Fredrikson & BYRON, P.A.

March 15, 2019

VIA ELECTRONIC FILING

Mr. Daniel P. Wolf
Executive Secretary
Minnesota Public Utilities Commission
121 Seventh Place East, Suite 350
Saint Paul, MN 55101-2147

Re: In the Matter of the Application of Enbridge Energy, Limited Partnership for a Pipeline Routing Permit and Partial Exemption for the Fond du Lac Line 4 Project in Minnesota on the Fond du Lac Reservation
MPUC Docket No. PL9/PPL-18-752

Dear Mr. Wolf:

Enclosed please find Enbridge Energy, Limited Partnership's ("Enbridge") Revised Application for a Pipeline Routing Permit and Partial Exemption (the "Revised Application") for the Fond du Lac Line 4 Project in Minnesota on the Fond du Lac Reservation (the "Project"), which has been e-filed today through www.edockets.state.mn.us. A summary of the changes made in the Revised Application is provided in this letter. In addition, Enbridge provides the responses below to the Comments and Recommendations on Application Completeness filed on March 11, 2019, by the Department of Commerce, Energy Environmental Review and Analysis ("EERA Comments"). With these revisions, Enbridge respectfully requests that the Minnesota Public Utilities Commission ("Commission") determine that the Revised Application is complete.

A. Overview of Revised Application.

Enbridge is filing a Revised Application that incorporates the revisions and additional information requested in the EERA Comments. In addition, the Revised Application reflects a slightly revised proposed centerline for the Project. This revision appears on Map Sheet 4 in Appendix A.2 and was included to fully avoid any potential impacts to an identified cultural site in this area. As required by Minn. R. 7852.200, subp. 3, Enbridge has included "REVISED" and the date on each changed page of the Revised Application and Appendices. To avoid confusion on eDockets, Enbridge is refiling the entirety of the Revised Application and Appendices,

including those that remain unchanged, so that the relevant documents are all dated March 15, 2019 in the eDockets register. Attachment A to this letter includes a table listing all revised sections, figures and appendices.

B. Response to EERA Comments.

1. Width of Permanent Right-of-Way.

EERA notes a discrepancy between the right-of-way requested in the Application and Figures 6.1.3-3, 6.1.3-4, and 6.1.3-5, and recommends that Enbridge "clarify the width of the permanent right-of-way they seek to permit and update any associated text, tables, and figures for consistency and clarify." Enbridge clarifies that the operational right-of-way[1] for the Project will be between 20 and 40 feet. In the Revised Application, Enbridge has updated Figures 6.1.3-3, 6.1.3-4, and 6.1.3-5 to reflect only the Project operation workspace as the operational right-of-way for Line 4. These figures do not show the entirety of the 50-foot operational right-of-way designated in the Line 3 Replacement Project Route Permit because the Project will overlap it through the Fond du Lac Reservation. As a general matter, Enbridge requests a 40-foot right-of-way from the Commission for the Project, although this will vary by parcel and may be less in some areas. Enbridge has provided EERA with shapefiles showing the varying right-of-way widths and anticipates that the final route maps attached to a route permit, if granted, would reflect the approved operational right-of-way.

2. Additional Temporary Workspace Typical Length, Width, and Acreage Estimate.

EERA recommends that Enbridge "revise Section 3.6.2 to address additional temporary workspace length, width, and estimated acreage." In the Revised Application, Section 3.6.2 has been updated to discuss additional temporary workspace length, width, and estimated acreage.

3. Other Route Location Maps.

EERA recommends that Enbridge: (a) provide a map of "Option 4" that depicts "the location of Line 2 and the location of Option 4 relative to Line 2;" and (b) revise maps and figures "where the arrangement of pipes in the mainline corridor is incorrectly depicted." In the Revised Application, a figure has been added to provide a map to Section 5.4.4 that shows the location of Line 2 and the location of Option 4 relative to Line 2. Enbridge clarifies that, within

[1] Enbridge uses "operational" or "operations" right-of-way instead of "permanent" right-of-way to reflect that the limited length of its agreements with the Fond du Lac Band of Lake Superior Chippewa ("Fond du Lac Band"). These terms should be considered interchangeable where they appear here or in the Revised Application.

the Fond du Lac Reservation, the Line 2 pipeline is on the northeast side of the corridor. The Revised Application corrects any maps or figures where this was previously incorrectly depicted.

4. Environmental Impact – Impacted Workspace and Permanent Right-of-Way.

EERA notes that the Application shows permanent right-of-way and workspace for the Line 3 Replacement Project that is not consistent with the Line 3 Replacement Project Route Permit. Specifically, the Route Permit for the Line 3 Replacement Project granted a 50-foot permanent right-of-way and a 95-foot workspace in wetlands and saturated wetlands. The Revised Application corrects any discrepancies regarding the Line 3 Replacement right-of-way by better distinguishing between Line 3 Replacement right-of-way and workspace and existing Enbridge right-of-way. The impact area calculations provided in the Application remain accurate.

5. Land Use and Management.

EERA suggests that Enbridge "provide an assessment whether the Project will alter/diminish (or not) existing land use and how/if it will affect land use plans and management plans. An assessment that addresses zoning or planning (if any) for this area – by any level of government – is recommended." Section 6.5 has been revised to add a discussion of existing comprehensive plans and land use management plans in St. Louis County, Carlton County, and Fond du Lac Reservation and potential impacts to the planned future land uses.

6. Cumulative Potential Effects.

EERA recommends that Enbridge "provide an analysis of cumulative impacts associated with permanent right-of-way needs for both the Line 3 Project and the Line 4 Fond du Lac Projects." This discussion is included in Section 6.19 of the Revised Application.

7. Local Government Land Use Laws.

EERA recommends that Enbridge provide an analysis of local government land use laws. A discussion of these issues is included in Sections 6.5 and 6.18 of the Revised Application.

8. Connected Actions.

EERA suggests that "it would be helpful for [Enbridge] to provide documentation in the record establishing that the Line 3 Project and Line 4 Fond du Lac project are not connected actions." Pursuant to Minn. R. 4410.0200, subp. 9c, "connected actions" are defined as follows:

> Two projects are "connected actions" if a responsible governmental unit determines they are related in any of the following ways:

A. one project would directly induce the other;

B. one project is a prerequisite for the other and the prerequisite project is not justified by itself; or

C. neither project is justified by itself.

The Project and the Line 3 Replacement Project are not "connected actions." First, neither project would directly induce the other. In other words, although Enbridge may construct the projects concurrently for efficiency and convenience, as EERA notes, Enbridge "intends to complete the Fond du Lac Line 4 Project as a separate, independent project from the Line 3 Pipeline Project." Second, neither project is a prerequisite for the other. Either project may proceed independently of the other. Enbridge and the Fond du Lac Band have had regular discussions regarding alternatives for addressing the above-grade segments of existing Line 4, and addressing these segments remains a priority for Enbridge and the Fond du Lac Band, irrespective of the timing of the Line 3 Replacement Project. Finally, each project is justified by itself. The justification for the Line 3 Replacement Project has already been fully analyzed by the Commission in Docket No. PL9/CN-14-916. As discussed in the Revised Application, the justification for the Fond du Lac Line 4 Project is to address specific concerns raised by the Fond du Lac Band regarding the above-grade installation of segments of the existing Line 4 pipeline and the impacts these segments have on the area hydrology and Band members' use of the area. In short, the Fond du Lac Line 4 Project would proceed absent the Line 3 Replacement Project, and vice versa. Accordingly, none of the three criteria for "connected actions" apply to the Fond du Lac Line 4 Project and the Line 3 Replacement Project, and they are not connected actions. Consistent with EERA's recommendation, the Revised Application presents impacts of the Fond du Lac Line 4 Project independent from the Line 3 Replacement Project.

Please let me know if you have any questions regarding this filing.

Sincerely,

/s/ Christina K. Brusven

Christina K. Brusven
Direct Dial: 612.492.7412
Email: cbrusven@fredlaw.com

Attachment A: Table of Revisions

TABLE OF CONTENTS
LIST OF TABLES
LIST OF FIGURES
Section
1.0 INTRODUCTION
Figure 1.1.2-1 Valve Location Map
2.0 PURPOSE AND NEED
No changes.
3.0 PROJECT DESCRIPTION
Section 3.6 Land Requirements
Table 3.6.1-1 Anticipated Land Requirements
Section 3.6.2 Additional Temporary Workspace (ATWS)
Table 3.8-1 Project Schedule
4.0 RIGHT-OF-WAY PREPARATION AND CONSTRUCTION SEQUENCE
Section 4.1.1 Right-of-Way Preparation and Construction Sequence, Construction Timing
5.0 ROUTE SELECTION PROCESS
Figure 5.2-1 Project Geographic Requirements
Section 5.4.1 Option 1 – Relocate Portions of the Existing Line 4 Pipeline through Multiple Segment Relocations
Figure 5.4.1-1 Option 1 Segment Relocation
Section 5.4.2 Option 2 - Remediate Line 4 in the Same Trench by Lowering the Existing Pipe
Figure 5.4.2-1 Option 2 Same Trench Line Lowering
Figure 5.4.2-2 Typical ROW Configuration
Figure 5.4.2-3 Option 2 Typical Construction Workspace in Fond du Lac Band Reservation – Same Trench Line Lowering Workspace in Uplands and Wetlands

	Section 6.5.3 Land Use Operation Impacts and Mitigation
	Table 6.8-.1-2 Soil Characteristics within Fond du Lac Band Line 4 Project
	Section 6.8.2 Soils Construction Impacts and Mitigation
	Section 6.10.3 Wildlife Operation Impacts and Mitigation
	Section 6.14.1 Wetlands Existing Environment
	Section 6.14.2 Wetlands Construction Impacts and Mitigation
	Table 6.14.2-1 Temporary Construction Impacts of the Fond du Lac Band Line 4 Project
	Section 6.14.3 Wetlands Operations Impacts and Mitigation
	Table 6.14.3-1 Permanent Wetland Conversion Impacts of the Fond du Lac Band Line 4 Project
	Section 6.15.2 Wetlands Construction Impacts and Mitigtion
	Section 6.16.3 Archaeological and Tribal Cultural Resource Surveys
	Section 6.18 Permit Table
	Table 6.18-1 Preliminary List of Government Authorities and Titles of Permits/Approvals (Fond du Lac Band Line 4 Project)
	Table 6.18-1 Preliminary List of Government Authorities and Titles of Permit/Approvals (Fond du Lac Band Line 4 Project)
	Added Section 6.19 Cumulative Potential Effects
7.0 REMOVAL OF EXISTING LINE 4	
	No changes.
8.0 REFERENCES	
	Revised to add additional references.
Appendix A – Project Overview Preferred Route Maps	
	Maps revised.
Appendix B – Enbridge Environmental Protection Plan	
	No changes.
Appendix C – Safety Data Sheets	
	No changes.
Appendix D – Typical Right-of-Way Configuration Drawings	

All figures revised.
Appendix E – Same Trench Line Lowering
Figure revised.
Appendix F – Unanticipated Discoveries Plan
No changes.
Appendix G – Potential Construction Impacts by Land Use and County
All figures and tables revised.
Appendix H – Contaminated Sites Management Plan
Revised Figure 1.

AFFIDAVIT OF SERVICE

In the Matter of the Application of Enbridge Energy, Limited Partnership for a Pipeline Routing Permit and Partial Exemption for the Fond du Lac Line 4 Project in Minnesota on the Fond du Lac Reservation

MPUC Docket No. PL9/PPL-18-752

STATE OF MINNESOTA)
) SS.
COUNTY OF HENNEPIN)

Alicia P. Jones, of the City of Minneapolis, the County of Hennepin, State of Minnesota, being duly sworn on oath, deposes and states that on the 15th day of March, 2019, she e-filed with the Minnesota Public Utilities Commission the following:

1. Cover Letter and Attachment A;

2. Enbridge Energy, Limited Partnership's Revised Route Permit and Partial Exemption Application with Figures and Appendices A-H; and,

3. Affidavit of Service.

A copy has also been served in accordance with the attached service list of record.

Alicia P. Jones

Subscribed and sworn to before me
this 15th day of March, 2019.

Notary Public

66216699.1

MARY ANN S MONAHAN
Notary Public
Minnesota
My Commission Expires January 31, 2024

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Christina	Brusven	cbrusven@fredlaw.com	Fredrikson Byron	200 S 6th St Ste 4000 Minneapolis, MN 554021425	Electronic Service	No	OFF_SL_18-752_PPL-18-752
Generic Notice	Commerce Attorneys	commerce.attorneys@ag.state.mn.us	Office of the Attorney General-DOC	445 Minnesota Street Suite 1800 St. Paul, MN 55101	Electronic Service	Yes	OFF_SL_18-752_PPL-18-752
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Jason	Risdall	jason.risdall@enbridge.com	Enbridge	26 East Superior St Duluth, MN 55802	Electronic Service	No	OFF_SL_18-752_PPL-18-752
Sara	Van Norman	sara@svn.legal	Van Norman Law, PLLC	1010 W Lake St Ste 100-130 Minneapolis, MN 55408	Electronic Service	No	OFF_SL_18-752_PPL-18-752
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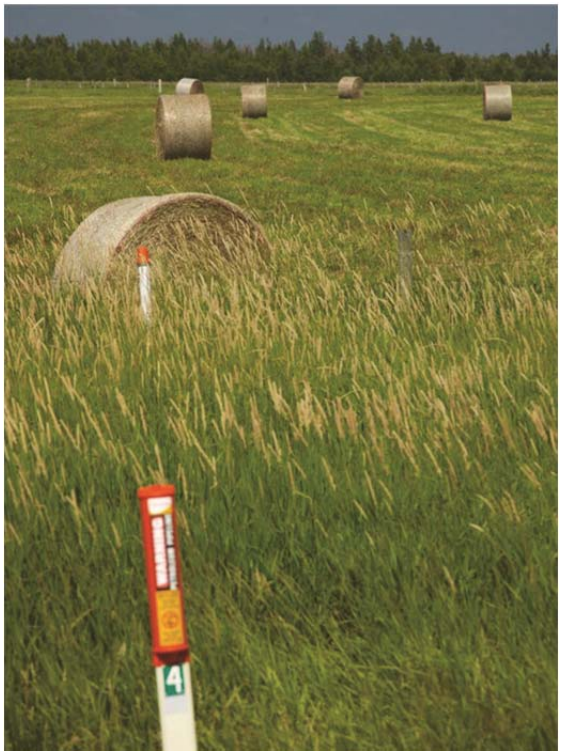
James	Watts	james.watts@enbridge.com	Enbridge Pipelines (North Dakota) LLC	26 E Superior St Ste 309 Duluth, MN 55802	Electronic Service	No	OFF_SL_18-752_PPL-18-752
Daniel P	Wolf	dan.wolf@state.mn.us	Public Utilities Commission	121 7th Place East Suite 350 St. Paul, MN 551012147	Electronic Service	Yes	OFF_SL_18-752_PPL-18-752



