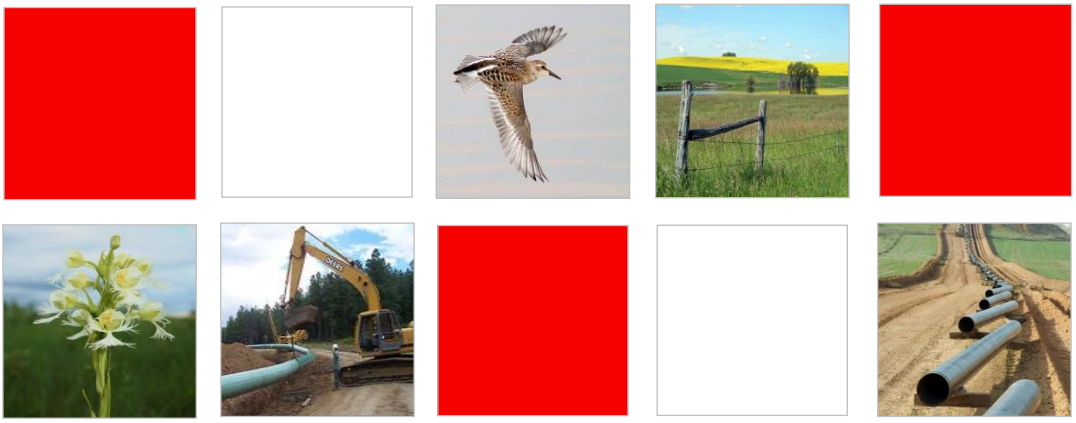

North Dakota Pipeline Company LLC
Sandpiper Environmental Services
Sandpiper Pipeline Project

Minnesota Environmental Information Report

Minnesota Public Utilities Commission
Routing Permit Docket No. PL-6668/PPL-13-474
Certificate of Need Docket No. PL-6668/CN-13-473

REVISED JANUARY 2014

ENBRIDGE

SANDPIPER PIPELINE PROJECT

Summary of Updates

Minnesota Environmental Information Report[a]		
Section	**Subsection**	**Description of Updates**
Section 1.0	**1.0**	Entity sponsoring application updated
	1.1	Project mileage, mileposts, facility description, Figure 1.1-1, and Table 1.1-1 updated
	1.2.3	Table 1.2.3-1 updated
	1.2.4	Facility description and Table 1.2.4-1 updated
	1.3	Mileposts updated
Section 2.0	**2.2.1**	Koch Pipeline Company Dakota Express Pipeline Project alternative updated
	2.3.2	Updated Figure 2.3.2-1
	2.3.3	Carlton County route alternative added, updated Figures 2.3.3-1, 2.3.3-2, 2.3.3-3, and 2.3.3-4, and updated Tables 2.3.3-1, 2.3.3-2, 2.3.3-3, and 2.3.3-4
Section 3.0	**3.1**	Data relating to municipalities and population estimates along the route updated and Table 3.1-2 updated
	3.2.4	Agricultural land and timber production affected updated
Section 4.0	**4.2**	Land use affected by construction and operation of Sandpiper updated and Table 4.2-1 updated
	4.2.1	Ownership of lands crossed by the Project and Table 4.2.1-1 updated
	4.3.1	Acres of forest land impacted by construction and operation updated

SANDPIPER PIPELINE PROJECT

Summary of Updates

Section 4.0	**4.3.2**	Acres of agricultural land impacted by updated
	4.3.3	Acres of open water and wetlands affected by construction updated
	4.3.4	Acres of open land affected by construction updated
	4.3.5	Acres of developed land affected by construction and Table 4.3.5-1 updated
	4.3.6	Roads and railroads crossed by the Project and Tables 4.3.6-1 and 4.3.6-2 updated and King of Trails Scenic Byway added
Section 5.0	**5.1**	Segments of the route crossing bedrock, elevation along the route, Table 5.1-1, and Figures 5.1-1 and 5.1-2 updated
	5.1.1	Mineral resources along the route and Table 5.1.1-1 updated and Table 5.1.1-2 added
	5.2	Number of mining operations and mineral leases crossed updated
Section 6.0	**6.2.2**	Tables 6.2.2-1, 6.2.2-2, and 6.2.2-3 updated
	6.3.1	Percent of prime farmland crossed by the route updated
	6.3.3	Percent of soils susceptible to wind erosion updated
	6.3.4	Percent of soils classified as droughty soils updated
	6.3.5	Percent of stony/rocky soils and segment of route crossing bedrock updated
Section 7.0	**7.1.1**	Existing vegetation resources affected by construction updated

SANDPIPER PIPELINE PROJECT

Summary of Updates

Section 7.0	**7.1.2**	Milepost ranges of ecological sections and subsections and Table 7.1.2-1 updated
	7.1.3	Results of consultation with MNDNR on sensitive plant communities and Table 7.1.3-1 updated
	7.1.4	Acres of forest land affected by construction and operation updated
	7.2.2	Description of large block habitat crossings and Figure 7.2.2-1 updated
	7.2.3	Acres of forested habitat affected by the right-of-way updated
	7.3.1	Number of waterbodies, including trout streams crossed and Table 7.3.1-2 updated
	7.3.2	Impacts on fishery resources updated
	7.4	Update on consultation status with USFWS, USACE, and MNDNR regarding threatened and endangered species and Table 7.4.1-1 updated
Section 8.0	**8.1.2**	Number of occurrences of Cretaceous Aquifer crossings updated
	8.2.2	Miles of federal and state designated aquifer crossed updated
	8.2.3	Wells near the Project and Table 8.2.3-1 updated
	8.3	Contaminated sites near the Project and Table 8.3-1 updated
Section 9.0	**9.1**	Added Big Sandy Lake Watershed crossing and updated Table 9.1-1 and Figure 9.1-1
	9.2	Number of waterbodies crossed and Table 9.2-1 updated

SANDPIPER PIPELINE PROJECT

Summary of Updates

Section 9.0	**9.2.1**	Impaired and infested waters and Table 9.2.1-1 updated
	9.2.2	Number of Public Water Watercourses crossed and Table 9.2.2-1 updated
	9.2.3	Update on calcareous fens affected by the Project
	9.2.4	Table 9.2.4-1 updated
	9.3.1	Number of wetlands crossed by the preferred route and Tables 9.3.1-1 and 9.3.1-2 updated
	9.3.2	Number of Public Water Basins crossed by the Project and Table 9.3.2-1 updated
	9.3.4	Acres of wetlands affected by construction updated
Section 10.0	**10.1**	Description of previously recorded cultural sites and Table 10.1-1 updated
	10.2	Description of Phase I Reconnaissance Survey and GIS Predictive Model updated
	10.3	Cultural Resources Phase II Evaluation Studies section added
	10.4	Percent of Phase I reconnaissance surveys completed updated
Section 11.0	**11.1.1**	Mileposts of National Scenic Trail and Nationwide Rivers Inventory crossings updated
	11.1.2	Table 11.1.2-1 updated and mileposts of Wildlife Management Area, Aquatic Management Area and state-designated trails crossings updated
	11.1.3	Mileposts of county park and forest land crossings updated

SANDPIPER PIPELINE PROJECT

Summary of Updates

Section 11.0	**11.1.4**	Mileposts of designated scenic byways crossings updated and King of Trails Scenic Byway updated
	11.2	Percent of route constructed adjacent to existing right-of-way updated
Section 12.0	**12.3**	Air permitting requirements updated
Section 13.0	**---**	References updated
Appendix B	**---**	Table of roads crossed by the Project route updated
Appendix E	**---**	Table of waterbodies crossed by the Project route updated
Appendix G	**G.1**	Minnesota Project Overview Map updated
	G.3	Preliminary Minnesota Facility Drawings updated
	G.4	Minnesota County Maps updated
	G.5	Minnesota Aerial and Topographic Route Maps updated
[a] Entity name updated throughout EIR from Enbridge Pipelines (North Dakota) LLC ('EPND') to North Dakota Pipeline Company LLC ('NDPC').		

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ACRONYMS

AMA	Aquatic Management Area
APP	Agricultural Protection Plan
bbl	Barrel
BGEPA	Bald and Golden Eagle Protection Act
bpd	Barrels Per Day
BWSR	Minnesota Board of Water and Soil Resources
CCRG	Commonwealth Cultural Resource Group
CN	Certificate of Need
CWA	Clean Water Act
CWI	County Well Index
DWSMA	Drinking Water Supply Management Area
EEP	Enbridge Energy Partners, L.P.
EI	Environmental Inspector
EILC	Ecologically Important Lowland Conifers
EIR	Minnesota Environmental Information Report
EPA	Environmental Protection Agency
EPND	Enbridge Pipelines (North Dakota) LLC
EPP	Environmental Protection Plan
ESA	Endangered Species Act
GIS	Geographic Information Systems
gpm	Gallons per minute

ACRONYMS

HCVF	High Conservation Value Forest
HDD	Horizontal Directional Drill
HP	Horse Power
LULC	Land Use/Land Cover
MAOP	Maximum Allowable Operating Pressure
MBTA	Migratory Bird Treaty Act
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MDOT	Minnesota Department of Transportation
MGS	Minnesota Geological Survey
MLRA	Major Land Resource Area
MNDNR	Minnesota Department of Natural Resources
MNR	Midwest Natural Resources
MP	Milepost
MPC	Marathon Petroleum Corporation
MPCA	Minnesota Pollution Control Agency
MPUC	Minnesota Public Utilities Commission
NDPC	North Dakota Pipeline Company LLC
NHIS	Natural Heritage Information System
NPC	Native Plant Communities
NPS	National Park Service

ACRONYMS

NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
NWI	National Wetland Inventory
OFMC	Old Forest Management Complex
OG	Old Growth
ORVW	Outstanding Resource Value Waters
OSA	Office of State Archaeologist
PAA	Plains All American Pipeline L.P.
PEM	Palustrine Emergent Wetland
PFO	Palustrine Forested Wetland
PIG	Pipeline Inspection Gauge
PLP	Permanent List of Priorities
PSS	Palustrine Shrub-Scrub Wetland
Project	Sandpiper Pipeline Project
PRP	Pipeline Routing Permit
PWI	Public Waters Inventory
RCRA	Resource Conservation Recovery Act
RSA	Representative Sample Area
SGCN	Species of Greatest Conservation Need

ACRONYMS

SHPO	Minnesota State Historic Preservation Office
SMZ	Special Management Zone
SNA	Scientific Natural Area
SSURGO	Soil Survey Geographic
STATSGO2	State Soil Geographic
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VFD	Variable Frequency Drives
VOC	Volatile Organic Compounds
WCA	Wetland Conservation Act
WMA	Wildlife Management Area
WPA	Wellhead Protection Area

1.0 INTRODUCTION

This Minnesota Environmental Information Report ("EIR") was prepared in support of the North Dakota Pipeline Company LLC[1] (referred to herein as "NDPC") Application to the Minnesota Public Utilities Commission ("MPUC") for a Pipeline Routing Permit ("PRP") and Certificate of Need ("CN") to construct and operate the Sandpiper Pipeline Project ("Sandpiper" or "Project") in Minnesota. This report provides: an assessment of the existing environment along the Project's preferred route and rejected alternate routes; an analysis of human and environmental impacts that could potentially result from pipeline right-of-way preparation, construction, operation, and maintenance of the Project; and a summary of the protection and restoration measures to be implemented to avoid and/or minimize environmental impacts. The EIR has been prepared in accordance with the MPUC's Pipeline Routing rules (Chapter 7853) and supplements information provided in both the PRP and CN applications as follows:

- Location of Preferred Route and Description of Environment (PRP, Section 7852.2600);
- Environmental Impact of Preferred Route (PRP, Section 7852.2700);
- Right-of-Way Protection and Restoration Measures (PRP, Section 7852.2800);
- Evidence of Consideration of Alternative Routes (PRP, Section 7852.3100);
- Information Required (CN, Section 7853.0600);
- Alternatives (CN, Section 7853.0540)
- Location (CN, Section 7853.0610);
- Wastewater, Air Emissions, and Noise Sources (CN, Section 7853.0620);
- Pollution Control and Safeguards Equipment (CN, Section 7853.0630); and
- Induced Developments (CN, Section 7853.0640).

1.1 PROJECT DESCRIPTION AND NEED

The Project is a new crude oil pipeline and associated facilities to increase crude oil transportation services from North Dakota to refineries in the Midwest and the East Coast in response to the demand for a growing supply of Bakken crude oil. The Project is

[1] North Dakota Pipeline Company LLC ("NDPC") is a limited liability company duly organized under the laws of the State of Delaware, qualified to do business in Minnesota and was formerly known as Enbridge Pipelines (North Dakota) LLC ("EPND"). NDPC is a joint venture between Enbridge Energy Partners, L.P. ("EEP"), NDPC's former sole parent entity, and Marathon Petroleum Corporation ("MPC"). Enbridge Energy, Limited Partnership, a wholly owned subsidiary of EEP and an affiliate of Enbridge Inc., owns and operates the U.S. portion of the existing Enbridge Mainline System. Collectively, the affiliated entities excluding NDPC are referred to as "Enbridge" in this document.

approximately 616-miles in length and will consist of a 373-mile-long, 24-inch-diameter crude oil pipeline and associated facilities from the existing Beaver Lodge station south of Tioga, North Dakota to a new NDPC Terminal near Clearbrook, Minnesota and a 243-mile-long, 30-inch-diameter pipeline and associated facilities from Clearbrook, Minnesota to the Superior Terminal in Superior, Wisconsin. The Project will deliver an annual capacity of 250,000 barrels per day ("bpd") from the existing Beaver Lodge station to Berthold, North Dakota, and an annual capacity of 225,000 bpd of crude oil from Berthold into Clearbrook, Minnesota, and an annual capacity 375,000 bpd of crude oil from Clearbrook, Minnesota to Superior, Wisconsin.

The Project's purpose is to transport the growing production of domestic crude oil from the Bakken and Three Forks formations in the Williston Basin[2] of eastern Montana and western North Dakota to meet the increased demands of refineries and markets in the Midwest and the East Coast. The capacity provided by the Project will provide independent utility to NDPC and its customers. NDPC's shippers will use the pipeline to transport crude oil to an NDPC affiliate terminal in Superior, Wisconsin. From there, the crude oil can be delivered to various other pipelines and refineries. Additionally, the Project will have the ability to provide redundant service[3] at Clearbook to the existing NDPC Line 81 deliveries in order to ensure reliable deliveries of 60,000 bpd annual capacity into the Minnesota Pipe Line Company system for delivery to Minnesota refineries. The Project is a positive step toward North American energy security and independence that will increase access to a growing, long-term, and reliable domestic source of energy and decrease reliance on crude oil imports from countries that are often unstable or unfriendly to the United States' interests.

The need for the Project is based on several factors, including:

- increasing demand for crude oil produced in North America from refineries and markets in the Midwest and the East Coast;
- compared to other modes of transportation, transporting North Dakota crude oil by pipeline to Midwest refineries and beyond is the safer and more economic transportation alternative; and
- reducing United States dependence on foreign offshore oil through increased access to stable, secure domestic crude oil supplies.

[2] The Bakken formation is currently the largest contributor to the total crude oil production in the Williston Basin, the oil industry refers to all of the crude oil production in the Williston Basin as "Bakken crude oil". The Williston Basin spans parts of western North Dakota, eastern Montana and parts of Saskatchewan and Manitoba.

[3] Redundant service is indicative of system design that allows for duplication of delivery if one component is unavailable.

The Project will entail construction and operation of the following infrastructure in Minnesota:

- approximately 302 miles of new 24- and 30-inch diameter, underground crude oil pipeline;
- a new terminal facility located near Clearbrook (near milepost ["MP"][4] 373) including two (2) 150,000 barrel ("bbl") tanks, two (2) 500 horse power ('HP') injection pumps to inject 150,000 bpd from the existing NDPC Line 81 into the Sandpiper Pipeline, one (1) 800 HP transfer pump for delivery to NDPC, and three (3) sets of leak detection meters (1 set for delivery from Sandpiper pipeline to NDPC tankage, 1 set for Line 81 delivery to NDPC tankage, and 1 set for flow injection from NDPC tankage into the Sandpiper pipeline). It will also include all associated terminal piping, interconnections, valves, manifold, and sumps, as well as an electrical substation, a fire suppression system (e.g., building, pond, piping), a maintenance building and a cold storage building;
- pumping facilities will be installed at the new terminal near Clearbrook, Minnesota which will include four (4) 5,500 HP pumps, four (4) 6,000 HP Variable Frequency Drives ("VFD"), a pump shelter, two (2) VFD/switchgear buildings. Additionally, it will include two (2) coriolis meters, a 24-inch Pipeline Inspection Gauge ("PIG") receiver and a 30-inch PIG launcher, as well as associated pump station piping and valves;
- new pipeline inspection tool launch and receiver traps, along with a mainline valve, will be installed at a site near Pine River, Minnesota; and
- approximately 15 mainline valves placed at major waterbody crossings and other features along the preferred route (presented in Table 1.2.4-1).

A general location map depicting the Project's preferred route in Minnesota is included as Figure 1.1-1. Detailed route maps of the Project are included in Appendix G.5. The Project will cross portions of Polk, Red Lake, Clearwater, Hubbard, Cass, Crow Wing, Aitkin, and Carlton counties. Table 1.1-1 summarizes the length of pipeline in each county.

[4] Note that mileposts denoted in this document are location references only and should not be used as definitive measurements of the pipeline.

Figure 1.1-1
General Project Location Map

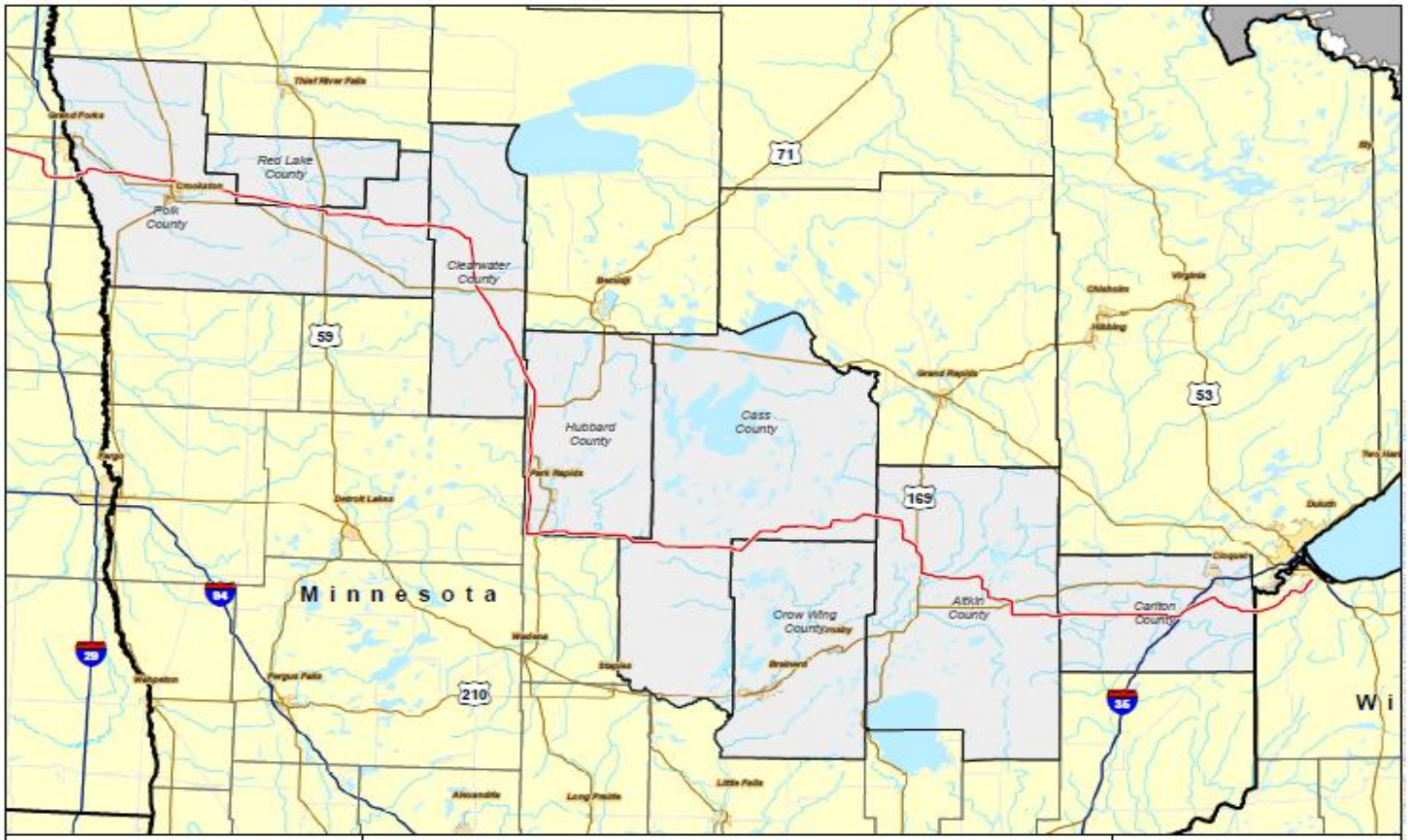


Table 1.1-1
Location and Length of the Sandpiper Pipeline Project in Minnesota

County	Milepost Range [a]	Pipeline Length (miles)
Polk [b]	300.0 – 331.1	31.1
	342.5 – 368.6	26.4
Red Lake	331.1 – 342.5	11.4
Clearwater	368.6 – 408.3	39.7
Hubbard	408.3 – 460.8	52.5
Cass [b]	460.8 – 480.9	20.0
	485.7 – 511.9	26.2
Crow Wing	480.9 – 485.7	4.8
Aitkin	511.9 – 561.8	50.3
Carlton	561.8 – 600.8	39.1
	Total	**301.6**

[a] Mileposts are used for reference and should not be used as a source to calculate actual linear distances.
[b] Two milepost ranges are presented for Polk County as the route exits Polk County into Red Lake County before entering Polk County again. For Cass County, the route exits Cass County into Crow Wing County before entering Cass County again.

The Project will generally be co-located with existing pipeline or third-party rights-of-way in Minnesota to the extent practicable. From the North Dakota border, at approximate MP 300, the Project will generally follow NDPC's existing Line 81 right-of-way across Polk, Red Lake, and Clearwater counties to approximate MP 373 at the new NDPC Clearbrook, Minnesota terminal. At Clearbrook, the pipeline will turn south and will generally follow the existing Minnesota Pipe Line Company right-of-way across Clearwater and Hubbard counties to a point near Hubbard, Minnesota at approximate MP 441. From Hubbard, the pipeline extends east by co-locating with existing electrical transmission, pipeline, and small utility rights-of-way, and crosses minimal greenfield parcels across Hubbard, Cass, Crow Wing, Aitkin, and Carlton counties to approximate MP 601, where it will cross the Minnesota/Wisconsin border.

Approximately 227 miles (75 percent) of the construction right-of-way will be co-located with or parallel to and offset from other existing rights-of-way. Other third-party rights-of-way include roads, pipelines and electric transmission lines.

NDPC proposes to begin construction of the Project in the fourth quarter of 2014. Construction will occur over approximately 14-16 months, with an in-service date in the first quarter of 2016.

1.2 LAND REQUIREMENTS

Construction of the Project will generally require a 120-foot-wide construction right-of-way in upland areas. Uplands are defined as an elevated region of land lying above the level

where water flows or collects in basins. This 120-foot-wide construction right-of-way will allow for temporary storage of topsoil and spoil, as well as accommodate safe operation of construction equipment. The Project will generally use a 95-foot-wide construction right-of-way in wetland areas. Table 1.2-1 presents temporary and permanent land requirements for the Project.

Table 1.2-1
Land Requirements for the Sandpiper Pipeline Project

Route Segment	Permanent Right-of-Way (feet)	Temporary Workspace (feet)	Total Land Requirements (feet)
North Dakota Border to Clearbrook – Co-located with existing NDPC pipeline	55 (~25 new)	65 (upland)	120 (upland)
		40 (wetland)	95 (wetland)
Clearbrook to Wisconsin Border – Co-located with Utility	50	70 (upland)	120 (upland)
		45 (wetland)	95 (wetland)
North Dakota border to Wisconsin Border – Greenfield	50	70 (upland)	120 (upland)
		45 (wetland)	95 (wetland)

From the North Dakota border to Clearbrook where co-located with existing NDPC rights-of-way, the right-of-way requirements in upland areas include typically up to 55-feet of permanent easement, of which 25-feet would be new easement, and 65-feet of temporary workspace for a total land requirement of 120-feet. In wetland areas, the temporary workspace requirement would be reduced to 40-feet for a total land requirement of 95-feet. The 55-feet of permanent right-of-way will be comprised of 30-feet of NDPC's existing permanent right-of-way and 25-feet will be new easement. In areas where Sandpiper will be co-located with other utilities or traversing greenfield (for the Project, the term greenfield is any portion of the route that is greater than 250-feet from the centerline of a known utility), the permanent right-of-way easement to be acquired will be 50-feet and would utilize 70-feet of temporary workspace. In wetland areas, the temporary workspace requirement would be reduced to 45-feet for a total land requirement of 95-feet. During construction, topsoil will normally be placed on one side of the working right-of-way, while the ditch spoil will be separated and located on the opposite side of the right-of-way. The working side (i.e., equipment work area and travel lane) will typically be 90-feet wide in uplands and 65-feet wide in wetlands; the working side will generally be located outside the existing right-of-way. Typical drawings depicting the construction footprint from the North Dakota border to Clearbrook in upland and wetland areas are included in Appendix F.

From Clearbrook to the Wisconsin border, the Project will require a construction footprint of 120-feet for standard pipeline construction in upland areas, including 50-feet of permanent easement and 70-feet of temporary workspace. In wetland areas, the temporary workspace requirement would be reduced to 45-feet for a total land requirement of 95-feet. The width of the spoil side and working side will vary depending on whether Sandpiper is co-located

with another utility or is constructed in a greenfield area. Typical drawings depicting the construction footprint from Clearbrook to the Wisconsin border in upland and wetland areas, whether parallel to third-party rights-of-way or in greenfield locations are included in Appendix F of the EIR.

A portion of the preferred route in eastern Minnesota is characterized by extensive wetlands; therefore, specialized construction methods will be utilized. The construction right-of-way and additional permanent right-of-way configurations in wetland areas are discussed in Section 1.3 of this report and in the Environmental Protection Plan ("EPP"), included as Appendix A.

1.2.1 Additional Temporary Workspaces

Additional temporary workspaces are required outside of the typical 120-ft-wide construction right-of-way to facilitate specific aspects of construction. Additional temporary workspaces will include areas to stage equipment, hold spoil material, and areas where construction methods require additional space. For example, additional temporary workspaces will be needed where the Project will cross features such as waterbodies, wetlands, roads, railroads, foreign pipelines and utilities, horizontal directional drill ("HDD") sites, and other special circumstances.

Table 1.2.1-1 lists the typical dimensions of additional temporary workspaces that will be used for pipeline construction.

Table 1.2.1-1
Typical Dimensions of Additional Temporary Workspaces for the Sandpiper Pipeline Project

Feature	Dimensions On Each Side of Feature [a]
Open-cut Road Crossings	100 feet by 75 feet
Bored Road , Foreign Pipeline, and Utility Crossings	100 feet by 75 feet
Railroad Crossings	200 feet by 100 feet
Pipeline Cross-Unders	100 feet by 75 feet
Waterbody Crossings >50 feet wide	200 feet by 100 feet
Waterbody Crossings <50 feet wide	200 feet by 100 feet
Horizontal Directionally Drilled Waterbody Crossings	200 feet by 100 feet
Wetland Crossings	200 feet by 75 feet

[a] Areas are in addition to the 120-foot-wide construction right-of-way

1.2.2 Pipe/Material Storage Yards and Contractor Yards

During construction, the Project will temporarily use off-right-of-way areas for pipe and materials storage. In addition, construction contractors will require off-right-of-way contractor yards to park equipment and stage construction activities.

NDPC has tentatively identified several pipeyards, rail sidings and contractor yards necessary for construction; additional pipeyards and contractor yards will be identified as Project planning and engineering progresses. NDPC has considered sensitive environmental features when planning the placement of pipeyards; the use of pipeyards will result in no impact to sensitive environmental features. The yards will be leased sites that will be restored upon the completion of the Project. While the locations of the pipeyards and rail sidings are subject to change, the tentative locations known as of the date of this filing are presented in Table 1.2.2-1.

Table 1.2.2-1
Pipeyards and Rail Sidings Used for the Sandpiper Pipeline Project

County	Facility (number)	Current Use
Polk	Rail Siding (2)	Railroad
	Pipeyard (2)	Alberta Clipper Pipeyard/Agriculture
Hubbard	Rail Siding (1)	Railroad
	Pipeyard (1)	Pasture/Field
Cass	Pipeyard (1)	Pasture/Field
Carlton	Rail Siding (1)	Railroad
	Pipeyard (1)	Pasture/Field

1.2.3 Access Roads

Public roads will typically be used to gain access to the construction right-of-way. In areas where public roads are limited, existing privately-owned roads may be used to access the construction right-of-way. If public or privately-owned roads are not available, NDPC may need to construct new access roads. Prior to use of private access roads, modifications to existing non-private roads, and construction of any new access roads, NDPC will obtain landowner permission, conduct environmental surveys, and obtain applicable environmental permits and clearances.

At this time, NDPC has tentatively identified a number of access roads that may be necessary for construction of the Project; additional roads will be identified as Project planning and engineering progresses. While the locations of the access roads are subject to change, a summary of known access roads is presented in Table 1.2.3-1.

Table 1.2.3-1
Access Roads Used by the Sandpiper Pipeline Project

County [a]	Milepost Range [b]	Number of Access Roads
Polk	301.2 – 367.2	22
Clearwater	368.6 – 406.5	35
Hubbard	408.3 – 459.3	48
Cass	461.8 – 474.4, 485.7 – 508.8	37
Crow Wing	480.9 – 481.7	2
Aitkin	511.9 – 556.3	38
Carlton	563.1 – 588.5	20
	Total	**202**

[a] At this time no access roads are planned for Red Lake County.
[b] Reflects milepost range of access road occurrence within each county.

1.2.4 Aboveground Facilities

Aboveground facilities associated with Sandpiper will include additional infrastructure at a new Clearbrook terminal, including two (2) 150,000 bbl tanks, two (2) 500 HP injection pumps to inject 150,000 bpd from the existing NDPC Line 81 into the Sandpiper pipeline, one (1) 800 HP transfer pump for delivery to NDPC, and three (3) sets of meters (1 set for delivery from Sandpiper to NDPC tankage, 1 set for Line 81 delivery to NDPC tankage, and 1 set for flow injection from NDPC tankage into the Sandpiper pipeline). The new Clearbrook terminal will also include all associated terminal piping, interconnections, valves, manifold, and sumps, as well as an electrical substation, a fire suppression system (e.g., building, pond, and piping), a maintenance building and a cold storage building.

Pumping facilities will also be installed at the new terminal at Clearbrook, Minnesota. These facilities include four (4) 5,500 HP pumps, four (4) 6,000 HP VFDs, a pump shelter, two (2) VFD buildings/switchgear buildings. Additionally, it will include two (2) coriolis meters, a 24-inch PIG receiver and a 30-inch PIG launcher, as well as associated pump station piping and valves.

Launch and receiver traps and a mainline valve will be installed at a site near Pine River, Minnesota. Additionally, approximately 15 mainline valves are currently planned to be installed in Minnesota based on preliminary engineering design and environmental surveys. Specifically, valve installation locations will be near major rivers, other environmentally sensitive areas, population centers, and pumping stations.

These facilities are summarized in Table 1.2.4-1.

Table 1.2.4-1
Proposed Aboveground Facilities Associated with the Sandpiper Pipeline Project [a]

County	Facility	Milepost [b]
Polk	Valve	300.2
	Valve	309.6
	Valve	319.1
	Valve	325.7
Red Lake	Valve	331.5
Polk	Valve	343.0
	Valve	348.6
Clearwater	Clearbrook Terminal and Pump Station Facility	372.9
	Valve	348.7
	Valve	401.0
	Valve	403.6
Hubbard	Valve	445.1
Cass	Tool Launch and Receiver Traps and Valve	479.4
Aitkin	Valve	524.2
	Valve	535.2
Carlton	Valve	595.7

[a] Facility locations are preliminary and subject to change based on engineering design.
[b] Mileposts are used for reference and may not reflect exact locations.

1.3 TYPICAL CONSTRUCTION SEQUENCE

A schematic depicting the typical pipeline construction sequence is provided as Figure 1.3-1. Specialized construction techniques (e.g., waterbody crossings) are described in subsequent sections of this document. Construction associated with aboveground facilities (e.g., the new Clearbrook terminal, pumping facilities, mainline valves, and launcher/receivers traps) involves pipe reconfigurations and installation of equipment. Pipeline construction will follow a typical sequence as described in the following paragraphs.

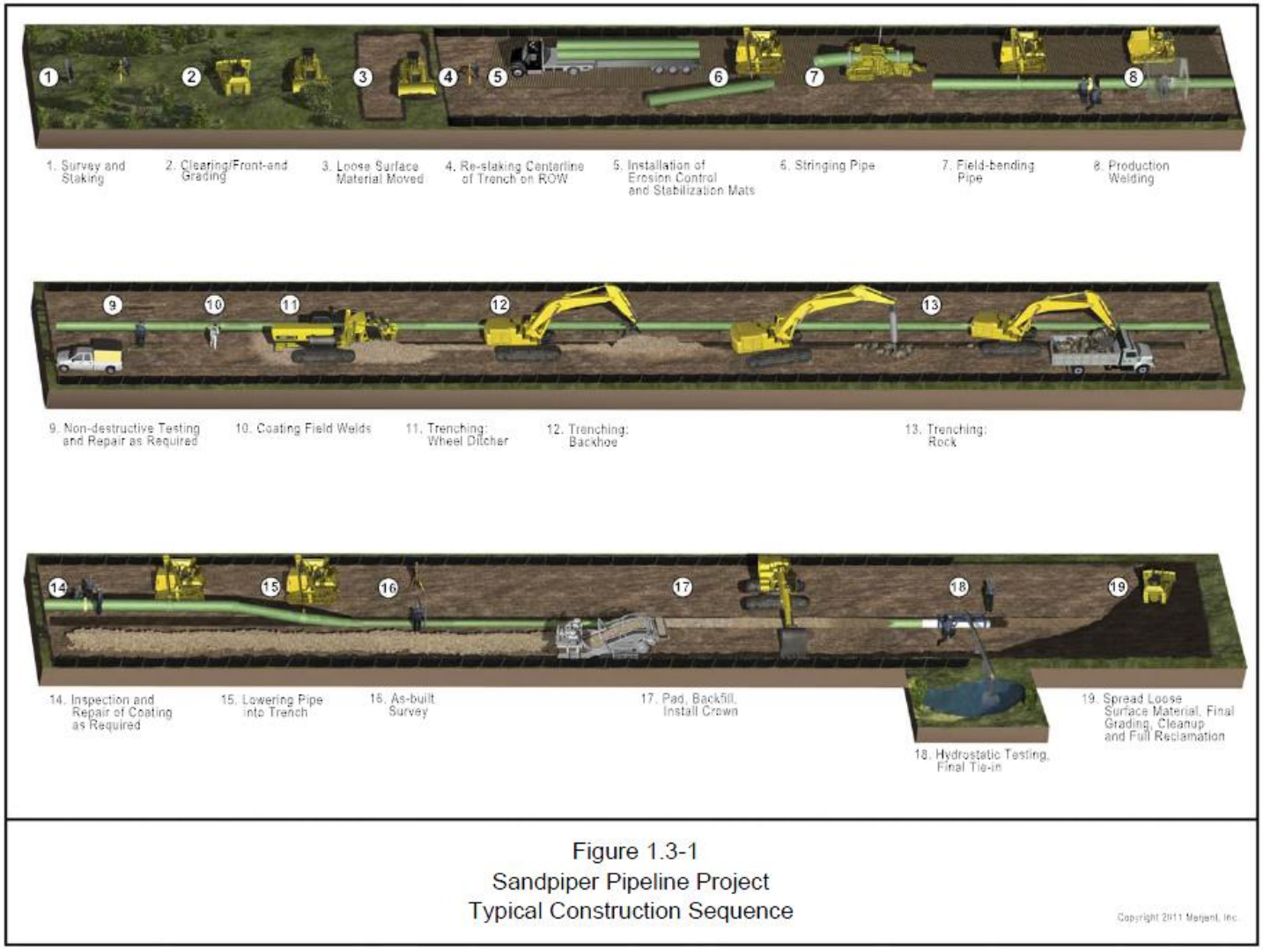
First, the right-of-way is surveyed, staked, and prepared for clearing. The right-of-way is then cleared and graded, as necessary, to provide construction access and safe movement of equipment and personnel during construction. Silt fence and other erosion control measures are installed, and sensitive areas are marked for avoidance. Appropriate safety measures are implemented before excavation begins, including notification through the One-Call system to ensure third-party utilities and adjacent pipelines are properly marked. Pipe, valves, and fittings are transported to the right-of-way by truck and placed along the right-of-way by side boom tractors or mobile cranes.

After individual pipe sections are strung along the right-of-way they are bent to conform to the contours of the trench and terrain. The pipe segments are lined up, clamped, welded, and field coated, and the welds are inspected. Trenching may occur before or after the pipe has been welded. Trenching is typically conducted using a backhoe or crawler-mounted, wheel-type trenching machine. Where appropriate, topsoil is segregated according to applicable permit conditions. The prepared pipe is lowered into the trench and, where applicable, tied-in to existing facilities. During backfilling, subsoil is replaced first and then the topsoil is replaced. Precautions, such as padding the trench with soil, are taken during backfilling to protect the pipe from rock damage.

Once the pipeline has been welded and inspected, and the trench has been backfilled, the pipeline is hydrostatically tested to ensure its integrity prior to the line being filled with crude oil and placed into service. The right-of-way is then cleaned-up and restored to preconstruction conditions, as practicable. Restoration includes implementing temporary and permanent stabilization measures, such as slope breakers, mulching and seeding.

NDPC may propose a winter construction schedule to address pipeline construction for approximately 11 miles of expansive wetlands generally located south and east of Clearbrook (from MP 395.0 to 396.0; MP 415.0 to 416.0; MP 460.0 to 462.0; MP 484.0 to 485.0; at MPs 496.5, 520.0, 546.0, and 555.0; MP 558.0 to 562.0, MP 586 to 587, and from MP 589 to 590). NDPC has developed winter construction techniques to minimize impacts of conventional wetland construction techniques; these activities are outlined in Section 8.0 of the EPP in Appendix A. In addition, NDPC may utilize frost roads to provide a stable winter working platform for pipe fabrication, associated equipment maneuvering, and lowering-in activities.

