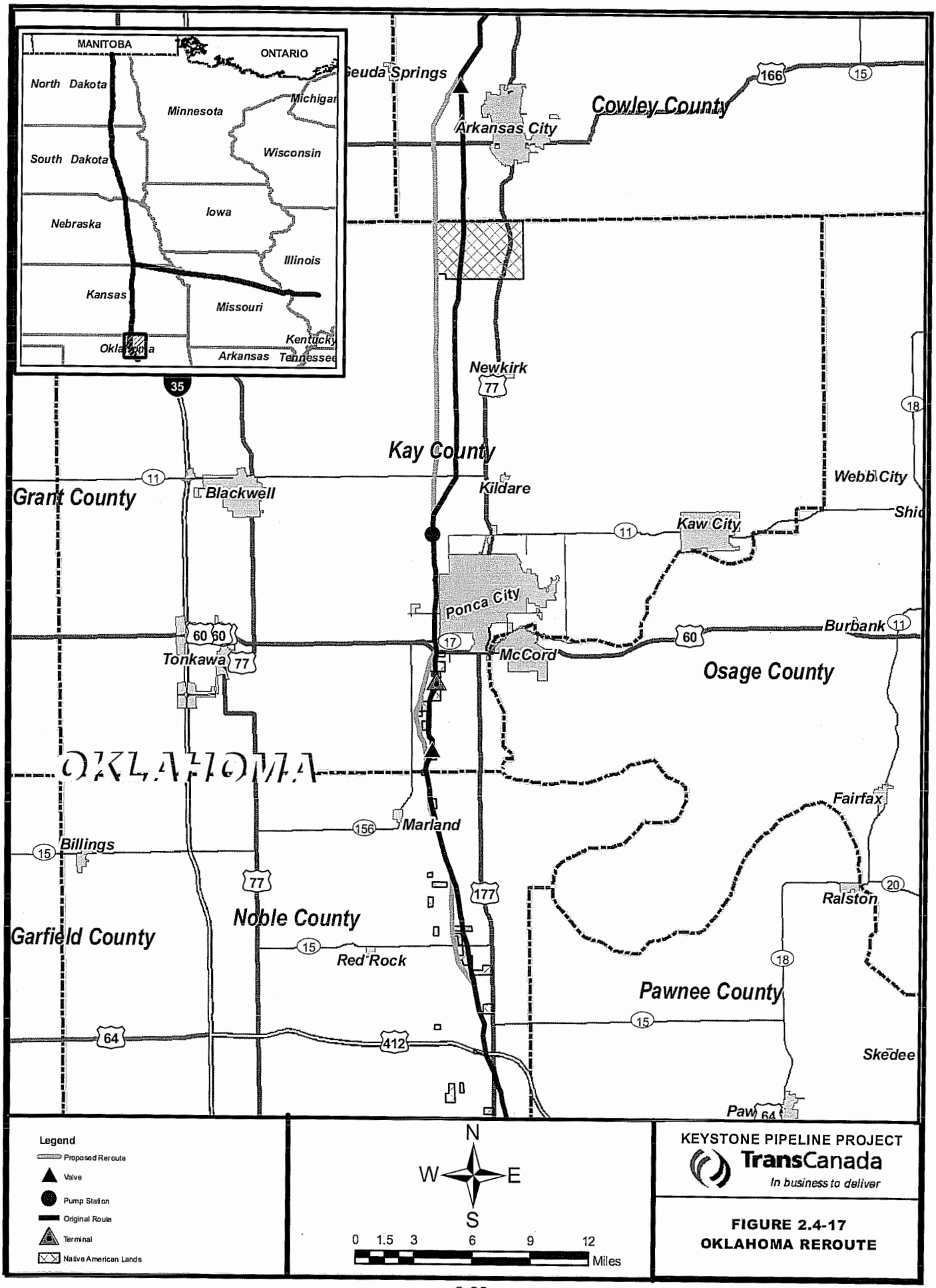
Oklahoma Reroute (MP 208.2 to MP 252.0)

During data collection and route refinement efforts associated with the Cushing Extension in Kay, Noble, and Payne Counties, Oklahoma, Keystone noted that its proposed pipeline route crosses Native American tribal and allotted lands. To avoid impacts to all such lands Keystone has developed a reroute (**Figure 2.4-17**). The reroute consists of three separate realignments located between MP 234.3 to MP 240.4, MP 242.0 to MP 243.7, and MP 246.2 to MP 252.0, based on the original pipeline route. In total, this reroute is 47.4 miles long and adds 0.4 mile to the original pipeline route.