Route Permit and Partial Exemption Application for the Minnesota Public Utilities Commission

Enbridge Energy, Limited Partnership • Fond du Lac Line 4 Project

MPUC Docket No. PL9/PPL-18-752

REVISED: March 15, 2019

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

DEFINITIONS

Annual Capacity	The average sustainable pipeline throughput over a year. Annual capacity is calculated assuming historic average annual operating conditions. These operating conditions include scheduled and unscheduled maintenance, normal operating issues, and crude supply availability. Annual capacity of a pipeline is typically 90% of design capacity, and represents the capacity requested in this Application.
Applicant	Enbridge Energy, Limited Partnership.
Aquifer	Geologic unit (or a combination of geologic units) that is capable of yielding usable quantities of water
Condensate	A commodity having a density from 600 kg/m³ up to but not including 800 kg/m³ and a viscosity of 0.4 mm2/s up to but not including 2 mm2/s will be classified as Condensates.
Design Capacity	The theoretical capacity of the pipeline and pumping facilities, at its current or proposed design state for given types of liquids and their batch sequence. Design capacity is calculated assuming theoretically ideal operating conditions.
Easement	The agreement(s) and/or interest in privately owned land held by Enbridge by virtue of which it has the right to construct and operate together with such other rights and obligations as may be set forth in such agreement.
Enbridge	Enbridge is the term used to collectively describe the various Enbridge companies, affiliates and legal entities, some of which are defined below.
Enbridge Energy, Limited Partnership	Enbridge Energy, Limited Partnership owns and operates the liquid pipeline system known as the Enbridge "Lakehead System." Together with Enbridge Pipelines Inc. in Canada, these operationally integrated pipeline systems form the longest liquid petroleum pipeline in the world.

DEFINITIONS

Enbridge Mainline Corridor	A pipeline corridor in Northern Minnesota where up to six pipelines are located and which cross the Fond du Lac Band Reservation.
Enbridge Mainline System	A term used to described the U.S. and Canadian portion of a major liquid pipeline systems owned by Enbridge Energy, Limited Partnership and Enbridge Pipelines Inc., respectively.
Enbridge Energy Partners, L.P.	Enbridge is a wholly owned subsidiary of Enbridge Energy Partners, L.P. (Enbridge Partners) which is a Delaware limited partnership headquartered at 5400 Westheimer Court, Houston, 77056 (ph. 713-627-5400); www.enbridgepartners.com.
Environmental Justice	Environmental justice refers to the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, and often relate to larger concentrations or minority and low-income communities concentrated in small geographic areas within a larger area.
Heavy Crude	A commodity having a density from 904 kg/m^3 to 940 kg/m^3 inclusive and a viscosity from 100 to 350 mm^2/s. As defined in the Enbridge Energy, Limited Partnership local tariff applying to crude petroleum and natural gas liquids.
Initial Annual Capacity	Average sustainable rate: average barrels per day over a year (90% of design capacity).
Initial Design Capacity	Theoretical capacity.
Light Crude	A commodity having a density from 600 kg/m^3 up to but not including 876kg/m^3 and a viscosity from 0.4 mm^2/s up to but not including 20 mm^2/s. Ad defined in the Enbridge Energy, Limited Partnership local tariff applying to crude petroleum and natural gas liquids.
Line 3 Replacement Project	A crude oil pipeline project owned by Enbridge Energy, Limited Partnership to be constructed under a certificate of need and route permit issued by the MPUC in Docket Nos. PL-9/CN-14-916 and PPL-15-137.

DEFINITIONS

Medium Crude	A commodity having a density from 876kg/m³ up to but not including 904kg/m³ and a viscosity from 20 mm²/s up to but not including 100mm²/s. As defined in the Enbridge Energy, Limited Partnership local tariff applying to crude petroleum and natural gas liquids.
Natural Gas Liquids (NGL)	A commodity having a maximum absolute vapor pressure of 1,250 kilopascals at 37.8°C and a density of up to but not including 600 kilograms per cubic meter (kg/m³) and a viscosity of up to but not including 0.4 square millimeters per second (mm²/s) will be classified as Natural Gas Liquids.
Person	An individual or entity, including any partnership, corporation, association, joint stock company, trust, joint venture, limited liability company, unincorporated organization, or governmental entity (or any department, agency, or political subdivision thereof).
Right-of-Way	The land included in permanent and temporary Easements that Enbridge possess for the purpose of construction and operation.
Routing Permits	Routing permits issued by the MPUC.
Shipper	A customer, who transports volumes on the common carrier pipeline system, including crude oil producers, refiners, and/or marketers.
Ultimate Annual Capacity	Maximum economic expansion capacity of individual pipeline that is sustainable average daily rate per day over a year.
Ultimate Capacity	Maximum economic expansion capacity of individual line. Additional pumping horsepower required over current design to meet this capacity.

ACRONYMS AND ABBREVIATIONS

A

AMA	Aquatic Management Area	ANSI	American National Standards Institute
ATWS	Additional Temporary Workspace		

B

BGEPA	Bald and Golden Eagle Protection Act	BMPs	Best Management Practice
BSA	Bank Service Area	BWSR	Minnesota Board of Water and Soil Resources

C

C.F.R.	Code of Federal Regulations	CO	Carbon Monoxide
CO_2	Carbon Dioxide	CWI	County Well Index
CWA	Clean Water Act		

D

dBA	decibels on the A-weighted Scale		

E

ECDs	Erosion Control Devices	EEP	Enbridge Energy Partners, L.P.

ACRONYMS AND ABBREVIATIONS

E

EIs	Environmental Inspector	EO	Element Occurrences
EPA or USEPA	Environmental Protection Agency	EPP	Environmental Protection Plan
ERM	Environmental Resources Management, Inc.	ESA	Endangered Species Act

F

Fond du Lac Band	Fond du Lac Band of Lake Superior Chippewa	Fond du Lac Band HIA	Fond du Lac Band of Lake Superior Chippewa Health Impact Assessment
Fond du Lac Band RMD	Fond du Lac Band of Lake Superior Chippewa Resource Management Division		

G

GHG	Greenhouse Gases	GIS	Geographic Information System
GPS	global positioning system		

I

IVP	Intelligent Valve Placement

K

Kbpd	Thousand Barrels Per Day

ACRONYMS AND ABBREVIATIONS

L

LFDL	Fond du Lac Band of Lake Superior	LRR	Land Resource Region

M

MAOP	Maximum Allowable Operating Pressure	MBS	Minnesota Biological Survey
MDH	Minnesota Department of Health	MP	Milepost
MPCA	Minnesota Pollution Control Agency	MLCCS	Minnesota Land Cover Classification System
MLRA	Major Land Resource Areas	MNDNR	Minnesota Department of Natural Resources
MNDOT	Minnesota Department of Transportation	MPUC or MNPUC	Minnesota Public Utilities Commission

N

NAGPRA	Native American Graves Protection and Repatriation Act of 1990	NHIS	Minnesota Natural Heritage Information System
NHPA	National Historic Preservation Act of 1966	NLEB	Northern Long-eared Bat
NOx	nitrogen oxides	NPC	Native Plant Community

ACRONYMS AND ABBREVIATIONS

N

NPS	Nominal Pipe Size	NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service	NRI	National Rivers Inventory
NWI	National Wetland Inventory		

O

O_3	Ozone	ORVW	Outstanding Resource Value Waters

P

Pb	Lead	PEM	Palustrine Emergent Wetlands
PFO	Palustrine Forested	PHMSA	Pipeline and Hazardous Materials Safety Administration
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter	PM_{10}	particulate matter less than 10 microns in diameter
Project	Fond du Lac Line 4 Project	psig	Pounds Per Square Inch Gauge
PSS	Palustrine Scrub-Shrub Wetlands	PUB	Palustrine Unconsolidated Bottom Wetlands
PVC	polyvinyl chloride	PWI	Public Water Inventory

ACRONYMS AND ABBREVIATIONS

R

RBC	Reservation Business Committee	RMD	Resource Management Division

S

SHPO	State Historic Preservation Office	SNA	Scientific and Natural Area
SO_2	Sulfur Dioxide	SOBS	Sites of Biodiversity Significance
SSURGO	Soil Survey Geographic Database		

T

TCP	traditional cultural properties	THPO	Tribal Historic Preservation Office
TSS	Total Suspended Solids		

U

USFWS	U.S. Fish & Wildlife Service	USACE	U.S. Army Corps of Engineers
USDA	United States Department of Agriculture	USGS	U.S. Geological Survey
USNPS	United States National Park Service		

ACRONYMS AND ABBREVIATIONS

V

VOC	Volatile Organic Compounds

W

WCA	Wetland Conservation Act	WMA	Wildlife Management Area
WPMO	Fond du Lac Wetlands Protection and Management Ordinance		

1.0 Introduction

Enbridge Energy, Limited Partnership (Enbridge or Applicant) hereby respectfully submits this Application for a Pipeline Route Permit and Partial Exemption for the Fond du Lac Line 4 Project (the Project) on the Fond du Lac Band of Lake Superior Chippewa (Fond du Lac Band) Reservation. The Project will relocate approximately 10 miles of the existing Line 4 pipeline from the center to the outer edge of the existing Enbridge Mainline Corridor within the Fond du Lac Band Reservation.

The Project addresses specific concerns raised by the Fond du Lac Band related to an above-grade segment of existing Line 4 pipe installed through the Fond du Lac Band Reservation in the 1970s. Fond du Lac Band has raised concerns that the above-grade Fond du Lac Band Line 4 segment creates a barrier to the natural water flow across the Reservation and, in some areas, impedes land access for the Band members to gather medicinal plants and other culturally important resources. After thoroughly investigating those concerns and potential alternatives, Enbridge and Fond du Lac Band agreed to relocate and bury the new proposed Line 4 segment within the Reservation adjacent to the current Enbridge Mainline Corridor. Once the Project is complete and the new relocated Line 4 segment is in service, the existing above-grade Line 4 segment will be deactivated and removed. Removal of the existing segment of Line 4 in the Fond du Lac Band Reservation will provide a positive impact on humans and the environment. The positive impacts include, removing the physical barrier and enhancing access to Band members who traverse this area and removing the hydrologic barriers to surface flow, allowing future environmental remediation of Fond du Lac Band lands.

1.1 Summary of Proposed Action

1.1.1 Pipeline

The proposed Project includes relocating approximately 10 miles of the existing 48-inch diameter Line 4 pipeline with approximately 10 miles of 36-inch diameter pipeline in the Right-of-Way adjacent to the existing Enbridge Mainline Corridor. The Project will be located in portions of St. Louis and Carlton Counties within the boundaries of the Fond du Lac Band Reservation. The Project will parallel the existing Enbridge Mainline Corridor for 100 percent of the proposed Preferred Route.

The segment of the existing Line 4 pipeline which will be relocated will be removed after the Project has received regulatory approvals and is constructed, tested, and placed into service.

A copy of the Project Overview Map is also enclosed as Appendix A of this Application.

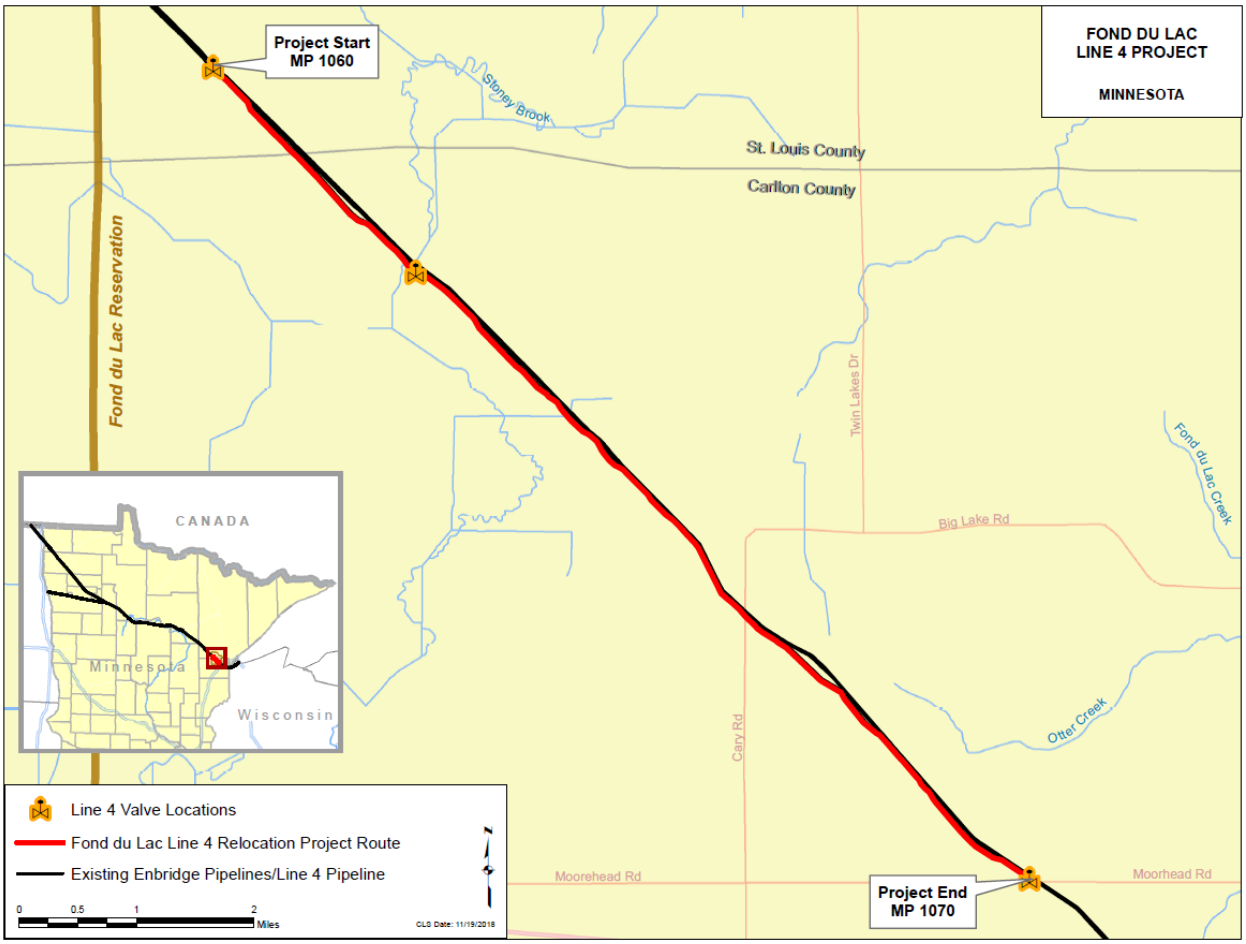


Figure 1.1-1 Project Overview Map

1.1.2 Associated Facilities

The Project's associated facilities include mainline valves, access roads, and cathodic protection equipment. Because the proposed Project will relocate a segment of the existing Line 4 pipeline between two existing mainline valve locations, no new pump stations are proposed as part of the Project. The Project will involve the following valve site work: the removal of an existing mainline valve at the existing milepost (MP) 1060 valve site; the installation of a new mainline valve at MP 1062; and the removal and replacement of an existing mainline valve at MP 1070 (see Figure 1.1.2-1). The valve work at these locations is required to place the valves in the right location for operational needs of the Enbridge Mainline System and to isolate segments of the pipeline near environmental features identified by the Fond du Lac Band.