Figure 1.3-1
Typical Pipeline Construction Sequence



1.4 ENVIRONMENTAL MITIGATION AND RESTORATION

NDPC has developed a Project-specific EPP which: contains elements of industry and company-wide Best Management Practices for mitigation measures; addresses construction spill prevention, containment, and control; drilling mud releases; noxious and invasive weeds; and restoration/revegetation measures. NDPC will implement standardized erosion control and restoration measures to minimize potentially adverse environmental effects resulting from right-of-way preparation, construction, and maintenance of the pipeline. These measures are further described in the Project's EPP, which is provided as Appendix A.

NDPC will comply with applicable federal, state, and local rules and regulations, and take all appropriate precautions to protect against pollution of the environment. In addition, NDPC will retain Environmental Inspectors ("EI") to verify that environmental protection measures, environmental permit conditions, and other environmental specifications are implemented appropriately by the contractor during construction.

2.0 ROUTE SELECTION AND ALTERNATIVES ANALYSIS

NDPC identified and evaluated alternatives to the proposed Project to determine whether the alternatives would be reasonable and environmentally preferable. These alternatives include the No-Action Alternative, system alternatives, and route alternatives. NDPC used the following criteria for considering alternatives:

- ability to meet the Project objectives;
- technical and economic feasibility; and
- significant environmental advantage over the proposed Project.

Not all conceivable alternatives have the ability to meet the Project objectives; an alternative that does not meet the Project objectives will not be pursued. In addition, not all conceivable alternatives are technically or economically feasible. Some alternatives may be impractical because they are legally unavailable to NDPC (for example land cannot be obtained even through the exercise of eminent domain authority) and/or cannot be implemented after taking into consideration costs and logistics in light of the overall Project purpose. NDPC focused its analysis on those alternatives that may reduce impacts and/or offer environmental advantage without merely transferring impacts from one area or group of landowners to another. The following subsections describe NDPC's process for selecting the preferred route and provide an analysis of alternatives.

2.1 NO-ACTION ALTERNATIVE

The Project objectives would not be met under the No-Action Alternative. In light of the overall increase in Bakken production and the need to increase pipeline capacity, the "no-action" alternative is unacceptable to NDPC and to the petroleum-consuming public, which requires secure and reliable sources. NDPC, its shippers, and residents of Minnesota and neighboring states will be negatively impacted without the capacity expansion afforded by this Project. The "no-action alternative" is not an option as NDPC would not be able to meet its shippers' near-term or future transportation requirements.

A No-Action Alternative would require Minnesota and North Dakota producers and shippers to seek other transportation means that are less safe and more costly than the proposed pipeline or reduce production of petroleum-based products. The only other alternatives for shippers delivering into the NDPC system would be to (1) truck or rail all or portions of the increased Bakken production to refineries outside North Dakota with the attendant problems noted below or (2) transport crude on non-Enbridge pipelines that are also at capacity, and thus, would require new pipe or facilities.

While the No-Action Alternative would avoid this Project's impacts, other companies would likely construct similar pipelines as substitutes for the Project, given the known demand for shipping capacity out of the Bakken formation. Such alternative projects could require the construction of additional and/or new pipeline or rail facilities in the same or other locations to transport the oil volumes proposed for the Project. These projects would generate

environmental impacts that could be equal to or greater than those described for this Project. For Minnesota, the impact of the no-action alternative would most likely be greater rail transportation, since most freight railroad routes from North Dakota to the Midwest and the East Coast pass through Minnesota. As Bakken production increases, so would train traffic carrying crude oil through Minnesota. Accordingly, the crude oil produced in the Bakken Formation could continue to be shipped by rail or truck; however, those alternatives have their own significant environmental impacts as discussed in Sections 2.2.2 and 2.2.3.

2.2 SYSTEM ALTERNATIVES

System alternatives are substitutes to the proposed action that would make use of existing or proposed pipeline or alternative transportation systems to meet the stated objectives of the Sandpiper Pipeline Project.

NDPC investigated several alternatives before determining that the Project was the most economic and feasible option available to meet Project objectives. NDPC limited its consideration of system alternatives to other pipeline projects under development and to alternate transportation modes.

2.2.1 Other Pipeline Systems

Plains All American Pipeline L.P. (“PAA”) has announced its plans to reverse its Wascana pipeline system and build a new pipeline, Bakken North, to provide additional takeaway capacity for growing Bakken crude production. The Bakken North pipeline, consisting of approximately 79 miles of new 12-inch diameter pipeline, extends from Trenton, North Dakota to the southern terminus of Plains’ Wascana system approximately 2.5 miles north of the town of Outlook in Sheridan County, Montana. The new pipeline will have an initial design capacity of 48,000 bpd, with a maximum capacity of up to 75,000 bpd. PAA plans to reverse the flow of its Wascana System in order to provide further transportation service to Regina, Saskatchewan. At Regina, PAA connects to third-party carriers providing access to Cushing, Oklahoma and PADD 2 delivery points. No in-service date is available; however, North Dakota Public Service Commission filings show construction was to be completed in late 2012.

High Prairie Pipeline, LLC is proposing to construct a new pipeline (referred to as the High Prairie Pipeline). The High Prairie Pipeline will consist of approximately 450 miles of new 16-inch diameter pipeline, beginning north of Alexander, North Dakota in McKenzie County and ending near Clearbrook, Minnesota in Clearwater County. High Prairie is also proposing to construct two laterals: a 17-mile lateral originating at Johnsons Corner, North Dakota in McKenzie County and connecting with the High Prairie Pipeline, and an 8-mile lateral beginning near Robinson Lake, North Dakota in Mountrail County and connecting with the High Prairie Pipeline. The new pipeline will have an initial design capacity of 150,000 bpd and end at Clearbrook, Minnesota. The anticipated in-service date is the fourth quarter of 2013.

Koch Pipeline Company, L.P., proposed to construct a new pipeline (referred to as the Dakota Express Pipeline) from western North Dakota through Minnesota to Hartford and Patoka, Illinois. However, Koch Pipeline Company announced in January 2014 that this project would not move forward, and as a result, it is no longer considered as an alternative pipeline system.

Industry forecasts for supply growth from the Bakken formation consistently show supply growth in excess of 1.0 million bpd by 2015. With this significant supply growth, Sandpiper and the other potential pipeline projects are not competing for the same production volumes, but are needed to meet the market demand for additional pipeline export capacity. New and increasing production volumes will be apportioned if additional pipeline capacity is not available or such volumes would be transported to market by truck or rail, which are more costly options for producers based on the current pricing at key marketing hubs. Trucking and rail also have a greater impact on the public.

Any other pipeline system would require entirely new right-of-way as well as new pump station sites, power supplies, valve sites, and potential access roads that would likely be equal to or greater in impact than the proposed Project.

2.2.2 Trucking

North Dakota crude oil could potentially be transported to the Superior, Wisconsin terminal by truck. However, there is currently insufficient truck capacity to transport the total annual capacity of 375,000 barrels of crude oil per day that would be moved by the Project. This alternative is also characterized by higher public safety and environmental risks, and higher incremental costs.

Accident data consistently illustrate that pipelines are the safest form of transportation for bulk liquids, including crude oil. As described in Section 7853.0540 of the CN Application, the likelihood of truck accidents, as compared to pipeline accidents, is significantly higher. The safety risk is magnified by the impact created by increased truck traffic on Minnesota highway routes. A trucking alternative would significantly overburden current public road capacity. Data from other states impacted by development in the Bakken Formation suggest that the use of trucking is negatively impacting communities and roadways, and that additional pipeline infrastructure would alleviate those transportation concerns (North Dakota Office of the Governor, 2012).

A typical truck carries 200 barrels of crude oil. For the purpose of this analysis, NDPC assumes a trucking company will optimize the use of its trucking fleet to transport the same crude oil volumes as this Project. NDPC further assumes that the trucking company will divide its transportation requirements into three individual truck hauls that will make round-trips between specified locations: two beginning at the Beaver Lodge Station near Tioga, North Dakota and ending at Berthold, North Dakota or Superior, Wisconsin and a third that begins at Clearbrook, Minnesota and ends at Superior. To achieve maximum optimization

of its trucking operations, NDPC also assumes that a fleet of trucks would be scheduled to run round-trip deliveries between the following three locations:

- Leaving Beaver Lodge Station near Tioga, North Dakota to deliver 25,000 bpd at Berthold, North Dakota; returning empty from Berthold back to Beaver Lodge;
- Leaving Beaver Lodge to deliver 225,000 bpd at Superior, Wisconsin; returning empty from Superior back to Beaver Lodge; and
- Leaving Clearbrook, Minnesota to deliver up to 150,000 bpd at Superior Wisconsin; returning empty from Superior back to Clearbrook.

In order to transport the same incremental 25,000 bpd of crude oil from Beaver Lodge to Berthold, 225,000 bpd from Beaver Lodge to Superior, and 150,000 bpd from Clearbrook to Superior as proposed by NDPC, a fleet of 4,354 trucks would be required. Table 2.2.2-1 provides details on the total truck requirements to meet objectives of the project.

Table 2.2.2-1
Total Daily Truck Requirements

	Crude oil volume (bpd)	Number of trucks in transit	Number of trucks returning empty	Number of trucks loading and unloading (assumed 20%)	Total truck requirements
Beaver Lodge, ND to Berthold, ND	25,000	32	32	13	77
Beaver Lodge, ND to Superior, WI	225,000	1,407	1,407	563	3,377
Clearbrook, MN to Superior, WI	150,000	375	375	150	900
				TOTAL	4,354

Even if the truck capacity issue were not so formidable, NDPC or its shippers would need to expand truck loading/unloading facilities at suitable locations to allow receipt into the Enbridge Superior Tank Farm and Terminal Facility. The estimated cost of trucking the volume of crude oil otherwise transported by a pipeline (incorporating operation and maintenance costs along with fuel costs) would be in the range of hundreds of millions of dollars per year as stated in Section 7853.0540 of the CN Application, which is significantly greater than the cost of transporting the oil by pipeline, which is the primary reason trucking is not considered a long-term, stable method to move crude oil. The safety and environmental risks, logistical requirements, and high cost eliminate the trucking option as an alternative.

In Minnesota, the trucks would primarily use U.S. Highway 2 or I-94, which already carry a substantial volume of commercial traffic. The additional truck traffic, and associated loads, on Minnesota roads would result in an increased need for repair and/or expansion, and the burning of fossil fuels through the trucks' combustion engines would impact air quality in the

region, as presented in Table 7853.0600-B.3 of Section 7853.0600 of the CN Application. The reliability of this alternative in a northern climate is compromised by periodic restrictions on truck traffic due to winter storms, spring road restrictions, other weather conditions, and road weight capacity restrictions.

2.2.3 Rail

North Dakota crude oil could potentially be transported to the Superior, Wisconsin terminal by rail. Similar to the trucking alternative, this alternative is characterized by higher public safety and environmental risk, unreasonable logistics and reliability, and higher incremental cost. Rail service to the Superior Terminal would require new rail right-of-way, which would result in similar or greater impacts to environmental features and landowners. Increasing volumes of North Dakota crude oil could also be transported to locations other than Superior, Wisconsin, but that would merely move the rail traffic from one route to another, which could traverse more populated areas. Similar to the trucking alternative, accident data consistently illustrate that pipelines are the safest form of transportation for bulk liquids, including crude oil. As described in Section 7853.0540 of the CN Application, the likelihood of rail accidents, as compared to pipeline accidents, is significantly higher. Rail transportation is also more disruptive to the public.

A typical rail car carries 600 barrels of crude oil. For the purpose of this analysis, NDPC assumes rail transportation providers will optimize the use of their rail tank cars to transport the same crude oil volumes as the Project. NDPC also assumes that the rail service provider will use long-haul unit or manifest trains with deliveries at intermediate stops between the Beaver Lodge Station and Superior, Wisconsin. NDPC also assumes that the numerous manifest or unit trains would be required to make the following deliveries equivalent to this Project:

- Leaving Beaver Lodge Station near Tioga, North Dakota with a rail fleet capacity of 250,000 bpd, and the ability to offload deliveries of 25,000 bpd of crude oil supplies at Berthold, North Dakota; no guarantee that empty rail tank cars would return to Beaver Lodge for reloading;
- Leaving Berthold with a rail fleet capacity of 225,000 bpd and the ability to offload entire capacity of rail fleet at Superior, Wisconsin; no guarantee that empty rail fleet would return to Beaver Lodge for reloading; and
- Leaving Clearbrook, Minnesota with a rail fleet capacity up to 150,000 bpd, and the ability to offload entire capacity of rail fleet at Superior, Wisconsin; no guarantee that empty rail fleet would return to Clearbrook for reloading.

In order to transport the same incremental 25,000 bpd of crude oil from Beaver Lodge to Berthold, 225,000 bpd from Beaver Lodge to Superior, and up to 150,000 bpd from Clearbrook to Superior as proposed by NDPC, a fleet of rail 2,052 cars would be required. Table 2.2.3-1 provides details on the total truck requirements to meet objectives of the project.

Table 2.2.3-1
Total Daily Rail Requirements

	Crude oil volume (bpd)	Number of rail cars in transit	Number of rail cars returning empty	Number of rail cars loading and unloading (assumed 20%)	Total rail car requirements
Beaver Lodge, ND to Berthold, ND	25,000	42	42	17	101
Beaver Lodge, ND to Superior, WI	225,000	563	563	225	1,351
Clearbrook, MN to Superior, WI	150,000	250	250	100	600
				TOTAL	2,052

This alternative would require the construction (by NDPC or its shippers) of rail car loading and off-loading facilities. Construction of new lateral aboveground rail service lines would be required and would pose additional risk and impact to landowners and the public. Rail service would result in the burning of fossil fuels, which would impact air quality in the region, as presented in Table 7853.0600-B.4 of Section 7853.0600 of the CN Application. In addition, the reliability of this alternative in a northern climate is compromised by periodic restriction in truck traffic required to deliver crude oil to rail facilities due to winter storms and spring road restrictions, and other weather related or road capacity restrictions. This alternative also would be subject to delays caused by scheduling conflicting rail traffic and a significant mechanical/maintenance requirement.

While rail tanker cars are a vital part of the short-haul distribution network for crude oil, pipelines are a safer and more economic transportation alternative. The estimated cost of shipping the volume of crude oil transported by a pipeline (incorporating operation and maintenance costs along with fuel costs for rail transportation) would be in the range of hundreds of millions of dollars per year as stated in Section 7853.0540 of the CN Application, which is significantly greater than the cost of transporting the oil by pipeline. The safety and environmental risks, logistical requirements, and high cost eliminate the rail option as an alternative.

2.3 ROUTE ALTERNATIVES

NDPC conducted an extensive review of possible route options to identify a preferred pipeline route that achieves the Project objectives, is technologically and economically feasible to construct, and minimizes impacts on landowners and the environment. The following subsections describe the route selection process and an analysis of the various route alternatives.

2.3.1 Initial Route Selection Process

During initial route studies, NDPC determined that the Project should begin at its Beaver Lodge station near Tioga, North Dakota, which is ideally located to efficiently transport crude oil produced in the Bakken Formation. NDPC determined that the Project should terminate at its Superior, Wisconsin terminal, where crude oil shipped from the Bakken could be further transported to refineries and markets in the Midwest and the East Coast.

NDPC owns and operates Line 81, an existing interstate pipeline transportation system that gathers crude oil from points near production wells in western North Dakota and transports the volumes to Clearbrook, Minnesota for delivery to Minnesota Pipe Line Company, which serves two Minnesota refineries, and the Enbridge Mainline System. From Clearbrook, Enbridge operates seven pipelines within the Enbridge Mainline System that provide connections with the Superior terminal and refineries throughout the Midwest and the East Coast. Once Sandpiper is constructed, the NDPC connection with the Enbridge Mainline System will be removed and Sandpiper will carry the existing NDPC Line 81 volumes to Superior, Wisconsin where they will enter the Enbridge Mainline System. NDPC sought to co-locate Sandpiper as much as possible with existing infrastructure.

NDPC assessed the route from Tioga, North Dakota to Superior, Wisconsin, with the intent of maximizing existing right-of-way to the extent practicable while identifying specific areas where co-location may not be practicable. The first step in the environmental review of the route and the selection process consisted of collecting publicly available environmental data to identify routing constraints. The sources of data consisted primarily of: Geographic Information Systems ("GIS") digital information layers, including U.S. Geological Survey ("USGS") topographic maps, USGS land use database, U.S. Department of Agriculture ("USDA") Farm Services Agency aerial photography and GIS data, National Wetlands Inventory ("NWI") maps, Minnesota Department of Natural Resources ("MNDNR") Natural Heritage Information System ("NHIS") data, Minnesota Department of Transportation ("MDOT") highway maps, USDA state soil geographic (State Soil Geographic ["STATSGO2"] and Soil Survey Geographic ["SSURGO"]) databases, and other natural feature databases obtained from the MNDNR website and other state and federal sources. Existing major utility rights-of-way also were identified for potential use in co-location.

The next step involved reviewing selected layers of the collected GIS data on digital USGS topographic maps and recent aerial photography to identify the locations of environmental constraints within the study area.

NDPC initially analyzed two routes in Minnesota between Clearbrook and the Minnesota/Wisconsin border, referred to as the Northern Route and the Southern Route. Both routes were included in NDPC's June 7, 2013, MPUC Notice Plan filing. NDPC chose to pursue the Southern Route between Clearbrook and the Minnesota/Wisconsin Border as its preferred route. The Northern Route is analyzed as a rejected route alternative in Section 2.3.3.

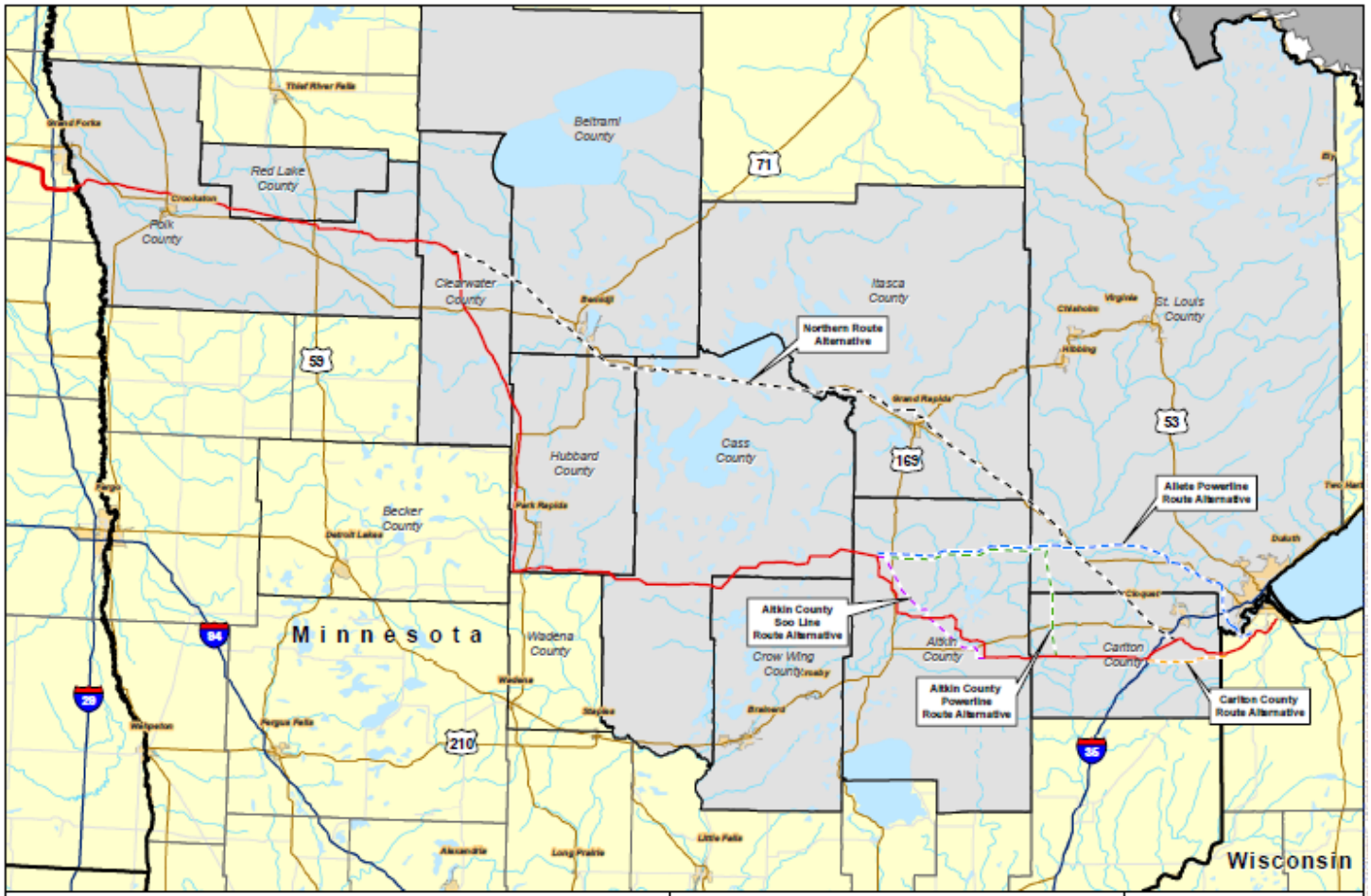
2.3.2 Refined Route Selection Process

NDPC conducted a number of route reconnaissance efforts in addition to the desktop review. During field reviews, the route was examined and adjustments were made to avoid or minimize potential impacts on sensitive environmental or cultural features, to adjust for preferred construction alignment, or to accommodate landowner concerns. Further refinement of the route was completed as detailed engineering design efforts led to the identification of specific facility modifications or additions. NDPC's existing pipeline right-of-way west of Clearbrook, Minnesota generally provides the opportunity for co-location; however, in some locations east of Clearbrook it is not feasible to use existing Enbridge rights-of-way due to inability to acquire land (even through the exercise of eminent domain authority), congestion, poor crossing conditions, or other constraints. Co-location with third-party rights-of-way east of Clearbrook provides environmental advantage in that land disturbance will be generally located alongside areas that have been previously disturbed. NDPC continues to refine the preferred route to address engineering, environmental, agency, and landowner concerns. The following subsections describe the route alternatives identified as a result of these efforts (see also Figure 2.3.2-1).

2.3.3 Comparison of Route Alternatives

NDPC conducted a detailed quantitative analysis of environmental impacts along each route alternative identified during the routing process. The analysis used the same sources of publicly available environmental data described in Section 2.3.1 to compare a variety of factors, including proximity to existing rights-of-way, wetlands, highly wind erodible soils, bedrock outcrops, prime farmland soils, perennial waterbodies, national forest land, tribal land, state forest land, state Wildlife Management Area ("WMA") land, state Aquatic Management Area ("AMA") land, railroads crossed, roads crossed, and other site-specific matters. No field survey data was used in the alternatives analysis as field surveys were not completed along the alternate routes. NDPC identified and analyzed five route alternatives, which are presented in the following subsections and shown in Figure 2.3.2-1. None of the route alternatives were adopted as the Project's preferred route.

Figure 2.3.2-1
Overview of Route Alternatives



Northern Route Alternative

As described in Section 2.3.2, the Northern Route Alternative was initially considered as a way to maximize co-location with the existing Enbridge Mainline right-of-way. The alternative deviated from the preferred route at approximate MP 375.8 and rejoined the preferred route at approximate MP 591.2. Table 2.3.3-1 provides a comparison of the prominent land use features of this alternative and the preferred route; Figure 2.3.3-1 depicts the alternative and the preferred route.

The main benefits of the Northern Route Alternative included the fact that it was approximately 44.3 miles shorter than the preferred route. The Northern Route Alternative would have crossed approximately 49.4 miles less greenfield land, and would have crossed fewer miles of highly wind erodible soils and prime farmland soils. The Northern Route Alternative would also have crossed approximately 4.9 miles less state WMA land and three fewer perennial waterbodies than the preferred route.

However, there are several significant disadvantages to the Northern Route. This route crossed 5.6 more miles of NWI-mapped wetlands as compared with the preferred route. The route alternative also crossed approximately 34.4 miles of the Chippewa National Forest and 11.5 more miles of state forest lands, which presents additional impacts to sensitive environmental forest features.

The Northern Route alternative also crosses the Leech Lake Indian Reservation and the Fond du Lac Indian Reservation. As Project planning progressed, it became apparent NDPC would not have been able to assemble a continuous right-of-way for a significant portion of the Northern Route. Without easements to construct and operate the pipeline, NDPC cannot feasibly construct Sandpiper using this alternative.

The Northern Route would have been partially located within the Enbridge right-of-way, which currently contains up to seven pipelines. NDPC recognizes landowner concerns with adding another pipeline in this established right-of-way. The width of the right-of-way results in constructability constraints. Safety risks would have increased during construction due to working within a congested right-of-way over active lines, working alongside pipeline operations staff completing routine maintenance work, and working alongside Pipeline Integrity Dig crews during time-sensitive repairs in a constricted space. Population centers such as Bemidji, Grand Rapids, Cass Lake, and Floodwood, as well as the tribal communities discussed above, would have been crossed by the Northern Route. Approximately 163,000 people live along the preferred route, which is less than half the population along the Northern Route Alternative. Additionally, the Northern Route Alternative crossed more bedrock outcrops, more railroads and roads, and a federal Superfund site.

Although the Northern Route Alternative would have met the project objective, NDPC determined that the alternative was infeasible because it unable to assemble the requisite

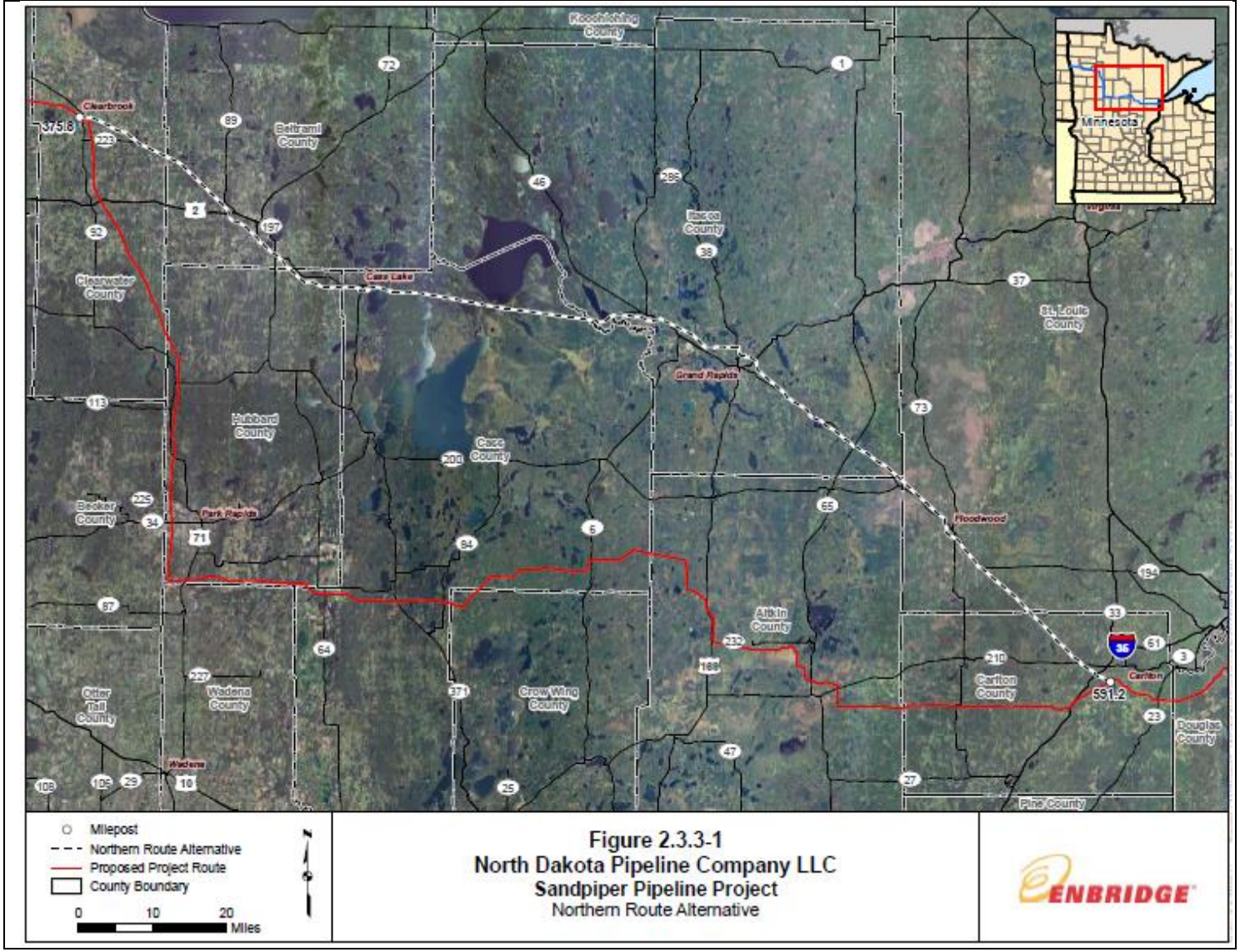
right-of-way easements and would have introduced additional environmental impacts to federal and tribal lands that the preferred route avoids. Additionally, the Northern Route Alternative presented construction constraints and increased safety concerns associated with installation of the project in a right-of-way with up to seven pipelines. Therefore, NDPC rejected this alternative route for the Project.

Table 2.3.3-1
Environmental Features Comparison – Northern Route Alternative

Environmental Features	Unit	Northern Route Alternative	Preferred Route
Length	miles	171.5	215.8
Adjacent to Existing Right-of-Way	miles	167.9	162.8
Greenfield Route [a]	miles	3.6	53.0
NWI-mapped Wetlands	miles	47.0	41.4
NWI-mapped Wetlands	number	375	458
Highly Wind Erodible Soils	miles	104.6	162.7
Bedrock Outcrops	miles	2.9	2.5
Prime Farmland Soils	miles	20.1	35.9
Perennial Waterbodies	number	33	36
National Forest Land	miles	34.4 [b]	0.0
Tribal Land	miles	56.7 [c]	0.0
State Forest Land	miles	36.2 [d]	24.7 [e]
State Wildlife Management Area Land	miles	0.0	4.9 [f]
State Aquatic Management Area Land	miles	0.3 [g]	0.6 [h]
Railroads Crossed	number	10	2
Roads Crossed	number	153	141
Other Major Issues	number	1 [i]	0

[a] Greenfield locations are defined for purposes of the alternatives analysis as any portion of the route that is greater than 250-feet from the centerline of a known utility.
[b] Chippewa National Forest
[c] Leech Lake and Fond du Lac Reservations
[d] Bowstring, Mississippi Headwaters, and Fond du Lac State Forests
[e] Huntersville, Land O' Lakes, Mississippi Headwaters, Foothills, Savanna, Hill River, and Waukenabo State Forests
[f] Crow Wing Chain, Grayling Marsh, Lawler, and Salo Marsh Wildlife Management Areas
[g] Clearwater River and Little Otter Creek Aquatic Management Areas
[h] Spire Valley Hatchery and LaSalle Creek Aquatic Management Areas
[i] St. Regis Superfund site

Figure 2.3.3-1
Northern Route Alternative



Aitkin County Powerline Route Alternative

The Aitkin County Powerline Route Alternative was considered as a way to maximize co-location with existing powerline rights-of-way through Aitkin County. The alternative deviated from the preferred route at approximately MP 516.6 and rejoined the preferred route at approximately MP 566.6. Table 2.3.3-2 provides a comparison of the prominent land use features of this alternative and the preferred route; Figure 2.3.3-2 depicts the alternative and the preferred route.

The main benefit of the Aitkin County Powerline Route Alternative was that it is adjacent to existing right-of-way for 38.8 more miles than the preferred route and would not have involved any greenfield construction over the examined segment. Thirteen fewer roads would have been crossed by this route. The Aitkin County Powerline Route Alternative would have crossed approximately 15.6 miles less highly wind-erodible soils and approximately 3 miles less prime farmland than the preferred route. No state WMA land would have been crossed by this route.

The main drawbacks of the route alternative were that it is 3.4 miles longer than the preferred route and would have impacted approximately 11.9 more miles of NWI-mapped wetlands and 14 more perennial waterbodies. The Aitkin County Powerline Route Alternative also crossed 22.5 more miles of state forest land.

From a constructability perspective, there is limited access to and from major roads along this alternative. This would have added several risks to the project, including equipment and material hauling limitations and lack of access for emergency responders in the event of a safety incident. This limited access would have created greater environmental impacts to the right-of-way and greater safety concerns from increased movement of construction equipment and materials. The limited access also resulted in disadvantages in the operability of the pipeline because access for maintenance would be difficult and limited. Additionally, the route passed through a significant wetland complex and the additional 12 miles of NWI-mapped wetlands have a high potential for added winter construction.

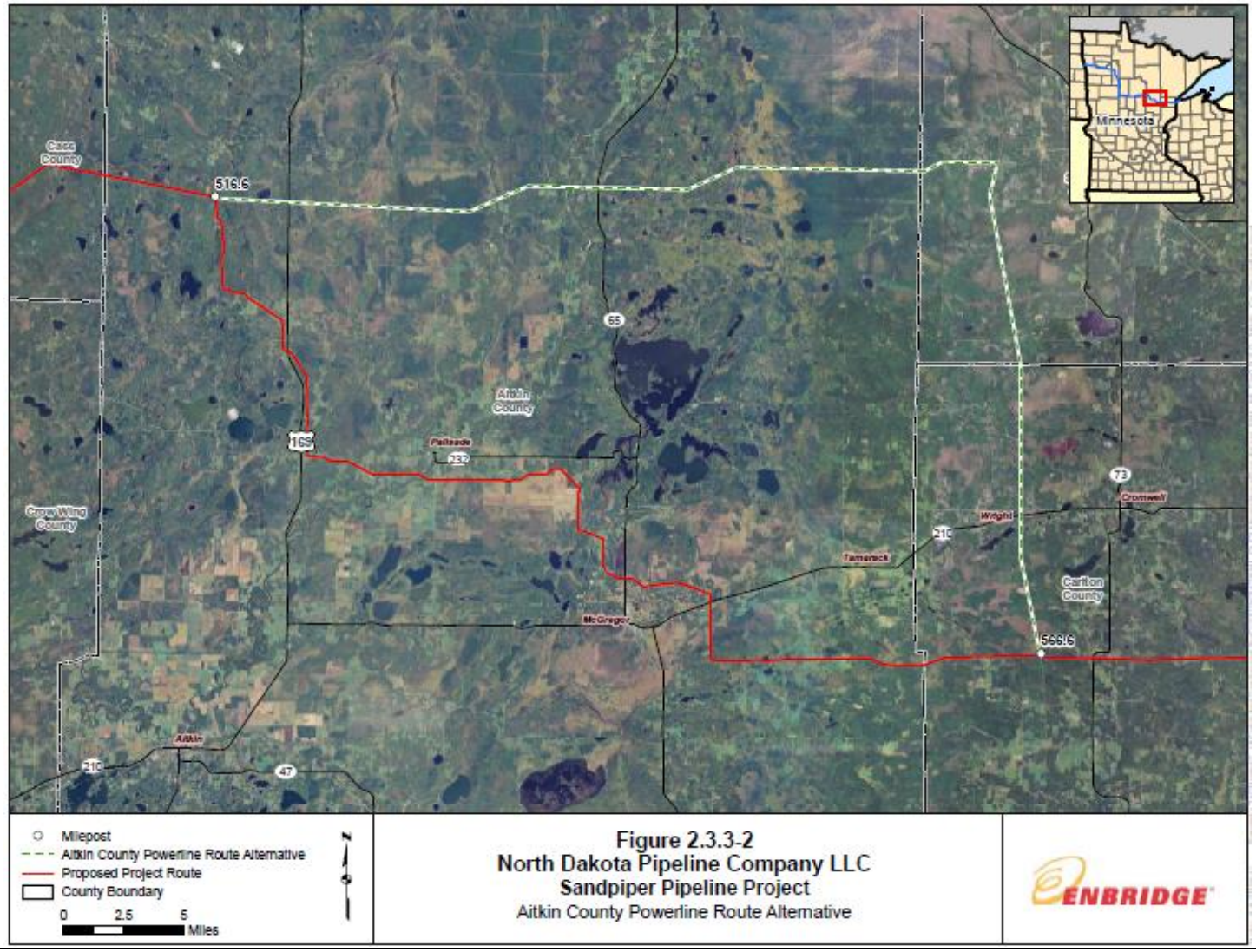
Although the Aitkin County Powerline Route Alternative would meet the project objective, NDPC determined that the alternative did not convey a significant environmental advantage over the preferred route. While it was advantageous from the perspective of co-location with existing rights-of-way, avoidance of state WMAs and reduction of prime farmland and highly wind-erodible soils, the Aitkin County Powerline Route Alternative would have added significant state forest and wetland impacts as well as disturbance for 3.4 additional miles of construction. Utilizing the Aitkin County Powerline Route Alternative would have merely transferred environmental impacts from one area and set of resources to another. Based on this environmental analysis and the increased safety concerns, as well as significant construction and future operational challenges, including the high potential for winter construction, NDPC rejected this alternative for the Project.

Table 2.3.3-2
Environmental Features Comparison – Aitkin County Powerline Route Alternative

Environmental Features	Unit	Aitkin County Powerline Route Alternative	Preferred Route
Length	miles	53.9	50.5
Adjacent to Existing Right-of-Way	miles	53.9	15.1
Greenfield Route [a]	miles	0.0	35.4
NWI-mapped Wetlands	miles	27.6	15.7
NWI-mapped Wetlands	number	167	123
Highly Wind Erodible Soils	miles	23.1	38.7
Bedrock Outcrops	miles	0.0	0.0
Prime Farmland Soils	miles	3.6	6.6
Perennial Waterbodies	number	20	6
National Forest Land	miles	0.0	0.0
Tribal Land	miles	0.0	0.0
State Forest Land	miles	31.8[b]	9.3[c]
State Wildlife Management Area Land	miles	0.0	3.1 [d]
State Aquatic Management Area Land	miles	0.0	0.0
Railroads Crossed	number	1	1
Roads Crossed	number	9	22
Other Major Issues	number	0	0

[a] Greenfield locations are defined for purposes of the alternatives analysis as any portion of the route that is greater than 250-feet from the centerline of a known utility.
[b] Savanna and Hill River State Forests
[c] Savanna, Hill River, and Waukenabo State Forests
[d] Grayling Marsh, Lawler, and Salo Marsh Wildlife Management Areas

Figure 2.3.3-2
Aitkin County Powerline Route Alternative



Allete Powerline Route Alternative

The Allete Powerline Route Alternative was considered as a way to maximize co-location with the existing Allete Powerline. The alternative deviated from the preferred route at approximately MP 516.5 and exited Minnesota near New Duluth. Table 2.3.3-3 provides a comparison of the prominent land use features of this alternative and the preferred route; Figure 2.3.3-3 depicts the alternative and the preferred route.

The main benefits of the Allete Powerline Route Alternative were that it was 5.5 miles shorter than the preferred route and was co-located with more existing right-of-way, crossed fewer roads, fewer miles of wind-erodible soils, fewer miles of prime farmland, and no WMAs.

