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.

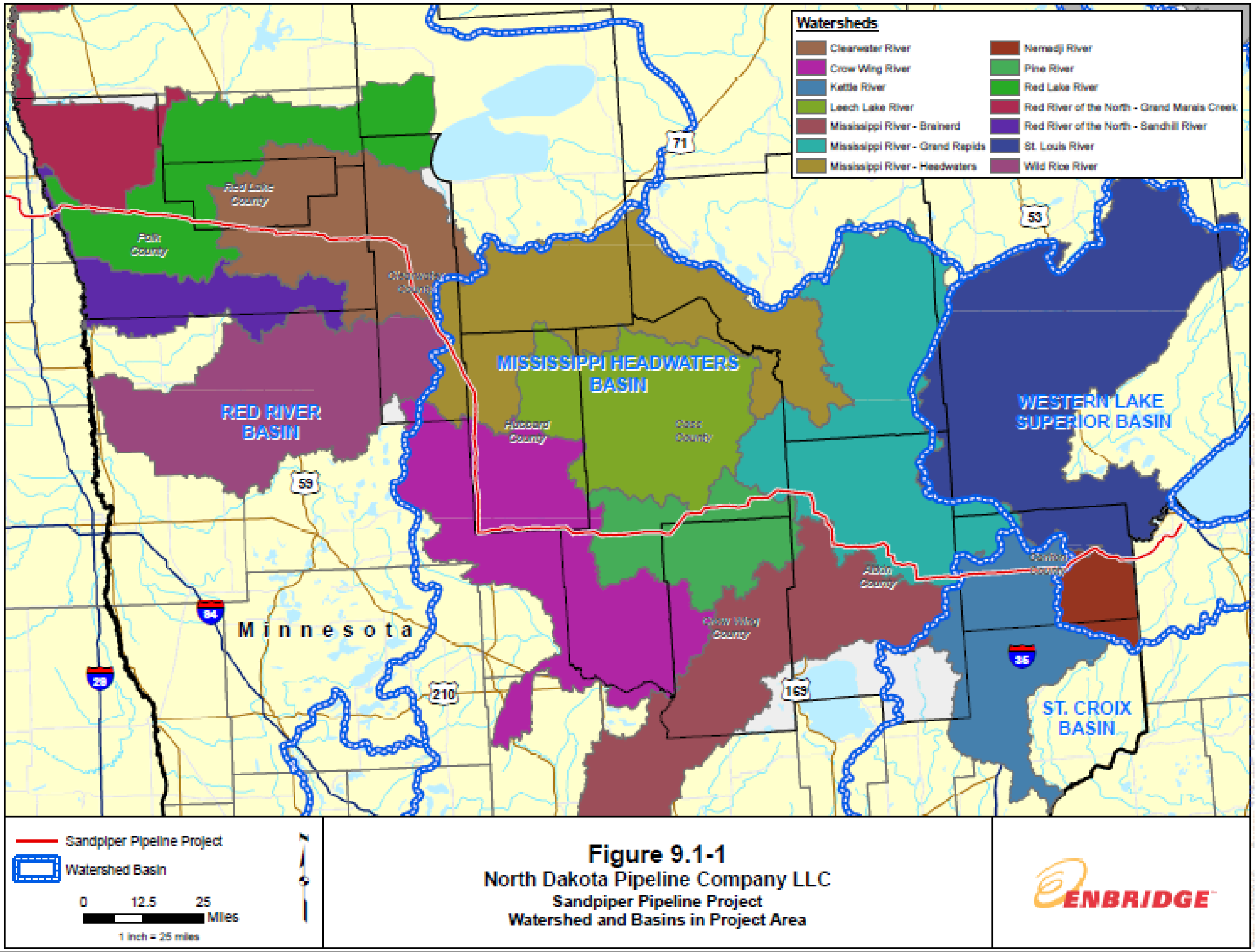
Table 9.1-1
Watersheds Crossed by the Sandpiper Pipeline Project Route

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.

<u>Open-Cut Method</u>

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.

<u>Horizontal Directional Drilling Method</u>

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).