Ten temporary access roads and two new operational access roads for the valve sites are proposed along existing trails and roads where public roads do not provide adequate access to the Right-of-Way for construction. These temporary access roads are also planned to be used during the construction of the Line 3 Replacement Project. Enbridge will restore the temporary access roads after construction of the Project and the Line 3 Replacement Project is complete.

Further, new cathodic protection test stations will be installed along the Project. A cathodic protection test station is a wire or cable attached to an underground metallic structure (i.e., Line 4 pipeline) that is encased in a polyvinyl chloride (PVC) pipe that extends 3 to 4 feet above-grade with a cap.

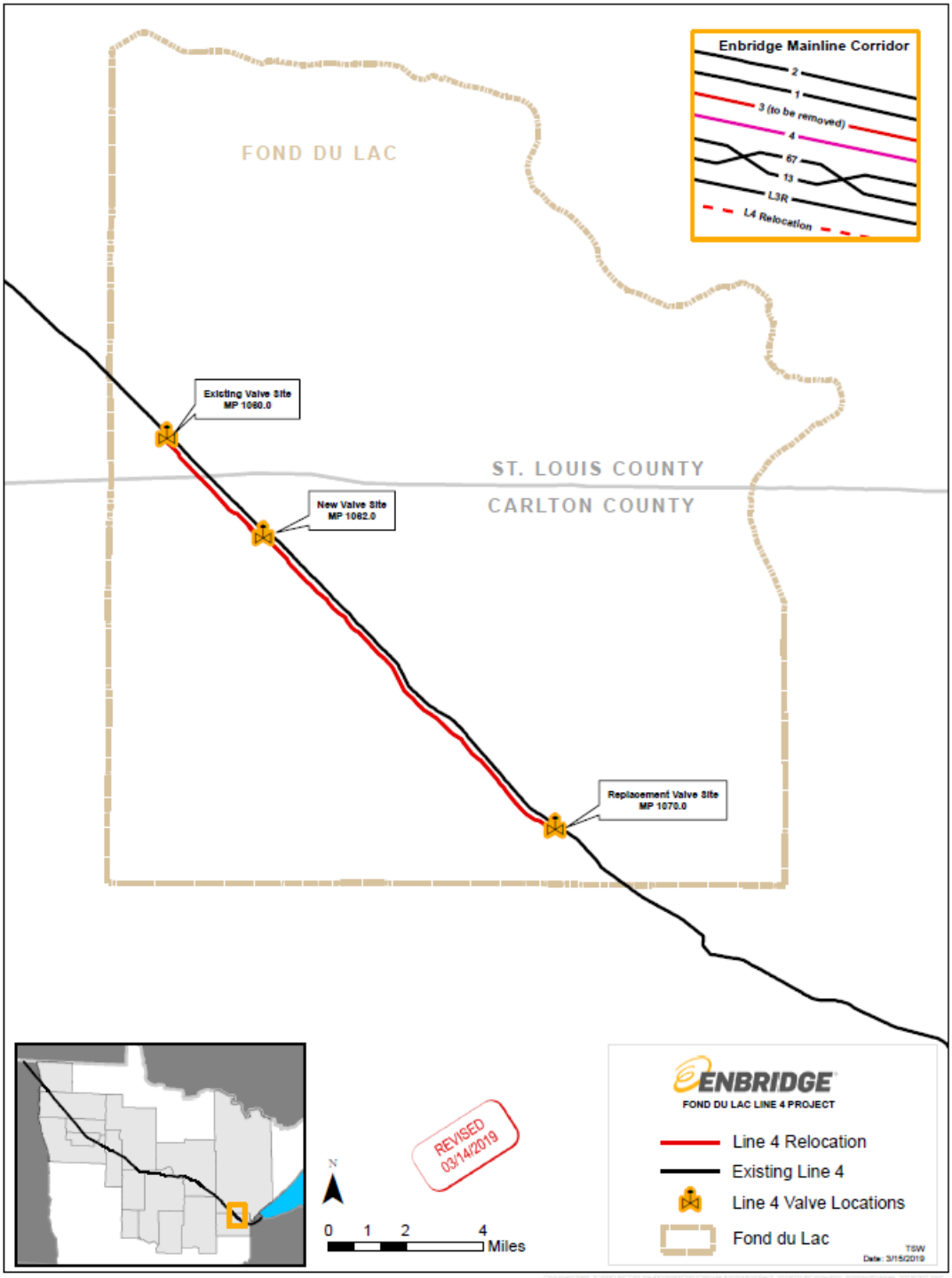


Figure 1.1.2-1 Valve Location Map

1.2 Statement of Ownership

Enbridge Energy, Limited Partnership (Enbridge) is a Delaware limited partnership authorized to do business in the State of Minnesota. Enbridge is a wholly owned subsidiary of Enbridge Energy Partners, L.P. (Enbridge Partners) which is a Delaware limited partnership headquartered at 5400 Westheimer Court, Houston, 77056 (ph. 713-627-5400); www.enbridgepartners.com.

1.2.1 Applicant's Name and Contact Information

Enbridge is the Applicant and will own and operate the Project. The Applicant's contact information is provided below:

Enbridge Energy, Limited Partnership
5400 Westheimer Court
Houston, Texas 77056
(713) 627-5400

1.2.2 Authorized Representative's Name and Contact Information

Listed below are the authorized representatives and their respective contact information for the Applicant.

Christina K. Brusven	Haley Waller Pitts
Fredrikson & Byron P.A.	Fredrikson & Byron P.A.
200 South Sixth Street	200 South Sixth Street
Suite 4000	Suite 4000
Minneapolis, Minnesota 55402	Minneapolis, Minnesota 55402
(612) 492-7000	(612) 492-7000
cbrusven@fredlaw.com	hwallerpitts@fredlaw.com

1.2.3 Contact Regarding Filing

The name, title, address, and telephone number for each contact person of the Applicant are as follows:

James Watts	Jason Risdall
Managing Legal Counsel	Supervisor Regulatory Affairs
26 E. Superior Street	26 E. Superior Street
Duluth, Minnesota 55802	Duluth, Minnesota 55802
218-464-5706	218-522-4705
James.Watts@enbridge.com	Jason.Risdall@enbridge.com

1.2.4 Applicant's Signatories and Preparer

The Application was prepared by Enbridge. The following individual is authorized to sign the Application on behalf of Enbridge:

/s/ James Watts
James Watts
Managing Legal Counsel
Enbridge Energy, Limited Partnership
By Enbridge Pipelines (Lakehead) L.L.C.

1.2.5 Other Outreach Tools

Enbridge has established the following outreach tools to allow interested parties the opportunity to obtain information about and submit questions/comments regarding the Project:

- E-mail: EnbridgeinMN@enbridge.com
- Toll-Free Number: 1-855-788-7812

Enbridge monitors these outreach tools in order to respond to questions in a timely manner.

1.3 Minnesota Public Utilities Commission (MPUC) Permit Process

Pipeline Routing Permit and Partial Exemption

Minnesota Statutes Section 216G.02 requires that the MPUC issue a pipeline Routing Permit for certain pipelines, including the Project, prior to construction. Enbridge is submitting this Application for a Route Permit under the partial exemption of pipeline route selection procedures (Minnesota Rules Chapter 7852.0700). The Route Permit application and associated filings can be viewed at the MPUC's website at: https://edockets.state.mnus/efiling/ under MPUC Docket No. PL9/PPL-18-752.

The flowchart in Figure 1.3-1 outlines the MPUC Partial Exemption process:

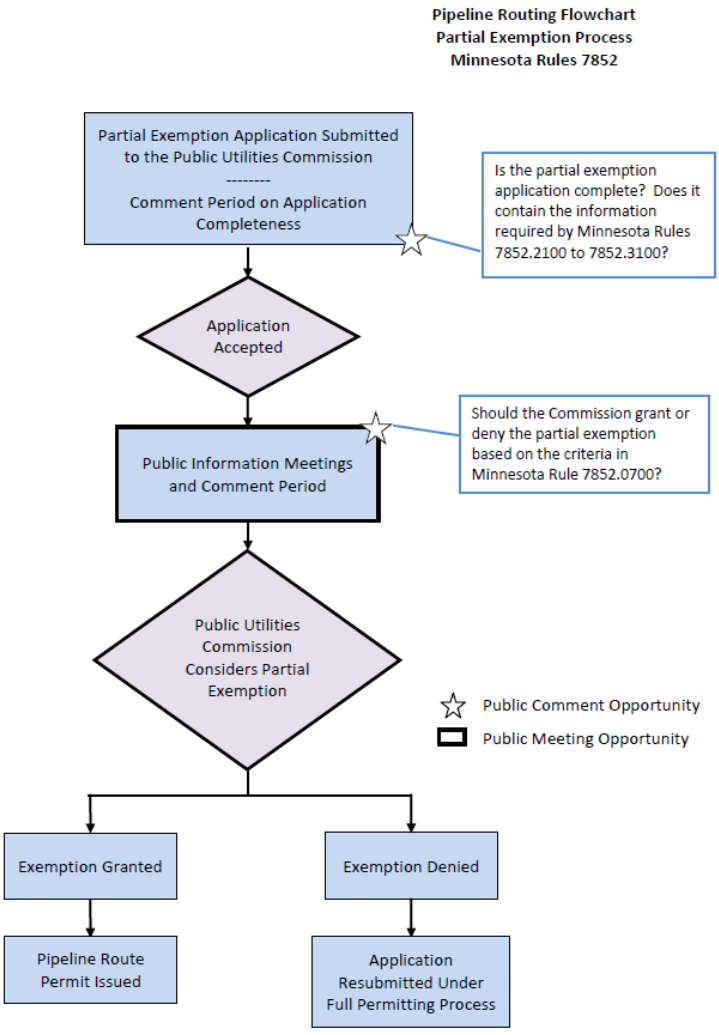


Figure 1.3-1 MPUC Partial Exemption Process

2.0 PURPOSE AND NEED

Enbridge is proposing this Project to address specific concerns raised by the Fond du Lac Band related to an above-grade segment of Line 4 installed through the Fond du Lac Band Reservation in the 1970s. Fond du Lac Band has raised concerns that the above-grade Fond du Lac Band Line 4 segment creates a barrier to the natural water flow across the Reservation and, in some areas, impedes land access for the Band members to gather medicinal plants and other culturally important resources. After thoroughly investigating those concerns and potential alternatives, Enbridge and Fond du Lac Band agreed to relocate and bury approximately 10 miles of a new proposed Line 4 segment adjacent to the existing Enbridge Mainline Corridor on the Fond du Lac Band Reservation. Once the Project is complete and the new relocated Line 4 segment is in service, the existing above-grade Line 4 segment will be deactivated and removed.

Originally, existing Line 4 was constructed above-grade in certain wetlands and heavily saturated soils using mound construction, whereby the pipeline is installed on the surface of the land and covered with soil. Due to the pipeline's location above-grade, hydrology is being affected within multiple wetland areas on the Reservation. In addition, over the years, soil erosion on portions of the above-grade pipe within the Reservation has led to pipeline exposures. By relocating this Line 4 segment and then subsequently removing the existing pipe, the Project will accomplish four goals:

1. The Project will protect the Line 4 pipeline against third-party damage.
2. After planned removal of this segment of existing Line 4, the Project enables planned future restoration of impacted wetlands by removing the hydrologic barrier to the surface flow to allow future environmental remediation of Fond du Lac Band lands.
3. After planned removal of this segment, the Project will improve land accessibility for the Fond du Lac Band Community, enabling use of this area for the Community to actively practice traditional activities and provide access for timber management.
4. After planned removal of this segment, the Project will eliminate exposed Line 4 pipe segments within Fond du Lac Band Reservation by relocating the existing, above-grade, 48-inch-diameter pipeline with a buried, 36-inch diameter pipeline.

Fond du Lac Band believes that the Project will benefit its Community by meeting each of these goals; Enbridge agrees.

3.0 Project Description

3.1 Background Information

3.1.1 History of Line 4

The existing Line 4 is a 36-to-48-inch outside diameter, approximately 1,100 mile long pipeline that extends from Edmonton, Alberta, Canada to Superior, Wisconsin. Construction of Line 4 began in the 1970s as 48-inch parallel loops to the existing Line 3 pipeline. In the 1990s, 36-inch diameter pipe was installed to connect the 48-inch loops until a continuous line was completed.

The existing Line 4 on the Fond du Lac Band Reservation was constructed with 48-inch pipe and installed above-grade using mound construction techniques, whereby the pipeline is installed on the surface of the land and covered with soil that is removed from areas immediately adjacent to the pipeline. The other Enbridge pipelines on the Fond du Lac Band Reservation (Line 1, Line 2, Line 3, Line 13, and Line 67) were installed below grade.