The main environmental drawbacks of the route alternative were that it crossed more perennial waterbodies, more railroads, more miles of NWI-mapped wetlands, more miles of bedrock outcrops, and more state forest land.

From a constructability standpoint, this route provided several added challenges over the preferred route. The first is the area where the route would have departed from the preferred route; that portion of the alternative heading east is comprised of extensive saturated wetlands and would likely have required winter construction practices for approximately 30 extra miles. This posed a major risk for the project should winter temperatures not be low enough to provide conditions conducive to winter construction. The section of this route from MP 515 to the area near Brookston, Minnesota also had limited access to and from major roads which added several construction and safety risks to the project, including prolonging construction duration, equipment and material hauling limitations, and also impedes access for emergency responders in the event of a safety incident. The limited access would have also resulted in disadvantages in the operability of the pipeline because access for maintenance would have been difficult and limited.

As noted above, this route also crossed several known rock outcroppings as it traveled into and out of the city of Duluth. With bedrock construction, significant delays to the construction process along with potential safety risk around extensive blasting, hammering and equipment travel over rock surfaces were expected. Finally, this route would have required a substantial HDD, approximately 1 mile in length, across Spirit Lake. While drills of this length have been completed in the past, there is the potential for inadvertent returns of drilling mud into the St. Louis River and Spirit Lake.

Although the Allete Powerline Route Alternative would have met the project objective, NDPC determined that the alternative had significant disadvantages when compared to the preferred route. While it was advantageous from the perspective of co-location with existing rights-of-way and was shorter in distance than the preferred route, the Allete Powerline Route Alternative added significant pipeline construction and safety risks, as well as pipeline operation risks due to limited access. The Allete Powerline Route Alternative also

added risks for extensive winter construction due to extensive saturated wetlands. It also created blasting risks associated with rock outcrops and shallow bedrock that are not associated with the preferred route. Based on this analysis, NDPC has rejected this alternative to the preferred route.

Table 2.3.3-3
Environmental Features Comparison – Allete Powerline Route Alternative

Environmental Features	Unit	Allete Powerline Route Alternative	Preferred Route
Length	miles	79.3	84.8
Adjacent to Existing Right-of-Way	miles	71.8	43.0
Greenfield Route [a]	miles	7.5	41.9
NWI-mapped Wetlands	miles	25.7	24.8
NWI-mapped Wetlands	number	204	192
Highly Wind Erodible Soils	miles	35.4	56.9
Bedrock Outcrops	miles	3.8	2.5
Prime Farmland Soils	miles	6.8	9.5
Perennial Waterbodies	number	20	14
National Forest Land	miles	0.0	0.0
Tribal Land	miles	0.0	0.0
State Forest Land	miles	27.7 [b]	9.3 [c]
State Wildlife Management Area Land	miles	0.0	3.1 [d]
State Aquatic Management Area Land	miles	0.0	0.0
Railroads Crossed	number	5	2
Roads Crossed	number	41	47
Other Major Issues	number	0	0

[a] Greenfield locations are defined for purposes of the alternatives analysis as any portion of the route that is greater than 250-feet from the centerline of a known utility.
[b] Hill River and Savanna State Forests
[c] Hill River, Waukenabo, and Savanna State Forests
[d] Grayling Marsh, Lawler, and Salo Marsh Wildlife Management Areas

Figure 2.3.3-3
Allete Powerline Route Alternative

Aitkin County Soo Line Route Alternative

The Aitkin County Soo Line Route Alternative was considered as a way to maximize co-location with the existing right-of-way associated with the Soo Line Trail in Aitkin County. The alternative deviated from the preferred route at approximately MP 516.5 and rejoined the preferred route at approximately MP 552.8. Table 2.3.3-4 provides a comparison of the prominent land use features of this alternative and the preferred route; Figure 2.3.3-4 depicts the alternative and the preferred route.

The main benefit of the Aitkin County Soo Line Route Alternative was that the construction right-of-way would have been generally co-located with the Soo Line Trail right-of-way. This route alternative would have crossed 8.0 fewer miles of highly wind erodible soils and 2.8 fewer miles of prime farmland soils. In addition, 7 fewer roads would have been crossed by this alternative. No state WMAs were crossed by this alternative, whereas the preferred route crosses the Grayling Marsh WMA on the corresponding segment of the route.

Both the route alternative and preferred route cross the Savanna, Hill River and Waukenabo State Forests. The main drawbacks of the Aitkin County Soo Line Route Alternative were that it would have impacted 8.2 miles of additional NWI wetlands and would have crossed one additional perennial waterbody that has the likelihood to contain sensitive species, and would have crossed the McGregor Marsh Scientific and Natural Area (“SNA”). Finally, there is the potential for the North Soo Line Railroad to be eligible for historic designation.

From a constructability perspective, there was limited access for construction, safety, and operability, and a high potential for added winter construction. In addition, a perceived advantage of the route alternative was that for the co-located length, construction impacts would have been limited to a single landowner. However, detailed review of the route alternative indicated that this was inaccurate. In nearly all locations along the route alternative, the construction footprint would have gone beyond the 100-foot easement of the Soo Line trail, creating impacts to landowners similar to the preferred route.

In addition, due to the easement width, only one side of the right-of-way would have been usable, and as such, the trail in many areas would have been permanently impacted via grading and/or cutting down of the trail. Furthermore, additional forested areas along the working side would have needed to be cleared in order for safe construction activities to commence. In order to construct the Project utilizing the trail right-of-way, trail closure for one to two years would likely have been necessary as the trail would be the primary method of ingress/egress for construction. Another consequence of trail use would be the safety-mandated need for regular access to the trail and pipeline from public roads. As the trail was a former railroad grade, existing access from public roads is very limited. The need for access, both during construction and operation, would have resulted in several new access roads and adjacent landowner impacts.

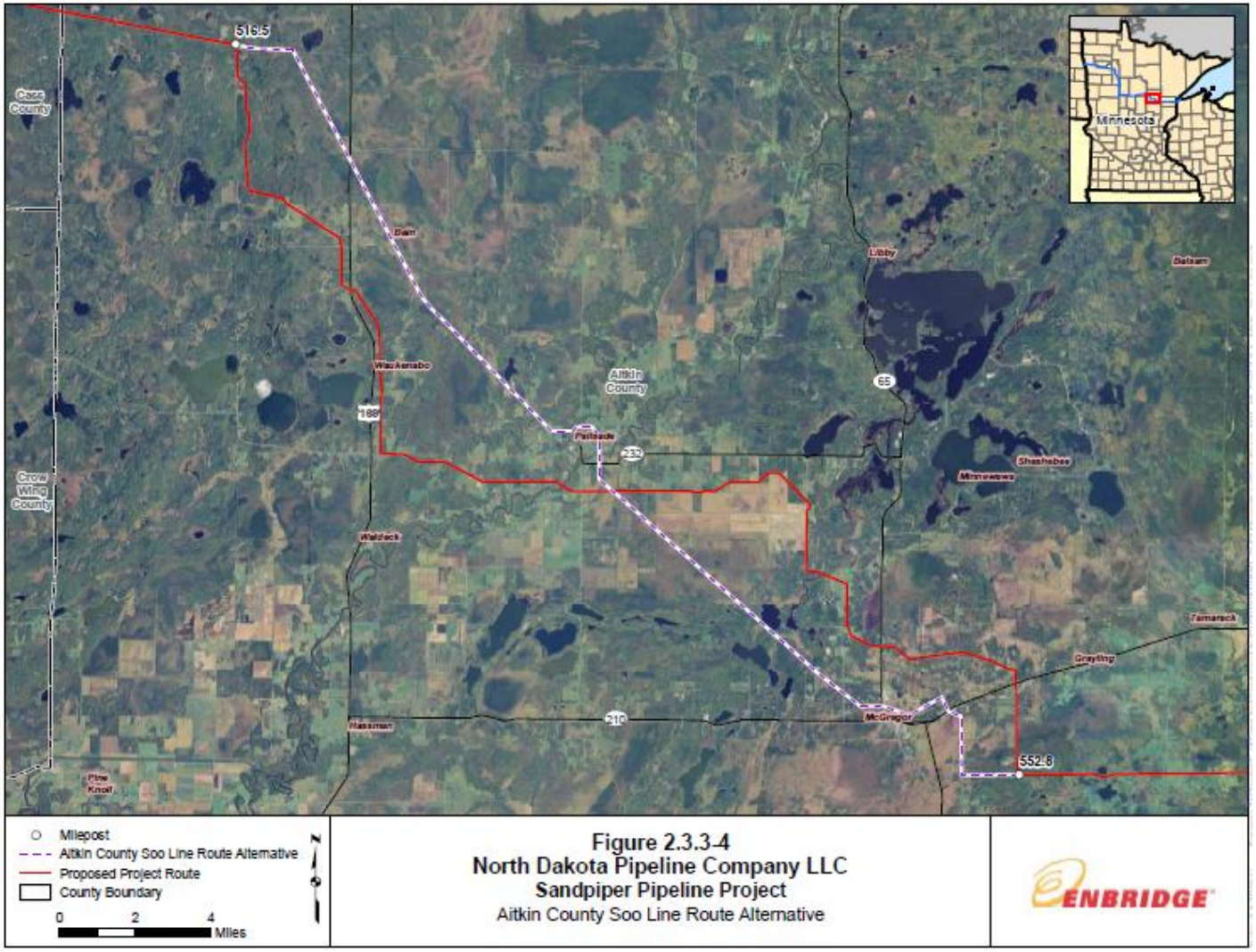
Although the Aitkin County Soo Line Route Alternative would have met the project objective, NDPC determined that the alternative did not convey a significant environmental advantage over the preferred route. While it was advantageous from the perspective of co-location with existing rights-of-ways, fewer miles of construction, avoidance of state WMAs and reduction of impacts to prime farmland and highly wind-erodible soils, the Aitkin County Soo Line Route Alternative added wetland and sensitive species impacts, as well as disturbance in three state forests and a Scientific and Natural Area. NDPC did not select this alternative to the preferred route based on this environmental analysis and the significant physical impacts to a recreational use trail, the public's use of the trail, and to adjacent landowners.

Table 2.3.3-4
Environmental Features Comparison – Aitkin County Soo Line Route Alternative

Environmental Features	Unit	Aitkin County Soo Line Route Alternative	Preferred Route
Length	miles	31.7	36.8
Adjacent to Existing Right-of-Way	miles	3.1	4.9
Greenfield Route [a]	miles	28.6	31.9
NWI-mapped Wetlands	miles	19.6	11.4
NWI-mapped Wetlands	number	79	91
Highly Wind Erodible Soils	miles	22.9	30.9
Bedrock Outcrops	miles	0.0	0.0
Prime Farmland Soils	miles	0.5	3.3
Perennial Waterbodies	number	5	4
National Forest Land	miles	0.0	0.0
Tribal Land	miles	0.0	0.0
State Forest Land	miles	9.3 [b]	9.3 [b]
State Wildlife Management Area Land	miles	0.0	1.1 [c]
State Aquatic Management Area Land	miles	0.0	0.0
Railroads Crossed	number	1	1
Roads Crossed	number	11	18
Other Major Issues	number	2 [d]	0

[a] Greenfield locations are defined for purposes of the alternatives analysis as any portion of the route that is greater than 250-feet from the centerline of a known utility.
[b] Savanna, Hill River and Waukenabo State Forests
[c] Grayling Marsh Wildlife Management Area
[d] McGregor Marsh Scientific and Natural Area, Soo Line Trail with Potential for Historic Designation

Figure 2.3.3-4
Aitkin County Soo Line Route Alternative



Carlton County Route Alternative

The Carlton County Route Alternative was part of NDPC's original application filed on November 8, 2013. After filing, NDPC determined that a more socioeconomically and environmentally advantageous route through part of Carlton County was available. That route has been incorporated into NDPC's current preferred route, which is represented in the revised pipeline route permit application filed with this Revised EIR. The former route for that section, now known as the Carlton County Route Alternative, is presented here to provide a comparison of the old route to the new preferred route. The former route was considered as a way to generally minimize impacts by taking the most direct route possible through Carlton County into Wisconsin. The alternative deviated from the preferred route at approximately MP 584.5 and exited Minnesota at approximately MP 600.8. Table 2.3.3-5 provides a comparison of the prominent land use features of this alternative and the preferred route; Figure 2.3.3-5 depicts the alternative and the preferred route.

The main benefits of the Carlton County Route Alternative are that it would have been 1.4 miles shorter than the preferred route and would have crossed 2.0 fewer miles of wetlands, 14 fewer NWI-mapped wetlands, and fewer miles of highly wind erodible soils.

The main drawback of the Carlton County Route Alternative is that it would have required over 10.5 miles of additional greenfield construction. In addition, it would have impacted one additional perennial waterbody and prime farmland in Carlton County.

From a constructability perspective, while the Carlton County Route Alternative minimized proximity to residences and lessened wetland construction, it contained a number of drawbacks. Some of these drawbacks include the proximity of active aggregate mining operations and the increased number of tributaries to cold water trout streams that would have been crossed by the Carlton County Route Alternative. Cold water trout streams are an important fisheries resource, are protected under Minnesota law, and construction across designated trout streams is subject to timing restrictions and potential crossing method limitations.

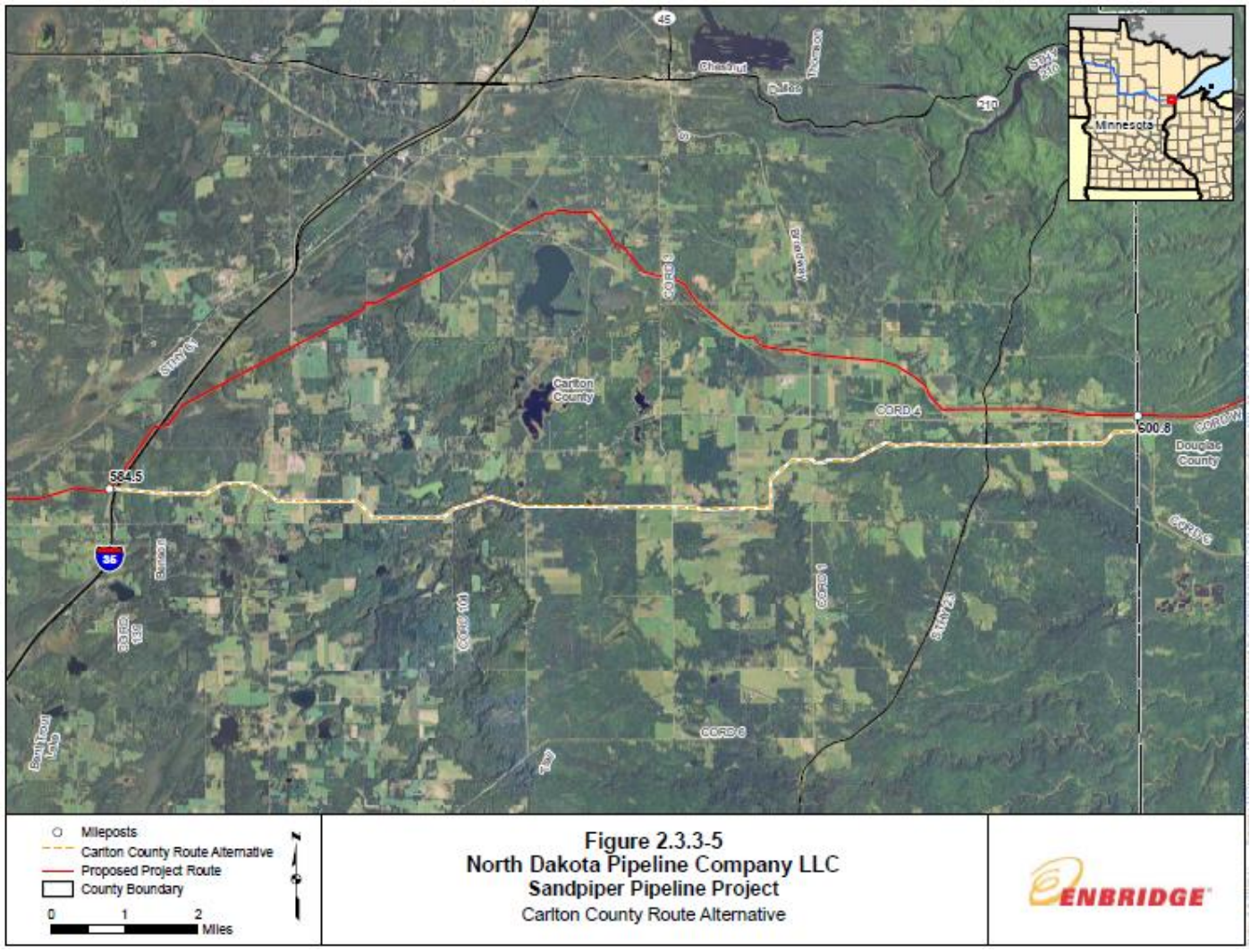
NDPC determined that the even though the Carlton County Route Alternative was advantageous from the perspective of fewer miles of construction, specifically in wetland areas, it did not convey a significant advantage over the preferred route due to increased impacts to farmland as well as increased construction footprints in greenfield areas. Additionally, the increased number of tributaries to cold water trout streams and the proximity of active aggregate mining operations add additional complexities to construction and operation of the pipeline that are not present on the preferred route. NDPC did not select this alternative to the preferred route based on this environmental analysis.

Table 2.3.3-5
Environmental Features Comparison – Carlton County Route Alternative

Environmental Features	Unit	Carlton County Route Alternative	Preferred Route
Length	miles	15.0	16.4
Adjacent to Existing Right-of-Way	miles	0.3	12.3
Greenfield Route [a]	miles	14.7	4.2
NWI-mapped Wetlands	miles	0.8	2.8
NWI-mapped Wetlands	number	12	26
Highly Wind Erodible Soils	miles	6.6	7.6
Bedrock Outcrops	miles	0.0	0.0
Prime Farmland Soils	miles	1.0	0.7
Perennial Waterbodies	number	4	3
National Forest Land	miles	0.0	0.0
Tribal Land	miles	0.0	0.0
State Forest Land	miles	0.0	0.0
State Wildlife Management Area Land	miles	0.0	0.0
State Aquatic Management Area Land	miles	0.0	0.0
Railroads Crossed	number	0	1
Roads Crossed	number	11	16

[a] Greenfield locations are defined for purposes of the alternatives analysis as any portion of the route that is greater than 250-feet from the centerline of a known utility or road.

Figure 2.3.3-5
Carlton County Route Alternative



3.0 SOCIOECONOMICS

Construction and operation of the Project will result in both temporary and long-term socioeconomic impacts along the preferred route traversed by the Project. During construction, there will be temporary increases in local population, demand for short-term housing, use of transportation systems, and expenditures in local economies for goods and services. Construction will also result in temporary impacts to agricultural production. Long-term impacts associated with the Project include payment of local property and/or ad valorem taxes and the creation of both permanent and temporary jobs for pipeline operation and maintenance activities.

This section provides a description of the existing socioeconomic conditions in the counties along the Project and an analysis of temporary and long-term impacts on those counties.

3.1 EXISTING SOCIOECONOMIC CONDITIONS

NDPC reviewed 2010 and 2012 U.S. Census Bureau data and estimates, as well as 2013 Minnesota Department of Employment and Economic Development Local Area Unemployment Statistics, to gather information on existing socioeconomic conditions in the eight counties crossed by the Project. Table 3.1-1 presents information on current population levels and density, per capita income, workforce, unemployment rates, and industry in these counties.

Population densities (an indicator of the extent of economic development) in the counties affected by the Project average 22.9 people per square mile. All county-level population densities are lower than the Minnesota average of 66.6 people per square mile, reflecting the rural character of the preferred route.

County population levels within the Project area range from a low of 4,087 persons in Red Lake County to a high of 62,882 persons in Crow Wing County. Populations in five of the eight affected counties along the preferred route have declined from 2010 to 2012, with Aitkin County experiencing the greatest overall loss at 1.7 percent.

Per capita income in 2011 ranged from a low of $22,408 in Red Lake County to a high of $25,645 in Crow Wing County. In general, per capita income is lowest in rural counties with low population densities and high unemployment rates, and highest in urban counties with high population densities and low unemployment rates.

The April 2013 unemployment rates in the Project area varied from 5.3 percent in Polk County to 15.2 percent in Clearwater County (compared to a statewide average of 5.4 percent). Seven of the eight counties crossed by the Project have higher unemployment rates than the statewide average.

Employment in the Project area is concentrated in the following areas: education health and social services; retail trade; manufacturing; arts, entertainment, recreation, and

accommodation and food services; and construction industries. Education, health, and social service; retail trade; and manufacturing are the top employment industries in the counties crossed by the preferred route.

In general, the preferred route avoids population centers and residential areas. Seven municipalities are located within approximately 1 mile of the preferred route and no municipal boundaries will be crossed by the preferred route (see Table 3.1-2). Most of the cities within 1 mile of the preferred route have populations of less than 1,500 persons. The largest community is the City of Crookston in Polk County, with a population of 7,891 persons.

Table 3.1-1
Existing Socioeconomic Conditions in the Sandpiper Pipeline Project Area

State/ County	Population Estimate[a]	Population Density (people per sq. mile)[a]	Per Capita Income[a]	Civilian Labor Force[b]	Unemployment Rate (percent)[b]	2007-2011 Major Employment Industries[a]
Minnesota	5,379,139	66.6	$30,310	2,978,412	5.4	Educational, health, and social services; Manufacturing; Retail trade
Polk	31,416	16.0	$24,274	18,244	5.3	Educational, health, and social services; Retail trade; Manufacturing
Red Lake	4,087	9.5	$22,408	2,537	9.0	Educational, health, and social services; Manufacturing; Wholesale Trade
Clearwater	8,703	8.7	$21,466	4,263	15.2	Educational, health, and social services; Retail trade
Hubbard	20,347	22.1	$24,869	9,117	8.9	Educational, health, and social services; Retail trade; Manufacturing
Cass	28,357	14.1	$24,772	13,744	9.6	Educational, health, and social services; Arts, entertainment, and recreation, and accommodation and food services; Retail trade
Crow Wing	62,882	62.6	$25,645	32,287	7.6	Educational, health, and social services; Retail trade; Arts, entertainment, and recreation, and accommodation and food services; Manufacturing
Aitkin	15,927	8.9	$24,694	7,095	8.4	Educational, health, and social services; Arts, entertainment, and recreation, and accommodation and food services; Retail trade; Wholesale trade; Construction

Table 3.1-1
Existing Socioeconomic Conditions in the Sandpiper Pipeline Project Area

State/ County	Population Estimate[a]	Population Density (people per sq. mile)[a]	Per Capita Income[a]	Civilian Labor Force[b]	Unemployment Rate (percent)[b]	2007-2011 Major Employment Industries[a]
Carlton	35,348	41.1	$24,808	17,811	6.6	Educational, health, and social services; Manufacturing; Arts, entertainment, and recreation, and accommodation and food services; Retail trade

[a] U.S. Census Bureau, http://quickfacts.census.gov, 2012 (estimated population); 2010 (population density); 2007-2011 (per capita income 2011 USD)

[b] Minnesota Department of Employment and Economic Development, LAUS Data, April 2013 www.deed.state.mn.us

Table 3.1-2 Municipalities within One Mile of the Sandpiper Pipeline Project		
County/Municipality	Approximate Milepost	Population (2010)[a]
Polk		
Crookston (city)	319.0	7,891
Clearwater		
Clearbrook (city)	376.0	518
Bagley (city)	388.0	1,392
Aitkin		
Palisade (city)	534.0	167
McGregor (city)	547.0	391
Carlton		
Carlton (city)	593.0	862
Wrenshall (city)	596.0	399
[a] U.S. Census Bureau, http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml		

3.2 GENERAL CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

3.2.1 Construction Schedule and Workforce

Construction of the Project is scheduled to occur over approximately 14-16 months, beginning in the fourth quarter 2014, with an in-service date in the first quarter of 2016. Using the Regional Input-Output Modeling System[5] as developed and maintained by the United States Department of Commerce, Bureau of Economic Analysis, NDPC estimates that approximately 17,315 person-years[6] of temporary construction jobs will be created for the duration of construction. NDPC, through its construction contractors and subcontractors, will attempt to hire local workers where the local workforce possesses the required skills. Construction personnel hired from outside the Project area will augment the local workforce and consist of supervisors, EIs, and highly skilled mechanical, electrical, and instrumentation/control tradesmen. Non-local workers will relocate to the Project area for the duration of construction. Workers generally will be dispersed along the length of the construction right-of-way rather than concentrating at a single work site.

Local workers will commute from their residences to Project work sites on a daily basis. Non-local workers will reside in the vicinity of the Project for short periods and will not

[5] http://www.bea.gov/regional/rims/
[6] Person-years is the equivalent of one-person working full-time for one year.

typically be accompanied by family members. As a result, incremental demand from non-local workers for public services will be small.

Local communities will benefit from monies paid to construction workers, both local and non-local, throughout the construction period. Workers will spend a portion of their earnings locally, thereby providing significant revenues to local communities. Both local and non-local workers will use hospitality services such restaurants, grocery stores, and gasoline stations. Non-local workers will require temporary housing in addition to hospitality services. Additionally, construction contractors and subcontractors may purchase materials from local vendors, and lease land and equipment for temporary field offices and material storage areas. Operation of the Project will likely require NDPC to hire additional full-time permanent employees.

Local communities will also benefit from periodic employment created by pipeline operation and maintenance activities. Workers for these activities may be local or non-local. Similar to the construction period, communities will benefit from the monies spent by temporary workers on local hospitality services and temporary housing. Additionally, construction contractors or NDPC employees may purchase materials from local vendors.

3.2.2 Housing

Short-term impacts on housing may result from workers seeking housing near the construction spreads. These impacts are not expected to be significant. NDPC does not expect that construction crews will encounter difficulties finding temporary housing in the Project area. Local workers will commute from their residences. Non-local workers will use hotels, motels, and apartments or bring their own mobile housing units (such as travel trailers or campers) and stay at local campgrounds. Demands for temporary housing within local communities will be minimal because workers generally will be dispersed along the length of the preferred route. Rental rates are not expected to rise significantly as a result of the Project, as the construction timeline is relatively short and workers will be distributed across construction spreads.

3.2.3 Transportation

Short-term impacts on local transportation systems may result from construction of the pipeline across roads and railroads, movement of construction equipment and material to work areas, and daily commuting of the construction workforce to work sites. These impacts are not expected to be significant.

Appendix B and Table 4.3.6-1 list the roads that will be crossed by the preferred route. NDPC typically will construct the pipeline across paved roadways and railroads using road-boring equipment. This equipment installs the pipeline beneath the road without closing it, thereby avoiding disruptions to vehicular or railcar movement and physical impacts on road/railroad beds. Unpaved roadways will typically be crossed by boring or by using the

open-cut method. The latter method will temporarily disrupt road traffic as the pipe trench is excavated across the roadway. To minimize traffic delays at open-cut crossings, NDPC will establish traffic detours before excavating the roadbed. If no reasonable detours are feasible, at least one traffic lane of the road will be maintained, except for brief periods when road closure is essential to install the pipeline. NDPC will minimize the duration of open-cut crossings and, in most cases, complete these road crossings in one day or less. NDPC will notify local residents prior to road closures. Additionally, NDPC will attempt to avoid closing roads during peak traffic hours.

To maintain safe conditions, NDPC will direct its construction contractors to adhere to local weight restrictions and limitations for its construction vehicles, and to remove soil that is left on the road surface by the crossing of construction equipment. In addition, when it is necessary for construction equipment to move across paved roads, mats or other appropriate measures will be used to prevent damage to the road surface.

NDPC anticipates that up to up to 8 truckloads of pipe segments per mile for 24-inch pipe and up to 14 truckloads of pipe segments per mile for 30-inch pipe per mile of pipeline will need to be transported over area roads to deliver the pipe along the preferred route. Truck traffic associated with transporting this pipe, as well as other construction-related travel associated with the Project, may increase the workload of local authorities to assist with traffic control. In addition, local authorities may need to assist with short-term detours at pipeline road crossings or delays in traffic flow from large, slow-moving vehicles. NDPC does not anticipate that these Project-related demands on local authorities will be significant.

The movement of construction personnel, equipment, and materials from contractor and pipe storage yards to the construction work area will result in additional short-term impacts on the local transportation system. Traffic will remain fairly consistent throughout the construction period, and will typically peak during early morning and evening hours. NDPC anticipates that road congestion will increase during these peak hours but will not significantly disrupt the normal flow of traffic in the Project area.

Incremental road congestion could be caused by construction workers commuting to and from work sites on a daily basis; however, due to the generally rural location of the Project, notable increases in rush hour traffic are not anticipated. Furthermore, because pipeline construction is generally scheduled to take full advantage of daylight hours, most workers will commute during off-peak hours (i.e., early morning and evening). In addition, construction workers typically will leave their personal vehicles at contractor yards and participate in ride shares to work sites with other workers; this will help reduce road congestion in the vicinity of work sites. NDPC may bus contractors from yards and other central locations to minimize the number of personal vehicles accessing the right-of-way.

3.2.4 Loss of Agricultural and Timber Production

Construction of the Project will affect approximately 1,610.3 acres of agricultural land, including hayfields and pasture (see Section 4.3.2). Landowners will be compensated for agriculture-related losses according to agreements negotiated between each landowner and NDPC. Long-term effects on crop yields are not expected because NDPC will use construction and restoration techniques designed to protect or restore soil productivity. These techniques are described in NDPC's Agricultural Protection Plan ("APP") (see Appendix C).

Construction also will result in the removal of approximately 1,524.5 acres of mature trees, saplings and shrubs within the construction right-of-way (see Section 4.3.1). Merchantable timber will be salvaged and sold if possible, unless otherwise agreed to with the landowner. If a commercial buyer cannot be found, the timber may be considered non-merchantable and disposed of by mowing, chipping, grinding, and/or hauling offsite to an approved disposal facility. Burning of non-merchantable wood may be allowed only where the contractor has acquired all applicable permits and approvals (e.g., agency and landowner) and in accordance with all federal, state, and local regulations. No burning will be allowed in wetlands.

3.2.5 Tax Revenues

Long-term economic benefits associated with operation of the pipeline will include increased tax revenues at the state and county level in the form of property and/or ad valorem taxes. NDPC estimates it could pay as much as approximately $24.9 million in additional annual property taxes in Minnesota beginning in 2016, subject to assessments by local government units.

4.0 LAND USE

4.1 EXISTING LAND USE

Land use along the preferred route was classified using the USGS Land Use/Land Cover ("LULC") Classification System. This system utilizes satellite imagery to classify land use into 29 categories. For the Project, these USGS land use categories were combined into five general categories: open land, forest land, agricultural land, developed land, and wetland/open water based on prevalent land use and vegetation cover types. Land use along the preferred route was classified by milepost into one of the five categories. Definitions of the five land use categories (per the USGS LULC Classification System) include:

- Agricultural Land consists of areas classified as cultivated crops and pasture.
- Developed Land consists of areas classified as low intensity developed, medium intensity developed, and high intensity developed.
- Forest Land consists of areas classified as deciduous forest, evergreen forest, and mixed forest.
- Open Land consists of areas classified as barren land, developed open space, shrub/scrub, and grasslands or herbaceous areas.
- Wetland/Open Water consists of areas classified as woody wetlands, emergent herbaceous wetlands, and open water.

It should be noted that the land use impacts presented in the following sections are based on USGS LULC digital data only and do not reflect information gathered from field surveys, aerial desktop surveys, or field reconnaissance.

4.2 LAND USE AFFECTED BY PIPELINE CONSTRUCTION AND OPERATION

The total land requirements for the Project generally include a 120-foot-wide construction right-of-way in upland areas and a 95-foot-wide construction right-of-way in wetland areas with additional temporary workspaces at feature crossings (e.g., roads, waterbodies). Table 1.2-1 presents land requirements for the Project.

At this time, NDPC has identified a number of access roads, pipeyards and rail sidings necessary for construction; additional pipeyards and contractor yards will be identified as Project planning and engineering progresses. NDPC considered sensitive environmental features when planning the placement of its pipeyards and use of the pipeyards will not impact sensitive environmental features. Access roads and yards known as of the date of this filing are presented in Tables 1.2.3-1 and 1.2.2-1.

For the approximately 302-mile-long segment across Minnesota, construction will affect approximately 4,266.1 acres of land. The predominant land use identified along the

preferred route is agricultural land, which covers 1,610.3 acres (or 37.7 percent) of the total construction area. Of the agricultural land affected, approximately 1,004.4 acres is cultivated and the remaining 606.0 acres is pasture land. Forested land accounts for 1,524.5 acres (or 35.7 percent) of the total construction area. Other land uses are wetland/open water (614.2 acres or 14.4 percent), open land (510.2 acres or 12.0 percent), and developed land (6.8 acres or less than 1 percent). Table 4.2-1 provides a summary of the land use categories affected by the Project's construction right-of-way and additional temporary workspaces in Minnesota.

Aboveground facilities associated with the Project will include additional infrastructure at the new Clearbrook terminal including tankage, pumps, meters, and new piping. A new pump station will also be sited at Clearbrook and will include pumps, VFD's, and pump and VFD shelters. Mainline valves will be placed at major waterbody crossings and other features along the preferred route. Additionally, new launch and receiver traps, along with a mainline valve, will be installed at a site near Pine River, Minnesota.

The land use categories that will be affected resulting from the siting of the new Clearbrook terminal facilities include agricultural land (122.9 acres or 77.1 percent of the site), wetland (14.6 acres or 9.2 percent), forested land (11.4 acres or 7.1 percent), and open land (10.5 acres or 6.6 percent). Geotechnical and engineering reviews at this site are complete. Construction will only occur on a portion of the parcel presented in this land use analysis. Archaeological surveys at this site were completed in 2013; wetlands and waterbody surveys will occur in 2014.

The land use categories that will be affected resulting from the siting of the Pine River facility include agricultural land (10.6 acres or 79.6 percent of the site), open land (1.4 acres or 10.6 percent), and forest land (1.3 acres or 9.8 percent). Field surveys are complete at the Pine River facility. Construction will only occur on a portion of the parcel presented in this land use analysis.

Following construction in areas where Sandpiper is co-located with existing NDPC right-of-way, NDPC will retain additional permanent right-of-way beyond the existing right-of-way. In areas where Sandpiper is co-located with other third party rights-of-way or is in greenfield areas, new permanent right-of-way will be obtained. The dimensions of the additional right-of-way used for environmental analysis purposes only are as follows:

- 55-foot-wide permanent right-of-way for all areas west of the Clearbrook terminal; when co-located with existing right-of-way, 30 feet will be existing easement and 25 feet will be new permanent right-of-way;
- 50-foot-wide permanent right-of-way in uplands east of the Clearbrook terminal;
- 50-foot-wide permanent right-of-way in small wetlands east of the Clearbrook terminal; and

- 50-foot-wide permanent right-of-way east of the Clearbrook terminal in areas where winter construction will be utilized (e.g., large wetland complexes).

Table 4.2-2 presents a summary of the land use categories affected by operation of the pipeline.

Table 4.2-1
Land Uses Affected by Construction of the Sandpiper Pipeline Project [a]

County	Forested		Agricultural		Developed		Open Land		Wetland/Open Water		Total	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Polk	16.0	0.4%	743.3	17.4%	3.0	0.1%	46.0	1.1%	39.1	0.9%	847.3	19.9%
Red Lake	1.8	<0.1%	143.0	3.4%	0.6	<0.1%	4.2	0.1%	11.6	0.3%	161.2	3.8%
Clearwater	268.1	6.3%	183.3	4.3%	0.3	<0.1%	62.1	1.5%	39.1	0.9%	552.9	13.0%
Hubbard	414.4	9.7%	220.9	5.2%	1.0	<0.1%	66.2	1.6%	44.0	1.0%	746.5	17.5%
Cass	375.2	8.8%	69.9	1.6%	0.3	<0.1%	157.5	3.7%	62.7	1.5%	665.6	15.6%
Crow Wing	38.9	0.9%	10.9	0.3%	0.0	—	18.6	0.4%	2.3	0.1%	70.8	1.7%
Aitkin	219.1	5.1%	145.0	3.4%	0.0	—	74.0	1.7%	236.0	5.5%	674.1	15.8%
Carlton	191.0	4.5%	94.0	2.2%	1.6	<0.1%	81.6	1.9%	179.4	4.2%	547.7	12.8%
Total [b]	**1,524.5**	**35.7%**	**1,610.3**	**37.7%**	**6.8**	**0.2%**	**510.2**	**12.0%**	**614.2**	**14.4%**	**4,266.1**	**100.0%**

[a] Calculations are based on the construction right-of-way described in Section 4.2 and additional temporary workspaces. Calculations do not include aboveground facilities.

[b] Due to rounding, totals may be off slightly.

Table 4.2-2
Land Uses Affected by Operation of the Sandpiper Pipeline Project [a]

County	Forested		Agricultural		Developed		Open Land		Wetland/Water		Total	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Polk	6.6	0.4%	334.2	17.9%	1.4	0.1%	19.2	1.0%	21.9	1.2%	383.4	20.5%
Red Lake	0.9	<0.1%	67.3	3.6%	0.3	<0.1%	1.8	0.1%	5.7	0.3%	75.9	4.1%
Clearwater	113.5	6.1%	81.0	4.3%	0.1	<0.1%	28.0	1.5%	20.6	1.1%	243.3	13.0%
Hubbard	168.9	9.0%	92.5	4.9%	0.5	<0.1%	31.4	1.7%	25.1	1.3%	318.3	17.0%
Cass	142.8	7.6%	30.5	1.6%	0.1	<0.1%	76.2	4.1%	30.2	1.6%	279.8	14.9%
Crow Wing	15.1	0.8%	4.6	0.2%	0.0	—	8.6	0.5%	0.9	<0.1%	29.2	1.6%
Aitkin	96.3	5.1%	61.2	3.3%	0.0	—	35.2	1.9%	112.4	6.0%	305.1	16.3%
Carlton	74.5	4.0%	38.7	2.1%	0.7	<0.1%	36.3	1.9%	86.8	4.6%	237.0	12.7%
Total [b]	**618.6**	**33.0%**	**710.0**	**37.9%**	**3.1**	**0.2%**	**236.7**	**12.6%**	**303.6**	**16.2%**	**1,872.0**	**100%**

[a] Calculations are based on the operational right-of-way described in Section 4.2. In most cases, the right-of-way will be allowed to revert to the original land use during operation of the Project. These calculations do not include aboveground facilities.

[b] Due to rounding, totals may be off slightly.

4.2.1 Ownership Status of Lands Crossed by the Pipeline

As shown in Table 4.2.1-1, the preferred route predominantly crosses private lands located outside of municipal areas (230.8 miles or approximately 75.5 percent of the route). The preferred route also crosses state lands owned and managed by various state agencies (28.1 miles or 9.2 percent) and county lands (47.0 miles or 15.4 percent). County lands include lands that may be owned by the state but administered by the county (tax-forfeit lands). NDPC continues to work with appropriate state land-managing agencies to identify and obtain the necessary licenses to cross these lands.