MANITOBA
ONTARIO
North Dakota
Minnesota
Michigan
South Dakota
Wisconsin
Nebraska
Iowa
Illinois
Kansas
Missouri
Kentucky
Oklahoma
Arkansas
Tennessee
Amazonia
Andrew County
Cosby
MISSOURI
Dekalb County
Clarksdale
St. Joseph
Easton
Buchanan County
Agency
Gower
De Kalb
Clinton County
Dearborn
Platte County
Edgerton
Trimble
59
29
169
36
759
229
752
31
6
371
116
Legend
Proposed Route
Original Route
Valve
Pump Station
N
W
E
S
0 1 2 4 6 8
Miles
KEYSTONE PIPELINE PROJECT
TransCanada
In business to deliver
FIGURE 2.4-14
AGENCY, MISSOURI
REROUTE


MANITOBA
ONTARIO
North Dakota
Minnesota
Michigan
South Dakota
Wisconsin
Nebraska
Iowa
Illinois
Kansas
Missouri
Kentucky
Oklahoma
Arkansas
Tennessee
MISSOURI
Elsberry
Lincoln County
Cave
Troy
Hawk Point
Fountain N' Lakes
Moscow Mills
Old Monroe
Chain of Rocks
Flint Hill
Saint Charles County
Warrenton
Wright City
Warren County
Truesdale
Innsbrook
Foristell
Wentzville
Josephville
St. Paul
O'Fallon
Lake St. Louis
61
147
47
79
70
40
Legend
Proposed Route
Original Route
Valve
Pump Station
N
W
E
S
0 1 2 4 6 8
Miles
KEYSTONE PIPELINE PROJECT
TransCanada
In business to deliver
FIGURE 2.4-15
TROY, MISSOURI
REROUTE


Coffeen
MANITOBA
ONTARIO
North Dakota
Minnesota
Michigan
South Dakota
Wisconsin
Nebraska
Iowa
Illinois
Kansas
Missouri
Kentucky
Oklahoma
Arkansas
Tennessee
ILLINOIS
51
70
Vandalia
Brownstown
40
185
140
Fayette County
Bond County
Smithboro
Greenville
127
Vernon
143
Patoka
Keyesport
Marion County
37
57
Salem
Clinton County
Carlyle
Beckemeyer
Huey
50
Sandoval
Odin
Junction City
Legend
Proposed Route
Original Route
Valve
Pump Station
Terminal
N
W
E
S
0
1.25
2.5
5
7.5
10
Miles
KEYSTONE PIPELINE PROJECT
TransCanada
In business to deliver
FIGURE 2.4-16
PATOKA, ILLINOIS
REROUTE


MANITOBA
ONTARIO
North Dakota
Minnesota
Michigan
South Dakota
Wisconsin
Nebraska
Iowa
Illinois
Kansas
Missouri
Kentucky
Oklahoma
Arkansas
Tennessee
Seuda Springs
Cowley County
Arkansas City
166
15
Newkirk
77
35
Kay County
18
Grant County
11
Blackwell
Kildare
Webb City
Kaw City
Ponca City
Burbank
60
17
McCord
Tonkawa
Osage County
OKLAHOMA
Fairfax
Marland
156
Billings
15
77
177
Ralston
20
Noble County
Garfield County
Red Rock
Pawnee County
64
412
Skedee
Legend
Proposed Reroute
Valve
Pump Station
Original Route
Terminal
Native American Lands
N
W
E
S
0 1.5 3 6 9 12
Miles
KEYSTONE PIPELINE PROJECT
TransCanada
In business to deliver
FIGURE 2.4-17
OKLAHOMA REROUTE