Line 4 has transported heavy, medium, and light crude oil at various capacity levels over its operating history. Line 4 has and continues to play an important and integral role in delivering crude oil to (i) Minnesota Pipeline Company's interconnecting facilities at Clearbrook, for ultimate delivery to Minnesota refineries, and (ii) the Superior Terminal, for ultimate delivery to other refineries in the United States and Canada.

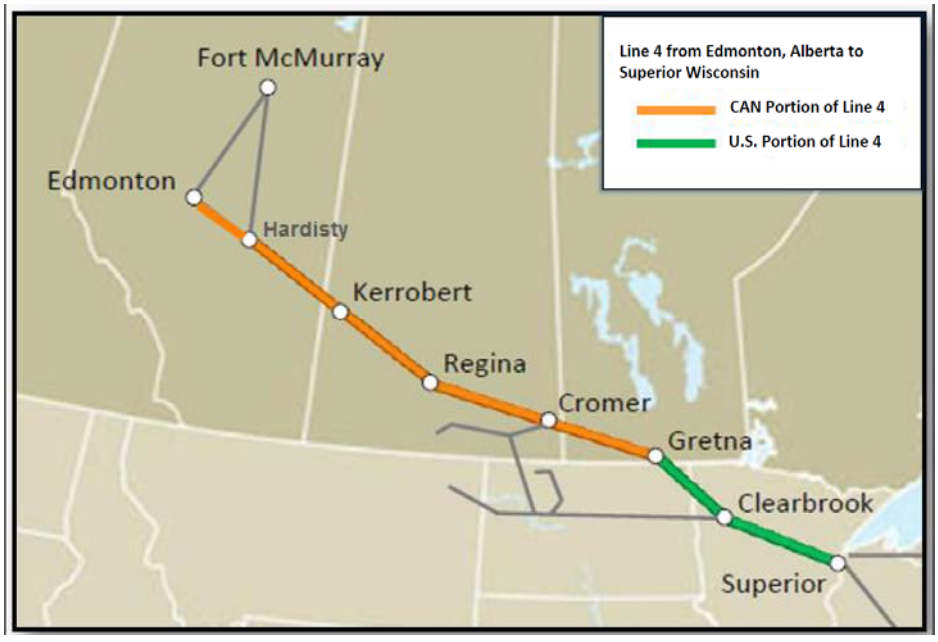


Figure 3.1-1 Overview Map of Line 4

3.2 General Location

The Project is located within the Fond du Lac Band Reservation in portions of Arrowhead Township in St. Louis County, and Progress and Perch Lake Townships in Carlton County, in northeastern Minnesota. Figure 3.2-1 shows the general location of the pipeline.

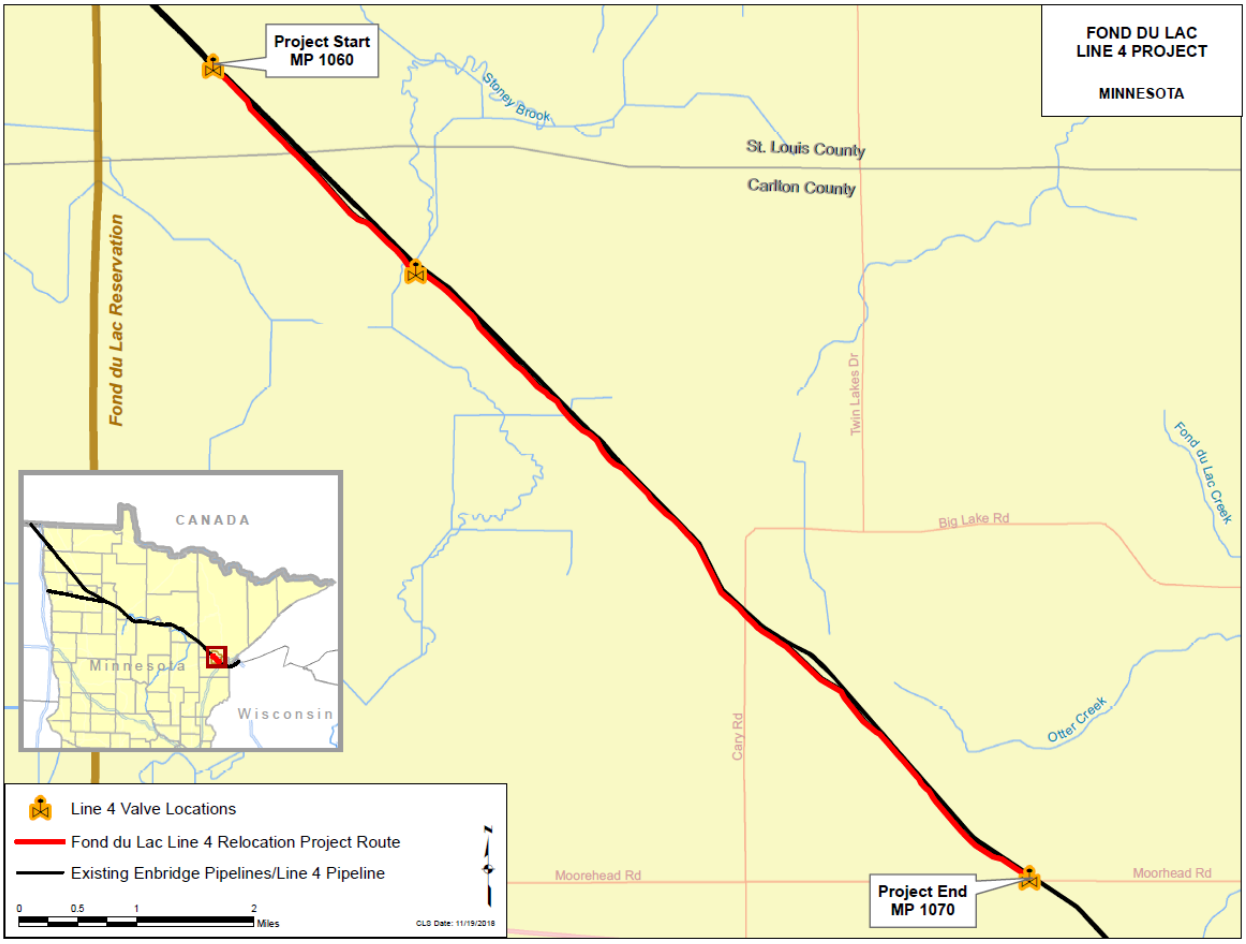


Figure 3.2-1 Project Overview Map

3.3 Proposed Project

Enbridge proposes to relocate an approximately 10-mile segment of the existing Line 4 pipeline with approximately 10 miles of new 36-inch diameter pipeline, parallel to the Line 3 Replacement pipeline as illustrated in Figures 3.2-1. After the 10-mile segment of pipe is relocated, the Line 4 pipe will be re-connected to the existing Enbridge Mainline System at the valve locations (MP 1060 & MP 1070) through mechanical excavation underneath the active pipelines (Line 3R, Line 67, and Line 13). The existing 10-mile segment of above-grade Line 4 pipe that will be relocated will be permanently deactivated following completion of the Project. Details regarding design specifications of the pipeline and associated above-ground facilities are provided below.

3.3.1 Pipeline Design Specifications

Table 3.3.1-1 summarizes the design parameters of the pipe required for the Project. The pipeline design specification outlined in the table below will be designed and constructed with all applicable state and federal rules or regulations.

The wall thickness of these sections will vary between 0.515-inch and 0.600-inch, and length of the pipe sections will be determined on a site-specific basis based on detailed engineering for the final route. The increased wall thickness designed at these crossings is primarily implemented to account for the additional stress caused by exterior loads and additional stress encountered during installation. A minimum wall thickness requirement for pressure containment is calculated for the entire mainline to satisfy the desired Maximum Allowable Operation Pressure (MAOP), thereby ensuring the entire mainline can withstand normal operating pressure at designed wall thickness. In addition, short lengths of heavier-wall pipe will be utilized at roads and water crossings.

The determination of an appropriate pipeline wall thickness is governed by design criteria in the Code of Federal Regulations (C.F.R.), which incorporates numerous factors, one such being the pipe design factor, which is a safety factor provided in C.F.R. § 195.106(a). Another such factor, the longitudinal seam factor, is a factor that takes into consideration the method by which the longitudinal weld was completed and can be found in C.F.R. § 195.106(e). The specified minimum yield strength as provided in the table means the amount of stress required to induce permanent deformation of the steel as prescribed by the specification that the pipe was manufactured to. Finally, the tensile strength is the maximum stress that the steel can withstand while being stretched or pulled before breaking.

Table 3.3.1-1 Fond du Lac Band Line 4 Project Pipe Specifications	
Explanation	**Specification**
Pipe Size (Diameter)	36-inch outside diameter (NPS 36)
Pipe Type (Grade)	X70 carbon steel pipe manufactured according to American Petroleum Institute (API) Specifications 5L PS2
Pipe Wall Thickness	
Nominal	0.515 inch
Road Bore	0.600 inch
Cased Railroad	N/A
Uncased Railroad	N/A
Horizontal Directional Drill (HDD)	N/A
Estimated Length	10 miles
Pipe Design Factor	0.72
Longitudinal Seam Factor	1.00
Class Location and Requirements	Not applicable (applies to natural gas pipelines)
Coating, mainline	14 mils Epoxy Bonding
Coating, trenchless	40 mils Epoxy Bonding ABR
Specified Minimum Yield Strength (psi)	70,000 psi
Tensile Strength (psi)	82,000 psi

3.3.2 Operating Pressure

The operating pressure of the Project will be up to 1,156 pounds per square inch gauge (psig). The maximum operating pressure of the relocated segment of Line 4, based on Barlow's formula, which is a calculation used to show the relationship between internal pressure, allowable stress, nominal thickness, and diameter, could be 1,440 psig.

3.4 Associated Facilities

The Project's associated facilities include mainline valves, access roads, and cathodic protection equipment. Because the proposed Project will relocate a segment of the existing Line 4 pipeline between two existing mainline valve locations, no new pump stations are proposed as part of the Project. The Project will involve the following valve site work: the removal of an existing mainline valve at the existing MP 1060 valve site; the installation of a new mainline valve at MP 1062; and the removal and replacement of an existing mainline valve at MP 1070.

Ten new temporary access roads and two new operational access roads for the valve sites are proposed to facilitate Project construction in coordination with the Line 3 Replacement Project. The proposed access roads will be located along existing trails and roads that lead to the Right-of-Way in areas where public roads do not provide adequate access for construction.

The Project will receive cathodic protection by tying into Enbridge's existing impressed current systems. All cathodic protection connections including test station leads, bonding cables and rectifier cables on the existing Line 4 will be reconnected on the relocated segment. New cathodic protection test stations will be installed along the Project. A cathodic protection test station is a wire or cable attached to an underground metallic structure (i.e., Line 4 pipeline) that is encased in a PVC pipe that extends 3 to 4 feet above-grade with a cap.

3.4.1 Valve Placement

Enbridge conducted an Intelligent Valve Placement (IVP) analysis for the Project's Preferred Route to ensure that the current and intended valve placement complies with federal law and the operational needs of the Enbridge Mainline System.

The valves to be installed will be 36-inch American National Standards Institute (ANSI) 600 weld end by weld end, full port, rising stem gate valves. These valves will be manufactured in accordance with industry standard, American Petroleum Institute Standard 6D "American Petroleum Institute Specification for Steel, Gate, Plug, Ball, and Check Valves for Pipeline Service." Table 3.4.1-1 below summarizes the current design parameters of the valves.

Table 3.4.1-1
Valve Design Parameters

Design Parameter	Specification
Diameter	36-inch outside diameter (NPS 36)
American National Standards Institute Rating	ANSI Class 600
Maximum Operating Pressure	1440 psig

3.4.2 Other Third-Party Ancillary Facilities

The new mainline valves are motor-actuated and a new electrical service including the installation of an electrical service meter will be required to remotely operate the valves.

3.5 General Design and Operational Specifications

The Project will be designed and constructed in accordance with federal pipeline safety regulations, specifically 49 C.F.R. Parts 194 and 195 and any applicable national technical standards, including American Society of Mechanical Engineers B31.4.

Line 4 is currently a dual diameter line with sections of 36-inch and 48-inch pipe in operation. The Project is being proposed with 36-inch pipe, rather than 48-inch pipe, for several reasons:

1. Hydraulic models indicate the ability to maintain the rated flow capacity with the 36-inch diameter pipe using pressures within the limits of the MAOP of the adjacent sections of Line 4;
2. By using 36-inch pipe, the Project will be able to leverage similar construction equipment, materials, and installation techniques as those being used on the adjacent Line 3 Replacement Project.
3. As an additional benefit to constructing with a 36-inch pipe, spare parts can be pooled together for the operation of the relocated Line 4 section with the other Enbridge pipelines of the same diameter. These include the sections of Line 4 that are currently 36-inches in diameter, the adjacent Line 3 Replacement pipeline, and the recent Alberta Clipper pipeline.
4. Line 4 already requires the use of dual diameter inspection tools, using 36-inch diameter pipe for this segment will have no effect on Enbridge's ability to inspect the pipeline.

3.5.1 Product Capacity Information

The Project's design and annual capacity information assumes that predominantly heavy crude oil will be transported on the Line 4 pipeline with the Fond du Lac Band segment relocation being placed in-service.

There are multiple variables that determine the capacity of a pipeline. First, liquid pipelines are generally designed at a specified capacity for a known liquid; so a change in fluid characteristics (e.g., density and viscosity) of the transported liquids will affect the capacity of the pipeline. Additionally, liquids are also batched, meaning that different liquids, or grades of crude oil, are shipped at different times, generally in a repeatable sequence. Therefore, both the fluid characteristics and batch sequence will affect the capacity of the pipeline.

Two definitions are used to describe pipeline capacity: Design Capacity and Annual Capacity.

Design Capacity: The average capacity of the pipeline and pumping facilities, at its current or proposed design state for given types of liquids and their batch sequence. Design capacity is calculated assuming ideal operating conditions. Design capacity for the entire existing Line 4 pipeline is 884 thousand barrels per day (kbpd). This will not be impacted by the Project.

Annual Capacity: The average sustainable pipeline throughput over a year. Annual capacity is calculated assuming historic average annual operating conditions. These operating conditions

include scheduled and unscheduled maintenance, normal operating issues, and crude supply availability. Annual capacity of a pipeline is typically 90 percent of design capacity, and represents the capacity requested in this Application. Annual Average Capacity for the Line 4 pipeline is 796 kbpd. This will not be impacted by the Project.