Table 4.2.1-1
Ownership of Lands Crossed by the Sandpiper Pipeline Project

Ownership	Crossing Length (miles)	Percentage of Route
State Lands	28.1	9.2
County Lands	47.0	15.4
Private Lands	230.8	75.5
Total [a]	**301.6**	**100**

[a] The source of this data is the MNDNR 2008 GAP Stewardship dataset available on MNDNR's DataDeli. The total does not equal the sum of the addends, This data should be used as an approximation only, as the GAP dataset has overlapping features, causing some crossings to be over-represented. NDPC continues to consult with private landowners, counties, and state agencies regarding the ownership of lands crossed by the Project route.

4.2.2 Areas with Comprehensive Land Use Plans

The Project will cross two watershed districts and eight counties where comprehensive land use plans have been established. These are the Wild Rice and Red Lake Watershed Districts; and Polk, Red Lake, Clearwater, Hubbard, Cass, Crow Wing, Aitkin, and Carlton counties. Watershed Districts are further discussed in section 9.1.

NDPC has initiated consultations with affected watershed districts and counties to ensure that the Project is designed and constructed in a manner that is consistent with these land use plans.

4.3 GENERAL CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

4.3.1 Forest Land

Approximately 1,524.5 acres of forest land will be temporarily disturbed during construction in Minnesota. Construction in most forested areas will be adjacent to existing pipeline or other third party rights-of-way. Following construction, approximately 618.6 acres of forest will be permanently converted to shrub and herbaceous cover types. This conversion is

required to facilitate safe pipeline operation and inspection. The remaining temporarily cleared forestland in the construction right-of-way will be allowed to revegetate.

Localized short- and long-term impacts will result from the construction of the pipeline through forested areas. Trees and brush will be removed from the construction right-of-way and additional temporary workspaces. Overlapping the construction right-of-way with existing maintained right-of-way to the greatest extent possible minimizes impacts on forest land. The existing permanent right-of-way will be maintained in an herbaceous state to facilitate aerial inspection.

Following construction, forested areas located on the new permanent right-of-way will be seeded to promote herbaceous cover types. Consistent with previous practices, the new permanent right-of-way will be maintained in an herbaceous state. Forested areas on the temporary right-of-way and in additional temporary workspaces will be restored to allow the natural reestablishment of forest cover. The rate of forest reestablishment will depend upon the type and age of the vegetation cleared, as well as the natural fertility of the areas affected. It is anticipated that early successional species will begin to colonize the temporary right-of-way and additional temporary workspaces within a few years after construction, followed by establishment of later successional species.

4.3.2 Agricultural Land

Approximately 1,610.3 acres of agricultural land will be temporarily disturbed during construction in Minnesota. Construction activities will temporarily utilize active cropland within construction work areas. Construction activities may also coincide with planting or harvesting, depending on the construction season. Following construction, agricultural activities will resume across the permanent pipeline right-of-way.

NDPC will maintain access to fields, storage areas, structures, and other agricultural facilities during construction, and will maintain irrigation and drainage systems that cross the right-of-way to the extent practicable. Impacted drainage systems will be repaired in accordance with the APP (see Appendix C). Agricultural land in the construction right-of-way will generally be taken out of production for one growing season and restored to previous uses following construction. Landowners will be compensated for crop losses and other damages caused by construction activities.

Based on a review of publicly-available information, including aerial photos along the preferred route and field review, NDPC anticipates that approximately 16 center-pivot irrigation systems will be crossed by the Project. Construction activities may interrupt the center-pivot irrigation systems, depending on the construction season. Irrigation systems that could be interrupted and result in crop damage will be identified and appropriate measures will be taken in accordance with the APP (see Appendix C).

NDPC will implement measures to avoid, minimize, or mitigate potential impacts on soil productivity in accordance with the APP (see Appendix C). These measures include erosion control, topsoil segregation, rock removal, and measures to avoid compaction or loosen compacted soils. To prevent soil compaction, drainage alteration, and damage to crops, operation of equipment on agricultural lands will be limited to access routes agreed upon with landowners.

NDPC will also take appropriate measures to protect livestock during construction. To minimize short-term disruption to livestock operations, NDPC will minimize the length of time that the trench is open and will coordinate with landowners to minimize disruption of access. Where appropriate, NDPC will maintain temporary access ways across the trench as necessary to allow the passage of livestock, and will erect temporary fences (including gates) as necessary to contain and protect livestock from construction-related hazards. After completing construction, fences and gates will be rebuilt to their former condition or better.

NDPC consulted with the Minnesota Department of Agriculture ("MDA") to determine if any organic farms will be crossed by the preferred route. MDA provided a list of certified organic farms based on the farms' participation in voluntary MDA organic programs, information supplied by organic certifying agencies, and the National Organic Program. Organic farmers are not required to register with the MDA, therefore, farms exempt from the requirement to certify and farms in transition to organic certification were not available. NDPC also learned of organic farms through a variety of project public outreach.

Appendix A of the APP (see Appendix C for the APP) sets forth the specific additional mitigation measures that will be applied specifically to Organic Agricultural Lands, such as Organic Certified farms or farms that are in active transition to become Organic Certified. NDPC will continue to work with affected landowners to identify organic farms and will implement mitigation measures accordingly.

4.3.3 Wetland/Open Water

Approximately 614.2 acres of open water and wetlands will be affected by construction of the Project. The open water will be affected at crossings of streams, rivers, and lakes. NDPC has reduced the construction workspace width to 95 feet in wetlands to reduce impacts on these areas and will continue to evaluate workspaces in wetland areas as construction planning progresses. Following construction, wetlands will be allowed to revegetate naturally. Construction impacts associated with these crossings are discussed in Section 9.3.4 and the EPP (see Appendix A).

4.3.4 Open Land

Approximately 510.2 acres of open land will be temporarily disturbed during construction of the Project. Open land will be temporarily disturbed during grading, trenching, backfilling,

and restoration. After final construction clean up, the open land in upland areas will be reseeded and mulched in accordance with the EPP (see Appendix A).

4.3.5 Developed Land

Approximately 6.8 acres of developed land will be affected during construction of the Project. Based on examination of aerial photographs, there are approximately 168 residences within 500-feet of the construction right-of-way (see Table 4.3.5-1). In addition, there are 21 residences within 50-feet of the construction right-of-way.

Table 4.3.5-1
Residences Within 50- and 500-Feet of the Sandpiper Pipeline Project

County	500-Feet	50-Feet
Polk	23	0
Red Lake	1	0
Clearwater	27	2
Hubbard	46	8
Cass	7	2
Crow Wing	2	0
Aitkin	21	1
Carlton	41	8
Total	**168**	**21**

During construction, residences in proximity to construction activities may be exposed to short-term increases in construction-related noise and dust. Construction-related dust emissions will generally be of short duration and dependent on soil type, weather conditions, and the extent of ground disturbance. Some minor dust emission is inevitable on any construction project; however, the construction right-of-way and access roads near residential areas will be sprayed with water as needed to control dust during active construction. During periods of high winds, work may be temporarily suspended if control measures are ineffective and if dust is excessive for the area. After construction is completed, measures to stabilize and revegetate the right-of-way will prevent ongoing dust emissions.

The heavy construction equipment needed to construct the Project will generate unavoidable short-term increases in ambient noise levels. Typical bulldozers, trackhoes, and sideboom tractors used to install large-diameter pipelines generate 80 to 90 decibels within 50-feet of the equipment. Increases in ambient noise levels due to heavy equipment operation will be limited to the construction period. Construction activities will generally be limited to daylight hours. No noise will be generated along the pipeline right-of-way during normal operation of the facility.

Some operational noise will be generated by the new Clearbrook terminal. NDPC's standards restrict the noise levels around neighboring dwellings and industrial facilities to 40 decibels, measured at a distance of 50-feet from the affected structure, unless state regulations allow higher noise levels. Noise control is incorporated into the design if these levels are exceeded.

4.3.6 Transportation Infrastructure

Roads and Railroads

The Project will cross federal, state, county, city/township, and private/commercial roads, and railroads. In total, the preferred route will cross 304 roads as summarized in Table 4.3.6-1; a complete list of road crossings is included in Appendix B.

Table 4.3.6-1
Number of Roads Crossed by the Sandpiper Pipeline Project

County	State or Federal	County/City	Private/Commercial
Polk	4	52	6
Red Lake	1	9	0
Clearwater	3	34	11
Hubbard	4	41	31
Cass	4	26	9
Crow Wing	0	2	2
Aitkin	2	22	4
Carlton	4	27	6
Total	**22**	**213**	**69**

Construction methods will vary among roadway types crossed by the Project. Typical crossing methods are discussed in NDPC's EPP (see Appendix A). NDPC proposes to bore beneath most paved roads allowing them to remain open during construction. Open-cut construction is typically proposed for unpaved roads, which will require temporarily closing these roads and implementing detours. If no reasonable detour is feasible, at least one traffic lane will be maintained, except for brief periods essential to laying the new pipeline. Construction disturbance at each open-cut road crossing will typically be limited to one day, which is not expected to have a significant impact on local traffic patterns. Detour, warning, traffic control, and safety signs will be posted as prescribed by federal, state, and local (county) departments of transportation. Attempts will be made to avoid road closures during peak-traffic time periods.

The Project will cross the Burlington Northern Santa Fe and the Canadian Pacific Railways at seven locations in Polk, Red Lake, Clearwater, Hubbard, and Aitkin counties as identified in Table 4.3.6-2. NDPC plans to cross most railroads by boring beneath them. Two crossings of the Burlington-Northern Santa Fe Railroad (one in Polk County at MP 307.5

and one in Clearwater County at MP 388.1) will be crossed by HDD. Both of these construction methods will allow the railroads to remain operational during construction. No long-term effects are expected on roads and railroads crossed by the preferred route because the function of these areas will be restored after construction.

Table 4.3.6-2
Railroads Crossed by the Sandpiper Pipeline Project

County	Milepost	Description	Township	Range	Section
Polk	307.5	Burlington Northern Railway	150	48	5
	318.8	Burlington Northern Railway	150	46	7
Red Lake	334.0	Burlington Northern Railway	150	44	27
Polk	347.7	Canadian Pacific Railway	149	42	2
Clearwater	388.1	Burlington Northern Railway	147	37	28
Hubbard	443.9	Burlington Northern Railway	139	35	34
Aitkin	550.3	Burlington Northern Railway	48	23	22

Designated Roadways

The King of Trails Scenic Byway

The King of Trails Scenic Byway (Minnesota State Highway 75) stretches along 414 miles of Minnesota's western border. Scenery along the byway includes prairies and farmlands. The Project will cross Minnesota State Highway 75 at approximate 318.5. NDPC proposes to bore this crossing. NDPC will consult with Polk County and MDOT regarding construction crossing techniques, restoration, and rerouting of traffic to area roadways during the construction period.

Lake Country Scenic Byway

The Lake Country Scenic Byway (Minnesota State Highway 34) is 88 miles long and was designated in 1999. The byway is made up of a 67-mile portion on Minnesota State Highway 34 from Detroit Lakes through Park Rapids to Walker, and a 21-mile spur connecting Park Rapids with Itasca State Park. The Project will cross the Lake Country Scenic Byway at approximate 433.6 in Hubbard County. NDPC proposes to bore this crossing. NDPC will consult with Hubbard County and MDOT during the permitting process regarding construction crossing techniques, restoration, and rerouting of traffic to area roadways during the construction period.

The Great River Road

The Great River Road (CSAH 10) in Minnesota has two components: a federally designated 430-mile National Route and a 755-mile state-designated alternate route. Combined, the route provides 1,185 miles of scenic, historic, and recreational opportunities for travelers. The Project will cross the Great River Road at approximate MP 403.4 in Clearwater County and approximate MP 533.8 in Aitkin County. NDPC proposes to bore this crossing. NDPC

will consult with Clearwater and Aitkin counties and MDOT during the permitting process regarding construction crossing techniques, restoration, and rerouting of traffic to area roadways during the construction period.

Veterans Evergreen Memorial Scenic Byway

Commonly referred to as the scenic road to Duluth, the Veterans Evergreen Memorial Scenic Byway occurs along a 50-mile stretch of State Highway 23 that runs from Banning State Park to New Duluth. The Project will cross Minnesota State Highway 23 at approximate MP 598.7 in Carlton County. NDPC proposes to bore this crossing. NDPC will consult with Carlton County and MDOT during the permitting process regarding construction crossing techniques, restoration, and rerouting of traffic to area roadways during the construction period.

Airports

Several airports are located within 1 mile of the preferred route in Minnesota. The airports include the Crookston Municipal Airport, the Bagley Airport, McGregor Municipal, and private airpark Sky Manor Aero Estates. NDPC will consult with the Federal Aviation Association and any other appropriate agencies regarding construction techniques and restoration of this area during the permitting process.

5.0 GEOLOGY

5.1 TERRAIN AND GEOLOGY

The Project primarily traverses the Interior Plain Physiographic Province, crossing into the Laurentian Upland Province—Superior Upland in the eastern portion of its preferred route in Minnesota (USGS, 2004). The geologic terrain of both of these provinces is characterized by ancient pre-Cambrian igneous and metamorphic rocks that have been uplifted and eroded to a relatively low-relief plain, forming the stable geologic core of the North American continent, known as the craton. The North American craton has been tectonically stable for over 500 million years. The Superior Upland is a southern extension of the Laurentian Upland Province. The basement rocks of this province are associated with the 2.5-billion-year-old Kenoran Orogeny, a mountain-building event, and are part of the Canadian Shield. Basement rocks of the Interior Plains Physiographic Province were generally formed from the tectonic collision of smaller continental plates over one billion years ago that resulted in continental accretion and expansion of the North American craton.

The bedrock geology underlying the preferred route is illustrated in Figure 5.1-1 (after Jirsa and others, 2011). Very limited occurrences of Paleozoic and Mesozoic sedimentary bedrock units lie randomly over the pre-Cambrian basement rocks across northern Minnesota. Ordovician sedimentary bedrock occurs in the northwestern portion of Polk County, but lies to the north of the preferred route. However, two relatively short segments (total length approximately 18.5 miles) of the preferred route cross Cretaceous sedimentary bedrock in both Aitkin and Cass counties. These sediments were deposited 65 to 136 million years ago and consist of sandstone lenses near the base of predominantly gray, soft, argillaceous shale (solidified mud and clay) sections.

Surficial geology along the preferred route is characterized by unconsolidated deposits from Pleistocene continental glaciation. In the Project area, these sediments were deposited primarily during four major episodes of glaciation of variable provenance. The sediments are comprised of both ground and end moraine, outwash deposits, ice-contact stratified drift (e.g., kames and eskers), and lacustrine sediments, including lake bottom and beach ridge deposits. Additionally, there are more recent deposits of alluvium in river channels and peat in the pothole depressions that are characteristic of the interrupted drainage of glaciated terrain. Figure 5.1-2 is a simplified map (after Hobbs and Goebel, 1982) of the surficial geology in relation to the preferred route.

Topography across the preferred route varies widely given the variable nature of glacial deposition. The interrupted drainage of glacial terrain can be of low relief and include wetlands, lakes, and gently rolling to undulating hills and ridges, as well as hummocky areas of high relief with steep hills and ridges associated with glacial end moraine deposits. Additionally, glacial erosion can remove unconsolidated deposits and scour bedrock, and glacial meltwater can incise significant valleys into bedrock (MNDNR, 1997). Elevations in

the Project area range from approximately 797-feet to 1,678-feet above mean sea level (see Table 5.1-1).

Regional maps of depth-to-bedrock coverage generally lack sufficient resolution to identify areas where bedrock occurs at specific depths (see Section 5.4). Accordingly, the depth to bedrock in a specific location is difficult to determine without sampling. Generally, depth to bedrock along the preferred route segments can exceed 450-feet; however, using digital coverage of depth-to-bedrock (Olsen and Mossler, 1982), the preferred route was found to cross an area of more or less continuous bedrock exposure from approximate MP 580.9 to MP 583.4. This area of shallow bedrock is located in Carlton County, and the bedrock geology is dominated by graywackes, slates, and metasediments. In areas where the pipeline is installed using HDD techniques, bedrock could be at a depth where it may be encountered during construction. These areas will be identified from geotechnical borings at the HDD crossings and will be factored into the design of the crossings.

As stated previously, the area crossed by the Project has been tectonically stable for over 500 million years. Therefore, there is a low probability of an earthquake of significant intensity or other seismic event in the Project area (National Atlas of the United States, 2013).

Table 5.1-1
Elevation Along the Sandpiper Pipeline Project

County	Elevation Above Mean Sea Level (feet)		
	Lowest	Average	Highest
Polk	797	1,043	1,332
Red Lake	1,030	1,090	1,126
Clearwater	1,270	1,463	1,617
Hubbard	1,361	1,460	1,678
Cass	1,276	1,385	1,517
Crow Wing	1,333	1,374	1,417
Aitkin	1,203	1,263	1,369
Carlton	908	1,196	1,317
Average	**1,147**	**1,284**	**1,422**

Figure 5.1-1
Bedrock Geology

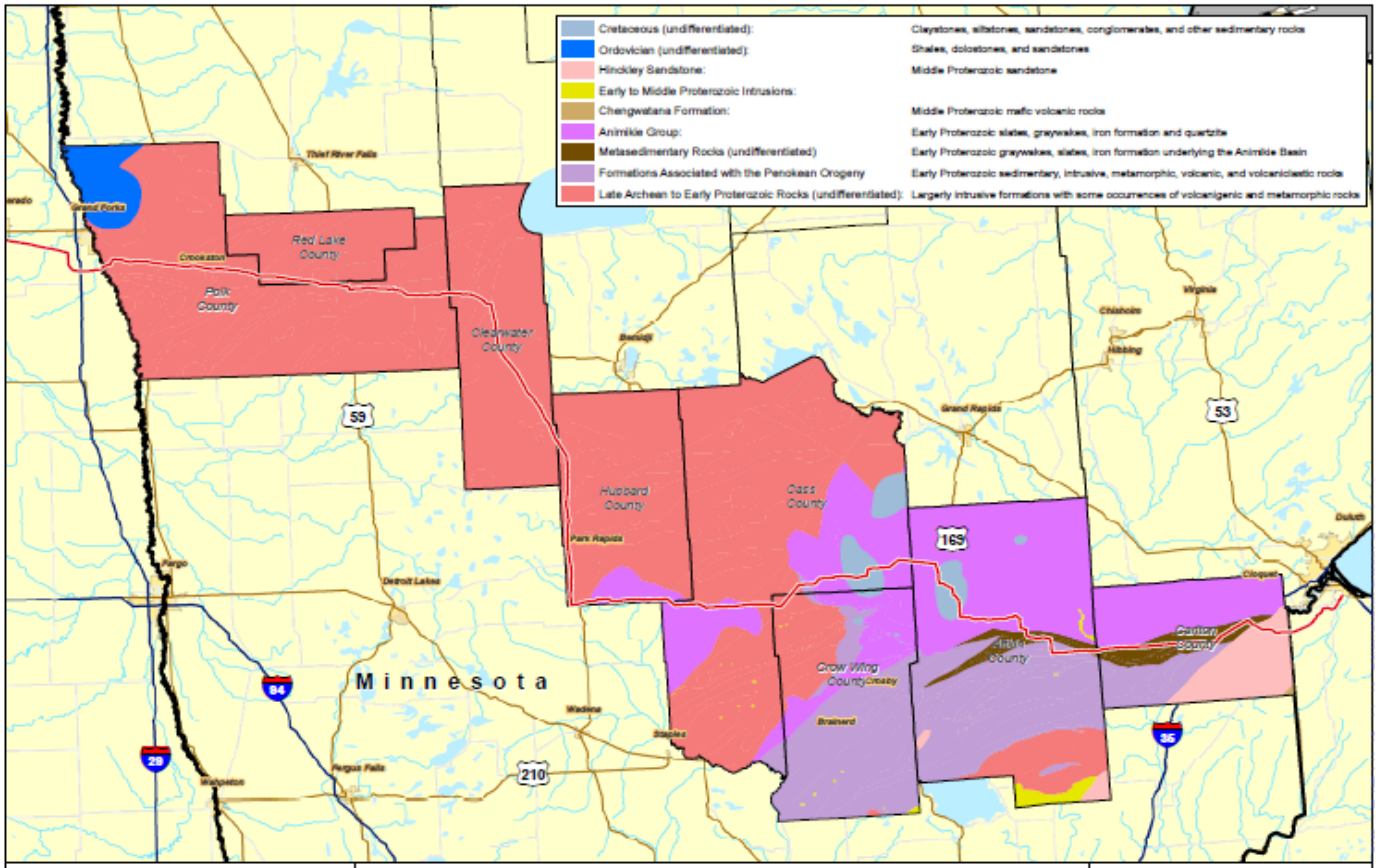
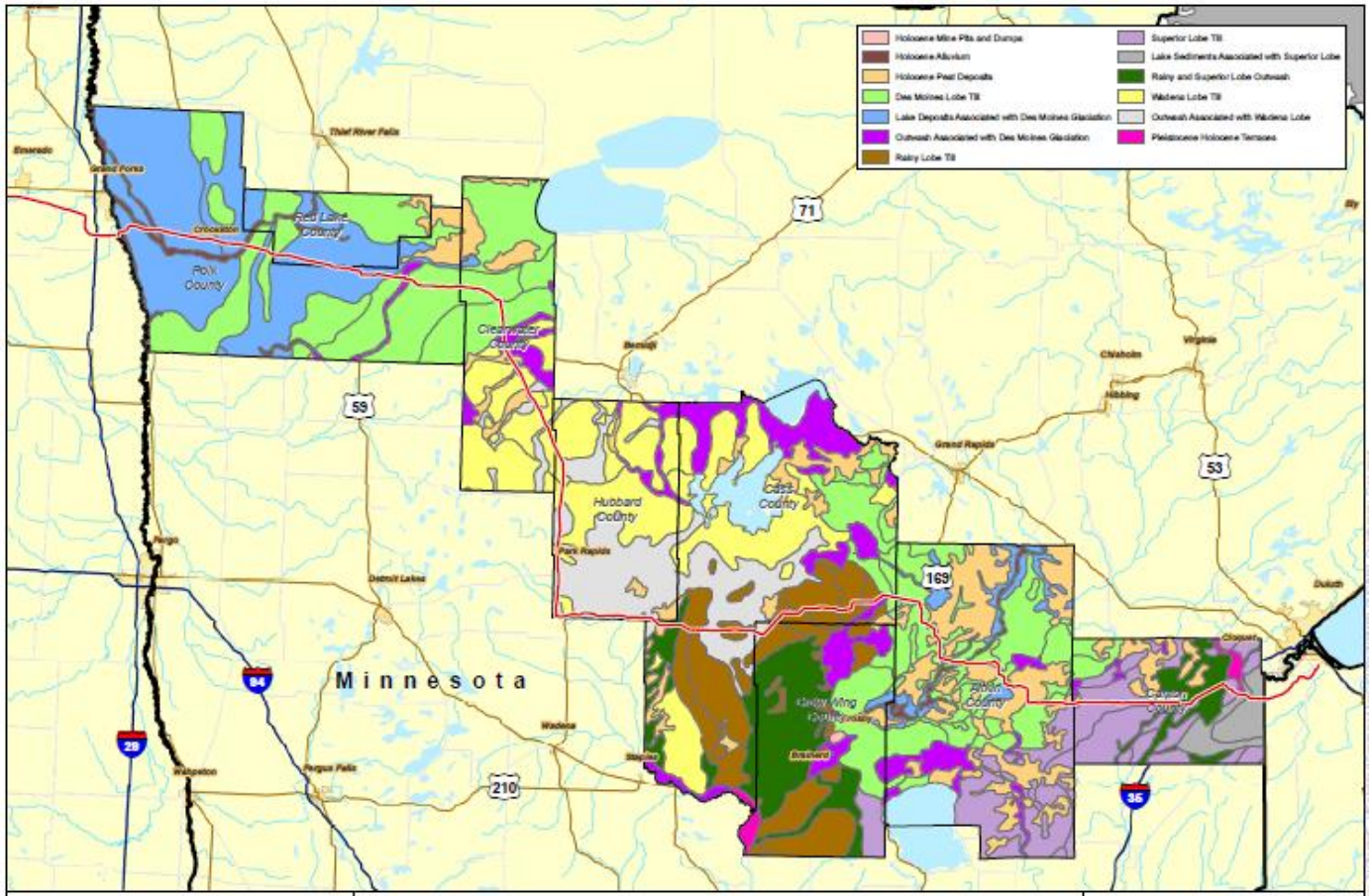


Figure 5.1-2
Quaternary Geology



5.1.1 Mineral Resources

Mineral resources in Minnesota include industrial (e.g., sand, gravel, and crushed stone) and metallic (e.g., iron ore, nickel, and titanium) minerals. USGS topographic maps, 2013 aerial photography, and MNDNR spatial data for mineral leases on state lands (as of January 2014) were used to identify surface features associated with mining or mineral resources.

Table 5.1.1-1 identifies possible mining and mineral resource areas within 1,500-feet of the construction workspace. Of the localities listed, 24 sites are possibly associated with non-metallic resources (20 gravel pits, 3 sand/gravel pits, and 1 sand pit) and 23 are tracts associated with active metallic mineral leases, all of which are located in Carlton County.

Table 5.1.1-1
Mineral Resources within 1,500-Feet of the Sandpiper Pipeline Project

County	Milepost	Operation	Distance and Direction from the Right-of-Way
Polk	318.1	Sand/Gravel Pit [a]	1498 feet south
Red Lake	331.6	Sand/Gravel Pit [a, b]	813 feet south
Polk	329.1	Gravel Pit [b, c]	1400 feet south
	352.6	Sand/Gravel Pit [c]	660 feet north (does not appear active)
	367.1	Gravel Pit [c]	1400 feet northwest (does not appear active)
Clearwater	375.4	Gravel Pit [c]	1150 feet northeast (does not appear active)
	383.8	Gravel Pit [c]	910 feet west (does not appear active)
	386.3	Gravel Pit [c]	1320 feet west
Cass	479.8	Gravel Pit [b, c]	80 feet north (from aerial coverage)
	497.6	Gravel Pit [b, c]	50 feet north (from aerial coverage)
	500.7	Gravel Pit [c]	1260 feet north (does not appear active)
Aitkin	516.2	Gravel Pit [b]	80 feet north
	524.0	Gravel Pit [c]	1200 feet southwest (does not appear active)
	528.3	Sand Pit [c]	250 feet west (does not appear active)
	529.3	Gravel Pit [c]	770 feet south (does not appear active)
	532.1	Gravel Pit [b, c]	780 feet south (from aerial coverage)

Table 5.1.1-1
Mineral Resources within 1,500-Feet of the Sandpiper Pipeline Project

County	Milepost	Operation	Distance and Direction from the Right-of-Way
	532.2	Gravel Pit [b, c]	1420 feet south (does not appear active)
Carlton	561.8	Metallic Mineral Exploration [d]	858 feet south
	562.0	Metallic Mineral Exploration [d]	1450 feet south-southeast
	562.1	Metallic Mineral Exploration [d]	1039 feet north-northwest
	562.1	Metallic Mineral Exploration [d]	159 feet south-southeast
	562.3	Metallic Mineral Exploration [d]	575 feet north-northeast
	562.4	Metallic Mineral Exploration [d]	620 feet south-southeast
	562.5	Metallic Mineral Exploration [d]	1373 feet north-northwest
	562.5	Metallic Mineral Exploration [d]	128 feet north
	562.6	Metallic Mineral Exploration [d]	1249 feet north
	562.7	Metallic Mineral Exploration [d]	120 feet north
	562.7	Metallic Mineral Exploration [d]	1042 feet south
	563.0	Metallic Mineral Exploration [d]	109 feet north
	563.0	Metallic Mineral Exploration [d]	1051 feet south
	563.2	Metallic Mineral Exploration [d]	99 feet north
	563.2	Metallic Mineral Exploration [d]	1057 feet south
	563.4	Metallic Mineral Exploration [d]	1210 feet north
	563.5	Metallic Mineral Exploration [d]	88 feet north
	563.5	Metallic Mineral Exploration [d]	1121 feet south-southwest
	563.7	Metallic Mineral Exploration [d]	1071 feet south
	563.8	Metallic Mineral Exploration [d]	899 feet north
	563.9	Metallic Mineral Exploration [d]	890 feet north
	564.0	Metallic Mineral Exploration [d]	23 feet south
	564.7	Metallic Mineral Exploration [d]	124 feet south
	565.5	Gravel Pit [b]	1350 feet south
	581.3	Gravel Pit [c]	970 feet north (does not appear active)
	587.9	Gravel Pit [b]	570 feet northwest
	588.2	Gravel Pit [b]	700 feet southeast
	593.1	Gravel Pit [b, c]	620 feet northeast (from aerial coverage)
	594.1	Gravel Pit [b, c]	750 feet southwest
	594.2	Gravel Pit [b, c]	790 feet northeast

Table 5.1.1-1 Mineral Resources within 1,500-Feet of the Sandpiper Pipeline Project			
County	Milepost	Operation	Distance and Direction from the Right-of-Way

[a] USGS (2013a)
[b] Based on a review of 2013 aerial photography
[c] Based on a review of USGS topographic maps
[d] Source: Minnesota Minerals Coordinating Committee (2013), MNDNR (2009). Does not include terminated or expired mineral contracts or leases.

Of the 23 metallic mineral exploration tracts presented in Table 5.1.1-1, the project would cross 10 tracts that the MNDNR actively leases for mineral exploration (see Table 5.1.1-2). All 10 tracts are located in Carlton County and are leased by Kennecott Exploration Company. A total of 2.4 miles of actively leased lands would be crossed by the Project.

Table 5.1.1-2
Lands Leased for Mineral Exploration Crossed by the Sandpiper Pipeline Project

Township / Range / Section	Beginning Milepost	End Milepost	Length (Miles) [a]	MNDNR Land Class
T47N / R21W / S6	561.8	562.0	0.2	Tax Lands
T47N / R21W / S6	562.0	562.1	0.1	Tax Lands
T47N / R21W / S6	562.1	562.3	0.3	Tax Lands
T47N / R21W / S6	562.3	562.6	0.3	School Trust
T47N / R21W / S6	562.6	562.9	0.3	Tax Lands
T47N / R21W / S5	562.9	563.1	0.3	Tax Lands
T47N / R21W / S5	563.1	563.4	0.3	Tax Lands
T47N / R21W / S5	563.4	563.6	0.3	Tax Lands
T47N / R21W / S4	563.9	564.1	0.2	Tax Lands
T47N / R21W / S4	564.6	564.9	0.2	Tax Lands
		TOTAL	2.4	

[a] Discrepancies between miles presented and the total are due to rounding.

In addition, the preferred route will cross two areas of bedrock greenstone belt terrain in the western portion of Minnesota (MNDNR, 2013g). Greenstone belt terrains is characterized by variably metamorphic rock that has undergone a change in existing rock structure or composition induced by location, chemicals, or temperature. Greenstone belt terrains have the potential to contain gold mineralizations.

5.1.2 Paleontology

Based on the thickness of the unconsolidated glacial material in the Project area, significant paleontological resources are not likely to be encountered during construction. Despite the fact that glacial deposits in Minnesota are of Pleistocene age, megafauna fossils tend to be scarce where glacial ice was present (Mather, 2009; Sloan, 2005). NDPC consulted with the Minnesota Geological Survey ("MGS") and confirmed that paleontological finds are not common in the northern half of Minnesota. However, NDPC has developed a Draft Unanticipated Discoveries Plan (included as Appendix D) that will be implemented in the event of an unanticipated paleontological find.

5.2 GENERAL CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

No unique geological features that have received state or federal protection will be disturbed by the Project. Construction and operation of the Project will result in minor impacts on topography and geology. Primary impacts will be limited to construction activities and consist of temporary alteration of slopes on the construction right-of-way due to grading and trenching operations. These disturbances will be necessary to create a level and safe construction area.

NDPC will minimize impacts by returning contours to pre-construction conditions to the extent practicable. In addition, NDPC will implement the erosion control measures described in the EPP (see Appendix A). These measures include the installation of slope breakers, temporary sediment barriers, and permanent trench breakers, as well as the revegetation and mulching of the construction right-of-way.

Blasting is not anticipated but may be required if bedrock is encountered within the depth of the trench. Only 2.5 miles of the preferred route will cross bedrock outcrops. If blasting is required, NDPC will conduct these activities in accordance with applicable U.S. Occupational Safety & Health Administration regulations.

Based on USGS topographic maps, 2013 aerial photography and data, and MNDNR mineral lease spatial data, the preferred route is located within 1,500-feet of 47 possible mining operations and mineral leases. Ten individual parcels where active MNDNR metallic mineral leases have been granted will be crossed by the Project's construction right-of-way. The greenstone belt terrains crossed by the Project do not contain any known gold mineralizations or high gold potential zones and are currently unexplored due to immensely thick overlaying glacial materials. However, these areas may attract mineral exploration activities in the future. There is a potential that future use of sand and gravel or mineral resources will be precluded where the pipeline is installed across these resource deposits. In areas where the Project is located adjacent to any existing utilities, any sand and gravel deposits in the Project area will be unavailable for mining.

For mineral leases on state lands, Minnesota Rule 6125.0700 requires that the mineral lessee be consulted prior to issuance of any other surface leases, permits or licenses, and such leases, permits or licenses shall not unduly interfere with the exploration or mining operations conducted on the leased mining units. NDPC will continue to consult with the MNDNR, Carlton County, and Kennecott concerning metallic mineral resources and active mineral leases that will be crossed by the Project.

Construction of the pipeline will not likely affect any significant paleontological resources; however, any unique resources exposed or excavated during pipeline construction will be recovered and studied for the scientific record and managed in accordance with NDPC's Unanticipated Discoveries Plan.

NDPC does not anticipate impacts associated with seismic activity within the Project area. Due to the limited potential for large, seismically induced ground movements, there is minimal risk of earthquake-related impacts on the pipeline. No additional mitigation beyond designing the pipeline to currently accepted industry specifications will be required.

No additional disturbance or loss of unique geological features, mineral resources, or scientifically important fossils will occur during operations because there will be no additional surface disturbance required beyond that used for construction.

6.0 SOILS

6.1 GENERAL SOIL COMPOSITION

The Project will cross the following Major Land Resource Areas ("MLRA"): Red River Valley of the North; Northern Minnesota Gray Drift; Rolling Till Prairie; Northern Minnesota Glacial Lake Basins; Superior Lake Plain; Central Minnesota Sandy Outwash; and Wisconsin and Minnesota Thin Loess and Till, Northern part.

The Red River Valley of the North MLRA consists of a nearly level glacial lake plain that is bordered on the east by outwash plains, gravelly beaches, and dunes. The dominant soil types in this area are Mollisols and Vertisols.

The Northern Minnesota Gray Drift MLRA consists of a complex pattern of moraines, outwash plains, drumlins, lake plains, and drainages. The dominant soil types in this area are Alfisols, Entisols, and Histosols, with some Mollisols in the westernmost part of the area.

The Rolling Till Prairie MLRA consists of stagnation moraines, end moraines, glacial outwash plains, terraces, and flood plains, and is mostly dominated by till-covered moraines. The dominant soil type in this area is Mollisols.

The Northern Minnesota Glacial Lake Basin MLRA consists of glacial lake plains with remnants of gravelly beaches, strandlines, deltas, and sandbars. The dominant soil types in this area are Alfisols, Entisols, and Histosols.

The Superior Lake Plain MLRA consists of till plains mixed with lake plains, lake terraces, beaches, flood plains, swamps, and marshes. This MLRA is also characterized by some rocky knobs, hills, and low mountains. The dominant soil types in this area are Alfisols, Spodosols, Inceptisols, and Entisols.

The Central Minnesota Sandy Outwash MLRA consists of mostly large outwash plains and stream terraces. The dominant soil types in this area are Mollisols and Histosols.

The Wisconsin and Minnesota Thin Loess and Till MLRA consists of landscapes dominated by gently undulating to rolling, loess-mantled till plains, drumlin fields, and end moraines mixed with outwash plains associated with major glacial drainage ways, swamps, and bogs. The dominant soil types in this area are Alfisols, Entisols, Histosols, and Spodosols.

The above-mentioned MLRAs generally range from somewhat poorly drained soils with sandy to clayey textures to well or excessively drained soils, and have a frigid temperature regime; an aquic or udic soil moisture regime; and mixed, smectic, or isotic mineralogy (USDA Natural Resources Conservation Service ["NRCS"], 2006).

6.2 IDENTIFICATION OF SOIL CONDITIONS

6.2.1 Background and Methodology

Detailed soil characteristics along the majority of the preferred route were identified and assessed using SSURGO database (USDA NRCS, 2013a). The SSURGO database is a digital version of the original county soil surveys developed by NRCS for use with GIS. It provides the most detailed level of soils information for natural resource planning and management. The majority of the details were gathered at a scale of 1:12,000. Soil maps are linked in the SSURGO database to information about the component soils and their properties (USDA NRCS, 2013b).

SSURGO data was unavailable for Crow Wing County; therefore NRCS STATSGO2 data was used instead. STATSGO2 was created by generalizing more detailed soil survey maps. Where more detailed soil survey maps were not available, information on geology, topography, vegetation, and climate was assembled and related to satellite images. Soils of similar areas were studied and the probable classification and extent of the soils was determined (USDA NRCS, 2013c).

SSURGO and STATSGO2 attribute data consists of physical properties, chemical properties, and interpretive groupings. Attribute data applies to the whole soil (e.g., listed hydric, prime farmland soils, or slope class), as well as to layer data for soil horizons (e.g., texture or permeability). The soil attribute data can be used in conjunction with spatial data to describe the soils in a particular area.

6.2.2 Soil Characteristics and Assessments

NDPC digitized and overlaid the preferred route and additional temporary workspaces onto SSURGO/STATSGO2 database data to identify soil mapping units in the Project area. Based on that analysis, NDPC identified soil characteristics that could affect or be affected by pipeline construction. These characteristics include highly erodible soils, prime farmland and hydric soils, compaction-prone soils, presence of stones and shallow bedrock, droughty soils, depth of topsoil, and percent slope.

Tables 6.2.2-1 and 6.2.2-2 provide a summary of significant soil characteristics identified along the preferred route by county according to the SSURGO and STATSGO2 databases. Table 6.2.2-3 lists topsoil depths for prime farmland crossed by the preferred route. Individual soil characteristics are discussed separately in the following sections.