3.5.2 Product Description

Enbridge transports a wide variety of petroleum products. The products, generally described, are condensate, light crude, medium crude, heavy crude, and natural gas liquids.

The Line 4 pipeline currently transports predominantly heavy crude oil. The products shipped on Line 4 are not expected to change with the Project in service.

3.5.3 Safety Data Sheets

Enclosed as Appendix C are the Safety Data Sheets for the crude oil that may be transported on the Project.

3.6 Land Requirements

As proposed, the Project will require the acquisition of new Right-of-Way and temporary workspace on the Fond du Lac Band Reservation in Minnesota. Land requirements have been minimized by the Project's Preferred Route, which was selected in coordination with Fond du Lac to primarily share and/or run parallel to the existing Enbridge Mainline Corridor.

The Project will typically require the acquisition of 20 to 40 feet of new Right-of-Way in uplands, wetlands, and saturated wetland areas. The temporary workspace within the Reservation may vary depending on the field conditions, but the Project will typically require 140 feet of temporary workspace in upland areas and 115 feet in wetlands and saturated wetland areas, much of which will be disturbed during construction of the Line 3 Replacement Project. The proposed area necessary for new Right-of-Way varies in width based on the terms of existing easements and the current alignment of existing pipelines or utilities within existing easements. The temporary workspaces will be located adjacent to and contiguous with the proposed new Right-of-Way corridor and will be identified by distinctive staking of construction limits prior to clearing. Additionally, the Project's construction impacts will be minimized because the temporary workspace will generally be extended 20 feet outside of what was disturbed for the Line 3 Replacement Project.

A more detailed discussion of the land requirements is provided in the following sections.

3.6.1 Typical New Right-of-Way and Temporary Workspace

As noted above, the Project's Preferred Route will follow the existing Enbridge Mainline Corridor on the Fond du Lac Band Reservation and run parallel to the permitted Line 3 Replacement Project. Shown on Table 3.6.1-1 below are the anticipated land requirements on the Fond du Lac Band Reservation based on the location of the proposed 36-inch diameter pipeline. The Right-of-Way Configuration Drawings are located in Appendix D.

Table 3.6.1-1
Anticipated Land Requirements

Planned Disturbance[a]				New Disturbance	
New Line 4 Temporary Workspace & Existing Enbridge ROW	New Line 4 Temporary Workspace & Planned Line 3R ROW	Planned New Line 4 ROW [b]	Temporary Workspace Planned to be Impacted by the Line 3R Project	New Temporary Workspace For Line 4	Total Land Requirements (ft.) [b]
40 – upland 40 – wetland 25 – saturated wetland	11.5 – upland 11.5 – wetland 26.5 – saturated wetland	20 - upland 20 - wetland 40 - saturated wetlands	48.5 - upland 23.5 - wetland 3.5 - saturated wetlands	20 - upland 20 - wetland 20 - saturated wetlands	140 - upland 115 - wetland 115 - saturated wetlands

[a] Disturbance on the Enbridge Right-of-Way planned to occur for the Line 3 Replacement Project.
[b] These are typical widths and may vary along the Preferred Route.

Overall, the amount of new Right-of-Way to be acquired is anticipated to be limited to 37 acres. In total, Project construction will affect approximately 168 acres of land. Of that total, 64 acres would be just the Line 4 temporary workspace and new Right-of-Way impacts. The rest of the total will be shared temporary workspace and new Right-of-Way workspace with the Line 3 Replacement Project.

As noted in Table 3.6.1-1 above, the Right-of-Way configuration drawings depicting the typical Project construction footprint in upland, wetland, and saturated wetland areas are included in Appendix D of this Application.

3.6.2 Additional Temporary Workspace (ATWS)

In areas that required special construction methods, the Project's Preferred Route will require additional temporary workspace (ATWS). Table 3.6.2-1 outlines the typical dimensions of additional temporary workspace. The total acreage for ATWS for the Fond du Lac Line 4 Project is approximately 16 acres.

Typical Dimensions of Additional Temporary Workspace	
Feature	Dimensions in feet on each side of feature in addition to the 120-foot-wide or 95-foot-wide temporary ROW
Open-cut road crossings	100 x 75
Bored Road, Foreign Pipeline, and Utility Crossings	100 x 75
Railroad Crossings	200 x 75
Pipeline Crossunders	100 x 75
Waterbody Crossings, including Horizontal Directional Drill crossings	200 x 75
Wetland Crossings	200 x 75

Table 3.6.2-1
Typical Dimensions of Additional Temporary Workspace

3.6.3 Associated Facilities

The associated facilities for the Project are valves (for which Enbridge acquires a separate and distinct easement) and cathodic protection test stations. Valves and other above-ground appurtenances (a perimeter fence with access gate, instrument building within the fenced area, valve stem, associated instrumentation, and electrical service meter) will require approximately 0.055 acre. New cathodic protection test stations will be installed along the Project. Ten temporary access roads and two new operational access roads for the valve sites are proposed along existing trails and roads where public roads do not provide adequate access to the Right-of-Way for construction. These temporary access roads are also planned to be used during the construction of the Line 3 Replacement Project. Enbridge will restore the temporary access roads after construction of the Project and the Line 3 Replacement Project is complete.

3.6.4 Trench Dimensions

Typical trench dimensions are included in Table 3.6.4-1 below. The total amount of soil excavated during construction will be approximately 100 thousand cubic yards that is separated, stored, and then returned to the trench during the Project's backfill operation.

Table 3.6.4-1
Typical Trench Dimensions

	36" outside diameter pipe
Minimum ditch depth to allow for a nominal 36-inches of ground cover to the top of the pipe	72-inches
Trench width at the bottom	5-feet
Trench width at the top	10-12-feet

3.6.5 Minimum Depth of Cover

In accordance with federal requirements (49 C.F.R. § 195.248(a)), the depth of cover between the top of the pipe and the ground level, road bed, or river bottom can range between 18 to 48 inches, depending on the location of the pipe and the presence of rock, which is provided below:

> § 195.248 Cover over buried pipeline.
>
> (a) Unless specifically exempted in this subpart, all pipes must be buried so that it is below the level of cultivation. Except as provided in paragraph (b) of this section, the pipe must be installed so that the cover between the top of the pipe and the ground level, road bed, river bottom, or underwater natural bottom (as determined by recognized and generally accepted practices), as applicable, complies with the following table:

Table 3.6.5-1
Minimum Depth of Cover Location

Location	Cover in inches	
	For normal excavation	For rock excavation[1]
Industrial, commercial, and residential areas	36	30
Crossing of inland bodies of water with a width of at least 100 feet from high water mark to high water mark	48	18
Drainage ditches at public roads and railroads	36	36
Deepwater port safety zones	48	24
Gulf of Mexico and its inlets in waters less than 15 feet deep as measured from mean low water	36	18
Other offshore areas under water less than 12 feet deep as measured from mean low water	36	18
Any other area	30	18

[1] Rock excavation is any excavation that requires blasting or removal by equivalent means.

Based on site characteristics for this Project, these federal regulations allow a depth of cover of 30 inches. Where the pipeline crosses cultivated agricultural lands, state law requires that a minimum depth of cover of 54-inches be maintained, unless waived by the landowner. However, this Project does not cross cultivated agricultural lands and the minimum depth of cover required by the state will not apply.

3.6.6 Right-of-Way Sharing and Paralleling

As proposed, the Project will parallel existing Enbridge pipelines within the Enbridge Mainline Corridor for 100 percent of its length.

Table 3.6.6-1
Fond du Lac Band Line 4 Project - Paralleling Enbridge Pipelines

Begin Mile Post	End Mile Post	Enbridge Pipelines	Third-Party Pipelines	Other Utilities Corridors	Roads/ Railroads/ Highways	Greenfield	Paralleling Miles	Greenfield Miles	Total
1060	1070	X					10		
Total Miles							10	0	10
Percentages							100%	0%	

3.6.7 Project Widths

The Preferred Route width is 750 feet and the new Right-of-Way width is between 20-40 feet.

3.7 Pipeline Estimated Costs and Accessibility

The total Project estimated cost is approximately $100 million.

3.8 Project Schedule

The Project time schedule is shown in Table 3.8-1 below.

Table 3.8-1
Project Schedule

Milestone	Time
Submission of Pipeline Routing Permit and Partial Exemption	1st Quarter 2019
Issuance of Pipeline Routing Permit and Partial Exemption	3rd Quarter of 2019
Construction Start Date	2nd Quarter of 2020
Anticipated Construction Complete	3rd Quarter of 2020
In-Service Date	3rd Quarter of 2020

The Project is proposed to be constructed in conjunction with construction of the Line 3 Replacement Project. This coordination will eliminate the need for Enbridge to re-mobilize after the Line 3 Replacement Project, reduce the duration of construction activity and extent of environmental impacts, and will expedite the restoration process.

3.9 Project Expansion

There are no current plans for expansion of the Project.

4.0 Right-of-Way Preparation and Construction Sequence

The following sections provide an overview of the typical processes and procedures that will be implemented for this Project. Associated facilities will be constructed concurrently with the pipeline.

4.1 Environmental Controls

Enbridge plans to utilize the Environmental Protection Plan (EPP) found in Appendix B for this Project. The EPP is a description of environmental techniques used to protect the environment and sets the minimum environmental standards that must be followed on the Project. The EPP includes general environmental practices, construction, restoration, and notification procedures addressing soils erosion and sedimentation, wetland and waterbody crossings, spill prevention and containment, construction and hydrotest dewatering, etc. Enbridge has developed standardized erosion control and restoration measures to minimize potentially adverse environmental effects associated with pipeline construction. These measures are described in more detail in Section 1 of Enbridge's EPP (Appendix B), and in Section 6 of this Application. Additional environmental standards that will be followed by the Project are included in Appendix B.

Further, Enbridge also plans to utilize the Unanticipated Discoveries Plan to set forth guidelines in the event archaeological resources or human skeletal remains are discovered during construction activities (Appendix F), and the Contaminated Sites Management Plan to present guidance on managing contaminated soil, water, debris or other materials which may be encountered during Project (Appendix H).

Enbridge will also assign Environmental Inspectors (EIs) to the Project. The same EIs for the Line 3 Replacement Project will be assigned to the Fond du Lac Band Line 4 Project. Environmental inspections will be conducted during construction and restoration activities. The EIs act as a resource for construction personnel and as a liaison among the contractor, Enbridge's Project Management, and agency officials. The EIs are responsible for assisting with pre-construction field tasks such as marking wetland and waterbody boundaries, clarifying environmental requirements, identifying possible issues and challenges ahead of construction, conducting environmental training of construction staff, offering advice and consultation to Enbridge's contractors, and conducting inspections/monitoring in accordance with applicable laws, permits, and Project plans. Enbridge's EIs are required to document environmental compliance throughout the duration of the Project. Additionally, Enbridge will be working with Fond du Lac Band throughout construction because they will also have a monitor from their resource management department on-site throughout Project construction.

4.1.1 Construction Timing

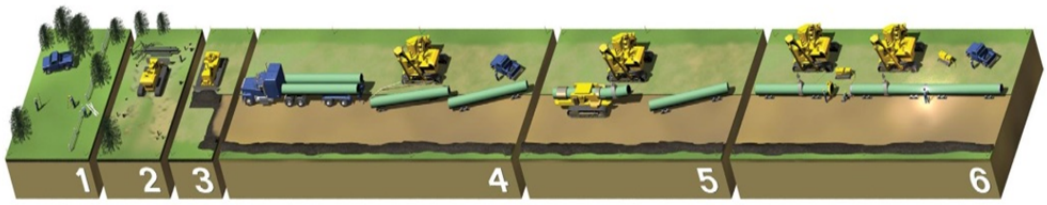
Certain parts of construction are best performed at set times of the year, and while construction timing is largely contingent on receiving all applicable permits, Enbridge strives to schedule construction to avoid and minimize impacts to the environment. Depending on when Enbridge receives required permits, it may be able to start construction activities in 2nd Quarter of 2020. Enbridge has contingency plans that accommodate restricted construction seasons for sensitive resources should the need arise.

If permitting authorizations and construction seasons allow as proposed, the Project is to be constructed in the same construction season as the Line 3 Replacement Project. Constructing in the same season will eliminate the need for Enbridge to re-mobilize and reopen the construction footprint after the Line 3 Replacement Project, further reducing the duration of construction activities and the extent of environmental impacts, and will allow for an expedited, and a more timely restoration process.

4.2 Preparing the Right-of-Way and Construction Sequence

Figure 4.2-1, illustrates the typical steps in pipeline construction. Pipeline construction includes survey and staking of the Right-of-Way; clearing and grading; topsoil stripping and soil segregation; pipe stringing; bending; welding/coating; inspection; trenching; lowering-in; backfilling; hydrostatic testing; cleanup; restoration and revegetation, as explained in the following sections. More detailed information, regarding the construction-related environmental policies, procedures, and protection measures that Enbridge plans to implement in the preparation of the Right-of-Way and construction of this Project, is discussed in the EPP (Appendix B).

Typical Project Construction Footprint in Upland and Wetland Areas



(1) Based on the information gathered during surveying, a final route is developed, and the route is then marked with stakes.

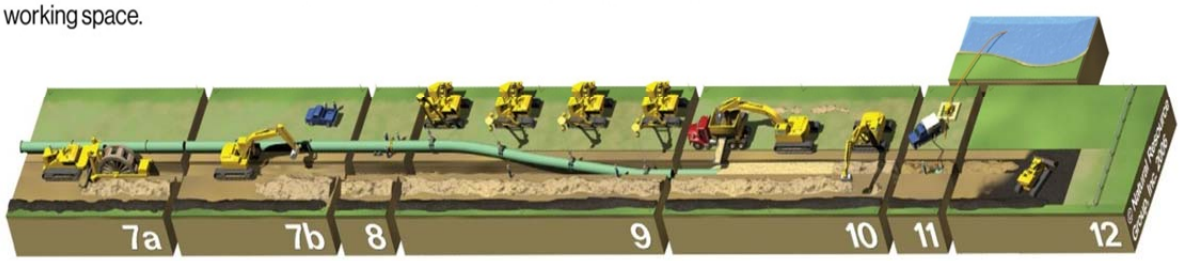
(2) Crews begin to prepare for construction by grading the right-of-way, removing trees and preparing the working space.

(3) In cultivated areas, the topsoil along the right-of-way is stripped and stored in piles for careful replacement following the installation of the pipeline.

(4) Crews then re-stake the center of the trench area, lay out, or "string," sections of the pipe along the right-of-way.

(5) Crews bend and weld the sections of pipe into a longer piece that follows the contours of the land.

(6) Individual sections are already coated to prevent corrosion. Each weld is inspected by X-ray and then coated.



(7a) Once this process is complete, a trench is dug to accept the pipe.

(7b) In agricultural areas, careful attention is paid to properly separate and store the topsoil and subsoil so they do not mix.

(8) The pipe coating is inspected one more time before the pipe is lowered into the trench.

(9) The pipe is lowered into the trench and laid within the prepared trench bottom.

(10) The trench is then carefully backfilled with subsoil and topsoil.

(11) Before operation, pressurized water is used to test the pipeline and verify the structural integrity of the pipe and welds.

(12) The right-of-way and workspace is regraded and vegetated according to agency requirements and landowner agreements.

The construction process usually takes less than two to three months to complete on an individual landowner's property, depending on weather conditions. Throughout the many phases of pre-planning and construction, Enbridge representatives work closely with communities and individuals along the route to provide information, seek input and answer questions.

NOTE: These illustrations are conceptual and general in nature; specific construction and restoration techniques could vary depending on circumstances.

Figure 4.2-1 Typical Project Construction Footprint in Upland and Wetland Areas

4.2.1 Construction Staking

Before construction begins, Enbridge crews will stake the centerline and exterior boundaries of the construction Right-of-Way. Exterior boundary stakes will mark the limit of approved disturbance areas and will be maintained throughout the construction period. Enbridge and its contractors will contact the Gopher One-Call System to identify and mark the locations of underground utilities. During staking, equipment involved in construction will be moved onto the Right-of-Way using existing roads for access wherever practicable. Figure 4.2.1-1 shows an example of the staked construction Right-of-Way to mark the centerline, workspace limits, and the area approved for ground disturbance.

Figure 4.2.1-1 Right-of-Way Staking

Once the Right-of-Way is properly staked, traffic control measures are implemented where the construction Right-of-Way intersects public roads to ensure both construction worker and public safety as shown in Figure 4.2.1-2.

Figure 4.2.1-2 Traffic Control

4.2.2 Clearing and Grading

Once the Right-of-Way is properly staked, clearing equipment is brought in to remove the existing vegetation. This specialized equipment is designed to remove vegetation quickly and efficiently. Absent agency regulations or landowner preference, Enbridge will remove or otherwise dispose of cut trees from the Right-of-Way prior to any soil disturbance activities to prevent soil mixing with cut timber. Landowners will be given the option to take custody of cut timber, in which case the trees will be stockpiled off the Right-of-Way for the landowner. Otherwise, equipment similar to that shown in Figure 4.2.2-1 will be used to efficiently mulch trees and shrubs without damaging the top soil.

Figure 4.2.2-1 Hydro-Axe

After clearing, temporary erosion control measures will be installed in accordance with Enbridge's EPP (Appendix B), as shown in Figure 4.2.2-2 (see also Figure 19A and 19B in the EPP Appendix B).

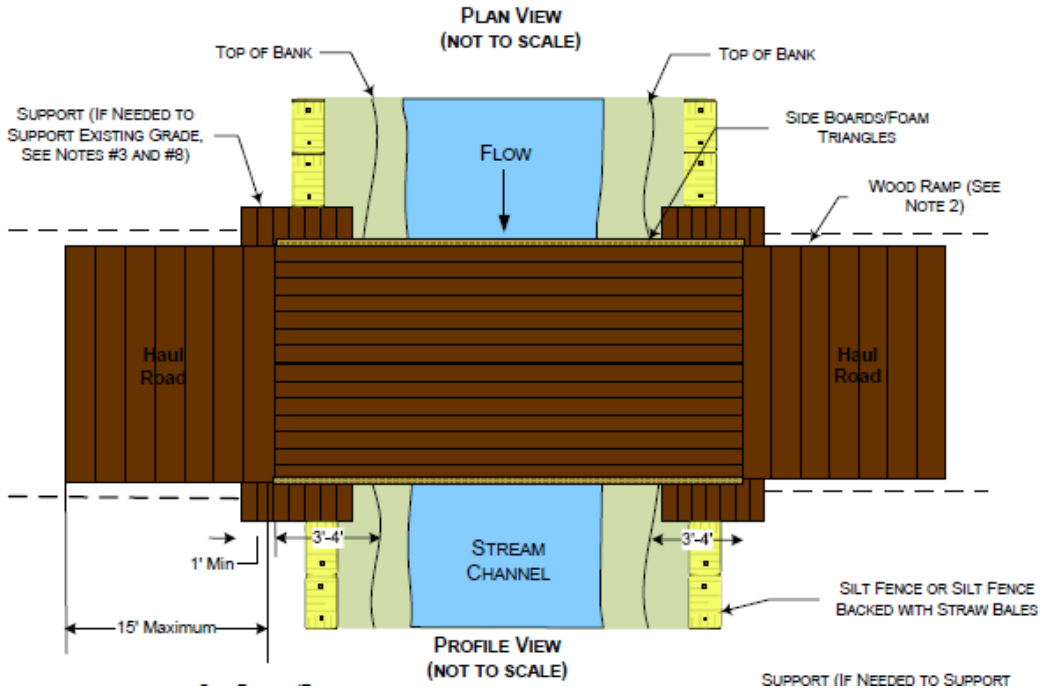


Figure 4.2.2-2 Typical Span Type Bridge With or Without Instream Support

Timber mats will be installed in wetlands where soil conditions cannot support construction equipment without causing rutting or significant soil disturbance (Figure 4.2.2-3). Additionally, mats will be placed at utility crossings where soil conditions are not adequate to support construction loads. Construction workspace will be reduced at wetland crossings as topsoil stripping for the entire footprint does not take place in wetland areas as it does in upland areas. In wetlands (unsaturated), topsoil will be stripped and segregated from the ditch line only. In saturated wetlands, no topsoil segregation will take place. Therefore, wetland areas require less workspace to place and store spoils and ultimately minimizes impacts as shown below in Figure 4.2.2-4 (see also Figure 24 in EPP Appendix B).

Figure 4.2.2-3 Timber Mats

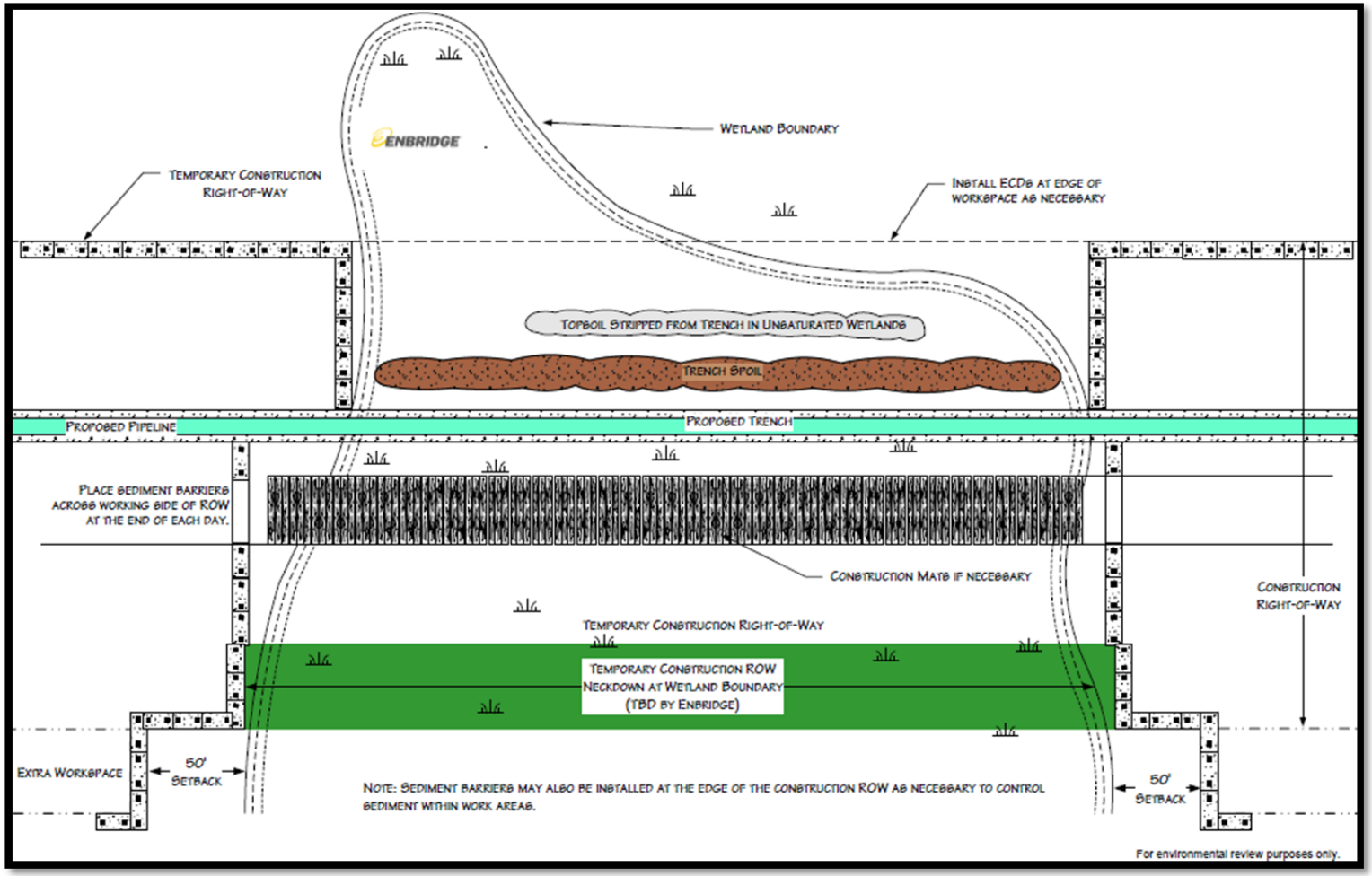


Figure 4.2.2-4 Typical Wetland Crossing Method

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4.2.3 Soil Separation

Topsoil will be stripped and segregated during construction in agricultural lands, residential areas, and other areas as requested by the Landowner or as specified in the Project plans, commitments, and/or permits. The topsoil is separated from the subsoil because it has the highest concentration of organic matter and will enhance the revegation process. Topsoil segregation methods include “trench-line-only” and the “modified ditch-plus-spoil side” methods.

The “trench-line-only” topsoil segregation method may be used where Enbridge determines that the width of the construction Right-of-Way is insufficient for other methods to be used. Enbridge may also use the trench-line-only topsoil segregation method in areas where there is a thick sod layer such as in hay fields, pastures, golf courses, and residential areas, unless otherwise requested by the landowner. Alternative topsoil segregation methods, such as “modified ditch-plus-spoil side’, may be used on a site-specific basis or as requested by the landowner. Topsoil is not typically segregated in standing water wetlands unless specifically requested by the landowner and/or managing land agency in accordance with applicable permit conditions.

The “modified ditch-plus-spoil side” method is shown in Figure 4.2.3-2 (see also Figure 3 in the EPP Appendix B). For a complete description of topsoil segregation methods and applications, see Sections 1.10 (uplands) and 3.6.1 (wetlands) of the EPP (Appendix B).

Figure 4.2.3-1 Topsoil Segregation

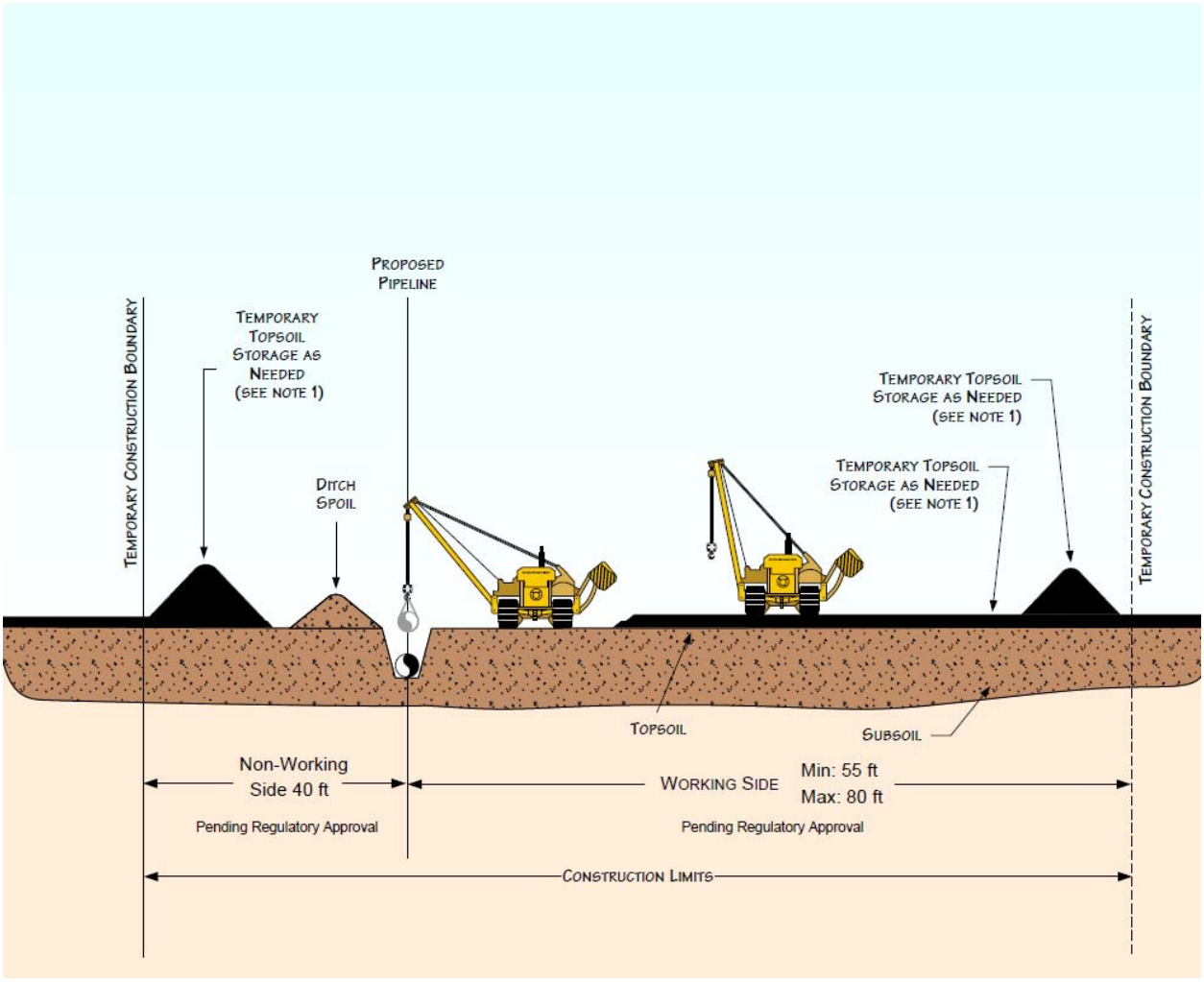

Figure 4.2.3-2 Typical Topsoil Segregation – Modified Ditch Plus Spoil Side

4.2.4 Stringing Pipe

Pipe, specifically fabricated for the Project, is loaded from the pipe yard located near the route in Carlton, Minnesota, onto specialized "stringing trucks" and transported to the construction Right-of-Way as shown in Figure 4.2.4-1.