Table 6.2.2-1
Soil Characteristics in the Sandpiper Pipeline Project Area

County	Total Acres in County [a]	Prime Farmland	Hydric Soils	Compact. Prone	Highly Erodible		Reveg. Concerns	Stony/ Rocky	Shallow to Bedrock
					Water	Wind			
		Acres							
Polk	847.3	707.4	416.8	285.0	24.1	483.1	142.6	1.4	0.0
Red Lake	161.2	125.5	157.8	5.0	2.4	111.0	35.7	0.0	0.0
Clearwater	552.9	467.7	127.7	52.7	107.7	231.6	92.9	0.0	0.0
Hubbard	746.5	388.9	178.4	56.5	209.9	704.7	384.2	0.0	0.0
Cass	665.6	343.6	108.5	68.6	149.7	579.5	319.8	0.0	0.0
Crow Wing	70.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aitkin	674.1	303.3	393.0	283.9	46.0	555.2	315.1	0.0	0.0
Carlton	547.7	274.0	139.5	157.3	87.6	251.4	266.1	10.8	0.0 [b]
Total	**4,266.1**	**2,610.5**	**1,521.6**	**909.1**	**627.3**	**2,987.4**	**1,556.4**	**12.2**	**0.0**

N/A Data not available for Crow Wing County.
[a] Acreage is based on the construction right-of-way dimensions as discussed in Table 1.2-1 and additional temporary workspace.
[b] As stated in section 5.1, the preferred route will cross 2.5 miles of shallow bedrock in Carlton County based on regional digital data. This information was not reflected in NRCS soils data.

Table 6.2.2-2
Topsoil Depths and Slope Class in the Sandpiper Pipeline Project Area [a]

County	Total Acres in County [a]	Topsoil Depth (inches) in Acres				Slope Class (percent) in Acres				
		0-6	>6-12	>12-18	>18	0-5	>5-8	>8-15	>15-30	>30
Polk	847.3	814.7	28.7	3.5	0.0	822.7	7.8	9.8	6.6	0.0
Red Lake	161.2	141.8	19.4	0.0	0.0	161.2	0.0	0.0	0.0	0.0
Clearwater	552.9	528.2	25.2	0.1	0.0	445.8	14.8	77.6	15.2	0.0
Hubbard	746.5	720.5	11.1	5.9	8.9	536.7	82.0	83.8	40.9	3.1
Cass	665.6	629.4	11.5	22.0	2.7	515.9	0.0	90.1	59.6	0.0
Crow Wing	70.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aitkin	674.1	534.7	107.8	27.9	3.4	607.3	48.0	5.6	13.0	0.0
Carlton	547.7	456.1	49.2	0.0	42.2	314.9	173.0	0.0	57.3	2.3
Total	**4,266.1**	**3,825.4**	**252.9**	**59.4**	**57.3**	**3,404.5**	**325.7**	**266.9**	**192.6**	**5.4**

N/A Data not available for Crow Wing County.
[a] Acreage is based on the construction right-of-way dimensions as discussed in Table 1.2-1 and additional temporary workspace.

Table 6.2.2-3
Topsoil Depths on Prime Farmland in the Sandpiper Pipeline Project Area

County	Total Prime Farmland Acres in County [a]	Topsoil Depth in Acres			
		0-6 inches	>6-12 inches	>12-18 inches	>18 inches
Polk	707.4	686.1	21.3	0.0	0.0
Red Lake	125.5	121.9	3.7	0.0	0.0
Clearwater	467.7	467.7	0.0	0.0	0.0
Hubbard	388.9	388.96	0.0	0.0	0.0
Cass	343.6	343.2	0.4	0.0	0.0
Crow Wing	N/A	N/A	N/A	N/A	N/A
Aitkin	303.3	303.3	0.0	0.0	0.0
Carlton	274.0	274.0	0.0	0.0	0.0
Total	**2,610.5**	**2,585.1**	**25.4**	**0.0**	**0.0**

N/A Data not available for Crow Wing County.
[a] Acreage is based on the construction right-of-way dimensions as discussed in Table 1.2-1 and does not include access roads or additional temporary workspace. Includes land listed by the NRCS as potential prime farmland if a limiting factor is mitigated (e.g., artificial drainage).

6.3 GENERAL CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

Pipeline construction activities such as clearing, grading, trench excavation, and backfilling, as well as the movement of construction equipment along the right-of-way, may result in impacts on soil resources. Clearing removes protective cover and exposes soil to the effects of wind and precipitation, which may increase the potential for soil erosion and movement of sediments into sensitive environmental areas. Grading and equipment traffic may compact soil, reducing porosity and percolation rates, which could result in increased runoff potential. Trench excavation and backfilling could lead to a mixing of topsoil and subsoil and may introduce rocks to the soil surface from deeper soil horizons. Contamination from release of fuels, lubricants, and coolants from construction equipment could also impact soils. NDPC will minimize or avoid these impacts on soils by implementing the mitigation measures described in the EPP and APP (see Appendices A and C, respectively). NDPC will develop a Contaminated Soils Plan to address issues from prior contamination if encountered during construction.

6.3.1 Prime Farmland and Topsoil Segregation

Prime Farmland

The USDA defines prime farmland as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses. It has the soil properties, growing season, and moisture supply

needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, few or no rocks, and is permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time and it either does not flood frequently during the growing season or is protected from flooding (USDA, NRCS 2013d). Soils that do not meet the above criteria may be considered prime farmland if the limiting factor is mitigated (e.g., by controlling soil moisture conditions through artificial drainage). Approximately 19.6 percent of the preferred route will cross prime farmland soils with no limiting factor. An additional 16.8 percent of the soils crossed are considered prime farmland if limiting factors are mitigated, and 24.8 percent of the preferred route will cross soils on farmland of statewide importance.

Impacts on prime farmland from construction of the Project could include interference with agricultural drainage (if present), mixing of topsoil and subsoil, and compaction and rutting of soil. These impacts could result from right-of-way clearing, trench excavation and backfilling, and vehicular traffic within the construction right-of-way. However, with the mitigation measures specified in the APP (see Appendix C), these impacts will be temporary and will not result in a permanent decrease in soil productivity.

NDPC will implement the measures described in its APP to minimize impacts on prime farmland and promote the long-term productivity of the soil. These measures will include topsoil segregation, compaction alleviation, removal of excess rock, and restoration of agricultural drainage systems and existing erosion control structures.

Topsoil Segregation

Topsoil thickness is the result of factors such as wetness, topography, climate, and the predominant vegetation present when the soil was being formed. Other factors being equal, prairie soils have more topsoil than forest soils; and wet soils have more topsoil than dry soils. According to data presented in Tables 6.2.2-2 and 6.2.2-3, topsoil depths along the majority of the preferred route are generally less than 6 inches but are thicker in some areas.

To minimize topsoil disturbance and topsoil/subsoil mixing associated with pipeline construction, NDPC will remove and segregate topsoil in cropland, hay fields, pasture, residential areas, and other areas as requested by the landowner (see EPP typical drawings presented as Figures 1, 2, and 3 in Appendix A). Topsoil will be stripped to a maximum depth of 12 to 18 inches unless otherwise requested by the landowner. If less-than-specified maximum depths of topsoil are present, every effort will be made to segregate to the depth that is present. The segregated topsoil and subsoil will be stockpiled separately and replaced in the proper order during backfilling and final grading of the construction right-of-way.

NDPC consulted with the MDA in the development of its APP. MDA recommended that additional procedures be developed to minimize adverse impacts on crop yields that could occur when topsoil layers with markedly different soil properties are mixed. Implementation of proper topsoil segregation, as detailed in the APP, will minimize the loss of crop productivity, ensure successful post-construction revegetation, and minimize the potential for long-term erosion problems. In the event of a conflict between the PRP and the APP, the APP contains a process to determine the best course of action.

6.3.2 Soil Compaction and Rutting

Soil compaction modifies the structure and reduces the porosity and moisture-holding capacity of soils. Construction equipment traveling over wet soils could disrupt the soil structure, reduce pore space, increase runoff potential, and cause rutting. The degree of compaction depends on moisture content and soil texture. Fine-textured soils with poor internal drainage that are moist or saturated during construction are the most susceptible to compaction and rutting. Approximately 21.3 percent of the preferred route is underlain by soils that are prone to compaction. In addition, approximately 13.4 percent of the preferred route will cross soils with organic surface horizons. These horizons also may be susceptible to rutting during pipeline construction.

NDPC will minimize compaction and rutting impacts by implementing the measures described in its EPP and APP (see Appendices A and C, respectively). These measures may include temporarily suspending certain construction activities on susceptible soils during wet conditions, constructing from timber mats, or using low-ground-weight equipment in wetlands. On agricultural land, compaction impacts may be mitigated through the use of deep tillage operations during restoration activities. If subsequent construction and cleanup activities result in further compaction, additional measures will be undertaken to reduce soil compaction.

6.3.3 Erosion by Wind and Water

Erosion is a continuing natural process that can be accelerated by human activity. Factors that influence the degree of erosion include soil texture, soil structure, length and percent of slope, vegetative cover, and rainfall or wind intensity. Soils most susceptible to erosion by water are typified by bare or sparse vegetative cover, non-cohesive soil particles with low infiltration rates, and moderate to steep slopes. Wind erosion processes are less affected by slope length or steepness. Clearing, grading, and equipment movement could accelerate the erosion process and, without adequate protection, result in discharge of sediment to adjacent waterbodies and wetlands.

The majority of the preferred route (greater than 85 percent) is underlain by soils that are not likely to be susceptible to water erosion (see Table 6.2.2-1); these soils are generally found on terrain with slopes that are less than or equal to 5 percent. Approximately 70.0 percent of the soils along the pipeline route are considered susceptible to wind erosion.

NDPC will implement the erosion control measures described in the EPP (see Appendix A) to minimize erosion both during and after construction activities. These measures may include construction of silt fences, installation of slope breakers, temporary sediment barriers, and permanent trench breakers, as well as revegetation and mulching of the construction right-of-way. Erosion and sedimentation controls will be inspected and maintained as necessary until final stabilization is achieved. NDPC also will implement dust mitigation measures, including the use of water trucks to moisten the right-of-way, as needed, to reduce impacts from wind erosion.

6.3.4 Droughty Soils

Droughty, or dry, soils were identified on the basis of surface texture and drainage class. Well drained to excessively drained soils with a coarse surface texture (i.e., fine sand or coarser) may be difficult to revegetate. Drier soils contain less water to aid in the germination and eventual establishment of new vegetation. Coarser textured soils also have a lower water holding capacity, which could result in moisture deficiencies in the root zone, creating unfavorable conditions for many plants. Approximately 36.5 percent of the preferred route will cross soils classified as droughty soils.

NDPC will minimize the impacts of pipeline construction on droughty, non-cultivated soils by timely reseeding using species tolerant of dry conditions and by applying mulch to conserve soil moisture. NDPC has initiated consultation with appropriate soil conservation authorities and will continue to work with these authorities to develop seed mixes and seeding dates adapted to the Project area, including droughty soil areas.

6.3.5 Stony/Rocky Soils and Shallow Bedrock Soils

Trenching or grading can bring stones or rocks to the soil surface where they can damage farm equipment and interfere with planting. Similarly, backfilling shallow bedrock could redistribute rock to an overlying soil horizon, which may reduce soil moisture-holding capacity. Less than 1 percent of the preferred route would cross stony or rocky soils.

Based on the analysis of the SSURGO/STATSGO2 soils data, no soils crossed by the preferred route are indicated to contain shallow bedrock (i.e., bedrock within five feet of the surface). However, other sources of geological data presented in Section 5.1 suggest that there is an area of more or less continuous bedrock exposure from approximate MP 580.9 to MP 583.4. If bedrock is encountered within the trench, NDPC will only backfill with this rock to the depth of the original bedrock layer. During clean up, NDPC will use rock pickers or other rock removal equipment to remove rocks of a greater size and density on the right-of-way than undisturbed areas adjacent to the right-of-way.

7.0 VEGETATION, WILDLIFE, AND FISHERIES

7.1 VEGETATION

7.1.1 Existing Vegetation Resources

As described in Section 4.0, approximately 35.7 percent of the area affected by the construction right-of-way will involve forest land consisting of deciduous, evergreen, and mixed forests. Construction in most forested areas will be adjacent to existing pipeline or other third-party rights-of-way. Approximately 37.7 percent of the area affected by the construction right-of-way will be agricultural land. This land consists of pastures or hay fields and cultivated crops such as corn, soybeans, wheat, oats, wild rice, and dry edible beans. Potatoes, sugar beets, vegetables, sod, and Christmas trees are also common crops in the counties crossed by the Project (USDA, 2007). The construction right-of-way will also affect wetlands/open water (approximately 14.4 percent), open land (approximately 12.0 percent), and developed land (less than 1 percent). The wetlands include emergent herbaceous wetlands, woody wetlands, and open water; the open land consists of maintained rights-of-way, shrub/scrub areas, grasslands, developed open space, and barren land.

7.1.2 Ecological Classifications

Based on Minnesota's Ecological Classification System (MNDNR, 2013f), the majority of the Project is located in the Laurentian Mixed Forest Province. The Project also will cross small portions of the Prairie Parkland, Tallgrass Aspen Parklands, and Eastern Broadleaf Forest Provinces (MNDNR, 1999).

Laurentian Mixed Forest Province

The preferred route will cross several sections and subsections within the Laurentian Mixed Forest Province between approximate MPs 383.0 and 600.8, as summarized in Table 7.1.2-1. Throughout this province, the most important land uses today are forestry, recreation, tourism, and (in some areas) agriculture.

Prairie Parkland Province

The preferred route will cross the Red River Prairie subsection of the Prairie Parkland Province between approximate MPs 299.9 and 323.4. The majority of this subsection is a glacial lake plain originally dominated by tallgrass prairie and wet prairie, mixed with wetlands, meandering waterways, and old beach ridges. Much of this area has been converted to agriculture and is intensively ditched.

Tallgrass Aspen Parklands Province

The preferred route will cross the Aspen Parklands subsection of the Tallgrass Aspen Parklands Province between approximate MPs 323.4 and 354.9. This subsection is part of a low, level lake plain originally occupied by extensive forested peatlands to the east and tallgrass prairie to the west. Agriculture is the dominant land use in the southern half of the subsection, though more recently extensive areas have also been cleared for farming in the northern half. There are more and larger blocks of presettlement vegetation in this subsection than in others where agriculture is widespread.

Eastern Broadleaf Forest Province

The preferred route will cross the Hardwood Hills subsection within the Eastern Broadleaf Forest Province, between approximate MPs 354.9 and 383.0. The subsection is characterized by steep slopes, high hills, and lakes and wetlands formed in glacial end moraines and outwash plains. Presettlement vegetation included prairies, aspen-oak lands, oak savannas, and mixed forests of oaks, sugar maple, basswood, and other hardwoods. Much of this subsection is now farmed.

Table 7.1.2-1
Ecological Sections and Subsections of the Laurentian Mixed Forest Province in the Sandpiper Pipeline Project Area

Section	Subsection	Description
Northern Minnesota Drift & Lake Plains	Chippewa Plains (MPs 383.0 to 413.1 and 414.0 to 415.0)	Characterized by three large, heavily used lakes and level to gently rolling plains. Conifers once dominated the sandier portions of the subsection. Aspen is now the most common tree species, found in pure stands and also mixed with birch, maple, oak, white spruce, jack pine, and red pine.
	Pine Moraines & Outwash Plains (MPs 413.1 to 414.0 and 415.0 to 508.7)	Lakes are very common, found on end moraines and outwash plains. Till plains are also present. White and red pine formerly dominated on end moraines and till plains, while jack pine barrens and jack pine woodlands were common on well-drained outwash plains. Black spruce, tamarack, white cedar, and black ash predominated on poorly drained sites.
	St. Louis Moraines (MPs 508.7 to 517.0, 517.9 to 521.9, and 552.1 to 573.3)	Characterized by rolling to steep slopes, with end moraines the dominant landform. Northern hardwood forests were common in the southern portion, while white pine, sugar maple, basswood, and balsam fir characterized the north. Today, quaking aspen is the primary species harvested.

Table 7.1.2-1 Ecological Sections and Subsections of the Laurentian Mixed Forest Province in the Sandpiper Pipeline Project Area		
Northern Minnesota Drift & Lake Plains	Tamarack Lowlands (MPs 517.0 to 517.9 and 521.9 to 552.1)	Defined by a glacial lake plain that lacks the well-defined beach ridges of better-known Glacial Lake Agassiz in western Minnesota. Lowland hardwoods (black ash) and lowland conifers (black spruce, tamarack, and white cedar) were originally the most common forest communities. Sedge meadows were extensive, and uplands were largely occupied by aspen-birch forests. Today much of the land is publicly owned.
Southern Superior Uplands	Glacial Lake Superior Plain (MPs 593.8 to 600.8)	A small subsection that extends into Wisconsin, coinciding with the basin of Glacial Lake Superior. Topography is level to gently rolling, except where water has cut deep valleys. Presettlement vegetation consisted of forests dominated by white spruce, white pine, and aspen-birch.
Western Superior Uplands	Mille Lacs Uplands (MPs 573.3 to 593.8)	Characterized by gently rolling till plains and drumlin fields. Dominant feature is Mille Lacs Lake. The original vegetation was a mix of maple-basswood forests in the south; conifer, hardwood, and mixed conifer-hardwood forests elsewhere; and peatland areas inhabited by sedge-fen, black spruce-sphagnum, or white cedar-black ash communities.

7.1.3 Sensitive Plant Communities

Native Plant Communities

The presence of Native Plant Communities ("NPC") along the preferred route was evaluated using NHIS data obtained from MNDNR in April 2013. An updated review of NPCs was conducted in January 2014 for occurrences within the Project's construction workspace and additional temporary workspace. These communities—a mixture of prairie, wetland, and forest types—are listed in Table 7.1.3-1.

Table 7.1.3-1 Native Plant Communities Identified in the Sandpiper Pipeline Project Area		
NPC Code	NPC Class[a]	NPC Type/Subtype
APn81	Northern Poor Conifer Swamp	Poor Black Spruce Swamp Poor Tamarack-Black Spruce Swamp
FPn73	Northern Rich Alder Swamp	Alder (Maple-Loosestrife) Swamp
FPn82	Northern Rich Tamarack Swamp (Western Basin)	Rich Tamarack (Alder) Swamp
MHn35	Northern Mesic Hardwood Forest	n/a
WFn64	Northern Very Wet Ash Swamp	n/a
WPn53	Northern Wet Prairie	Wet Brush-Prairie (Northern)
[a] Agassiz Interbeach Prairie Complex, an unclassified community, also occurs in the Project area.		

In consultation with MNDNR, NDPC identified 2013 rare plant survey sites by examining NPCs and other sensitive plant communities, including Sites of Biodiversity Significance (including draft data for Clearwater, Hubbard, Cass, and Aitkin counties), designated Calcareous Fens, Minnesota Biological Survey data, Railroad Rights-of-Way Prairies, and previously unsurveyed sites that may be eligible for mapping in the MNDNR NHIS. The field protocol for rare plant surveys was developed in consultation with MNDNR. NDPC has recently revised its survey area to account for changes in the route since the last filing. In 2014, NDPC will complete early-season rare plant surveys at 17 sites and late-season rare plant surveys at 9 sites.

NDPC will continue to consult with MNDNR prior to and throughout the 2014 survey season.

Sensitive Forest Resources

As part of its early coordination review, MNDNR recommended avoidance of Old Growth ("OG") stands; Special Management Zones ("SMZs"), which extend 330 feet around the OG perimeter; Ecologically Important Lowland Conifers ("EILCs"); Representative Sample Areas ("RSAs"); and High Conservation Value Forests ("HCVFs") (MNDNR, 2013g). NDPC contacted MNDNR in August 2013 to obtain information on forest resources within a 2-mile-wide study area centered on the pipeline. MNDNR responded in August 2013 with further locational information on OG SMZs, OG forest stands, RSAs, HCVFs, and EILCs within the 2-mile-wide study area centered on the pipeline. In addition, MNDNR identified areas of Old Forest Management Complex ("OFMC") within the 2-mile-wide study area and recommended that NDPC access publicly available digital data showing state forest resources for further analysis. NDPC obtained this data, conducted a review against the Project's 120-foot-wide construction right-of-way, and sent its findings to MNDNR in late October 2013.

Through consultation with MNDNR Regional Plant Ecologists, NDPC determined that the Sandpiper 120-foot construction right-of-way is beyond the minimum SMZ and does not intersect designated OG, nor does it intersect any RSAs, EILCs, or HCVFs. However, the proposed Sandpiper 120-foot-wide construction right-of-way crosses one Old Forest Management Complex ("OFMC") in the Hill River State Forest. MNDNR has noted that OFMC stands are open to normal timber harvest with one of the management objectives being maintenance/enhancement of older forest features. NDPC will continue to consult with MNDNR to ensure forest management objectives are met.

Other Sensitive Communities

Peatland SNAs are unique areas identified by an underlying substrate of peat organic soils that support spruce, tamarack and sedge fens and wetlands of important state significance.

The Project will not cross any Peatland SNAs or other SNAs. Calcareous fens are further discussed in section 9.2.3.

7.1.4 General Construction and Operation Impacts and Mitigation

Clearing of herbaceous vegetation during construction is anticipated to result in a short-term impact to vegetation. Active revegetation measures and rapid colonization by annual and perennial herbaceous species in the disturbed areas will restore most vegetative cover within the first growing season. Clearing of woody shrubs and trees will be the primary long-term impact on vegetation associated with the Project. Woody shrubs and trees will be allowed to recolonize the temporary construction right-of-way and extra workspaces as described in the EPP (see Appendix A). However, recolonization of disturbed areas by woody shrubs and trees will be slower than recolonization by herbaceous species. As natural succession is allowed to proceed in these areas, the early successional or forested communities present before construction will eventually reestablish. NDPC will employ best management practices to control the spread of noxious weeds and invasive plants as described in the EPP (see Appendix A).

Clearing trees in the construction right-of-way could affect undisturbed forest vegetation growing along the edges of the cleared areas. By exposing some edge trees to elevated levels of sunlight and wind, evaporation rates and the probability of tree knockdown could increase. Due to the increased light levels penetrating the previously shaded interior, shade-intolerant species will be able to grow, and the species composition of the newly created forest edge will likely change. The proposed clearing could also temporarily reduce local competition for available soil moisture and light and may allow some early successional species to become established and persist on the edge of the undisturbed areas adjacent to the site.

The Project will result in the clearing of approximately 1,524.5 acres of forest land during construction. Approximately 618.6 acres of this forest land will be maintained clear of trees for operational purposes, including facilitating aerial inspections, preserving pipeline integrity, and providing access for maintenance or emergency work in compliance with federal regulations.

Impacts on vegetation adjacent to the Project area will be minimized through adherence to soil erosion control specifications and by confining clearing activities to the approved right-of-way and extra workspaces. To prevent damage to adjacent trees, NDPC will fell trees toward the cleared right-of-way. Upon completion of construction, NDPC will revegetate disturbed areas in accordance with the EPP (see Appendix A) unless otherwise directed by landowners or land managing agencies. Timely restoration of the construction right-of-way and reseeding with an appropriate seed mix will minimize the duration of vegetative disturbance.

7.2 WILDLIFE

7.2.1 Existing Wildlife Resources

As described in Section 7.1.2, the Project will be constructed through several major ecosystems, including deciduous forest, coniferous forest, wetland, and prairie. Wildlife habitats within these ecosystems are diverse. Existing wildlife resources in the construction right-of-way are described below.

The Project will cross land that has been altered for use as hayfields, pastures, and row crop production. These agricultural fields provide limited wildlife habitat. Common mammalian species, including white-tailed deer, woodchucks, striped skunks, raccoons, weasels, Virginia opossum, and various mice and voles, use these areas for feeding and cover. Common bird species, such as European starlings, American crows, eastern meadowlarks, and house sparrows, are also typically found in agricultural fields.

Forested areas affected by the Project are found primarily along the eastern portion of the preferred route. Mammalian species typical of Minnesota's deciduous forests include eastern chipmunks, black bears, snowshoe hares, gray squirrels, gray fox, porcupines, pine martens, and several species of bats. Some of these species also inhabit northern Minnesota's coniferous forests, while others, such as least chipmunks, snowshoe hares, and red squirrels, are more unique to evergreen forests. The structural diversity of forests provides a variety of habitats that can support a large number of avian species, including songbirds, game birds, and raptors.

Wetlands affected by the Project consist primarily of emergent herbaceous wetlands, woody wetlands, and open water. The emergent wetlands and open water provide habitat for a variety of aquatic wildlife, including muskrats, beavers, mink, river otters, waterfowl, wading birds, and numerous species of reptiles and amphibians. The woody wetlands provide additional habitat for terrestrial wildlife, such as white-tailed deer, moose, gray wolves, black bears, and a variety of small mammals and songbirds.

Open lands affected by the Project consist primarily of shrub/scrub areas, grasslands, developed open space, and barren land. The undeveloped, vegetated open lands likely support several species of birds, numerous small rodents, and several species of snakes. Species such as coyote, red fox, and a variety of raptors typically hunt open areas for the varied prey. Other common wildlife species that may use open areas include thirteen-lined ground squirrels, eastern cottontail rabbits, and white-tailed jackrabbits.

7.2.2 Special Wildlife Areas

Wildlife Management Areas

The Project will cross state-designated WMAs (also described in Section 11.0). The following discussion focuses on the wildlife species typically present in these areas. WMAs represent areas with high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses. The type of wildlife habitat in each WMA crossed by the Project is described below.

- The Crow Wing Chain WMA is a complex of lakes, wetlands, old fields, and forests (including a candidate OG northern hardwood stand) along the Crow Wing River. Half of the WMA is forested with aspen, jack pine, red pines, white pines, and oaks; the other half consists of emergent wetlands and lowland brush. Hunting options include deer, bear, small game, forest game birds, waterfowl, and wolves. Non game viewing opportunities include pileated woodpeckers, broad-winged hawks, and warblers. The Project is co-located with another third-party right-of-way as it crosses the Crow Wing Chain WMA.

- The Grayling Marsh WMA includes uplands dominated by aspen, low areas that are primarily brush and grass, and a wetland impoundment. There are good opportunities for viewing waterfowl, nesting sandhill cranes, ruffed grouse, woodcock, sharp-tailed grouse, swamp sparrows, gray catbirds, deer, bear, and wolves.

- The Lawler WMA is mostly made up of marsh and low brushy areas; the upland area is limited to a small grass field. Trapping and hunting opportunities include deer and waterfowl. Beaver, mink, deer, common yellowthroats, swamp sparrows, and alder flycatchers may be seen. The Project is co-located with another third-party right-of-way as it crosses the Lawler WMA.

- The Salo Marsh WMA is a complex of wetlands and forests dominated by aspen and balsam fir. Management emphasis is on waterfowl in the wetland areas and on deer, bear, woodcock, and ruffed grouse in the upland timber. Wildlife viewing opportunities include red-headed blackbirds, bald eagles, and grebes.

Figure 7.2.2-1 presents the preferred route as it passes through these WMAs. NDPC continues to consult with MNDNR regarding these WMA crossings.

Large Block Habitats

MNDNR recommends that, to the extent feasible, the Project avoids fragmenting large contiguous blocks of habitat of 40 or more acres (MNDNR, 2013g). According to MNDNR,

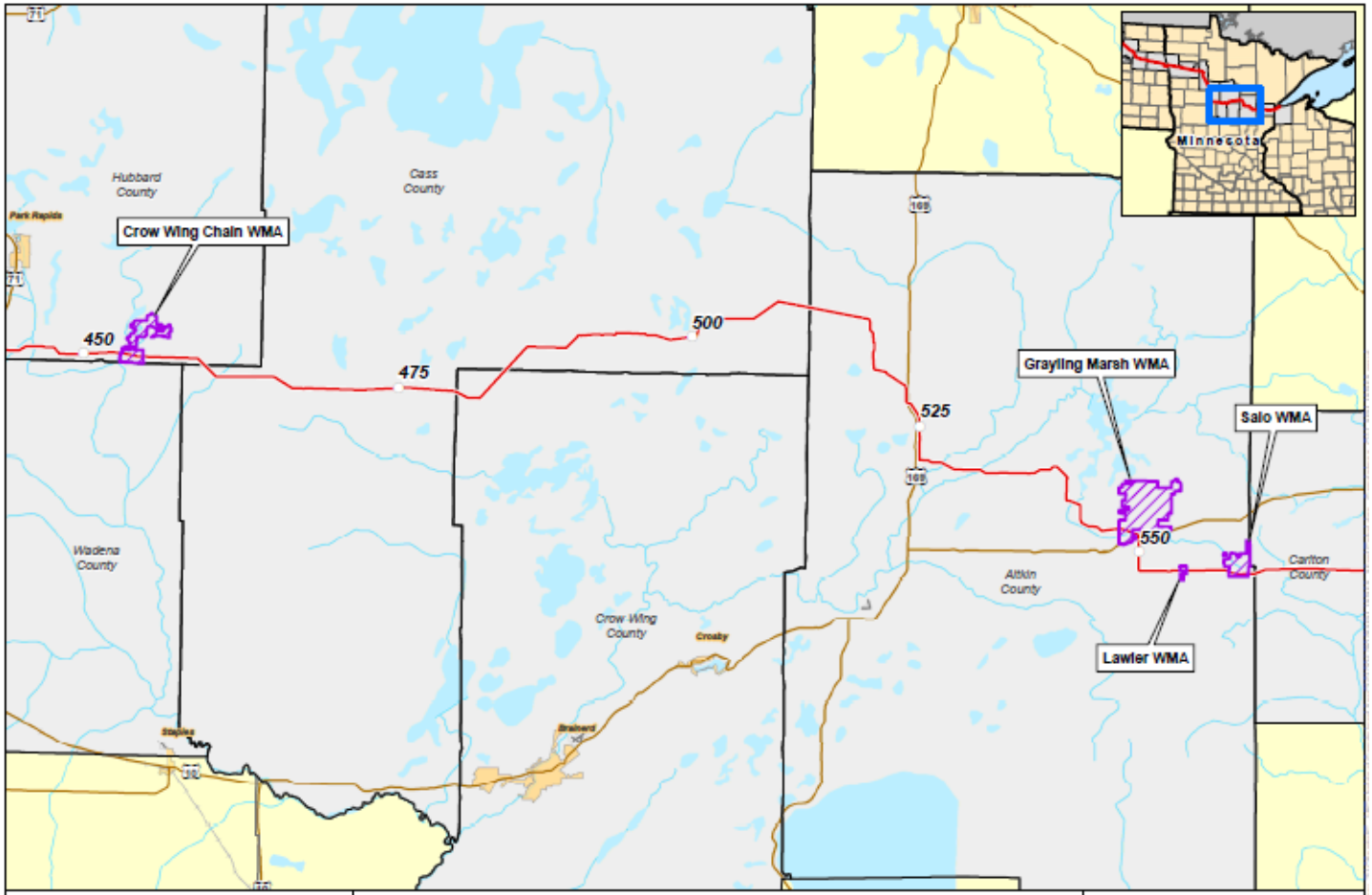
large blocks of habitat and habitat complexes (grassland, wetlands, or forest) can provide an increased diversity and abundance of wildlife, especially for area-sensitive species.

NDPC identified contiguous blocks of grassland/herbaceous, wetland, and forested land that were 40 acres or larger and that also overlapped with the Project route. Land cover types were determined using the USGS LULC Classification System presented in Section 4 of this EIR. Approximately 75 percent of the route that crosses these contiguous areas is co-located with existing third-party rights-of-way, thereby avoiding new fragmentation of large block habitats across much of the Project. On the remaining 25 percent of the route that crosses the contiguous areas, approximately 74 percent of the large block habitats overlap with the route for less than 0.1 mile, 21 percent of the habitats overlap with the route for less than 0.2 mile, and the remaining 5 percent overlap with the route for greater than 0.2 mile. Large block habitat crossings will be restored, allowed to revegetate, and will retain their original habitat function after the pipeline is constructed according to the EPP (see Appendix A). Forested areas on the temporary right-of-way and in additional temporary workspaces will be restored to allow the natural reestablishment of forest cover; the new permanent right-of-way will be maintained in an herbaceous state.

Key Habitats

MNDNR provided NDPC with a list of Key Habitats for Minnesota's Species of Greatest Conservation Need ("SGCN") as defined by the State Wildlife Action Plan (MNDNR, 2013g). Key Habitats, defined as the habitats most important to the greatest number of SGCN, are specific to individual ecological subsections. Many of the Key Habitats provided by MNDNR overlap with the NPCs described in Section 7.1.3 and with large block habitats. Consultation with MNDNR regarding minimization of impacts to Key Habitats is ongoing.

Figure 7.2.2-1
MNDNR Wildlife Management Areas



7.2.3 General Construction and Operation Impacts and Mitigation

Construction and operation of the Project are not expected to have a significant impact on wildlife. Temporary impacts will occur during construction due to clearing of vegetation and disturbance in the right-of-way.

Long-term impacts will be limited to a loss of forest habitat because of clearing the temporary construction right-of-way and extra workspaces that are located in forested areas. Because the Project will be generally co-located with other existing pipelines and third-party rights-of-way, construction and operation of the Project will not significantly alter the character of the landscape for the majority of the preferred route. Landscape alteration will occur in areas of the preferred route where greenfield construction will be required.

Clearing the construction right-of-way will remove vegetative cover and will cause temporary displacement of wildlife species along the preferred route. The construction right-of-way and additional temporary workspaces will remain relatively clear of vegetation until the Project is completed. Some smaller, less mobile animals such as amphibians, reptiles, and small mammals may experience direct mortality during clearing and grading activities. Larger and more mobile animals will disperse from the Project area during construction. Displaced individuals may temporarily occupy adjacent, undisturbed areas, possibly causing increased competition with other individuals in those areas. Some individuals may return to their previously occupied habitats after construction has been completed and suitable habitat has become reestablished. The intensity of construction-related disturbances will depend on the particular species and the time of year during construction.

Clearing of herbaceous and shrub communities in the open areas of the temporary right-of-way, both in upland and wetland areas, will cause a short-term impact due to the relatively quick recolonization of plant species that comprise these communities. Herbaceous cover will be seeded on disturbed areas following the completion of pipeline construction, and it is expected that pre-existing herbaceous and shrub habitats will quickly become reestablished. It is expected that the wildlife species that use these habitats will also return relatively soon after construction. NDPC will employ best management practices as described in its EPP (see Appendix A to this EIR) to limit the introduction or spread of invasive plant species.

After post-construction seeding with herbaceous species, temporary right-of-way and additional temporary workspaces in previously forested areas will be allowed to revegetate naturally with tree and shrub species common to the area. There will be medium-term impacts on wildlife that use forests, due to the conversion of previously forested habitat to herbaceous-dominated habitat on the temporary construction right-of-way. Over time, natural growth and succession will restore the temporary portion of the construction right-of-way and extra workspaces to a forested community, with wildlife typical of forest habitats returning.

Potential long-term impacts on wildlife are associated with the permanent clearing of forest vegetation. The Project will involve the permanent removal of 618.6 acres of forested habitat for the right-of-way, which will be converted to non-forest habitat for the life of the pipeline. Long-term impacts on wildlife species inhabiting undisturbed forests will be minimized in areas where the Project parallels existing, maintained rights-of-way. It is anticipated that the incremental loss of this forested habitat along the existing cleared right-of-way will not have a significant effect on wildlife species.

7.3 FISHERIES

7.3.1 Existing Fisheries Resources

Representative Fish Species

As described in Section 9.2, the Project will cross 144 waterbodies including 57 perennial streams and 87 intermittent streams. Most of these waterbodies contain warm-water fisheries, though some cold-water fisheries are also present in the area. Game fish species found in waterbodies in the vicinity of the Project are listed in Table 7.3.1-1 (MNDNR, 2013h).

Table 7.3.1-1
Game Fish Species in the Sandpiper Pipeline Project Area

Warm-Water Game Fish	Cold-Water Game Fish
Bass (largemouth, rock, smallmouth)	Brook trout
Bullhead (black, brown, yellow)	Rainbow trout
Catfish (channel)	
Crappie (black)	
Muskellunge	
Perch (yellow)	
Pike (northern)	
Sunfish (bluegill, green, hybrid, pumpkinseed)	
Walleye	

Designated Trout Streams

The preferred route will cross five MNDNR designated trout streams, along with four unnamed trout stream tributaries (see Table 7.3.1-2). NDPC is exploring methods for crossing these streams that will minimize impacts to the resource. NDPC will continue to work with Regional Assessment Ecologists from the MNDNR to plan these crossings and to identify other sensitive fisheries crossed by the Project.

Table 7.3.1-2 Trout Stream Locations along the Sandpiper Pipeline Project Area		
County	Waterbody Name	Approximate Milepost
Hubbard	LaSalle Creek	408.4
	Straight River	436.3
Cass	Spring Brook	503.5
Carlton	King Creek	578.9
	Unnamed Stream (tributary to Blackhoof River)	586.7
	Blackhoof River	586.7
	Unnamed Stream (tributary to Blackhoof River)	586.7
	Unnamed Stream (tributary to Blackhoof River)	586.8
	Unnamed Stream (tributary to Blackhoof River)	586.8

Aquatic Management Areas

MNDNR provided NDPC with a list of five AMAs in proximity to the Project. AMAs represent lakes, rivers, streams, and adjacent areas that are critical for fish and other aquatic life and compatible recreational uses. Of the five AMAs listed, the Project will cross two, the Spire Valley Hatchery and LaSalle Creek AMAs. These crossings are further described in Section 11.1.2.

7.3.2 General Construction and Operation Impacts and Mitigation

Installation of the pipeline across streams may temporarily impact movement of fish upstream and downstream of crossing sites due to disturbances associated with construction. The physical disturbance of the streambed may temporarily displace adult fish and may dislodge other aquatic organisms. Some mortality of less mobile organisms, such as small fish and invertebrates, may occur within the trenching area. Aquatic plants, woody debris, and boulders that provide in-stream fish habitat will also be removed during trenching. Noise disturbances upstream and downstream of the sites will deter fish that may otherwise inhabit the area. These disturbances will be temporary and are not expected to significantly affect fisheries resources.

Sediment loads may temporarily increase downstream during open-cut stream crossings. These increased loads may temporarily affect the more sensitive fish eggs, fish fry, and invertebrates inhabiting the downstream area. In a review of 27 case studies of open-cut pipeline water crossings, Reid and Anderson (1999) found that adverse effects on fish and fish habitat were not consistently documented. Where adverse effects did occur, the effects

were short-term, and recovery generally occurred within a year of construction. The crossings will be completed as quickly as possible, and the suspended sediment levels will return to pre-construction levels after in-stream work is completed.

Most streambank vegetation will be removed across the right-of-way during construction. After construction, an area over the pipeline will be maintained in an herbaceous state, and trees that are located near the pipeline will be cut and removed from the right-of-way. Changes in the light and temperature characteristics of some streams may affect the behavioral patterns of fish, including spawning and feeding activities, at the pipeline crossing locations. The maintained streambanks, however, are not wide enough to have a significant impact on general temperature and light conditions of the streams crossed by this Project.

To minimize the potential for adverse impacts on the fisheries at river and stream crossings, NDPC will implement erosion and sediment control measures specified in the EPP (see Appendix A) and limit the duration of construction in these waterbodies.