Figure 4.2.4-1 Pipe Loading

Before excavating the pipeline trench, Enbridge will string individual joints of pipe along the construction Right-of-Way and arrange the pipe to be accessible to construction personnel as shown in Figure 4.2.4-2. Small portable cranes and/or side-boom tractors are used to unload the stringing trucks and place the pipe along the Right-of-Way.

Figure 4.2.4-2 Pipe Stringing

4.2.5 Bending and Welding/Coating and Inspection

A mechanical pipe-bending machine bends individual joints of pipe to the angle needed to accommodate changes in the natural ground contour or pipeline alignment as shown in Figure 4.2.5-1. In certain areas where field bending is not practicable, prefabricated fittings will be used.

Figure 4.2.5-1 Field Bending

After pipes are strung and bent, the pipe sections will be welded together and placed on temporary supports next to the trench. Figure 4.2.5-2 below shows a “welding shack” being lowered onto the pipe. These shacks contain automated welding machinery, which performs the welds. Some manuals welds will also need to be made in areas where conditions are not conducive to the automated process.

Figure 4.2.5-2 Welding Shacks

Although federal regulations require only 10 percent of the welds to be inspected, Enbridge will field-inspect 100 percent of the welds and will apply coating at welded joints as shown in Figure 4.2.5-3.

Figure 4.2.5-3 Field Inspection

4.2.6 Trenching and Lowering of the Pipeline

Construction personnel will use backhoes and/or ditching machines to excavate a trench that is approximately 6 feet deep. To the extent practicable, trench walls will be vertical. The trench will typically be 10-12 feet wide at the top. In unstable and saturated soils, the trench could be wider. The pipe will then be lowered into the trench using side-boom tractors as shown in Figure 4.2.6-1.

At this point, construction survey crews will use precision global positioning system (GPS) equipment to mark the final position of the pipeline before be backfilled. This step will ensure adequate depth of cover has been achieved and that the pipeline is located properly within the easement.

Figure 4.2.6-1 Lowering of the Pipeline

To the extent that there is water in the trench, trench dewatering may include use of a dewatering structure such as a straw bale dewatering structure with a geotextile filter bag to provide additional filtration near sensitive resource areas in accordance with Section 5.1 of Enbridge's EPP (Appendix B) and applicable permits. Landowner approval is required in advance of placement of dewatering structures outside of the approved construction Right-of-Way. If water is discharged to a well-vegetated upland area, dewatering filter bags and controlled discharge rates will be used to minimize the potential for erosion and subsequent release of sediment into nearby surface water and wetlands as shown in Figure 4.2.6-2 (see also Figure 22C in EPP Appendix B) and Figure 4.2.6-3 (see also Figure 21 in EPP Appendix B). Fond du Lac Band must approve all dewatering including the location and type of dewatering structures.

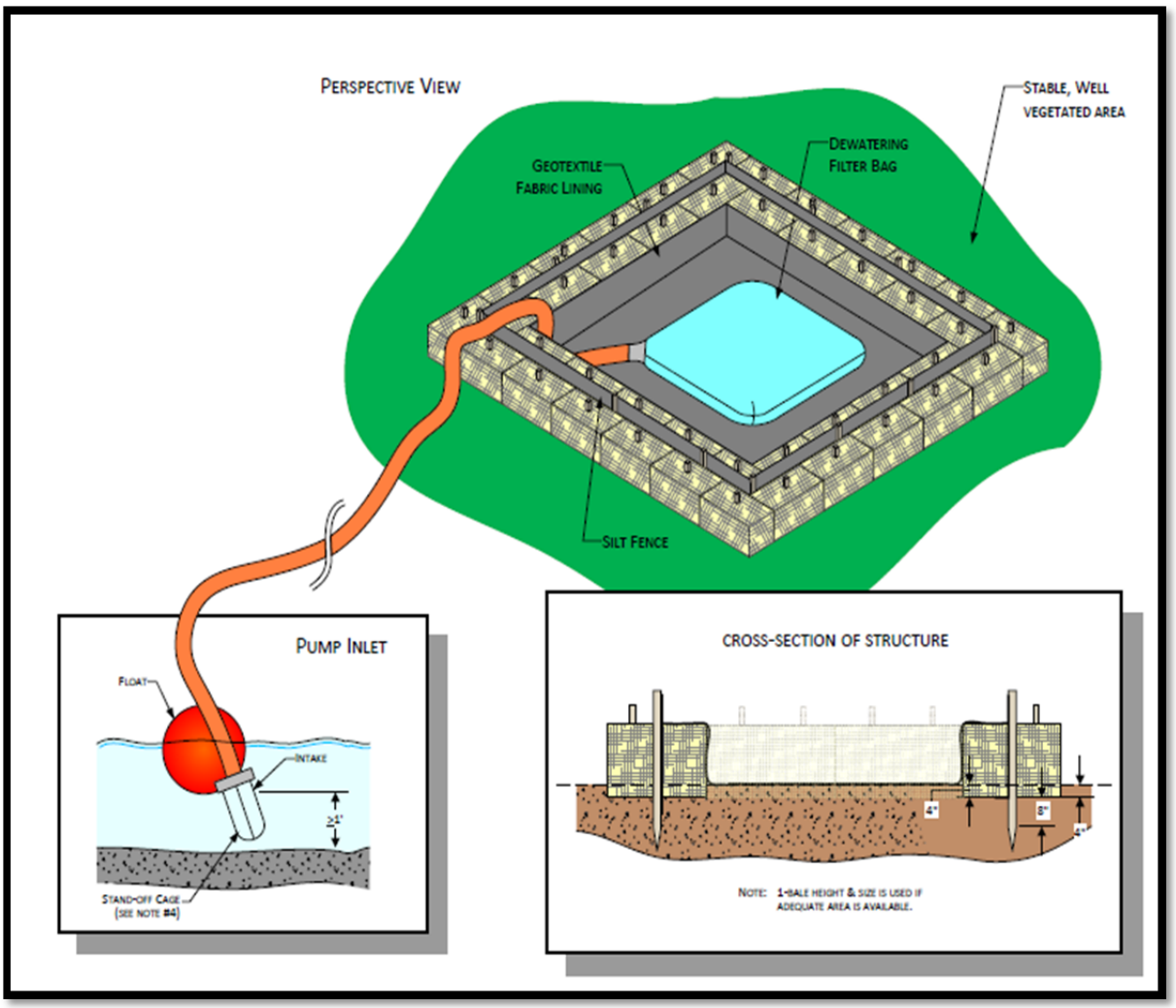

Figure 4.2.6-2 Straw Bale Dewatering Structure

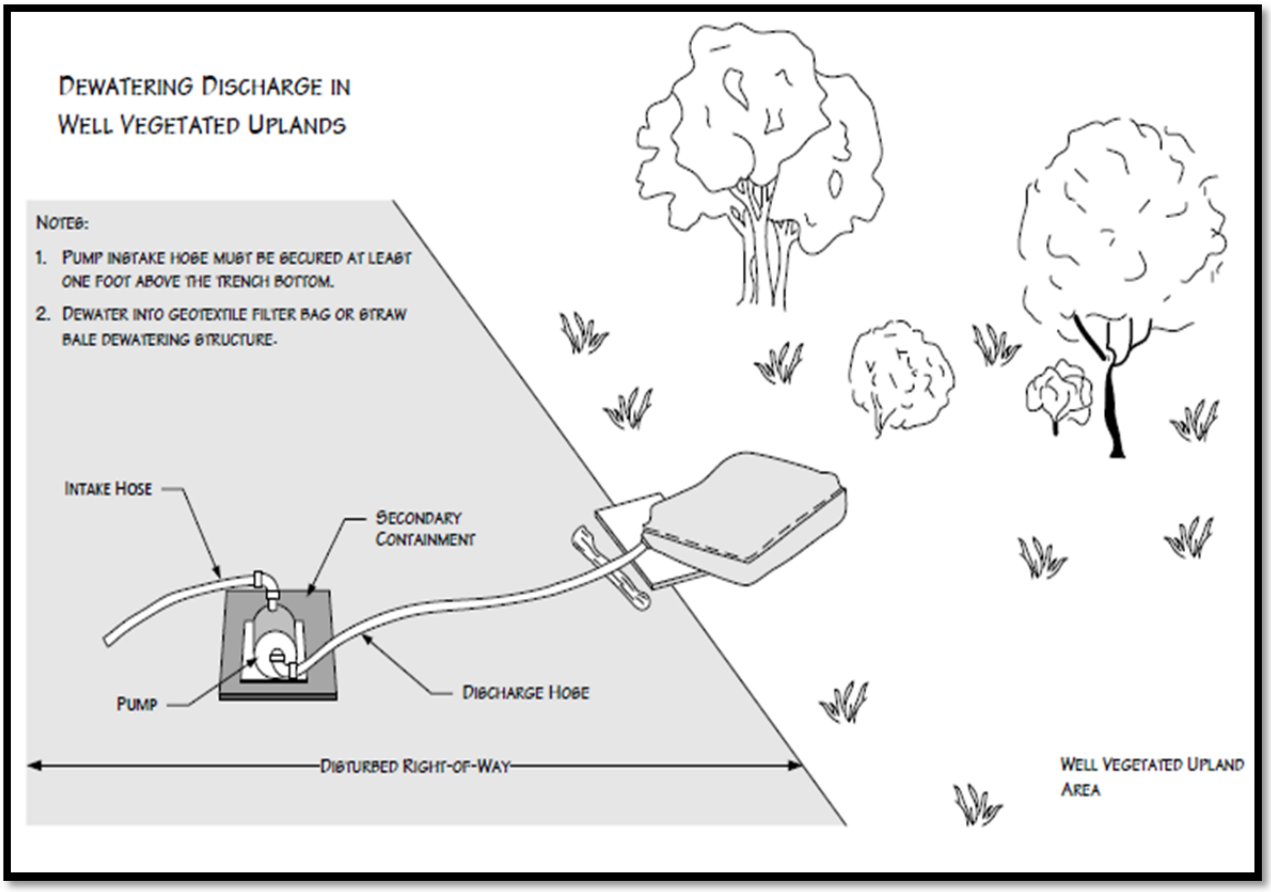

Figure 4.2.6-3 Typical Dewatering Measures

At waterbody crossings, crews will utilize one of the construction methods listed for installing pipe: open cut, flume (Figure 4.2.6-4, see also Figure 17 in EPP), or dam-and-pump. The method selected for a specific crossing will include erosion control, bank stabilization, and bank revegetation, and will minimize construction impacts on the waterbodies.

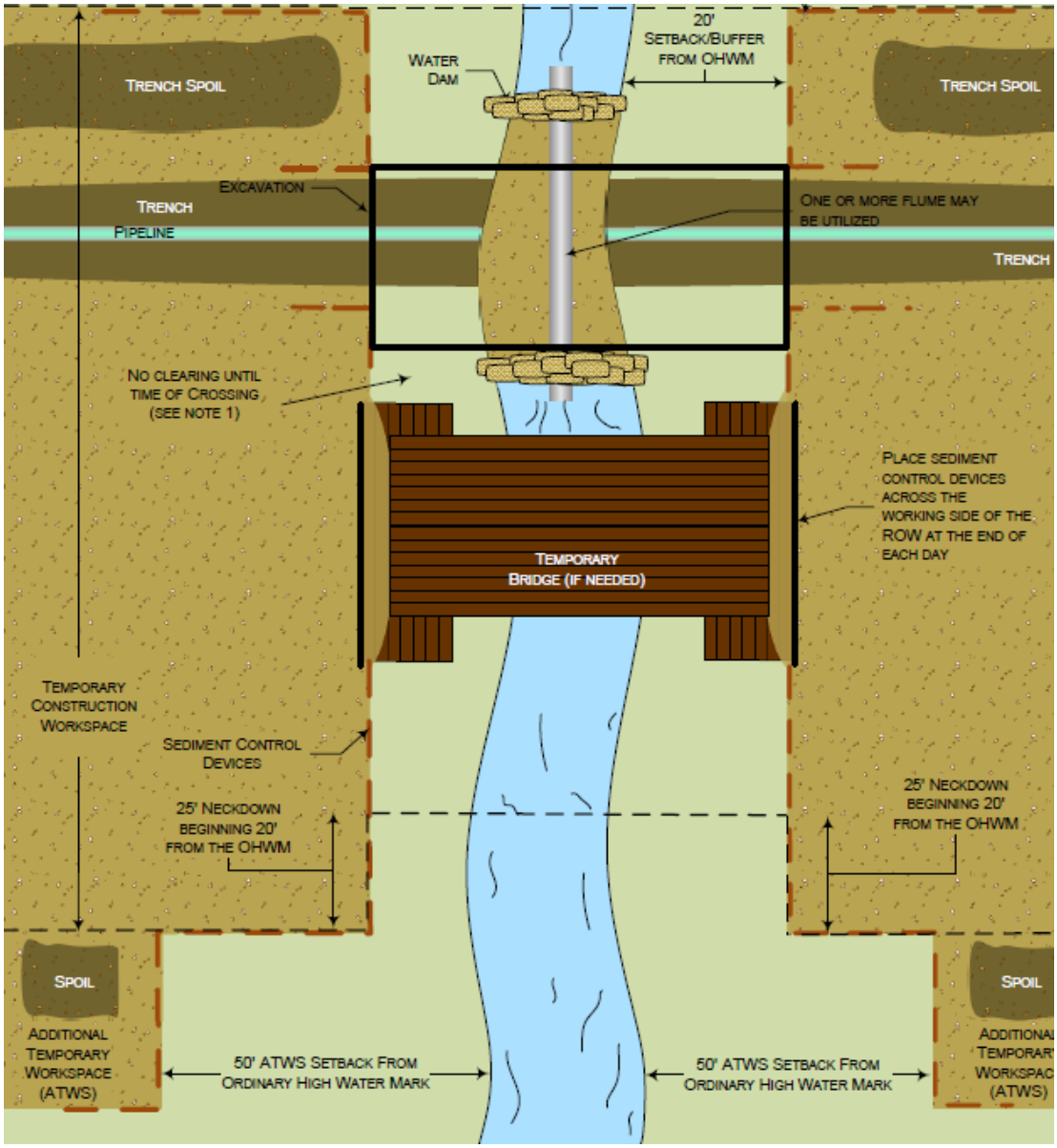

Figure 4.2.6-4 Flume Method

4.2.7 Backfilling the Trench

The trench will then be backfilled to the approximate ground surface elevation as shown on Figure 4.2.7-1. Construction debris will not be permitted in the backfill. If excessive amounts of rocks are included in the backfill, the pipeline will be protected with rock shield or similar protective coating and/or backfilled with clean padding before backfilling with rocky material.