7.4 THREATENED AND ENDANGERED SPECIES

NDPC initiated consultation in early 2013 with the Midwest Region Ecological Services Field Office (“Region 3”) of the United States Fish and Wildlife Service (“USFWS”) for the Minnesota portion of the Project. The initial consultation letter included a list of federally endangered, threatened, and candidate species that may occur in the Project area in Minnesota. The letter also requested discussions with USFWS to ensure that NDPC considered recommendations regarding the federal Endangered Species Act (“ESA”), Migratory Bird Treaty Act (“MBTA”), and Bald and Golden Eagle Protection Act (“BGEPA”) during Project planning. NDPC discussed initial recommendations with USFWS staff over the phone and received an email in April 2013 with information on federally listed species in the state.

Also in April 2013, the Mountain Prairie Region Ecological Services Field Office (“Region 6”) of the USFWS, whom NDPC had been consulting with for the North Dakota portion of the Project, advised NDPC that it would assume the overall USFWS lead for the entire Project, including the Minnesota portion. Region 6 further stated that consultation and project-specific communications with the USFWS regarding ESA Section 7 consultation could not proceed until a lead federal permitting agency was established for the Project. Therefore, the 2013 ESA species survey protocols and field surveys conducted by NDPC were based on informal information exchanges between NDPC and the USFWS Regions 3 and 6 Ecological Services Field Offices between April and December 2013, or publicly available information.

In November 2013, NDPC met with representatives from the U.S. Army Corps of Engineers (“USACE”) who had now assumed the role of the lead federal agency for the Project, and representatives from USFWS Regions 3 and 6. Region 3 was now designated as the lead USFWS region for the Project, and Section 7 informal consultation under the ESA had been

initiated between the USACE and USFWS. In December 2013, NDPC met again with USFWS Regions 3 and 6, and USACE representatives to discuss federally protected species that occur in the vicinity of the Project and compliance with the ESA, MBTA, and BGEPA. Informal consultations with USACE and USFWS will continue in 2014.

NDPC also initiated consultation with the MNDNR Endangered Species Review Coordinator in early 2013 to understand the potential presence of threatened and endangered species in the vicinity of the Project. NDPC conducted a review of Minnesota NHIS data provided by the MNDNR in April 2013. Table 7.4.1-1 shows NHIS records of threatened or endangered species that occur within a 2-mile-wide study area and that have Element Occurrences within the 2-mile-wide study area that are less than 20 years old, in accordance with MNDNR recommendations in the handout entitled "Determining Potential Impacts to Rare Features" (dated March 2006 and provided to NDPC with NHIS data).

Table 7.4.1-1
Element Occurrences in Minnesota's Natural Heritage Information System for Threatened and Endangered Species

ZOOLOGICAL RECORDS		
Species	Status	County
Blanding's Turtle (*Emydoidea blandingii*)	threatened (state)	Cass
Henslow's Sparrow (*Ammodramus henslowii*)	endangered (state)	Red Lake
BOTANICAL RECORDS		
Lanceleaf Grapefern *(Botrychium lanceolatum)*	threatened (state)	Carlton
Butternut (*Juglans cinerea*)	endangered (state) [a]	Cass
Oake's Pondweed (*Potamogeton oakesianus*)	endangered (state) [a]	Cass

[a] Revised status as of August 19, 2013.

Although there are no NHIS occurrences of Dakota skipper (*Hesperia dacotae*) in the Project area NDPC consulted with USFWS and MNDNR on a grassland/native prairie habitat assessment in 2013. Similarly, although there are no known occurrences of threatened or endangered mussel species within 2 miles upstream or downstream of any Project waterbody crossings, NDPC has consulted with MNDNR on a mussel habitat assessment. As noted in Section 7.1.3, NDPC also has been consulting with MNDNR regarding rare plant surveys. NDPC will continue to consult with MNDNR regarding ongoing habitat assessments and field surveys as they relate to the potential presence of threatened and endangered species in the vicinity of the Project.

7.4.1 General Construction and Operation Impacts and Mitigation

NDPC will continue to consult with USFWS and MNDNR on the status of mitigation strategies for special-status species. If any of these species are identified in the construction right-of-way during surveys, NDPC will work with these agencies to develop mitigation plans to avoid or minimize impacts on the potentially affected species.

8.0 GROUNDWATER RESOURCES

Groundwater is the primary source of water for private, public, commercial, and industrial uses along the preferred route. As discussed in Section 5.0, the preferred route traverses heavily glaciated terrain dominated by thick glacial drift deposits. Although groundwater occurs in both the glacial drift and underlying bedrock aquifers, the glacial drift aquifers tend to be more heavily used for water production in the Project area due to their greater accessibility and the occurrence of permeable aquifer sediments. Groundwater productivity and quality varies greatly throughout the Project area owing to the wide variability seen in the geology.

8.1 AQUIFERS

8.1.1 Glacial Aquifers

Thick glacial sediments, including till, outwash, alluvium and lacustrine deposits, cover much of the Project area. Groundwater yields from these glacial deposits vary but typically range from less than 1 gallon per minute ("gpm") in till and lacustrine deposits to upwards of 500 gpm in alluvium and outwash deposits (Kanivetsky, 1979). Well depths in the glacial deposits typically range from approximately 30- to 380-feet (USGS, 1985).

Unconsolidated glacial aquifers: occur above the bedrock; are typically comprised of sand and gravel deposits; and include alluvial outwash, beach-ridge, valley train, and ice-contact stratified drift deposits. Such deposits may occur as surficial phreatic aquifers or as buried aquifers resulting from repeated glaciations and are typically confined in nature.

Surficial aquifers are an important source of groundwater throughout the Project area, and can provide adequate water volumes to supply municipalities and irrigation systems. The depth of the material is generally less than 100-feet, but may reach several hundred feet in some areas (Adolphson et al., 1981). Short-term groundwater yields from unconfined surficial aquifers vary, but can range from approximately 10 to 3,000 gpm. Water quality of these surficial aquifers can be affected by surface activities, including industrial and agricultural land use, due to the relatively shallow depth of the water table and the relatively coarse texture of the material in the overlying unsaturated zone. Surficial aquifers generally yield good quality water (USGS, 1985).

Buried drift aquifers occur as well-sorted sands and gravels deposited in bedrock valleys, alluvial channels, and outwash plains formed by advancing and retreating glaciers. These deposits subsequently were covered by fine-textured materials (generally glacial till), which formed a confining layer above the aquifer. The confined buried sand and gravel deposits typically are less than 10-feet thick but may locally occur up to 150-feet thick (Adolphson et al., 1981). Buried drift aquifers have limited potential use for high capacity wells, but constitute an important source of groundwater in the region. Well yields range from approximately 10 gpm to 1,000 gpm (Adolphson et al., 1981). The confining layer (e.g., glacial till) above the aquifer generally protects it from contamination resulting from human

activity at the surface. Buried drift aquifers tend to contain highly mineralized water (USGS, 1985).

8.1.2 Cretaceous Aquifer

The Project traverses two occurrences of the Cretaceous Aquifer in Cass and Aitkin counties. It is generally confined and ranges from 200- to 350-feet below the surface (Olsen and Mossler, 1982). Pumping rates of wells screened in this aquifer usually do not exceed 10 gpm, but can locally produce up to 25 gpm (Adolphson et al., 1985). This aquifer is not widely used for groundwater, except where drift aquifers are absent or where well yields are poor. Most water use from this aquifer is for rural domestic and livestock supplies, and the potential for development of large municipal and industrial water supplies is low.

8.1.3 Precambrian Aquifers

The preferred route crosses over Precambrian aquifers comprised of undifferentiated granite, greenstone, and slate from central Minnesota to the northwest and Proterozoic metasediments from central to eastern Minnesota. These aquifers can yield limited supplies of water to rural domestic and livestock wells where fractures, faults, and weatherized zones provide porosity and permeability. Wells in these aquifers are generally completed at depths ranging from 30- to 400-feet and generally yield between 1 and 25 gpm (Adolphson et al, 1981).

8.2 EXISTING GROUNDWATER RESOURCES

8.2.1 Public Water Supply Wells

The Minnesota Department of Health (“MDH”) and the MGS jointly maintain a water well database known as the County Well Index (“CWI”). The CWI is a computerized database that contains basic information for over 340,000 water wells and boreholes drilled in Minnesota. CWI data is derived from water well contractors’ documentation of geologic materials encountered during drilling. The CWI was used to identify public water supply wells located near the preferred route (MGS, 2014). No public water supply wells were identified in the vicinity of the Project.

8.2.2 Federal and State Designated Aquifers

The preferred route will not cross any Environmental Protection Agency (“EPA”)-designated sole-source aquifers (EPA, 2013). The only EPA-designated sole-source aquifer in Minnesota is the Mille Lacs Aquifer, located south of the preferred route.

The pipeline will cross about 0.3 mile of a Drinking Water Supply Management Area (“DWSMA”) for Sundsrud’s Court near approximate MP 433.0 in the vicinity of Park Rapids

in Hubbard County (MDH, 2014). MDH rates the sensitivity of the aquifer that supplies the well for that water supply as "high." NDPC consultations with the operators of the DWSMA and the MDH regarding this crossing are ongoing.

In addition, the Project crosses the Wrenshall DWSMA between MP 594.7 and MP 595.3 in Carlton County for a crossing distance of 0.6 mile. The Wrenshall 1 Wellhead Protection Area ("WPA") within the DWSMA also will be crossed for a distance of 390 feet (MDH, 2014). The project is co-located with the Enbridge Mainline system as it crosses this DWSMA and WPA. NDPC has initiated consultation with the operators of the WPA and the MDH regarding this crossing.

8.2.3 Water Supply Wells

A review of the CWI database (MGS, 2013) identified 12 drilling records within 200-feet of the preferred pipeline route (see Table 8.2.3-1). Of these, one was for a test hole and two were for irrigation wells. The remaining nine logs were for residential domestic supply wells. NDPC continues to consult with affected landowners regarding known cased wells in the vicinity of the right-of-way. If such wells are identified, the locations of these wells will be noted. NDPC will develop site-specific plans for wells that could be impacted by construction.

Table 8.2.3-1
Wells/Boreholes Identified Within 200-Feet of the Sandpiper Pipeline Project

County	Milepost	Distance from Pipeline Centerline (feet)	Direction from Pipeline Centerline	Use
Hubbard	412.4	80	East	Domestic
	414.9	63	West	Test hole-abandoned
	414.9	34	East	Irrigation
	422.4	81	East	Domestic
	431.6	84	East	Domestic
	433.0	120	East	Domestic
	433.0	112	Northeast	Domestic
	437.6	62	East	Domestic
	449.1	160	Northeast	Irrigation
Carlton	582.5	175	South	Domestic
	591.7	186	North	Domestic
	596.1	139	North	Domestic

8.3 CONTAMINATED GROUNDWATER

NDPC accessed a Minnesota Pollution Control Agency ("MPCA") database (MPCA, 2014) to identify sites with known or potential contamination within 0.5 mile of the Project. This database included federal regulatory listings, such as the National Priority List (or federal Superfund); Comprehensive Environmental Response, Compensation, and Liability Information System, (or potential National Priority List sites); No Further Response Action Planned; Resource Conservation and Recovery Act ("RCRA") Treatment, Storage, and Disposal; and RCRA hazardous waste generators. State listings included the: Permanent List of Priorities ("PLP", or state-equivalent Superfund); Delisted PLP; Voluntary Investigation and Cleanup; Permitted Solid Waste Facilities; Unpermitted Dumps; Closed Landfill Program; and the State Assessment Program.

The following types of sites/facilities listed in the database were eliminated from further consideration: sites permitted for construction or industrial stormwater discharge, feedlots, waste water dischargers, and small to minimal hazardous waste generators regulated under RCRA. Table 8.3-1 summarizes the sites that were identified with potential contamination located within 0.5 mile of the Project. Based on this information, a total of 30 sites were identified along the pipeline route. Of these sites, 21 sites were determined to be more than 500-feet from the preferred route and, therefore, are not anticipated to impact or be impacted by the Project. Since inaccuracies are inherent to the database, it will be necessary to evaluate facilities on a site-by-site basis. Prior to Project construction, NDPC will assess the potential for encountering contaminated groundwater if any of the sites are actually located within 500-feet of the preferred route. NDPC will consult with the appropriate regulatory agencies to confirm the Project will not encounter contamination from the site. If necessary, appropriate avoidance or mitigation measures will be developed and implemented in accordance with applicable state and federal regulations.

Table 8.3-1
Contaminated Sites within 0.5 Mile of the Sandpiper Pipeline Project

County	City	Site/Facility Name	Milepost	Distance from Centerline (feet)	Listing Type
Polk	Fisher	B Wagner Farms	306.7	2,096	Landfill, Permitted By Rule
	Fisher	Sugro Inc	306.7	2,096	Tank Site
	Fisher	Bygland Lutheran Church	306.7	2,096	Tank Site
	Fisher	Mark Egeland Inc	306.7	2,096	Tank Site
	Fisher	Independent School District 600	306.7	2,096	Tank Site
	Crookston	Crookston Dump I	318.1	1,506	Unpermitted Dump Site
Clearwater	Clearbrook	Riviana Foods Inc - Clearbrook Facility	375.4	1,362	Multiple Activities

Table 8.3-1
Contaminated Sites within 0.5 Mile of the Sandpiper Pipeline Project

County	City	Site/Facility Name	Milepost	Distance from Centerline (feet)	Listing Type
	Bagley	Friborg Residence	384.2	2,166	Leak Site
	Bagley	Clearwater County Demolition Debris Land Disposal	386.4	1,749	Multiple Activities
Hubbard	Lake Alice Township	Lake Alice Township Dump	413.0	2,351	Unpermitted Dump Site
	Park Rapids	Buck Stop	419.8	2,157	Tank Site
	Park Rapids	Headwaters Country Club Dump	431.1	1,760	Unpermitted Dump Site
Cass	Backus	Grinning Bear Demolition Landfill	477.6	1,474	Landfill, Open
	Outing	Crooked Lake Dump	501.5	972	Unpermitted Dump Site
Aitkin	Palisade	Robinson Store & Ab Service	528.9	1,386	Multiple Activities
Carlton	Moose Lake	Minnesota Sex Offender Program Moose Lake	569.4	1,459	Multiple Activities
	Carlton	City of Carlton Garage	591.0 [a]	5	Multiple Activities
	Carlton	Northern Natural Gas Compressor Station	591.0 [a]	5	Tank Site
	Barnum	Carlton County Highway Department	591.0 [a]	5	Tank Site
	Carlton	Conoco Terminal	591.0 [a]	5	Tank Site
	Carlton	Carlton Co Sheriff's Department	591.0 [a]	5	Tank Site
	Carlton	Carlton Feed Mill	591.0 [a]	5	Tank Site
	Carlton	Carlton Storage	591.0 [a]	5	Tank Site
	Carlton	Bw Smith Property	591.0 [a]	5	Tank Site
	Wrenshall	Wrenshall Dump	594.3	1,660	Unpermitted Dump Site
	Wrenshall	Conoco Inc Lakehead Tank Farm	595.9	2,238	CERCLIS Site
	Wrenshall	Former Conoco Lakehead Pipeline Terminal	595.9	261	Leak Site
	Wrenshall	Northern Natural Gas Co - Wrenshall LNG Plant	596.1	1,603	Multiple Activities
	Wrenshall	Northern Natural Gas Co	596.1	1,595	Tank Site
	Wrenshall	Wrenshall Public School PBR	596.6	1,436	Landfill, Permitted By Rule

[a] The presence of multiple sites at this milepost is likely attributable to a database entry error.

8.4 GENERAL CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

Construction of the project is not expected to have long-term impacts on groundwater resources. Ground disturbance associated with pipeline construction is primarily limited to the upper 10-feet, which is above the water table of most regional aquifers. Construction activities, such as trenching, backfilling, and dewatering, that encounter shallow surficial aquifers may result in minor short-term fluctuations in groundwater levels within the aquifer. Once the construction activity is complete, the groundwater levels typically recover quickly.

8.4.1 Blasting

Blasting is not currently anticipated for the Project. Blasting to install the pipeline in a bedrock aquifer has the potential to adversely affect water quality and water yields in nearby water wells. Only 2.5 miles of the preferred route will cross areas with bedrock outcrops. If blasting is required, NDPC will conduct these activities in accordance with applicable regulations.

8.4.2 Releases

The introduction of contaminants into groundwater due to accidental release of construction related chemicals, fuels, or hydraulic fluid during construction could have an adverse effect on groundwater quality, most notably near shallow water wells. Spill-related impacts from pipeline construction are primarily associated with fuel storage, equipment refueling, and equipment maintenance. NDPC's EPP (see Appendix A) outlines measures that will be implemented to prevent accidental releases of fuels and other hazardous substances. The EPP also describes response, containment, and cleanup procedures. By implementing the protective measures set forth in the EPP, long-term contamination due to construction activities is not anticipated.

Accidental releases from the pipeline system during operations can also potentially affect groundwater. Pipeline operation is regulated by the U.S. Department of Transportation-Office of Pipeline Safety. NDPC will implement an ongoing inspection program, under that office's regulations, to monitor the integrity of the pipeline system. Monitoring activities include regular inspection of the cathodic protection system, which addresses the possible corrosion potential for a steel pipe installed below the ground surface. In addition, NDPC will use computerized inspection tools that travel through the inside of the pipeline to check pipe integrity. The NDPC System is patrolled by air biweekly (26 times a year not to exceed 3 weeks between flights) to inspect surface conditions of land on or adjacent to the pipeline right-of-way. As required by federal law, NDPC will maintain an Emergency Response Plan to address pre-planning, equipment staging, notifications, and leak containment procedures to be implemented in the event of a pipeline release.

9.0 SURFACE WATER RESOURCES

Minnesota is known for its abundant surface water resources, including lakes, rivers, streams, and wetlands. From a water resource management perspective, Minnesota is divided into 10 major drainage basins that are used by governing agencies to identify and assess water quality issues and develop water quality protection goals.

9.1 MAJOR BASINS AND WATERSHEDS

Surface waters crossed by the preferred route are located within the Red River of the North, Mississippi Headwaters, St. Croix River, and Western Lake Superior Basins (USGS, 2013). Table 9.1-1 summarizes the watersheds crossed by the Project (USGS, 2013), which are also shown in Figure 9.1-1.

The Red River of the North Basin encompasses a 39,270 square mile surface drainage area to the main stem of the Red River of the North within the United States. The basin represents an important hydrologic region where good quality water is a valued resource vital to the region's economy. Additionally, the drainage flows northward into Manitoba, Canada and is of international concern. The Red River of the North receives most of its flow from its eastern tributaries largely as a result of regional patterns in precipitation, evapotranspiration, soils and topography. Annual runoff varies greatly, but most runoff occurs in spring and early summer from rains falling on saturated soils.

The Mississippi Headwaters Basin covers approximately 20,162 square miles. The basin is a mixture of forest, prairie, agriculture, and urban land areas. From the headwaters, the Mississippi River flows south 2,340 miles to the Gulf of Mexico (USGS, 1990).

The St. Croix River Basin covers approximately 7,733 square miles in Minnesota and Wisconsin and extends from near Mille Lacs Lake in Minnesota on the west to near Cable, Wisconsin, on the east. Approximately 45 percent of the watershed is located in Minnesota.

The Lake Superior Basin covers approximately 9,126 square miles in Minnesota and Wisconsin. The Lake Superior Basin is Minnesota's only basin that is on a Great Lake coastline. Much of the land within the Lake Superior basin is forested, with very little agriculture due to the cool climate and poor soils. Streams within the basin flow to Lake Superior, which discharges into Lake Huron, and ultimately flows into the St. Lawrence Seaway via Lakes Erie and Ontario.

The Project will cross the Red Lake Watershed District and Wild Rice Watershed District in Minnesota as discussed in Section 4.2.2. The primary purpose of watershed districts is to conserve the natural resources within them through land use planning, flood control, and other conservation practices. The project also crosses the Big Sandy Lake Watershed Management Project between MPs 540.5 and 562.4 in Aitkin and Carlton counties, which includes Big Sandy Lake and Lake Minnewawa. Both lakes are currently listed as 303(d)

impaired Waters List due to excessive nutrients, specifically phosphorous loading. Neither lake is crossed by the Project.

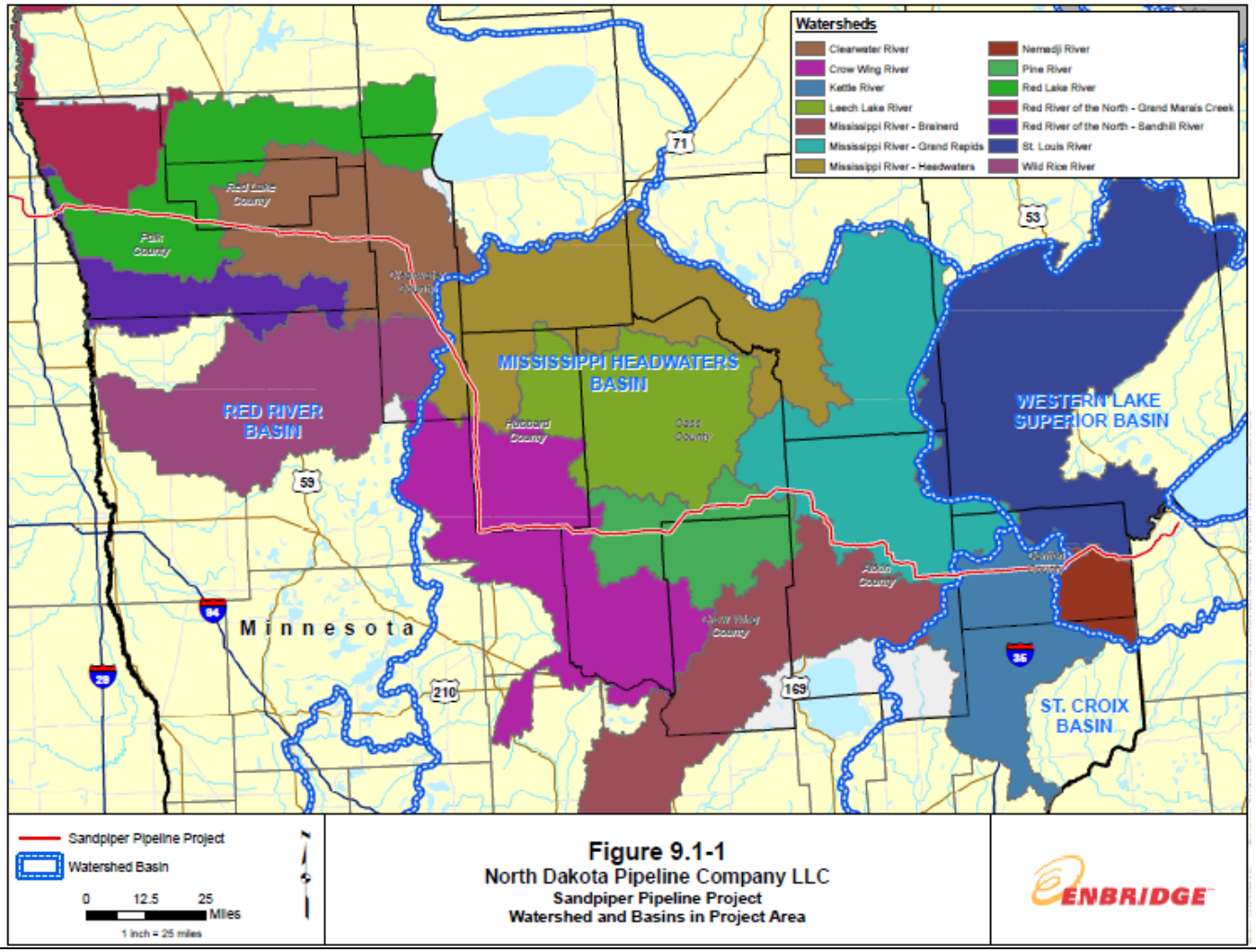
Table 9.1-1
Watersheds Crossed by the Sandpiper Pipeline Project Route

Basin Name	Watershed Name	Hydrologic Unit Code (HUC)	Milepost In	Milepost Out	Crossing Length (miles)
Red River of the North	Sandhill-Wilson	9020301	299.3	302.6	3.3
	Red Lake	9020303	302.6	307.6	5.0
	Grand Marais-Red	9020306	307.6	313.7	6.1
	Red Lake	9020303	313.7	315.4	1.8
	Grand Marais-Red	9020306	315.4	316.4	1.0
	Red Lake	9020303	316.4	336.1	19.6
	Clearwater	9020305	336.1	393.7	57.6
	Eastern Wild Rice	9020108	393.7	393.7	0.1
	Clearwater	9020305	393.7	393.9	0.1
	Eastern Wild Rice	9020108	393.9	399.3	5.4
Mississippi Headwaters	Mississippi Headwaters	7010101	399.3	417.5	18.2
	Crow Wing	7010106	417.5	466.7	49.1
	Pine	7010105	466.7	489.7	23.0
	Leech Lake	7010102	489.7	489.8	0.1
	Pine	7010105	489.8	491.9	2.1
	Leech Lake	7010102	491.9	492.3	0.4
	Pine	7010105	492.3	507.7	15.3
	Prairie-Willow	7010103	507.7	522.6	15.0
	Elk-Nokasippi	7010104	522.6	522.7	0.1
	Prairie-Willow	7010103	522.7	523.0	0.3
	Elk-Nokasippi	7010104	523.0	526.1	3.1
	Prairie-Willow	7010103	526.1	527.4	1.3
	Elk-Nokasippi	7010104	527.4	529.2	1.8
	Prairie-Willow	7010103	529.2	534.5	5.3
	Elk-Nokasippi	7010104	534.5	535.4	0.8
	Prairie-Willow	7010103	535.4	554.7	19.3
	Elk-Nokasippi	7010104	554.7	554.8	0.1
	Prairie-Willow	7010103	554.8	555.3	0.5
	Elk-Nokasippi	7010104	555.3	555.6	0.3
	Prairie-Willow	7010103	555.6	561.8	6.1
St. Croix	Kettle	7030003	561.8	584.0	22.2

Table 9.1-1
Watersheds Crossed by the Sandpiper Pipeline Project Route

Basin Name	Watershed Name	Hydrologic Unit Code (HUC)	Milepost In	Milepost Out	Crossing Length (miles)
Western Lake Superior	Beartrap-Nemadji	4010301	584.0	584.2	0.2
St. Croix	Kettle	7030003	584.2	584.3	0.1
Western Lake Superior	Beartrap-Nemadji	4010301	584.3	584.5	0.2
St. Croix	Kettle	7030003	584.5	585.0	0.5
Western Lake Superior	Beartrap-Nemadji	4010301	585.0	589.9	4.9
	St. Louis	4010201	589.9	591.0	1.1
	Beartrap-Nemadji	04010301	591.0	594.9	3.8
	St. Louis	04010201	594.9	596.4	1.5
	Beartrap-Nemadji	04010301	596.4	598.8	2.4
	St. Louis	04010201	598.8	600.8	2.0

Figure 9.1-1
Watersheds and Basins in the Project Area



9.2 WATERBODY CROSSINGS

NDPC conducted waterbody field surveys along the preferred route in 2013 to identify waterbody (e.g., lakes, streams, rivers, and drainage ditches) locations and widths at the point of crossing. Hydrographic spatial data coverage was used to identify waterbodies (e.g., lakes, streams, rivers, and drainage ditches) crossed by the preferred route (MNDNR, 2013a) when survey data was not available. This review identified 144 waterbodies crossed by the preferred route, including 57 perennial streams and 87 intermittent streams (includes ephemeral waterways). Of these waterbodies, 60 are designated as Public Waters by MNDNR, and 7 are considered navigable waters. Waterbodies crossed by the Project are summarized in Table 9.2-1. A list of individual waterbodies crossed by the Project is included in Appendix E. NDPC has recently revised its survey area to account for changes in the route since the last filing. As of the end of the 2013 field season, 93 percent of waterbody field surveys were complete in Minnesota. The remaining 7 percent will be surveyed in early 2014. NDPC will determine the appropriate crossing method for each waterbody upon further consultation with appropriate regulatory agencies and further engineering review.

Table 9.2-1
Summary of Waterbodies Crossed by the Sandpiper Pipeline Project [a]

County	Intermittent	Perennial	MNDNR Public Watercourses	Wild and Scenic Rivers	State Canoe Routes[b]	Trout Streams/ Tributaries[c]	Navigable Waters[d]
Polk	22	9	11	0	3	0	2
Red Lake	7	3	3	0	0	0	0
Clearwater	5	8	10	0	1	0	0
Hubbard	0	9	9	0	1	2	0
Cass	12	10	6	0	1	1	0
Crow Wing	0	0	0	0	0	0	0
Aitkin	35	6	7	0	1	0	2
Carlton	6	12	14	0	0	6	3
Total	**87**	**57**	**60**	**0**	**7**	**9**	**7**

[a] MNDNR (2013a)
[b] MNDNR (2013b)
[c] MNDNR (2013c); Designated a Trout Stream, per Minnesota Rules 6264, Subp.4.
[d] Red River of the North and Red Lake River (Polk County); Mississippi River and Sandy River (Aitkin County); Kettle River, West Branch Moose River, and Moose River (Carlton County).

9.2.1 Water Quality

Clean Water Act ("CWA") Section 303(d), requires that each state review, establish, and revise water quality standards for all surface waters within the state. To comply with this requirement, each state crossed by the Project has developed its own beneficial use classification system to describe state designated use(s). Regulatory programs for water quality standards include default narrative standards, nondegradation provisions, a Total Maximum Daily Load ("TMDL") regulatory process for impaired waters, and associated minimum water quality requirements for the designated uses of listed surface waterbodies within the state.

The Project will cross 11 impaired streams in 15 different locations as identified by MPCA's 2012 Inventory of Impaired Waters per CWA Section 303 (d). Table 9.2.1-1 lists these streams, their affected use, and reason for impairment. No impaired lakes or wetlands on the 2012 Inventory will be crossed by the Project (MPCA 2013).

In addition, MPCA has recently released its draft list of 2014 impaired waters (MPCA 2013). All of the waterbodies crossed by the Project on the 2012 Inventory remain on the 2014 Inventory. One crossed waterbody gained a new impairment (Grand Marais Creek); one crossed waterbody was delisted for an affected use (Mississippi River); and the Project will cross one new waterbody on the 2014 Inventory that was not previously listed (two crossings of the Shell River). These draft changes are reflected in Table 9.2.1-1. No impaired lakes or wetlands on the 2014 Inventory will be crossed by the Project. NDPC will continue to monitor the status of these waterbodies and plan construction activities accordingly in the event that the 2014 Inventory is finalized by MPCA.

The MNDNR maintains a list of Minnesota waterbodies infested with aquatic invasive plants, animals, and diseases. The list is periodically updated as invasive species are observed in new waterbodies. Activities within these waters are regulated by the MNDNR to prevent spread to non-infested waters. NDPC reviewed waterbodies crossed with the MNDNR Designation of Infested Waters (dated December 16, 2013) (MNDNR, 2014a). The Project crosses the Crow Wing River (MP 454.6), which is designated as being infested with Eurasian watermilfoil. No other waterbodies crossed by the Project were included in the Infested Waters list. NDPC will take the appropriate measures during construction to ensure that activities at the Crow Wing River will not result in spread of Eurasian watermilfoil. NDPC will continue to monitor the status of this list and will plan construction activities accordingly in the event that additional waterbodies are added to the list.

Table 9.2.1-1
Impaired Streams Crossed by the Sandpiper Pipeline Project

County	Waterbody	Milepost	Affected Use	Use Support [a]	Impairment
Polk	Red River of the North	300.0	Aquatic Consumption	5A	Mercury, PCB
	Red Lake River	306.2	Aquatic Consumption, Aquatic Life	5B	Mercury, Temperature
	Grand Marais Creek	308.6	Aquatic Life	5A	Dissolved Oxygen, pH, Temperature, *Chlorpyrifos*
	Red Lake River	325.7	Aquatic Consumption, Aquatic Life	5B	Mercury, Temperature
Clearwater	Silver Creek	374.8	Aquatic Recreation	5C	Fecal Coliform
	Silver Creek	375.1	Aquatic Recreation	5C	Fecal Coliform
	Silver Creek	375.4	Aquatic Recreation	5C	Fecal Coliform
	Clearwater River	387.9	Aquatic Consumption, Aquatic Life	5B	Mercury, Dissolved Oxygen
	Walker Brook	389.9	Aquatic Life	5C	Dissolved Oxygen
	Mississippi River	403.6	Aquatic Life	4D	Dissolved Oxygen
Hubbard	Straight River	436.3	Aquatic Life	5C	Dissolved Oxygen
	Shell River	*438.7*	*Aquatic Life*	*4C*	*Fisheries Bioassessment*
	Shell River	*443.5*	*Aquatic Life*	*4C*	*Fisheries Bioassessment*
	Crow Wing River	454.6	Aquatic Consumption	4A	Mercury
Cass	Moose River	510.0	Aquatic Life	5C	Dissolved Oxygen
Aitkin	Mississippi River	534.0	Aquatic Consumption	4A	Mercury
Carlton	Kettle River	572.9	Aquatic Consumption	5C	Mercury

Note [a]	*Italicized text* indicates draft status or change on the MPCA's 2014 List of Impaired Waters Categories: 4A: Impaired or threatened but all necessary TMDL plans have been completed. 4C: Impaired or threatened but does not require a TMDL because impairment not caused by a pollutant. 4D: Impaired or threatened but doesn't require a TMDL plan because the impairment is due to natural conditions with only insignificant anthropogenic influence. 5A: Impaired by multiple pollutants and no TMDL study plans are approved by EPA. 5B: Impaired by multiple pollutants and at least one TMDL study plan is approved by EPA. 5C: Impaired or threatened by one pollutant.

9.2.2 Public Water Watercourses

The Project will cross 60 watercourses (Public Water Watercourses) listed on the MNDNR Public Waters Inventory ("PWI") (MNDNR, 2013d). These watercourses are regulated as public waters under the MNDNR's Public Waters Permit Program. The public watercourses are summarized in Table 9.2.2-1.

Table 9.2.2-1
MNDNR Public Water Watercourses Crossed by the Sandpiper Pipeline Project

Milepost	Type	Name	PWI Classification
300.0	Centerline (River)	Red River of the North	PWI Natural Watercourse
302.7	Stream (Perennial)	Unnamed Waterbody	PWI Natural Watercourse
303.8	Stream (Intermittent)	Unnamed Waterbody	PWI Natural Watercourse
306.2	Centerline (River)	Red Lake River	PWI Natural Watercourse
308.5	Stream (Intermittent)	Grand Marais Creek	PWI Natural Watercourse
317.5	Drainage Ditch (Intermittent)	Unnamed Waterbody	PWI Altered-Natural Watercourse
325.7	Centerline (River)	Red Lake River	PWI Natural Watercourse
326.5	Stream (Perennial)	Kripple Creek (Perennial)	PWI Natural Watercourse
331.1	Drainage Ditch (Perennial)	Judicial Ditch #66 (Perennial)	PWI Altered-Natural Watercourse
335.6	Drainage Ditch (Intermittent)	Judicial Ditch #64 (Intermittent)	PWI Altered-Natural Watercourse
340.5	Drainage Ditch (Intermittent)	Lower Badger Creek	PWI Altered-Natural Watercourse
343.0	Stream (Intermittent)	Beau Gerlot Creek	PWI Natural Watercourse
346.9	Stream (Perennial)	Poplar River	PWI Natural Watercourse
357.1	Stream (Perennial)	Hill River	PWI Natural Watercourse
371.2	Stream (Perennial)	Lost River (Perennial)	PWI Natural Watercourse
374.8	Stream (Perennial)	Silver Creek	PWI Natural Watercourse
375.1	Stream (Perennial)	Silver Creek	PWI Natural Watercourse
375.4	Stream (Perennial)	Silver Creek	PWI Natural Watercourse
376.6	Stream (Intermittent)	Unnamed Waterbody	PWI Natural Watercourse
387.9	Centerline (River)	Clearwater River	PWI Natural Watercourse
389.9	Stream (Perennial)	Walker Brook	PWI Natural Watercourse
391.1	Stream (Intermittent)	Unnamed Waterbody	PWI Natural Watercourse
402.7	Stream (Perennial)	Unnamed Waterbody	PWI Natural Watercourse
403.6	Stream (Perennial)	Mississippi River	PWI Natural Watercourse
408.4	Stream (Perennial)	LaSalle Creek	PWI Natural Watercourse
424.5	Stream (Perennial)	Unnamed Waterbody	PWI Natural Watercourse

Table 9.2.2-1
MNDNR Public Water Watercourses Crossed by the Sandpiper Pipeline Project

Milepost	Type	Name	PWI Classification
426.0	Connector (Lake)	Hay Creek Connector Lake	PWI Natural Watercourse
436.3	Centerline (River)	Straight River	PWI Natural Watercourse
438.7	Stream (Perennial)	Shell River (Perennial)	PWI Natural Watercourse
443.5	Stream (Perennial)	Shell River (Perennial)	PWI Natural Watercourse
445.8	Centerline (River)	Shell River (Perennial)	PWI Natural Watercourse
447.4	Centerline (River)	Unnamed Waterbody	PWI Natural Watercourse
454.6	Centerline (River)	Crow Wing River	PWI Natural Watercourse
462.4	Drainage Ditch (Perennial)	Big Swamp Creek (Perennial)	PWI Altered-Natural Watercourse
479.2	Centerline (River)	Pine River	PWI Natural Watercourse
488.3	Stream (Perennial)	Blind Lake Creek (Perennial)	PWI Natural Watercourse
499.2	Stream (Perennial)	Daggett Brook	PWI Natural Watercourse
503.5	Stream (Perennial)	Spring Brook	PWI Natural Watercourse
510.0	Stream (Perennial)	Moose River	PWI Natural Watercourse
515.4	Stream (Intermittent)	Unnamed Waterbody	PWI Natural Watercourse
521.0	Stream (Perennial)	Unnamed Waterbody	PWI Altered-Natural Watercourse
528.7	Stream (Intermittent)	Unnamed Waterbody	PWI Natural Watercourse
530.8	Stream (Perennial)	Willow River	PWI Natural Watercourse
534.0	Centerline (River)	Mississippi River	PWI Natural Watercourse
543.3	Centerline (River)	Sandy River	PWI Natural Watercourse
550.2	Drainage Ditch (Perennial)	Sandy River	PWI Altered-Natural Watercourse
564.6	Connector (Wetland)	West Branch	PWI Natural Watercourse
564.8	Stream (Perennial)	Kettle River – West Branch	PWI Natural Watercourse
569.3	Stream (Perennial)	Heikkila Creek	PWI Natural Watercourse
572.9	Drainage Ditch (Perennial)	Kettle River	PWI Natural Watercourse
577.4	Stream (Perennial)	Moose Horn River, West Fork	PWI Natural Watercourse
578.9	Stream (Intermittent)	King Creek	PWI Natural Watercourse
581.4	Stream (Perennial)	Park Lake Creek	PWI Natural Watercourse
582.4	Stream (Perennial)	Moose Horn River	PWI Natural Watercourse
586.7	Stream (Perennial)	Unnamed Waterbody	PWI Natural Watercourse
586.7	Stream (Perennial)	Blackhoof River	PWI Natural Watercourse
586.7	Stream (Perennial)	Unnamed Stream	PWI Natural Watercourse

Table 9.2.2-1 MNDNR Public Water Watercourses Crossed by the Sandpiper Pipeline Project			
Milepost	Type	Name	PWI Classification
586.8	Stream (Perennial)	Unnamed Stream	PWI Natural Watercourse
586.8	Stream (Perennial)	Unnamed Stream	PWI Natural Watercourse
597.7	Stream (Intermittent)	Unnamed Stream	PWI Natural Watercourse

As part of its early coordination review, MNDNR presented a proposed crossing location for the Shell River in Hubbard County (MNDNR, 2013g). MNDNR noted that based on aerial photography there are two existing routes between Twin Lakes and Hinds Lake near MP 445.0 and MP 446.0. MNDNR requested that NDPC utilize the southern route of disturbance, as it crosses one fewer tributary. NDPC plans to use the recommended southern route for the Project in this area.

9.2.3 Special Designated Waterbodies

Outstanding Resource Value Waters

MNDNR designates certain surface waters and wetlands as Outstanding Resource Value Waters ("ORVW") to provide an additional level of protection to preserve their values for recreational, cultural, aesthetic, or scientific resources. Based on review of Minnesota Rule 7050.0180, NDPC confirmed that the Project will not cross or be located near any published ORVWs.

Calcareous fens are rare peat-accumulating wetlands which have additional legal protection in Minnesota. Calcareous fens are designated as ORVWs and are given special protection by state regulations. Calcareous fens may not be filled, drained, or otherwise degraded by any activity except as provided for in a fen management plan approved by the MNDNR. NDPC has contracted with Midwest Natural Resources ("MNR") to conduct wetland delineation surveys in Minnesota. Members of the MNR survey team are knowledgeable in the identification of calcareous fens and other rare plant communities that may indicate the presence of a calcareous fen.

NDPC has reviewed available MNDNR data regarding known calcareous fens to identify documented sites, and will seek to avoid impacts to calcareous fens by identifying known fens, documenting previously unknown fens during wetland surveys, coordinating with the MNDNR, and making route and construction modifications as necessary. No previously identified fens will be affected by Sandpiper; however, 2013 field surveys identified a previously unknown calcareous fen associated with the Hill River drainage (approximate MP 356.2) that would be crossed by the proposed pipeline route. In coordination with the MNDNR, NDPC met with specialists from the Division of Ecological and Water Resources in September 2013 to verify the fen boundaries and discuss possible route alternatives to

avoid disturbance to the fen. NDPC will continue to consult with the MNDNR regarding this fen.

NDPC has recently revised its survey area to account for changes in the route since the last filing. As of the end of the 2013 field season, NDPC has surveyed approximately 98 percent of the route in Minnesota in areas that have characteristics that are conducive for the formation of calcareous fens, and 93 percent of the entire route. The remaining unsurveyed sections of the route will be completed in 2014.

Wild and Scenic Rivers

Pursuant to Section 5(d) of the National Wild and Scenic Rivers Act, the National Park Service ("NPS") maintains the Nationwide Rivers Inventory ("NRI"), a listing of more than 3,400 free-flowing river segments in the United States that are believed to possess one or more "outstandingly remarkable" natural or cultural values judged to be of more than local or regional significance. The NRI includes river segments that potentially qualify as national wild, scenic, or recreational river areas. Under a 1979 Presidential Directive and related Council on Environmental Quality regulations, all federal agencies must seek to avoid or mitigate actions that will adversely affect NRI segments. NRI waterbodies are to be taken into consideration by each federal agency in its normal planning and environmental review process. Impacts need to either be avoided or mitigated to prevent adverse effects on the river. In addition, federal agencies need to consult with the NPS prior to review of actions that may adversely affect a river listed on the NRI.

Streams listed on the NRI that will be crossed by the Project are the Red Lake, Clearwater, Moose, and Willow Rivers (NPS, 2013). However, the Project will not cross any streams designated as federal Wild and Scenic Rivers in Minnesota. Additionally, it will not cross any streams designated under the 1973 Wild and Scenic Rivers Act of Minnesota. NDPC initiated consultation with the NPS regarding these crossings; in addition, river crossings will be coordinated with the MNDNR. These rivers are further discussed in Section 11.1.1.

State Canoe/Boating Routes

The preferred route will cross five waterbodies listed as state-designated canoe and boating routes (MDNRb, 2013) in seven different locations: the Red River of the North, Red Lake River (twice), Pine River, Crow Wing River, and the Mississippi River (twice). The MNDNR manages canoe/boating routes in the state and NDPC has initiated consultations with the MNDNR regarding appropriate crossing plans as part of the License to Cross Public Waters permitting process. State boating routes crossed by the Project are further discussed in Section 11.1.2.

9.2.4 Waterbody Construction Methods

NDPC is planning to install the pipeline under waterbodies using several different crossing methods, including open-cut or dry crossing methods, such as the dam-and-pump or flume method. Dry crossing methods may be used depending on site conditions, stream type, and/or presence of sensitive species. NDPC is also evaluating the use of the HDD method at certain crossings. NDPC continues to evaluate crossing plans based on the results of environmental, civil, and geotechnical surveys near waterbodies. For all public waterbody crossings, NDPC will work with the MNDNR to determine crossing plans that result in the least impact to the resource. The following subsections describe typical construction procedures that will be used to install the pipeline across waterbodies.

Clearing and Grading

NDPC will clear existing vegetation from the construction right-of-way as necessary to prepare for grading operations. A buffer of undisturbed non-woody vegetation will be maintained on stream banks until the trenching begins at the stream crossing. Woody vegetation within this buffer may be cut manually and removed during initial clearing of the right-of-way. Additionally, some limited grading at stream banks may be necessary to install temporary bridges across streams. Grading will be directed away from the waterbody to reduce the potential for material to enter the waterbody.

Prior to trenching, NDPC may need to grade approaches to waterbodies to create a safe working surface and to allow for limitations on pipe bending. Temporary erosion control measures (e.g., silt fences, staked straw bales) will be installed as necessary to minimize the potential for disturbed soils to enter the waterbody from the right-of-way as discussed in the EPP (see Appendix A). Additional temporary workspaces at waterbody crossings typically will be set back 50-feet from the water's edge where topographic and other site conditions permit.

Spoil containment devices such as silt fence and/or staked straw bales will be installed and set back from the waterbody bank to minimize the potential for sediment to migrate off the construction right-of-way and back into the waterbody.

Temporary Equipment Bridges

Temporary bridges will be installed across waterbodies to allow the passage of equipment along the construction right-of-way with the possible exception of waterbodies that are too wide to bridge, minor waterbodies such as agricultural and intermittent drainage ditches, and waterbodies that are not state-designated fishery streams. Equipment bridges generally will be installed during the clearing and grading phase of construction. Construction equipment, with the exception of clearing/bridge installation equipment, will be required to use the bridge to cross over the waterbody. The clearing equipment typically

must cross the streams prior to bridge installation. Care will be taken to minimize bed and bank disturbance during bridge installation.

Equipment bridges will consist of one of the following: clean rock placed over flume pipes; prefabricated construction mats placed over the waterbody with or without a culvert; or flexi-float or other temporary bridging. Equipment bridges will be designed to pass the maximum foreseeable flow of the stream, and will be maintained to prevent flow restriction while the bridge is in place. Bridges will be cleaned as necessary to minimize loose soil from equipment entering the stream. Bridges will be removed during final cleanup of the right-of-way.

Trenching and Installation

After the initial clearing and grading is completed, the pipeline will be installed across waterbodies using one of four methods: open-cut, dam-and-pump, flume, or HDD, as discussed in the EPP (Appendix A). These methods are described below.

Open-Cut Method

The open-cut method, also called the wet trench method, is a waterbody crossing technique that often minimizes total duration of in-stream disturbance. This method will involve excavating the trench through the waterbody or ditch using draglines or backhoes operating from the stream banks. Spoil excavated from the waterbody bed or banks will be temporarily placed on the right-of-way at least 10-feet from the water's edge or in extra workspaces typically set back 50-feet from the water's edge, except where the adjacent upland consists of actively cultivated or rotated cropland or other disturbed land. Spoil containment devices such as silt fence and/or staked straw bales will be installed to contain the spoil and to minimize the potential for sediment to migrate off of the construction right-of-way and back into the waterbody.

During excavation of the in-stream trench, earthen "trench plugs" will be left at each end of the excavation to isolate the in-stream trench segment from the adjacent pipeline trench and to prevent the stream flow from entering the adjacent excavated pipeline trench. When the trench within the waterbody is excavated to the appropriate depth, the trench plugs will be removed and a prefabricated section of pipe will be positioned and lowered into the trench. The trench then will be backfilled and the pipeline ends will be tied-in to the adjacent pipeline segments.

NDPC will attempt to complete in-stream trenching and backfilling within 24-hours for minor waterbodies (i.e., less than 10-feet wide) and within 48-hours for larger waterbodies (i.e., greater than 10 but less than 100-feet wide). Site-specific crossing conditions, permit requirements, or weather conditions may extend the completion of crossings beyond these time frames.

Dam-and-Pump Method

The dam-and-pump method is a dry crossing method used for sensitive streams with low gradients and flow, or sensitive streams with meandering channels. This method involves constructing temporary dams, generally consisting of sandbags, plastic sheeting, and/or steel bulkheads, across the waterbody upstream and downstream of the crossing prior to excavation. Pumps will be used to transport the stream flow around the construction area. Pumping activities will commence simultaneously with dam construction to prevent interruption of downstream flow. The downstream discharge will be directed into an energy-dissipation device (e.g., splash pup, concrete weight, or equivalent) where required to prevent scouring of the waterbody bed or adjacent banks. The pump capacity will be greater than the anticipated flow of the waterbody being crossed. The pumping operation will be staffed continually and pumping will be monitored and adjusted as necessary to maintain the flow of water downstream and prevent excessive drawdown of the waterbody, upstream of the construction area. Additionally, a backup pump or pumps will be onsite in the event that the primary pump(s) fails.

Once the dams and pumps have routed the stream flow around the construction area, the water from the area between the dams will be pumped into a staked straw bale or similar dewatering structure. Dewatering structures will be located in well-vegetated upland areas, if present, and will be designed in a manner to prevent the migration of heavily silt-laden water into waterbodies or wetlands. Backhoes working from one or both waterbody banks, or within the isolated waterbody bed, will excavate the trench across the waterbody to the appropriate depth. Spoil will be temporarily stockpiled on the construction right-of-way at least 10-feet from the water's edge and/or in temporary extra workspaces at least 50-feet from the water's edge and contained by silt fence and/or staked straw bales.

After the trench is excavated to the proper depth, a prefabricated section of pipe will be positioned and lowered into the trench. The trench will then be backfilled with the material excavated from the stream, unless otherwise specified in federal or state stream crossing permits. The bottom contours of the streambed and the stream banks will be restored as near as practicable to preconstruction conditions prior to removing the dams and restoring the stream flow. Water that accumulated in the construction area will be pumped into a staked straw bale or similar dewatering structure prior to backfilling and/or removal of the dams.

Flume Method

The flume method is a dry crossing method used for sensitive, relatively narrow waterbodies free of large rocks and bedrock at the trenchline, and that have a relatively straight channel across the construction right-of-way. The flume method is generally not appropriate for wide, deep, or heavily flowing streams. This method will involve placing one or more pipes (i.e., flumes) in the waterbody bed to convey stream flow and isolate the construction area. The capacity of the flume(s) will be sufficient to transport the maximum flows that can be generated seasonally within the waterbody. Flume(s) typically will be 40- to 60-feet in length and will be installed before trenching. Flume pipes will be aligned to

prevent impounding of water upstream of the construction area or to cause erosion downstream.

The upstream and downstream ends of the flume(s) will be incorporated into dams made of sandbags and plastic sheeting (or equivalent). The upstream dam will be constructed first and will funnel stream flow into the flume(s). The downstream dam will then be constructed to prevent water from flowing back into the area to be trenched. The dams will be monitored and adjusted as necessary to minimize leakage. The flume will remain in place until the portion of the pipeline under the stream is installed, the trench is backfilled, and the stream banks are restored.

Prior to trenching, the area between the dams typically will be dewatered. Backhoes are located on one or both of the waterbody banks or work within the isolated segment of the waterbody bed and will excavate a trench across the waterbody and under the flume(s). Excavated spoil material will be placed on the construction right-of-way and/or in temporary extra workspaces and will be contained by silt fences and/or staked straw bales. Water that accumulates in the construction area will be pumped into a dewatering structure prior to backfilling or removal of the dams.

After the trench is excavated to the proper depth, a prefabricated section of pipe will be positioned and lowered into the trench beneath the flume pipe(s). The trench is then backfilled with the material excavated from the stream unless otherwise specified in federal or state stream crossing permits. The bottom contours of the streambed and the stream banks will be restored as near as practicable to preconstruction conditions prior to removing the dams and flume pipes and returning the stream flow.

Horizontal Directional Drilling Method

NDPC will evaluate use of the HDD method at select waterbody crossings (see Table 9.2.4-1). This method is used to minimize or avoid impacts on the streambed, banks, and associated riparian vegetation at a waterbody crossing. The feasibility of this method is dependent on site geology and length of the drill path; geotechnical studies at proposed HDD crossings are ongoing. The HDD method also requires additional temporary workspaces on both sides of the drilled area for materials and equipment associated with the drilling operation and to fabricate the pipeline segment that will be installed under the waterbody.

The HDD method will be conducted in three general stages. The first stage will consist of drilling a small diameter pilot hole along a pre-determined path under the waterbody. The second stage will involve incrementally enlarging or “reaming” the pilot hole to a diameter that will accommodate the pipeline. The third stage will involve pulling a prefabricated segment of pipeline through the enlarged hole and then welding the pipe segment to the adjoining sections of pipeline.

Table 9.2.4-1
Proposed Horizontal Directional Drill Locations – Waterbodies

County	Name	Milepost
Polk	Red River of the North	299.2
	Red Lake River	306.2
	Red Lake River	325.6
Clearwater	Clearwater River	387.9
	Mississippi River	403.6
Hubbard	Hay Creek	425.9
	Straight River	436.2
	Shell River	438.7
	Shell River	445.79
	Shell River	447.21
Aitkin	Willow River	530.8
	Mississippi River	533.9
	Sandy River	543.2

Throughout the process of drilling and enlarging the pilot hole, a bentonite clay slurry, known as “drilling mud”, will be circulated through the drilling tools to lubricate the drill bit, remove drill cuttings, and stabilize the open hole. Drilling mud will be recycled to the extent practicable and, after the pipeline is installed, the mud will be disposed of according to applicable regulations. NDPC identifies procedures in the EPP (see Appendix A) to address the potential for the inadvertent release of drilling mud during HDD operations.

NDPC will conduct geotechnical investigations to evaluate the feasibility of using the HDD method at the select waterbodies. Geotechnical investigations are necessary because the preferred route will cross regions with soils that may not be conducive to HDD technology, such as soils containing cobbles, boulders, layers of gravel, and/or non-cohesive sands. If these investigations determine that potential installation problems exist in using the HDD method at the waterbody crossing, an alternate, environmentally acceptable method will be specifically designed for the crossing.

Restoration and Revegetation

The following discussion on restoration and revegetation applies to streams crossed using the open-cut, dam-and-pump, and flume crossing methods. Typically, stream bank and

streambed restoration and stream bank revegetation will not be necessary when the stream is crossed using the HDD method.

After the trench is excavated to the proper depth, a prefabricated section of pipe will be lowered into position and the trench will be backfilled with the material excavated from the stream. Backfilling will commence after the pipe is positioned in the trench at the desired depth. Backfill material will consist of the spoil material excavated from the trench unless otherwise specified in federal or state stream crossing permits. The bottom contours of the streambed and the stream banks will be restored as near as practicable to preconstruction contours and conditions. Steep stream banks will be re-contoured to a more stable configuration. If there is potential for significant bank erosion, the disturbed banks will be stabilized with rock riprap or other bank protection measures. Jute thatching or erosion control blankets will be installed on the stream banks upslope of the riprap or on the entire bank if no riprap is used. The banks and adjacent disturbed areas will be seeded in accordance with seeding recommendations and/or permit stipulations, and mulch will be applied as needed on slopes. Stream banks will be stabilized and temporary sediment barriers will be re-installed within 24-hours of completing the crossing (weather and soil conditions permitting) to minimize the potential for sedimentation. Trench breakers will be installed at the stream banks, as needed, where slopes are adjacent to waterbodies.

Flumes and temporary dams will be removed from the streambed after the crossing has been returned to original grade and the banks have been reconstructed and stabilized with erosion control materials. Temporary erosion control measures will be installed and maintained until permanent erosion control measures are installed and effective. Permanent slope breakers will be installed, where needed, across the full width of the right-of-way during final cleanup.

Where necessary for access, the travel lane portion of the construction right-of-way and the temporary bridge will remain in place until final cleanup activities are completed. Temporary bridges will be removed after final cleanup, seeding, mulching, and other right-of-way restoration activities have been completed. The temporary erosion control measures will be removed after vegetation has been reestablished.

The pipe section installed under the stream will be tied-in to the pipeline. If trench dewatering is necessary during the tie-in process, the water will be pumped into a filtration device located in a well-vegetated area and in a manner to prevent the migration of heavily silt-laden water into waterbodies or wetlands.

9.2.5 General Construction and Operation Impacts and Mitigation

Pipeline construction across rivers and streams can result in temporary and long-term adverse environmental impacts if not mitigated. Temporary impacts from in-stream trenching could include an increase in the sediment load downstream of the crossing location. Sustained periods of exposure to high levels of suspended solids have been

shown to cause fish egg and fry mortality, as well as other deleterious impacts on fisheries and other aquatic resources. Surface runoff and erosion from the cleared right-of-way also can increase in-stream sedimentation during construction resulting in the shallowing of pools and a reduction of the quality of spawning beds and benthic substrate. NDPC's proposed waterbody construction methods, specifically with respect to erosion control, bank stabilization, and bank revegetation, will minimize short- and long-term impacts on the waterbodies along the preferred route.

Long-term impacts on water quality can result from alteration of the stream banks and removal of riparian vegetation. Soil erosion associated with surface runoff and stream bank sloughing can also result in the deposition of sediments in waterbodies. Sediments deposited on stream bed gravel could result in fish egg mortality and damaged spawning habitat. Removal of riparian vegetation also can lead to increased light penetration into the waterbody, causing increased water temperature, which potentially could be detrimental to coldwater fisheries.

NDPC will avoid or minimize impacts on waterbodies by implementing the erosion and sediment control measures described in the EPP (see Appendix A). NDPC will limit the duration of construction within waterbodies and limit equipment operation within waterbodies to the area necessary to complete the crossing. Disturbed areas at crossings will be restored and stabilized as soon as practical after pipeline installation.

Alternative construction techniques (e.g., HDD or dry crossing methods) may be used at selected waterbodies to avoid and minimize impacts on these waterbodies. The HDD method is a well-established construction technique for installing pipeline under large waterbodies that avoids impacts associated with conventional open-cut methods. HDD installations have the potential to affect waterbodies, however, through inadvertent releases of drilling mud during construction. If the HDD method is used to cross waterbodies, NDPC will follow the EPP (see Appendix A) to prevent an inadvertent release of drilling mud or to minimize environmental effects resulting therefrom.

Releases from refueling operations, fuel storage, or equipment failure in or near a waterbody could affect aquatic resources and contaminate the waterbody downstream of the release point. NDPC will minimize the potential impact of spills of hazardous materials by adhering to the relevant provisions in its EPP (see Appendix A).

9.2.6 Hydrostatic Testing

NDPC will hydrostatically test the new pipe to verify its integrity prior to placing the pipeline in service. Hydrostatic testing will be conducted in accordance with U.S. Department of Transportation Office of Pipeline Safety regulations. The test procedure consists of filling a section of pipe with water and maintaining a prescribed pressure for a prescribed period of time which will establish the maximum allowable operating pressure ("MAOP").

NDPC is evaluating potential sources for appropriating hydrostatic test water, including major waterbodies crossed by or adjacent to the pipeline and/or groundwater sources such as high-capacity irrigation wells or municipal wells. NDPC is evaluating transferring water from one test section to another to minimize the total quantity of water needed to complete the hydrostatic test. NDPC will obtain the applicable water appropriation and discharge permits for hydrostatic testing activities.

Water used for hydrostatic testing will be discharged on land, returned to the waterbody from which it was appropriated, or discharged to a different waterbody after hydrostatic testing is completed, in accordance with the MPCA's National Pollutant Discharge Elimination System permit requirements for the Project. If the water is discharged to an upland area, energy dissipation devices (e.g., straw bale structures) and controlled discharge rates will minimize the potential for erosion and subsequent release of sediment into nearby surface waters and wetlands. If hydrostatic test water is discharged directly into waterbodies, energy dissipation devices (e.g. splash pups) and controlled discharge rates will be used to prevent stream bottom scour. NDPC will develop a site-specific discharge plan for each waterbody that will receive hydrostatic test discharges. At this time, NDPC does not anticipate the use of test water additives and no chemicals will be used to dry the pipeline following the hydrostatic testing.

9.3 WETLAND CROSSINGS

In Minnesota, wetland crossings are regulated by the USACE, MNDNR, the Minnesota Board of Water and Soil Resources ("BWSR"), and local governmental units through the Wetland Conservation Act ("WCA"). NDPC has initiated consultations with the USACE, MNDNR, and BWSR/local governmental units regarding WCA and known wetland mitigation easements in the Project area, and will continue to coordinate with these agencies throughout the Project.

As part of the permitting requirements for both the WCA and USACE, NDPC will avoid and minimize impacts to wetlands to the extent possible. NDPC will acquire all needed wetland permits for the Project from local, state, and federal agencies.

9.3.1 Existing Wetland Resources

NDPC has recently revised its survey area to account for changes in the route since the last filing. NDPC conducted wetland delineation surveys along approximately 93 percent of the pipeline route in 2013 to more accurately identify the wetlands that will be affected during Project construction. Wetlands were identified and mapped in general accordance with the *Corps of Engineers Wetland Delineation Manual* (U.S. Army Corps of Engineers, 1987) and the appropriate regional supplement. The remaining 7 percent of the preferred route will be surveyed for wetlands in 2014.

NDPC used NWI data in digital format obtained from MNDNR to identify wetlands that will be crossed by the preferred route (MNDNR, 2013e) where field-verified survey data was not

available. Through a combination of NWI and 2013 field data NDPC determined that the preferred route will cross a total of 874 wetlands. Field data indicated several contiguous wetland areas with identical unique wetland identification numbers. Wetlands with identical identification numbers were consolidated into single wetlands that reduced the number of wetland crossed, but not the length of wetland crossed. This number accounts for NDPC's plans to reduce the construction right-of-way width to 95 feet in surveyed areas but does not account for this reduction in unsurveyed areas and will be further refined pending review of 2014 field data. A summary of the wetland crossings is provided in Table 9.3.1-1.

Table 9.3.1-1
Wetlands Crossed by the Sandpiper Pipeline Project

County	Approximate Distance (miles)	Number of Wetland Crossings
Polk	5.7	82
Red Lake	2.4	47
Clearwater	9.8	157
Hubbard	8.5	127
Cass	11.2	179
Crow Wing	0.9	20
Aitkin	26.1	155
Carlton	15.0	107
Total	**79.9**	**874**

[a] Sum total discrepancy for wetland miles crossed is due to rounding.

A total of approximately 79.9 linear miles of wetlands will be crossed by the preferred route using a combination of NWI and field data through 2013. Predominant wetland types crossed by the Project, as classified per Cowardin et al (1979), are palustrine emergent ("PEM"), palustrine shrub-scrub ("PSS"), and palustrine forested wetlands ("PFO"). Common plant species identified in these wetlands may include: broad-leaved cattail (*Typha latifolia*), reed canary grass (*Phalaris arundinacea*), lake sedge (*Carex lacustris*), water sedge (*Carex aquatilis*), speckled alder (*Alnus rugosa)*, black willow (*Salix nigra*), black ash (*Fraxinus nigra*), tamarack (*Larix laricina*), and black spruce (*Picea mariana*). A summary of the wetland types crossed, the total length of crossing, and area affected are presented in Table 9.3.1-2.

Table 9.3.1-2
Summary of Wetland Types Affected by Construction of the Sandpiper Pipeline Project

County	Wetland Type [a]	Distance (miles)	Acres Affected [b]
Polk	PEM	4.8	54.5
	PFO	0.5	5.0
	PSS	0.5	5.4
	PUB	<0.1	0.2
Polk Total		**5.7**	**65.1**

Table 9.3.1-2
Summary of Wetland Types Affected by Construction of the Sandpiper Pipeline Project

County	Wetland Type [a]	Distance (miles)	Acres Affected [b]
Red Lake	PEM	1.9	21.9
	PSS	0.6	6.0
Red Lake Total		**2.4**	**28.0**
Clearwater	PEM	6.9	61.8
	PFO	1.9	31.4
	PSS	0.8	15.3
	PUB	0.1	1.6
Clearwater Total		**9.8**	**110.0**
Hubbard	PEM	4.0	37.5
	PFO	1.6	18.3
	PSS	2.8	30.6
	PUB	<0.1	0.8
Hubbard Total		**8.5**	**87.2**
Cass	PEM	5.6	65.3
	PFO	3.2	38.1
	PSS	2.3	26.2
	PUB	0.2	2.1
Cass Total		**11.2**	**131.8**
Crow Wing	PEM	0.6	6.5
	PFO	0.2	2.3
	PSS	<0.1	0.5
	PUB	0.1	1.3
Crow Wing Total		**0.9**	**10.6**
Aitkin	PEM	10.9	131.8
	PFO	7.3	85.1
	PSS	8.0	94.9
	PUB	<0.1	0.6
Aitkin Total		**26.1**	**312.4**
Carlton	PEM	2.9	34.7
	PFO	7.6	89.8
	PSS	4.5	58.5
	PUB	0.1	1.3
Carlton Total		**15.0**	**184.3**
Grand Total		**79.9**	**929.4**

Table 9.3.1-2 Summary of Wetland Types Affected by Construction of the Sandpiper Pipeline Project			
County	Wetland Type [a]	Distance (miles)	Acres Affected [b]

[a] PEM = Palustrine Emergent; PFO = Palustrine Forested; PSS =Palustrine Scrub-Shrub; PUB = Palustrine Unconsolidated Bottom (Cowardin et al, 1979)

[b] Note that the acreages presented do not account for NDPC's plans to reduce the construction footprint width to 95-feet in wetlands in areas that have not yet been surveyed. NDPC will further evaluate workspace footprints to minimize wetland impacts. Final acreages will be determined pending completion of wetland field surveys and evaluation of workspace in wetland areas. Note that any discrepancies between wetland acreages presented and the sum totals are due to rounding.

9.3.2 Public Water Wetlands

The Project will cross five wetlands (Public Water Wetlands) and five basins (Public Water Basins) listed on the MNDNR Public Waters Inventory (MNDNR, 2013f). Public Water Wetlands are Type 3, 4, and 5 wetlands, as defined in the USFWS Circular No. 39 (1971 edition), that are 10 acres or larger in unincorporated areas or 2.5 acres or larger in incorporated areas (MNDNR, 2013g). Type 3, 4, and 5 wetlands include: inland shallow fresh marshes; inland deep fresh marshes; and inland open fresh water, shallow ponds, and reservoirs. These wetlands are regulated as public waters under the MNDNR's License to Cross Public Waters program. These features are summarized in Table 9.3.2-1.

Table 9.3.2-1
MNDNR Public Water Wetlands and Basins Crossed by the Sandpiper Pipeline Project

From Milepost	To Milepost	Crossing Length (miles)	Name	PWI Classification
395.9	396.0	0.1	Mud	Basin
425.9	426.0	0.1	Unnamed	Wetland
429.9	430.0	0.2	Portage	Basin
450.4	450.4	<0.1	Frandsen Slough	Wetland
457.8	458.2	0.3	Unnamed	Basin
459.9	459.9	<0.1	Unnamed	Wetland
460.3	460.5	0.3	Badoura Bog	Wetland
467.2	467.3	<0.1	Unnamed	Basin
490.3	490.4	0.1	Peterson	Basin
503.5	503.5	<0.1	Scout Camp Pond	Wetland

9.3.3 Wetland Construction Methods

Typical pipeline construction in most wetlands will be similar to construction in uplands and will consist of clearing, trenching, dewatering, installation, backfilling, cleanup, and revegetation. However, due to the unstable nature of some wetland soils, construction activities may differ somewhat from standard upland procedures. Construction activities will be minimized in wetlands and/or special construction techniques will be used to minimize the disturbance to vegetation and soils and to maintain wetland hydrology. Where a wetland cannot support construction equipment, construction activities will be accomplished from timber construction mats or by the use of low ground pressure equipment, thus limiting disturbance to the wetland. A typical construction schematic illustrating a wetland crossing is provided in the EPP (see Appendix A).

Clearing and Grading

Vegetation within wetlands will be cut off at the ground level, leaving existing root systems intact to preserve natural sources of rootstock and to facilitate revegetation of the native wetland species after construction. Stumps will only be removed over the trench line and where necessary for safe operation of equipment. Trees, shrubs, and stumps that are removed will be disposed of properly outside wetlands. Timber construction mats, as necessary, and temporary erosion control measures will be installed at this time.

Trenching and Installation

Typically, the pipeline trench will be excavated in wetlands using a backhoe excavator. In unsaturated wetlands, up to 12-inches of topsoil will be stripped from the trench line and stockpiled separately from trench spoil.

If the soils in the wetland area are stable and capable of supporting equipment with or without timber construction mats, the pipe will be strung, welded, and lowered into the trench as in upland areas. When water is present in the trench, the trench may be temporarily dewatered and/or concrete and/or bag weights may employed to install it into the trench and as buoyancy control implements to achieve negative buoyancy.

It may not be feasible to use the construction methods described above for crossing large wetlands with standing water and saturated soils. In these wetlands, the trench will be dug by a backhoe supported on timber mats, but it is often not feasible to separate topsoil. The pipe will be assembled in an upland area and floated across the wetland in the excavated trench using the “push-pull” and/or “float” techniques. When the pipeline is in position, floats (if used) will be removed, the pipeline will be placed into position, and the pipe tied-in to the upland portion of the pipeline.

After the pipe has been installed, the trench will be backfilled and the original contours will be restored to the extent practicable. In areas where the topsoil has been segregated, the

topsoil will be replaced after backfilling to facilitate the natural revegetation process. Any excess backfill material will be removed to an upland area.

Cleanup and Revegetation

Cleanup and rough grading will begin as soon as practical after the trench is backfilled. Timber mats, if used, will be removed during final cleanup operations. Disturbed wetland areas will be revegetated with a cover crop in accordance with NRCS or other agency recommendations, unless standing water is prevalent or as otherwise directed by landowners or regulatory agencies. No fertilizer, lime, or mulch will be applied in wetlands.

9.3.4 General Construction and Operation Impacts and Mitigation

Based on review of NWI data, (MNDNR, 2013e) in conjunction with field data collected through 2013, a total of 874 wetlands will be crossed by the Project in Minnesota. Pipeline construction across these wetlands will result in temporary impacts on approximately 929.4 acres as determined by totaling the acreages within the construction workspace and additional temporary workspace. This number overestimates wetland impacts as it does not account for NDPC's plans to reduce the construction to 95 feet in wetlands in areas that have not yet been surveyed, and to further evaluate workspace footprints. A summary of wetlands affected during construction is provided in Table 9.3.1-2.

At this time, NDPC does not anticipate that wetlands will be permanently filled or drained as a result of the Project. Construction will result in temporary impacts and, in a few situations, minor changes in plant species composition. The temporary impacts include: loss of wetland vegetation and wildlife habitat as a result of clearing and other construction activities; soil disturbance associated with clearing, trenching, and equipment traffic; and increases in turbidity and alterations of hydrology as the result of trenching, dewatering, and soil stockpiling activities.

Approximately 414.0 acres of PEM wetland will be temporarily affected by pipeline construction. NDPC anticipates that there will be no long-term impacts on emergent wetlands. The wetlands will be restored to preconstruction conditions and the herbaceous vegetation will be allowed to naturally revegetate in these areas.

Approximately 237.5 acres of PSS wetland and approximately 270.1 acres of PFO wetland will be cleared and temporarily disturbed during pipeline construction. The impacts on scrub-shrub wetlands and forested wetlands will be of a longer duration than emergent wetlands because the woody vegetation will require a longer time to reestablish on the temporary right-of-way after restoration.

After the pipeline is constructed, additional right-of-way will be maintained free of larger-diameter trees along the existing right-of-way. This additional maintained right-of-way will result in the permanent conversion of approximately 132.0 acres of forested wetland to

emergent or scrub-shrub wetland, based on varying right-of-way widths (refer to Section 1.2).

NDPC will minimize impacts in wetlands by implementing the mitigation measures specified in the EPP (see Appendix A).

10.0 CULTURAL RESOURCES

Cultural resources are the material remains of human activity and can include sites, buildings, districts, and landscapes. Cultural resources are finite and non-renewable; once destroyed they and the information they provide are lost. Federal laws and regulations provide the standards for cultural resources identification, evaluation, and mitigation of impacts. If a cultural resource meets the criteria for listing on the National Register of Historic Places ("NRHP"), it is considered significant and termed a "historic property." NDPC prefers to avoid historic properties and the Project was designed in part to consider impacts to archaeological sites that may meet the criteria as historic properties.

NDPC has initiated consultations with federal, state, and local government agencies regarding the Project. During the course of agency consultation, NDPC has discussed possible impacts to cultural resources and the process of identifying, evaluating, and avoiding such impacts (see the Pipeline Routing Permit, Section 7852.3000, for a list of government agencies). NDPC contacted the Minnesota State Historic Preservation Office ("SHPO") prior to initiating field surveys and will continue to consult with this office regarding the Project.

10.1 PREVIOUSLY RECORDED CULTURAL RESOURCES

Preliminary consultation and searches of agency databases confirmed there are no National Landmarks, NRHP-listed properties, historic districts, or cultural landscapes within the Project area. The Minnesota Historical Society maintains a list of over 30 historic sites around the state. NDPC checked this list, as well as the list of additional historic sites on the Preservation Alliance of Minnesota's website. No historic site listed by either institution is located in the Project area.

NDPC reviewed existing file data maintained by the Minnesota SHPO to determine if any portion of the preferred route was surveyed previously for cultural resources. For the purposes of gathering information and reviewing previously recorded data, the Project area is defined as the environmental survey area, which is between 250- and 450-feet wide, plus known facilities off the mainline portion of the Project. The construction and permanent rights-of-way are located entirely within the Project's environmental survey area. Pipeline construction will require a 120-foot-wide right-of-way in uplands and a 95-foot-wide right-of-way in wetlands.

At least 25 previous cultural resources surveys completed over the past 20 years or more have covered approximately one-third of areas adjacent to the environmental survey area plus facilities off the pipeline right-of-way. The remaining two-thirds of the environmental survey area have not been surveyed for cultural resources. The completed surveys incorporated various survey methods and the precise location of the surveyed areas is often difficult to discern based on the large-scale maps provided in the reported results.

Several large linear surveys were completed for pipeline projects that parallel the Project's environmental survey area; these surveys are the most relevant for the Project. These large surveys were completed by Enbridge; Great Lakes Gas Transmission Company, Limited Partnership; Lakehead Pipeline Company; and Minnesota Pipe Line Company. Table 10.1-1 lists the reports for some of these major survey efforts. Environmental survey area widths for these linear surveys varied widely. Some of the previous surveys' footprints partially overlap the environmental survey area in a number of locations but NDPC determined that the overlap was not sufficient to discount a comprehensive survey effort specific to the Project.

Table 10.1-1
Cultural Resources Reports of Pipeline Right-of-Way Surveys Key to the Sandpiper Project

Principal Investigator/ Affiliation	Report Title	Date
D. Weir/ Commonwealth Associates, Inc.	A Cultural Resources Inventory – St. Vincent to St. Clair Gas and Sault Lateral Pipelines (Minnesota, Wisconsin, and Michigan)	1981
C. Dobbs / Institute for Minnesota Archaeology	1990 Great Lakes Gas Transmission Company Pipeline Expansion Project: Phase I Cultural Resource Inventory	1990
C. Dobbs / Institute for Minnesota Archaeology	1990 Great Lakes Gas Transmission Company Pipeline Expansion Project: Phase II Cultural Resource Inventory	1991
C. Dobbs / Institute for Minnesota Archaeology	A Phase I Archaeological Survey of the Great Lakes Gas Transmission Limited Partnership Pipeline Corridor	1996
Bielakowski/ The 106 Group	Phase I Cultural Resources Survey for the Enbridge Pipeline Southern Lights 20-inch Crude Line (LSr) and Alberta Clipper Pipeline Projects, Kittson, Marshall, Pennington, Red Lake, Polk, and Clearwater Counties, Minnesota	2007
Doperalski et al. / The 106 Group	2007 Phase I and II Cultural Resources Survey for the Minnesota Pipeline Company's MinnCan Project, Clearwater, Hubbard, Wadena, Todd, Morrison, Stearns, Meeker, Wright, McLeod, Carver, Sibley, Scott and Dakota Counties, Minnesota.	2007
Doperalski et al. / The 106 Group	Phase I Cultural Resources Survey for the Minnesota Pipeline Company's MinnCan Pipeline Project Access Roads and Extra temporary Work Spaces, Clearwater, Hubbard, Wadena, Todd, Morrison, Stearns, Meeker, Wright, McCloud, Carver, Sibley, Scott and Dakota Counties, Minnesota.	2008

Records on file at the SHPO and the Office of the State Archaeologist ("OSA") indicate that more than 380 archaeological sites were recorded within a 2-mile-wide study area

surrounding the environmental survey area. The known sites in the 2-mile-wide study area come from all cultural periods: Earthworks, burials, and numerous campsites and artifact scatters represent the Pre-contact period; homesteads, logging camps, and historic burials represent the Post-contact or historic period; and three sites in the region, a trading post, village, and burial, represent the Contact period.

Four previously recorded sites were located within the environmental survey area; two were revisited during the 2013 NDPC survey. Archaeological site 21CE0066 was recorded as the remains of a farmstead during the MinnCan Project survey. This site in Clearwater County was re-visited during the 2013 NDPC survey, and its current condition was documented. Previously recorded site 21HB0061 was the foundation remains of a schoolhouse in Hubbard County, also recorded during the MinnCan Project survey. This site could not be relocated in NDPC's 2013 survey. Site 21HB0071 was recorded as an isolated lithic flake during the MinnCan Project survey (Doperalski et al. 2007). Site 21CA0736 was recorded by Hamline University in 2011 and interpreted as a historic logging camp. A portion of the site was in the environmental survey area and revisited during the 2013 NDPC survey. None of the previously recorded sites has been recommended as eligible for listing on the NRHP. No inventoried standing structures located in the environmental survey area are on file at the state agencies. Information about previously recorded sites in the vicinity of facilities and off-right-of-way yards has not been compiled at this time.

10.2 CULTURAL RESOURCES PHASE I RECONNAISSANCE SURVEY AND GIS PREDICTIVE MODEL

Given the general lack of previous survey coverage of the Project area and lower than expected identified archaeological site and historic structure density, NDPC initiated Phase I reconnaissance, or inventory, surveys along the entire environmental survey area in 2013.

NDPC contracted with Commonwealth Cultural Resource Group ("CCRG") to conduct field surveys in Minnesota. NDPC directed CCRG to apply standard methodologies and utilize the guidelines provided by the SHPO and the OSA. The primary focus of the 2013 Phase I reconnaissance survey was the identification of resources and an initial assessment of their boundaries and research potential. NDPC directed CCRG to classify resources according to the criteria utilized by federal agencies when evaluating eligibility for listing on the NRHP. Standard survey methods of note include pedestrian walkover along the entire environmental survey area and subsurface shovel testing at specific locations determined by ground surface visibility and other factors.

In addition, NDPC is using statistically-based GIS predictive models during the Phase I reconnaissance survey. NDPC contracted with Foth Companies ("Foth") to develop the Archaeological and Historic Structures Sensitivity Model using a minimum of 14 datasets. Foth compiled the datasets and projected the predictive models in three distinct zones of low, moderate, or high sensitivity. NDPC determined survey targets for each of the three

zones, namely 100 percent coverage of the moderate and high sensitivity zones and at least 10 percent coverage of the low sensitivity zones. Periodically, Foth reviewed CCRG's completed survey data and provided additional model runs to reflect the supplemented and most recent datasets. NDPC will use the Archaeological and Historic Structures Sensitivity Model to define the most effective survey methods for the remaining Phase I reconnaissance survey.

Beginning with datasets gathered for the Sensitivity Model, sub-consultant Strata Morph Geoexploration, Inc. (Strata Morph), conducted a desktop assessment of the Project area looking for possible deeply buried living surfaces that might contain buried archaeological resources. Deeply buried living surfaces are the result of rapid soil formation, generally alluvial deposits in Minnesota, which cover and preserve a ground surface. After the desktop analysis Strata Morph conducted a windshield survey of potential locations across the environmental survey area, and identified nine locations with the potential to contain deeply buried surfaces, and possibly archaeological material. These nine locations will be tested by deep coring methods such as mechanical augering or backhoe trenching in 2014.

Phase I reconnaissance inventories of approximately 79 percent of the Project environmental survey area were completed in Minnesota in 2013. During the inventory CCRG identified 35 archaeological sites and revisited 2 previously recorded sites. Of the 37 sites recorded in the environmental survey area, 29 date to Pre-contact period occupations and consist of various assemblages of stone tools and tool-making debris, faunal (animal) remains, pottery, and pit features. Seven sites date to historic period occupations from the 19th and 20th centuries, and one site was occupied during both Pre-contact and historic periods. One of the historic period sites is a previously unrecorded family cemetery plot. This small cemetery will be protected from unauthorized disturbance in accordance with Minnesota Statute 307.08. The remaining 21 percent of the environmental survey area in Minnesota will be surveyed in 2014. If additional Project facilities or yards are identified, Phase I reconnaissance surveys will be designed and implemented following the Sensitivity Model.

NDPC prefers to avoid inventoried sites that may meet the criteria for listing on the NRHP. NDPC will conduct Phase II site evaluations if more information is needed to make a recommendation regarding National Register eligibility. If avoidance of a NRHP-eligible property is not possible, or places an undue burden on the Project, NDPC will consult with interested parties.

10.3 CULTURAL RESOURCES PHASE II EVALUATION STUDIES

CCRG conducted Phase II evaluation studies at four Pre-contact sites during the 2013 field season (21PL0102, 21PL0096/21PL0097, and 21PL0098). Testing included intensive surface collection and excavation of 1 meter x 1 meter test units. Test units were excavated until two levels of sterile soil were reached. Features identified in the soil matrix were

excavated in cross-sections, and one-half of the feature soil was removed for additional testing. Analysis is underway for data collected during the Phase II studies.

10.4 GENERAL CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

NDPC has completed Phase I reconnaissance surveys of approximately 79 percent of the environmental survey area and will conduct the remaining surveys in 2014. NDPC will continue to consult with government agencies, including the Minnesota SHPO, regarding identification and evaluation of historic properties. The preferred method of mitigating impacts to historic properties, or sites treated as historic properties, is avoidance, which may include routing the pipeline around historic properties, installing the pipeline beneath historic properties using conventional bore or HDD technology, and/or fencing all or portions of historic properties to ensure that they are avoided during construction. If avoidance is not possible, mitigation measures, such as data recovery in the case of archaeological sites, may be used.

NDPC has developed a Draft Unanticipated Discoveries Plan (see Appendix D) for use during all Project construction activities. The Unanticipated Discoveries Plan prescribes actions to be taken in the event that a previously unrecorded archaeological site or human remains are discovered during construction activities. The Unanticipated Discoveries Plan directs the Construction Contractor and the Lead EI to stop activity and protect the find, then contact the appropriate expert or authority. In the event of such a discovery, construction activities in the immediate vicinity of the discovery will not resume until the find is fully investigated and cleared.

11.0 FEDERAL, STATE, AND COUNTY RECREATIONAL AREAS

11.1 EXISTING DESIGNATED RECREATIONAL AREAS

The preferred route will not cross any national parks, national forests, national landmarks, wilderness areas, wildlife refuges, waterfowl production areas, or national wildlife management areas. However, the Project will cross a federally designated trail, state and county forests, county parks, state WMAs and AMAs, state-designated trails, designated scenic byways, and state-designated water trails as discussed in the following subsections.

11.1.1 Federally Designated Recreation Areas and Trails

The preferred route will not cross federal recreation areas. However, the North Country Trail, a National Scenic Trail, will be crossed at MP 417.6 in Hubbard County. NDPC initiated consultation with NPS and the North Country Trail Association regarding this crossing. Because the trail is on county-owned land, NDPC will also consult with Hubbard County to minimize impacts on the trail.

As discussed in Section 9.2, the preferred route will cross four Minnesota rivers that are listed on the NRI. These rivers are the Red Lake River (MP 305.7 and 325.7) in Polk County, the Clearwater River (MP 388.3) in Clearwater County, the Moose River (MP 511.4, MP 512.6, MP 513.5 and MP 513.8) in Cass and Aitkin counties, and the Willow River in Aitkin County (MP 531.2). None of these are federally designated as National Wild and Scenic River. NDPC has initiated consultation with the NPS regarding these river crossings. In addition, NDPC will coordinate with the MNDNR regarding these river crossings, as they are all public waters.

11.1.2 State-Designated Recreation Areas

State Park and Forest Land

The Project will cross state forest land administered by the MNDNR as presented in Table 11.1.2-1, including MNDNR Division of Forestry-administered consolidated conservation and school trust lands. The Project will not cross any state park land. NDPC has initiated consultation with MNDNR regarding state land crossings and understands routes passing through school trust lands must produce maximum long-term economic return for the Trust. NDPC will continue to work with MNDNR to permit any crossings of state lands.

Table 11.1.2-1 State Forests Crossed by the Sandpiper Pipeline Project		
State Forest	Milepost Range	Crossing Length (miles)
Clearwater		
Mississippi Headwaters State Forest	404.1 – 405.8	1.8
Hubbard		
Huntersville State Forest	458.0 – 459.0	1.0
Cass		
Foot Hills State Forest	467.7 – 470.8	3.1
Land O' Lakes State Forest	499.2 – 501.3	2.1
	504.4 – 511.9	7.5
Aitkin		
Hill River State Forest	517.3 – 524.8	8.0
Waukenabo State Forest	525.2 – 525.7	0.5
Savanna State Forest	551.4 – 552.2	0.8
	Total	**24.7**

State Wildlife Management Areas, Scientific Natural Areas, and Aquatic Management Areas

WMAs are state lands that are actively managed for wildlife production and provide habitat for many wildlife species. WMAs are open to the public for recreational activities such as bird and wildlife watching, hunting, and trapping. WMAs generally are closed to motorized vehicles and horses. The Project will cross the following WMAs: Crow Wing Chain WMA in Hubbard County from MP 454.2 to MP 456.0; and Grayling Marsh (MP 548.5 to MP 549.5), Lawler (MP 556.0 to MP 556.5), and Salo Marsh (MP 559.7 to MP 561.3) WMAs in Aitkin County. Figure 7.2.2-1 presents the Project route as it passes through these WMAs. The Project is co-located with existing rights-of-way through the Crow Wing Chain and Lawler WMAs. The Project deviates from an existing right-of-way through Salo Marsh WMA to avoid a large wetland complex, and crosses Grayling Marsh WMA along a greenfield route. In all instances, NDPC attempted to co-locate the Project as much as possible through WMAs unless doing so would result in greater impacts to wetlands or other known sensitive resources, or would present significant constructability concerns.

AMAs are state lands that have been established to protect, develop, and manage lands critical for fish and other aquatic life, for water quality, and for their biological and recreational value. The Project will cross the LaSalle Creek AMA near MP 408.4 and will be co-located with an existing pipeline right-of-way at this crossing. The Project also will cross the Spire Valley Hatchery AMA from MP 503.2 to MP 503.3 and from MP 503.4 to MP 503.6 and will be co-located with an existing transmission line at this crossing.

The Project will not cross any SNAs or designated State Recreation Areas. NDPC has initiated consultation with MNDNR regarding crossings of WMAs and AMAs and will continue to work with MNDNR to permit any crossings of state lands.

State-Designated Trails and Canoe and Boating Routes

The Project will cross the Paul Bunyan State Trail at MP 473.6 in Cass County and the Willard Munger State Trail at MP 582.7 in Carlton County. The Project will also cross seven canoe and boating routes: the Red River of the North, Red Lake River (twice), Pine River, Crow Wing River, and the Mississippi River (twice). NDPC initiated consultation with the MNDNR and Mississippi Headwaters Commission regarding these waterbody crossings.

11.1.3 County-Designated Recreation Areas

County Park and Forest Land

The Project will cross county park land in Aitkin County in two places (from approximate MP 516.8 to MP 517.0 and MP 554.8 to MP 555.0). The Project will also cross approximately 47 miles of county-managed land. These lands are identified as forested or miscellaneous use tax-forfeited parcels, but may be managed for various natural resource components in addition to providing recreational opportunities, such as hunting and fishing. County-managed lands along the preferred route are located in Clearwater, Hubbard, Cass, Crow Wing, Aitkin, and Carlton counties. NDPC has initiated consultation with each county to minimize impacts on these lands.

11.1.4 Designated Scenic Byways

King of Trails Scenic Byway

The King of Trails Scenic Byway (Minnesota Highway 75) stretches along 414 miles of Minnesota's western border. Scenery along the byway includes prairies and farmlands. The Project will cross Minnesota State Highway 75 at approximate MP 318.5. NDPC will consult with Polk County and MDOT regarding construction crossing techniques, restoration, and rerouting of traffic to area roadways during the construction period.

Lake Country Scenic Byway

The Lake Country Scenic Byway is an 88-mile-long Minnesota Scenic Byway designated in 1999. A 67-mile stretch follows Minnesota State Highway 34 between Detroit Lakes and Walker, and includes a 21-mile spur on US Highway 71 stretching from Park Rapids to Itasca State Park. The Project will cross Minnesota State Highway 34 at approximate MP 433.6. NDPC will consult with Hubbard County and MDOT regarding construction crossing techniques, restoration, and rerouting of traffic to area roadways during the construction period.

The Great River Road

The Great River Road in Minnesota has two components: a federally-designated 430-mile National Route and a 755-mile state-designated alternate route. Combined, the route provides 1,185 miles of scenic, historic, and recreational opportunities for travelers. The Project will cross the Great River Road at approximate MP 403.4 in Clearwater County and approximate MP 533.8 in Aitkin County. NDPC will consult with Clearwater and Aitkin counties and MDOT regarding construction crossing techniques, restoration, and rerouting of traffic to area roadways during the construction period.

Veterans Evergreen Memorial Scenic Byway

This designated Minnesota Scenic Byway occurs along a 50-mile stretch of State Highway 23 that runs from Banning State Park to New Duluth. The Project will cross Minnesota State Highway 23 at approximate MP 598.7. NDPC will consult with Carlton County and MDOT regarding construction crossing techniques, restoration, and rerouting of traffic to area roadways during the construction period.

11.1.5 Other Public Lands

A variety of conservation easements are present in Minnesota, residing with various state and federal agencies such as BWSR, USFWS, and MNDNR. Easements can also reside with non-profit conservation groups such as Minnesota Land Trust and The Nature Conservancy ("TNC"). Additionally, easements that protect wetland mitigation sites are found throughout the state. NDPC is engaged in identifying and avoiding to the extent possible all property under the protection of conservation easements.

As suggested by MNDNR (MNDNR, 2013g), NDPC reviewed TNC website for tracts that might be crossed by the Project. The website indicated that the preferred route does not cross any lands owned or managed by the TNC. This was also confirmed by NDPC's right-of-way acquisition group; no tracts under TNC management or ownership were identified during a land records inquiry of parcels affected by the Project.

11.2 GENERAL CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

Construction and operation of the pipeline is not expected to have significant impacts on recreational lands. In Minnesota, 75.3 percent of the preferred route will be constructed adjacent to existing NDPC rights-of-ways or generally adjacent to existing third-party rights-of-way, which will minimize potential impacts on public lands and recreational areas. The Project will have only minor and temporary impacts on public recreational areas. Impacts on recreational use of public land areas primarily will be limited to temporary inconveniences and localized disturbances, including noise, dust, and visual intrusions associated with construction activities. There will be no long-term impact on recreational activities within the public lands areas as a result of construction and operation of the

pipeline. As discussed in Section 7.1.4, vegetation maintenance of the permanent right-of-way will be take place along the pipeline right-of-way, which could have limited visual impacts on public lands that are densely forested.

Project construction could temporarily restrict public use of recreational areas. Potential impacts on recreational activities will be dependent on the timing of construction, the season in which the recreational activity occurs, and the construction methods used. Public access to state and county lands will be maintained to the greatest extent possible during construction. Short-term closures of some areas may be necessary during construction. After construction is completed, public lands will be restored to allow previous uses and recreational activities to continue. NDPC will consult with the appropriate state and county land management agencies to avoid and minimize impacts on recreational areas.

Boating and recreational use of the waterbodies crossed by the Project may be affected during construction of the pipeline, including state- and county-designated canoe routes. Depending on the crossing method used, impacts on recreational users may include construction noise, downstream turbidity, or temporary obstructions such as sediment curtains or construction equipment at the crossing location. NDPC initiated consultation with NPS, MNDNR, Mississippi Headwaters Commission, and local governments regarding the waterbody crossings.

12.0 AIR QUALITY

12.1 EXISTING AIR QUALITY

The counties in which the Project will be constructed and operated are all designated as in attainment or unclassifiable for the National Ambient Air Quality Standards for all criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen oxides (NO_X), ozone (O_3), particulate matter less than 2.5 microns in diameter (PM2.5), particulate matter less than 10 microns in diameter (PM10), and sulfur dioxide (SO_2).

12.2 APPLICABLE AIR QUALITY RULES

The following state and federal air quality regulations will apply to the Project:

- 40 C.F.R. Part 60 Subpart Kb will apply to the new floating roof storage tanks constructed at the new Sandpiper Clearbrook Terminal.
- The Project scope at the new Sandpiper Clearbrook Terminal will be subject to Minnesota permitting requirements under Minnesota Administrative Rules Chapter 7007.
- Gasoline and diesel engines used for construction are subject to federal mobile source emission regulations found in 40 C.F.R. Part 85.

12.3 GENERAL CONSTRUCTION AND OPERATION IMPACTS AND MITIGATION

Construction and operation of the Project is not expected to have a significant impact on air quality. Construction of the pipelines and associated facilities could result in intermittent and short-term fugitive emissions. These emissions would include dust from soil disruption and combustion emissions from the construction equipment. The fugitive dust emissions would depend on the moisture content and texture of the soils that would be disturbed. However, emissions from construction are not expected to cause or significantly contribute to a violation of an applicable ambient air quality standard because the construction equipment would be operated on an as-needed basis, primarily during daylight hours. Emissions from the gasoline and diesel engines would be minimized because the engines must be built to meet the standards for mobile sources established by the EPA mobile source emission regulations (Title 40 C.F.R. Part 85). In addition, the EPA requires that the maximum sulfur content of diesel fuel for highway vehicles is 15 parts per million.

NDPC's EPP specifies that to minimize dust generated from construction activities, the contractor will take all reasonable steps to control dust near residential areas and other areas as directed by NDPC. Control practices may include wetting soils on the right-of-way, limiting working hours in residential areas, and/or additional measures as appropriate based on site-specific conditions. The use of dust suppression techniques will minimize fugitive

dust emissions during construction of the project, thereby minimizing potential air quality impacts on nearby residential and commercial areas.

The scope of work at the new NDPC Clearbrook Terminal will be subject to air permitting requirements found in Minnesota Administrative Rules Chapter 7007. NDPC plans to submit a stationary source applicability determination request to the MPCA regarding the stationary source status of the proposed new terminal. NDPC will submit an appropriate air permit application based on the result of stationary source determination. NDPC will complete the required New Source Performance Standards notifications and submittals for the new storage tanks. The potential emissions at the new NDPC Clearbrook Terminal will be Volatile Organic Compounds ("VOC") from new external floating roof storage tanks, piping components (such as valves, pump seals, and flanges), fugitive emissions, and pipeline operations equipment and is estimated to be approximately less than 24 tons of VOC per year.

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Appendix B

Roads Crossed by the Sandpiper Pipeline Project Route

Appendix B Roads Crossed by the Sandpiper Pipeline Project Route		
County	Milepost	Road Name
Polk	300.6	430TH AVE SW
	301.1	CO Hwy 58
	303.2	State 220
	304.2	400TH AVE SW
	304.8	225TH ST SW
	305.3	390TH AVE SW
	305.8	385TH AVE SW
	307.3	370TH AVE SW
	307.6	HWY 2
	307.7	367TH AVE SW
	309.3	CR 20- 350TH AVE SW
	310.2	230TH ST SW
	310.4	340TH AVE SW
	311.4	330TH AVE SW
	312.4	CR 18-320TH AVE SW
	313.4	310TH AVE SW-Section Line
	313.6	230TH ST SW
	314.4	300TH AVE SW-Section Line
	315.4	290TH AVE SW-Section Line
	316.4	280TH AVE SW-Section Line
	317.5	270TH AVE SW-Section Line
	318.5	HWY 75
	319.6	250TH AVE SW-Section Line
	320.7	240TH AVE SW - CR 54
	321.7	230TH AVE SW-Section Line
	322.7	220TH AVE SW-Section Line
	323.7	210TH AVE SW - CR 13
	324.7	200TH AVE SW
	326.8	180TH AVE SW-Section Line
	327.8	170TH AVE SW - CR 11
	329.8	150TH AVE SW-Section Line
	330.2	CR 53-260TH ST SW
	331.1	CR 50-140TH
Red Lake	333.0	CR 113
	335.1	HWY 32
	336.1	110TH ST SE-Section Line
	337.1	TOWNSHIP ROAD 96

	337.1	CR 115-Section Line
	339.2	CR 116
	340.2	150TH AVE SE
	341.1	CR 12
	342.2	CR T179
	342.5	CR-209-280TH ST SE
Polk	344.3	CR38- 190TH AVE SE
	345.3	200TH AVE SE
	346.4	210TH AVE SE
	347.4	220TH AVE SE
	347.8	HWY 59
	348.4	290TH ST SE
	350.1	DRIVEWAY
	350.6	DRIVEWAY
	350.7	250TH AVE SE
	351.0	DRIVEWAY
	351.5	DRIVEWAY
	352.3	265TH AVE SE
	352.7	DRIVEWAY
	353.6	295TH ST SE
	353.8	280TH AVE SE - CR 8
	355.3	295TH AVE SE-Section Line
	356.4	305TH AVE SE-Section Line
	356.9	310TH AVE SE
	357.5	300TH ST SE - CR 5
	358.1	320TH AVE SE-Section Line
	359.1	330TH AVE SE
	360.2	310TH ST SE
	361.0	345TH AVE SE-Section Line
	361.5	350TH AVE SE - CR 6
	361.7	DRIVEWAY
	362.5	360TH AVE SE
	364.5	380TH AVE SE
	366.5	400TH AVE SE - CR 2
	367.6	410TH AVE SE-Section Line
Clearwater	368.6	101ST AVE-Section Line
	369.0	DRIVEWAY
	369.5	109TH AVE-Section Line
	370.5	LOST RIVER ROAD
	371.6	CR 7
	372.6	TAFLIN LAKE ROAD

	375.0	159TH AVE-Section LIne
	375.9	CR 74
	376.4	HWY 92
	377.8	460TH ST - CR 3
	378.5	DRIVEWAY
	378.8	DRIVEWAY
	378.8	450TH ST
	379.0	181ST AVE
	379.4	446TH ST
	379.9	HWY 223 - LEONARD ROAD
	382.2	418TH ST
	383.9	400TH ST - CR 1
	385.9	DRIVEWAY
	385.9	FAIRGROUND ROAD - CR 24
	386.1	DRIVEWAY
	387.0	UNKNOWN NAME
	388.1	HWY 2
	388.2	AIRPORT DRIVE
	389.4	350TH ST
	390.6	340TH ST
	392.5	CR 30-Walker Brook Valley Rd
	393.0	320TH ST - CR 13
	394.6	229TH AVE
	395.3	300TH ST
	398.5	DRIVEWAY
	398.6	HWY 32-PIONEER ROAD
	398.6	270TH ST
	398.8	UNKNOWN NAME
	400.1	CR 36-UPPER RICE LAKE
	400.3	MALLARD GRADE TRAIL
	400.5	UNKNOWN NAME
	401.3	250TH ST
	401.8	CR 2
	402.3	240TH ST
	403.5	230TH ST - CR 9
	405.0	CLEARLINE ROAD
	406.1	ROCKY TRAIL
	406.8	200TH ST
	407.3	SOLITUDE DRIVE
	407.7	Itasca Township 187
	407.7	DRIVEWAY

	407.8	DRIVEWAY
Hubbard	409.2	DRIVEWAY
	409.5	DRIVEWAY
	410.0	105TH AVE-Section Line
	410.1	DRIVEWAY
	410.6	DRIVEWAY
	410.6	DRIVEWAY
	411.3	400TH ST
	412.4	DRIVEWAY
	412.4	390TH ST
	413.4	CR 95
	414.9	NORWAY DRIVE
	414.9	HWY 71
	416.3	UNKNOWN NAME
	417.6	UNKNOWN NAME
	418.4	UNKNOWN NAME
	418.7	UNKNOWN NAME
	418.7	UNKNOWN NAME
	419.4	320TH-WABISISH LAKE ROAD
	420.5	CR 89- Knotty Pine Drive
	420.9	DRIVEWAY
	421.1	DRIVEWAY
	421.5	300TH ST
	422.4	DRIVEWAY
	422.5	Jade Rose Dr
	423.0	UNKNOWN NAME
	423.8	DRIVEWAY
	424.0	INLAND DRIVE
	424.3	UNKNOWN NAME
	424.8	HWY 71
	425.5	260TH ST
	426.4	UNKNOWN NAME
	427.1	UNKNOWN NAME
	427.2	UNKNOWN NAME
	428.1	CR 32
	429.8	DRIVEWAY
	430.6	CR 48
	430.9	UNKNOWN NAME
	431.6	200TH ST - TOWNSHIP RD 8
	432.6	190TH ST
	432.9	109TH AVE

	433.0	DRIVEWAY
	433.6	HWY 34
	434.6	170TH ST
	435.6	160TH ST
	436.6	150TH ST
	437.6	CR 14
	438.8	109TH AVE - CR 111
	439.4	UNKNOWN NAME
	440.2	114TH ST - TOWNSHIP ROAD 15
	440.7	110TH ST - CR 111
	441.2	UNKNOWN NAME
	441.7	109TH AVE- Section Line
	442.3	TOWNSHIP RD 18
	442.7	119TH AVE-Section Line
	443.1	UNKNOWN NAME
	443.7	129TH AVE - CR 115
	443.9	HWY 71
	444.4	UNKNOWN NAME
	444.6	UNKNOWN NAME
	445.5	UNKNOWN NAME
	445.5	UNKNOWN NAME
	446.8	159TH AVE - TOWNSHIP RD 24
	447.0	DRIVEWAY
	448.1	CR 6
	448.8	179TH AVE
	451.0	CR 11
	452.0	209th Ave
	453.0	DUCK LAKE RD
	453.5	225TH
	453.9	CR 13
	454.2	ANTLER DRIVE
	457.0	259TH AVE-HUNTERSVILLE SHORTCUT ROAD
	458.2	269TH AVE-STATE RECREATIONAL TRL
	460.0	COUNTY ROAD 110
	460.8	Hubbard Line Rd
	462.0	MCKINLEY RD SW
Cass	463.5	HWY 64
	464.1	UNKNOWN NAME
	464.5	76TH AVE SW
	465.6	72ND AVE SW-CR 112
	466.5	68TH AVE SW-Section Line

	466.6	UNKNOWN NAME
	466.7	UNKNOWN NAME
	467.6	UNKNOWN NAME
	467.8	BULL MOOSE TRAIL
	471.8	48TH AVE SW - CR 113
	471.9	DRIVEWAY
	472.1	UNKNOWN NAME
	472.7	44TH AVE SW
	473.6	PAUL BUNYAN TRAIL
	473.6	HWY 371
	475.3	UNKNOWN NAME
	475.8	32ND AVE SW
	476.8	28TH AVE SW
	477.8	24TH AVE SW
	478.6	UNKNOWN NAME
	479.4	HEUER RD SW
	479.6	HEUER RD SW
	479.8	HWY 84
	480.8	12TH AVE SW - CR 43
Crow Wing	481.2	UNKNOWN NAME
	481.3	CR 56
	481.9	BULLDOZED ROAD
	482.2	UNKNOWN ROAD
Cass	487.0	4TH ST NE
	488.4	Blind Lake Road
	488.7	WILD TRAIL NE
	488.7	Arndt Dr
	491.8	OLD GRADE TRAIL NE
	492.4	CR 160-12TH NE
	494.1	CR 160-12TH ST NE
	495.4	CR 160-12TH ST NE
	497.2	CR 55
	497.7	LAKE WASHBURN RD NE - CR 48
	499.1	CR 155 NE
	501.8	LAKE WASHBURN RD NE - CR 48
	503.3	HWY 6
	508.7	UNKNOWN NAME
	510.1	PIKUS FOREST RD NE
Aitkin	514.5	410TH AVE - CR 19
	516.7	OSPREY AVE - CR 29
	523.0	540TH ST - CR 68

	524.0	525TH LANE
	524.3	HWY 169
	525.9	510TH LANE
	526.9	500TH LANE
	528.9	480TH ST - CR 3
	529.4	UNKNOWN NAME
	530.8	334TH PLACE
	531.4	330TH AVE
	533.9	CR 10-Great River Road
	534.5	NATURE AVE - CR 5
	535.3	SOO LINE RECREATIONAL TRAIL
	537.1	DRIVEWAY
	537.5	270TH PLACE-Farm Road
	541.0	240TH AVE - CR 62
	542.9	450TH ST - CR 71
	543.9	230TH AVE - CR 62
	546.3	HWY 65
	548.5	200TH AVE - CR 73
	549.0	UNKNOWN NAME
	550.1	185TH PLACE
	550.4	HWY 210
	550.5	185TH PLACE
	556.7	KESTREL AVE - CR 16
	558.1	DRIVEWAY
	558.2	395TH LANE
Carlton	563.9	ERICKSON RD - TOWNSHIP RD 1020
	563.9	SOUTH FINN ROAD
	564.3	DRIVEWAY
	564.3	DRIVEWAY
	565.7	UNKNOWN NAME
	567.3	UNKNOWN NAME
	568.9	HWY 73
	569.9	CR 129
	572.4	HEIKKILA ROAD
	573.9	FETTERS ROAD - CR 35
	574.8	CR 35-Section Line
	576.8	CR 157
	577.8	AHO ROAD - TOWNSHIP RD 256
	578.2	DRIVEWAY
	580.3	STRANDBERG ROAD
	580.6	UNKNOWN NAME

	581.3	CR 4
	582.5	BRANDT ROAD - CR 144
	582.7	CR 61
	582.7	WILLARD MUNGER STATE TRAIL
	585.6	INTERSTATE 35
	587.8	CR-5
	588.0	Nendick Road
	588.9	Gilgoly Road
	591.8	West Chub Lake Road
	592.9	East Chub Lake Road
	593.7	CR 3
	594.3	Alcohol Road
	595.0	CR 356- Thell Road
	596.1	CR 1
	596.3	Matten Road
	597.1	MAERE RD - TOWNSHIP RD 373
	597.5	CEMETERY ROAD
	598.4	CEMETERY ROAD
	598.8	HWY 23
	599.4	TOWNSHIP RD 385
	601.6	EAST MILITARY RD - COUNTY W

Appendix E

Waterbodies Crossed by the Sandpiper Pipeline Project Route

Appendix E
Waterbodies Crossed by the Sandpiper Pipeline Project Route

Milepost	Waterbody Name	Type	Hydrology	County
300.0	Red River	River/Stream	Perennial	Polk
302.7	Unnamed Stream	River/Stream	Perennial	Polk
303.8	Unnamed Stream	River/Stream	Intermittent	Polk
306.2	Red Lake River	River/Stream	Perennial	Polk
308.6	Grand Marias Creek	River/Stream	Perennial	Polk
309.3	Unnamed Ditch	Drainage ditch	Intermittent	Polk
310.2	County Ditch 34	Drainage ditch	Intermittent	Polk
312.4	Judicial Ditch 60	Drainage ditch	Perennial	Polk
312.5	Unnamed Ditch	Drainage ditch	Intermittent	Polk
313.4	Unnamed Ditch	Drainage ditch	Intermittent	Polk
316.5	Unnamed Ditch	Drainage ditch	Intermittent	Polk
316.5	Unnamed Ditch	Drainage ditch	Intermittent	Polk
321.8	Unnamed Ditch	Drainage ditch	Intermittent	Polk
323.7	Unnamed Ditch	Drainage ditch	Intermittent	Polk
324.7	Unnamed Ditch	Drainage ditch	Intermittent	Polk
324.7	Unnamed Ditch	Drainage ditch	Intermittent	Polk
325.7	Red Lake River	River/Stream	Perennial	Polk
326.5	Kripple Creek	River/Stream	Perennial	Polk
327.8	Unnamed Ditch	Drainage Ditch	Intermittent	Polk
329.4	Unnamed Ditch	Field drainage	Intermittent	Polk
329.8	Unnamed Ditch	Drainage ditch	Intermittent	Polk
329.8	Unnamed Ditch	Drainage ditch	Intermittent	Polk
331.1	Judicial Ditch 66	Drainage ditch	Perennial	Red Lake
333.0	Judicial Ditch 66	Drainage Ditch	Perennial	Red Lake
335.6	Judicial Ditch 64	Drainage ditch	Intermittent	Red Lake
336.5	Unnamed Ditch	Drainage ditch	Intermittent	Red Lake
338.2	Judicial Ditch 64	Drainage ditch	Intermittent	Red Lake
339.2	Unnamed Ditch	Drainage ditch	Intermittent	Red Lake
339.7	Unnamed Ditch	Drainage ditch	Intermittent	Red Lake
340.2	Unnamed Ditch	Drainage ditch	Intermittent	Red Lake
340.5	Lower Badger Creek	River/Stream	Perennial	Red Lake
340.7	Unnamed Ditch	Drainage ditch	Intermittent	Red Lake
342.8	Beau Gerlot Creek	River/Stream	Intermittent	Polk
343.0	Beau Gerlot Creek	River/Stream	Intermittent	Polk
343.8	Unnamed Ditch	Drainage ditch	Intermittent	Polk
346.9	Poplar River	River/Stream	Perennial	Polk
353.0	Ditched stream	Drainage ditch	Intermittent	Polk
353.9	Unnamed Ditch	Drainage ditch	Intermittent	Polk
357.1	Hill River	River/Stream	Perennial	Polk
360.8	Unnamed Ditch	Drainage ditch	Intermittent	Polk

Appendix E
Waterbodies Crossed by the Sandpiper Pipeline Project Route

Milepost	Waterbody Name	Type	Hydrology	County
363.1	Unnamed Ditch	Drainage ditch	Intermittent	Polk
371.2	Lost River	River/Stream	Perennial	Clearwater
374.8	Silver Creek	River/Stream	Perennial	Clearwater
375.1	Silver Creek	River/Stream	Perennial	Clearwater
375.4	Silver Creek	River/Stream	Perennial	Clearwater
382.8	Unnamed Stream	River/Stream	Intermittent	Clearwater
387.9	Clearwater River	River/Stream	Perennial	Clearwater
389.9	Walker Brook	River/Stream	Perennial	Clearwater
391.1	Unnamed Stream	River/Stream	Intermittent	Clearwater
396.7	Unnamed Stream	River/Stream	Intermittent	Clearwater
400.6	Unnamed Ditch	Drainage ditch	Intermittent	Clearwater
402.7	Bear Creek	River/Stream	Perennial	Clearwater
403.6	Mississippi River	River/Stream	Perennial	Clearwater
407.3	Unnamed Stream	River/Stream	Intermittent	Clearwater
408.4	La Salle Creek	River/Stream	Perennial	Clearwater
424.5	Unnamed Stream	Open water wetland /Beaver dam/pond	Perennial	Hubbard
425.9	Hay Creek	River/Stream	Perennial	Hubbard
436.3	Straight River	River/Stream	Perennial	Hubbard
438.7	Shell River	River/Stream	Perennial	Hubbard
443.5	Shell River	River/Stream	Perennial	Hubbard
445.8	Shell River	River/Stream	Perennial	Hubbard
447.4	Oxbow Pond	River/Stream	Perennial	Hubbard
454.6	Crow Wing River	River/Stream	Perennial	Cass
461.3	Ditch	Drainage ditch	Perennial	Cass
461.6	Unnamed Ditch	Drainage ditch	Perennial	Cass
462.4	Big Swamp Creek	River/Stream	Perennial	Cass
463.1	Unnamed Stream	River/Stream	Perennial	Cass
479.2	Pine River	River/Stream	Perennial	Cass
483.3	Unnamed Stream	River/Stream	Intermittent	Cass
484.4	Unnamed Stream	River/Stream	Intermittent	Cass
485.5	Unnamed Stream	River/Stream	Intermittent	Cass
488.3	Blind Lake Creek	River/Stream	Perennial	Cass
490.9	Unnamed Stream	River/Stream	Perennial	Cass
492.2	Unnamed Stream	River/Stream	Intermittent	Cass
495.7	Unnamed Stream	River/Stream	Intermittent	Cass
496.2	Unnamed Stream	River/Stream	Intermittent	Cass
497.9	Unnamed Stream	River/Stream	Intermittent	Cass
499.2	Dagget Brook	River/Stream	Perennial	Cass
503.4	Unnamed Stream	River/Stream	Intermittent	Cass

Appendix E
Waterbodies Crossed by the Sandpiper Pipeline Project Route

Milepost	Waterbody Name	Type	Hydrology	County
503.5	Spring Brook	River/Stream	Perennial	Cass
508.0	Unnamed Stream	River/Stream	Intermittent	Cass
508.6	Unnamed Stream	River/Stream	Intermittent	Cass
509.4	Unnamed Stream	River/Stream	Intermittent	Cass
510.0	Moose River	River/Stream	Perennial	Cass
510.0	Unnamed Stream	River/Stream	Intermittent	Aitkin
511.9	Unnamed Stream	River/Stream	Intermittent	Aitkin
515.4	Unnamed Stream	River/Stream	Intermittent	Aitkin
517.2	Unnamed Stream	River/Stream	Intermittent	Aitkin
521.0	White Elk Creek	River/Stream	Perennial	Aitkin
521.5	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
521.6	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
521.7	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
528.7	White Elk Creek	River/Stream	Perennial	Aitkin
530.8	Willow River	River/Stream	Perennial	Aitkin
532.4	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
533.3	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
533.6	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
534.0	Mississippi River	River/Stream	Perennial	Aitkin
535.5	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
535.8	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
536.3	Unnamed Ditch	Ditch	Intermittent	Aitkin
536.5	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
537.5	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
538.5	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
539.1	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
539.3	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
539.6	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
540.0	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
541.0	Unnamed Ditch	Ditch adj. to rd.	Intermittent	Aitkin
540.5	Unnamed Ditch	Ditch adj. to rd.	Intermittent	Aitkin
543.3	Sandy River	River/Stream	Perennial	Aitkin
544.1	Unnamed Ditch	Ditch	Intermittent	Aitkin
544.4	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
545.1	Unnamed Stream	River/Stream	Intermittent	Aitkin
545.3	Unnamed Stream	River/Stream	Intermittent	Aitkin
545.6	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
547.5	Unnamed Stream	River/Stream	Intermittent	Aitkin
548.0	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
548.5	Unnamed Ditch	Ditch	Intermittent	Aitkin

Appendix E
Waterbodies Crossed by the Sandpiper Pipeline Project Route

Milepost	Waterbody Name	Type	Hydrology	County
549.8	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
550.1	Unnamed Ditch	Drainage ditch	Intermittent	Aitkin
550.2	Sandy River	River/Stream	Perennial	Aitkin
550.4	Unnamed Stream	River/Stream	Perennial	Aitkin
556.9	Unnamed Ditch	Drainage ditch	Perennial	Aitkin
557.0	Unnamed Ditch	Drainage ditch	Perennial	Aitkin
558.2	Unnamed Ditch	Drainage ditch	Perennial	Aitkin
564.6	West Branch Kettle River	River/Stream	Perennial	Carlton
564.8	West Branch Kettle River	River/Stream	Perennial	Carlton
569.3	Heikkila Creek	River/Stream	Perennial	Carlton
572.5	Unnamed Stream	River/Stream	Perennial	Carlton
572.9	Kettle River	River/Stream	Perennial	Carlton
575.8	West Fork Moose Horn River Tributary	River/Stream	Perennial	Carlton
577.4	West Fork Moose Horn River	River/Stream	Perennial	Carlton
578.2	Unnamed Stream	River/Stream	Perennial	Carlton
578.9	King Creek	River/Stream	Perennial	Carlton
579.5	Unnamed Stream	River/Stream	Perennial	Carlton
581.4	Park Lake Creek	River/Stream	Perennial	Carlton
581.9	Unnamed Stream	River/Stream	Perennial	Carlton
582.4	Moose Horn River	River/Stream	Perennial	Carlton
586.7	Unnamed Stream	River/Stream	Perennial	Carlton
586.7	Blackhoof River	River/Stream	Perennial	Carlton
586.7	Unnamed Stream	River/Stream	Perennial	Carlton
586.8	Unnamed Stream	River/Stream	Perennial	Carlton
597.7	Unnamed Stream	River/Stream	Perennial	Carlton

Appendix G

Project Maps

(See Book 2 of 2)