Figure 4.2.7-1 Backfilling

Road crossings may be completed by several different methods, including using the road bore technique depicted in Figure 4.2.7-2. Using this technique, the road crossing is undetectable to the public and does not interfere with traffic. Figure 4.2.7-3 shows a typical road crossing technique (see also Figure 25 in the EPP Appendix B).

Figure 4.2.7-2 Road Boring

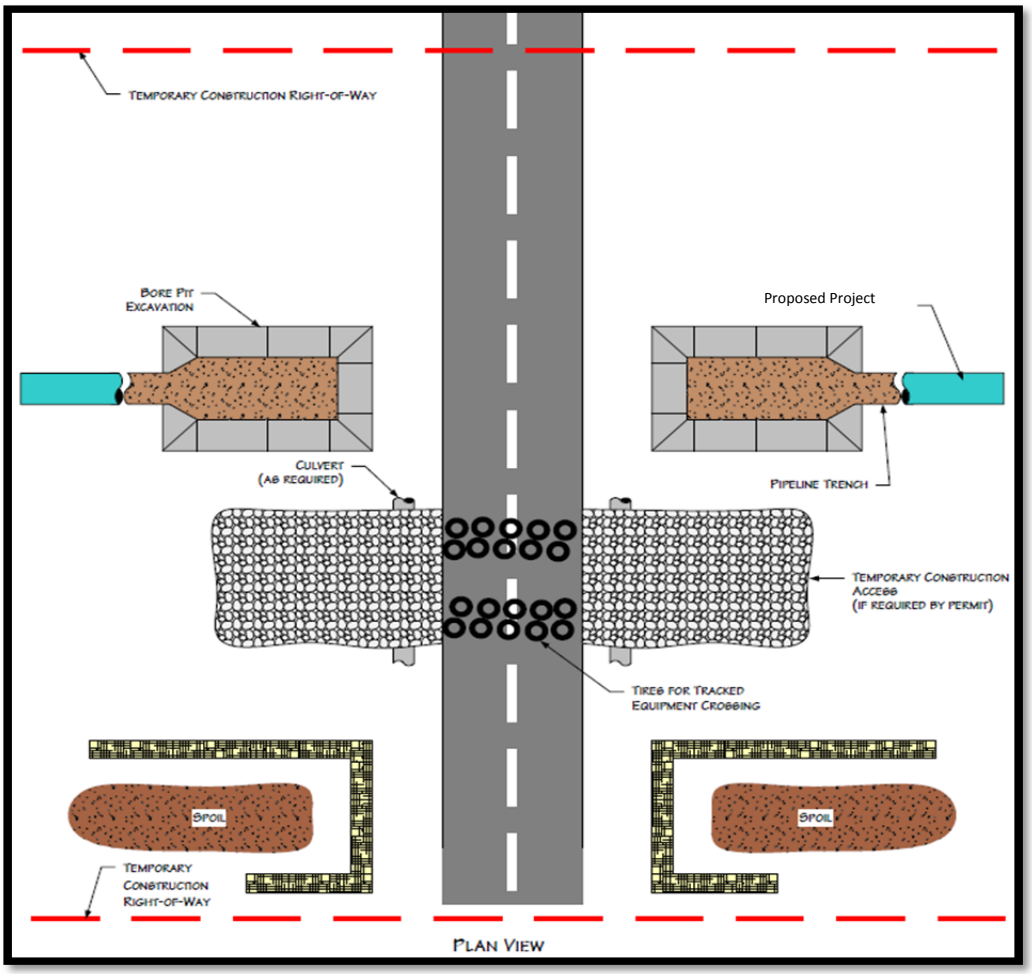

Figure 4.2.7-3 Typical Improved Road Crossing

4.2.8 Hydrostatic Testing

After backfilling, Enbridge will hydrostatically test the pipeline in accordance with Pipeline and Hazardous Materials Safety Administration (PHMSA) regulations. Hydrostatic testing ensures that the pipeline system is capable of operating at the design pressure. Hydrostatic testing involves filling a segment of the pipeline with water and maintaining a prescribed pressure for a specified amount of time. The length of test segments will be determined by topography and water availability. Hydrostatic test water use and discharge will be consistent with Section 5.2 of Enbridge's EPP (Appendix B) and applicable permits.

4.2.9 Restoration and Revegetation

After backfilling is complete, in the work areas Enbridge will regrade, restore, and decompact, as necessary to preconstruction conditions to the extent practicable as shown in Figure 4.2.9-1.

Figure 4.2.9-1 Regrading

Topsoil will be re-spread over areas from which it was removed. Permanent soil stabilization efforts will primarily include revegetation of the Right-of-Way. Fences that were removed during construction will be reconstructed across the Right-of-Way. Figure 4.2.9-2 shows the preparation of the Right-of-Way for the installation of erosion control devices that are used during restoration activities.

Figure 4.2.9-2 Erosion Control

Figure 4.2.9-3 Rock Removal

Disposal of timber, slash, and rock will be in accordance with landowner preferences, applicable regulations, and the EPP (Appendix B). Slash will be stockpiled on the edge of the Right-of-Way, chipped and spread across the Right-of-Way in upland areas, hauled offsite, or burned on-site in accordance with applicable regulations. Excess rock will be stockpiled on-site if requested by the landowner, or disposed of in an alternative, landowner-approved upland area or permitted landfill.

Typically, at waterbody crossings, banks will be restored as near as practicable to preconstruction conditions after backfilling is complete and the separated topsoil has been re-spread within the work areas. The work areas will then be seeded with an appropriate seed mix and covered with an erosion control blanket *(*Figure 4.2.9-4, see also Figure 26 EPP Appendix B). Erosion controls, (e.g. straw bales, biologs, silt fences) will be installed as necessary based on site-specific conditions as detailed in the EPP (Appendix B). Bridges will be removed during final cleanup, or if access is needed, after final cleanup and permanent seeding.

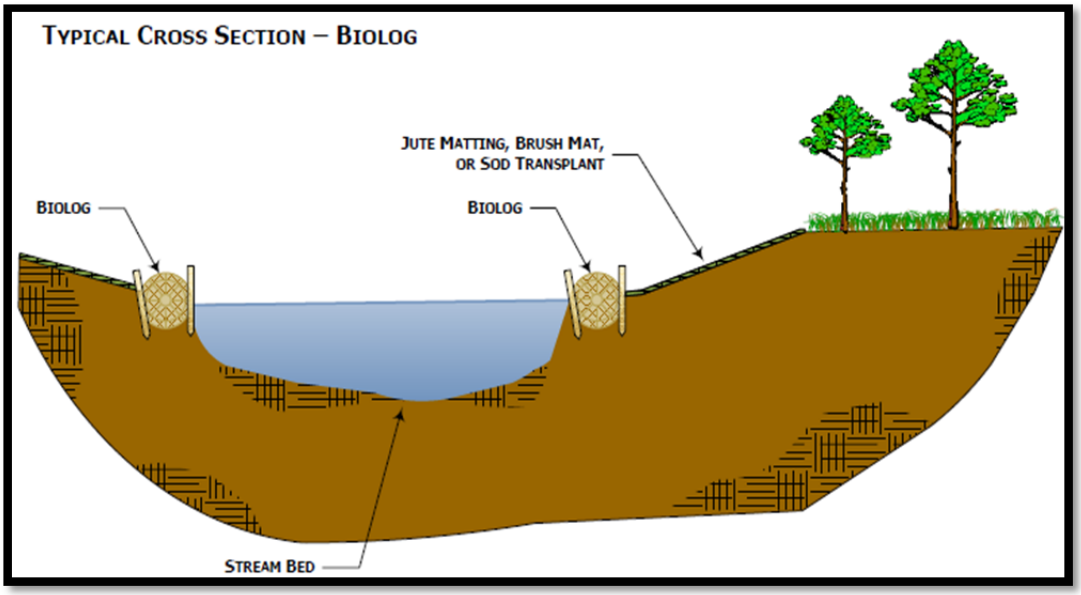

Figure 4.2.9-4 Typical Stream Bank Stabilization – Biolog

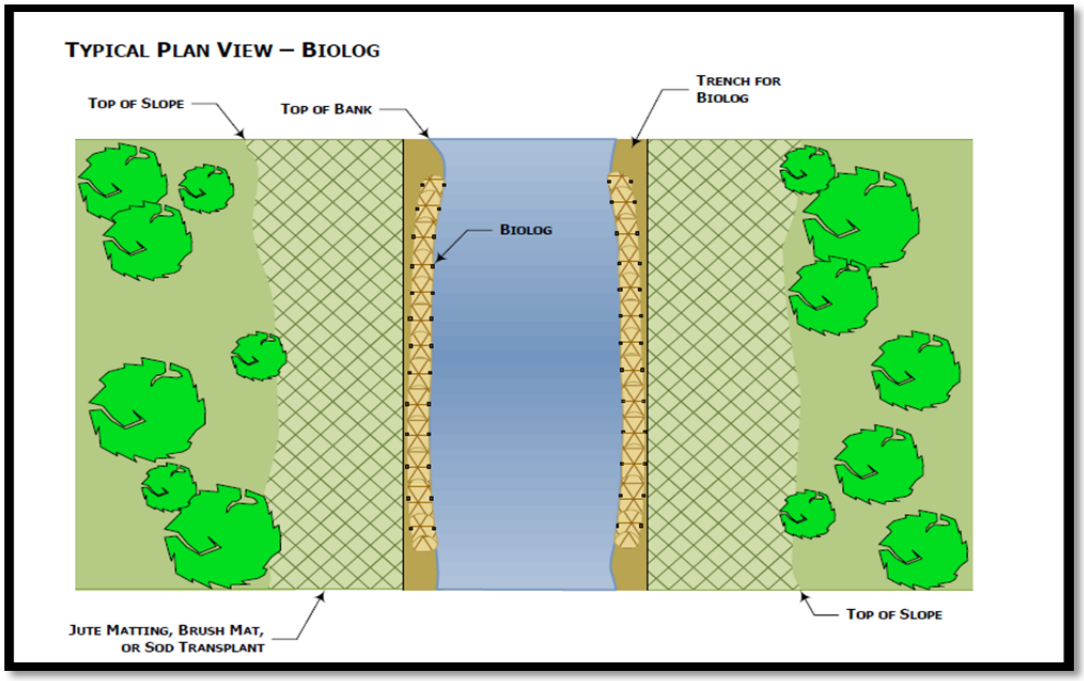

Figure 4.2.9-5 Restored Pipeline

Enbridge will restore original land grade and contours to the extent practicable and will install permanent erosion controls devices to ensure restoration takes place. All disturbed areas will be revegetated in accordance with Enbridge's EPP (Appendix B), permit requirements, and site-specific landowner requests. Enbridge also complies with other federal, state, and local rules and regulations as applicable.

After restoration is complete, Enbridge contacts its affected landowners and/or tenants to discuss any outstanding issues related to the completion of the Project on their respective property. Enbridge will continue to work with each affected party to ensure cleanup and restoration conforms to the easement agreement.

4.3 Operation and Maintenance

As a crude oil pipeline, the Project's design, construction, maintenance, and operation functions are regulated by PHMSA under 49 C.F.R. § Part 195, which governs transportation of hazardous liquids by pipeline. Enbridge abides by all PHMSA regulations and works directly with various regional, state, and local agencies, landowners, tribal, and other stakeholders to ensure that its programs meet the needs of the Community in which it operates.

Figure 4.3-1 Restored Pipeline Right-of-Way

5.0 Route Selection Process

5.1 Project Development Process

Enbridge and the Fond du Lac Band worked together to identify a Preferred Route for the Project that results in minimal human and environmental impacts. As part of the route selection process, Enbridge and the Fond du Lac Band considered: (i) the priorities of the Fond du Lac Band, particularly removing the above-grade mounded pipe, (ii) state criteria where applicable, such as Minnesota Rules Chapter 7852.0700, and (iii) overall environmental, engineering, and economic factors.

Enbridge and Fond du Lac Band agreed to relocate and bury the Project within the Reservation parallel to the existing Enbridge Mainline Corridor. Data collected for the routing analysis within the Fond du Lac Band Reservation shows that 100 percent of this relocation route would run parallel to the Enbridge Mainline System Right-of-Way. Concurrent to this Partial Exemption filing, Fond du Lac Band will be filing a separate letter outlining their support for the Project.

The following sections more fully describe the route selection process that was employed for the Project.

5.2 Development and Application of Routing Criteria

Geographic Requirements

This Project addresses concerns regarding the above-grade Fond du Lac Band Line 4 segment that's creating a barrier to the natural water flow across the Reservation and, in some areas, impedes land access for the Band members to gather medicinal plants and other culturally important resources. Accordingly, Enbridge and Fond du Lac Band focused their route selection process on relocating the approximately 10-mile segment of existing Line 4 between the two existing mainline valve sites located on the Reservation, as shown on Figure 5.2-1 below.

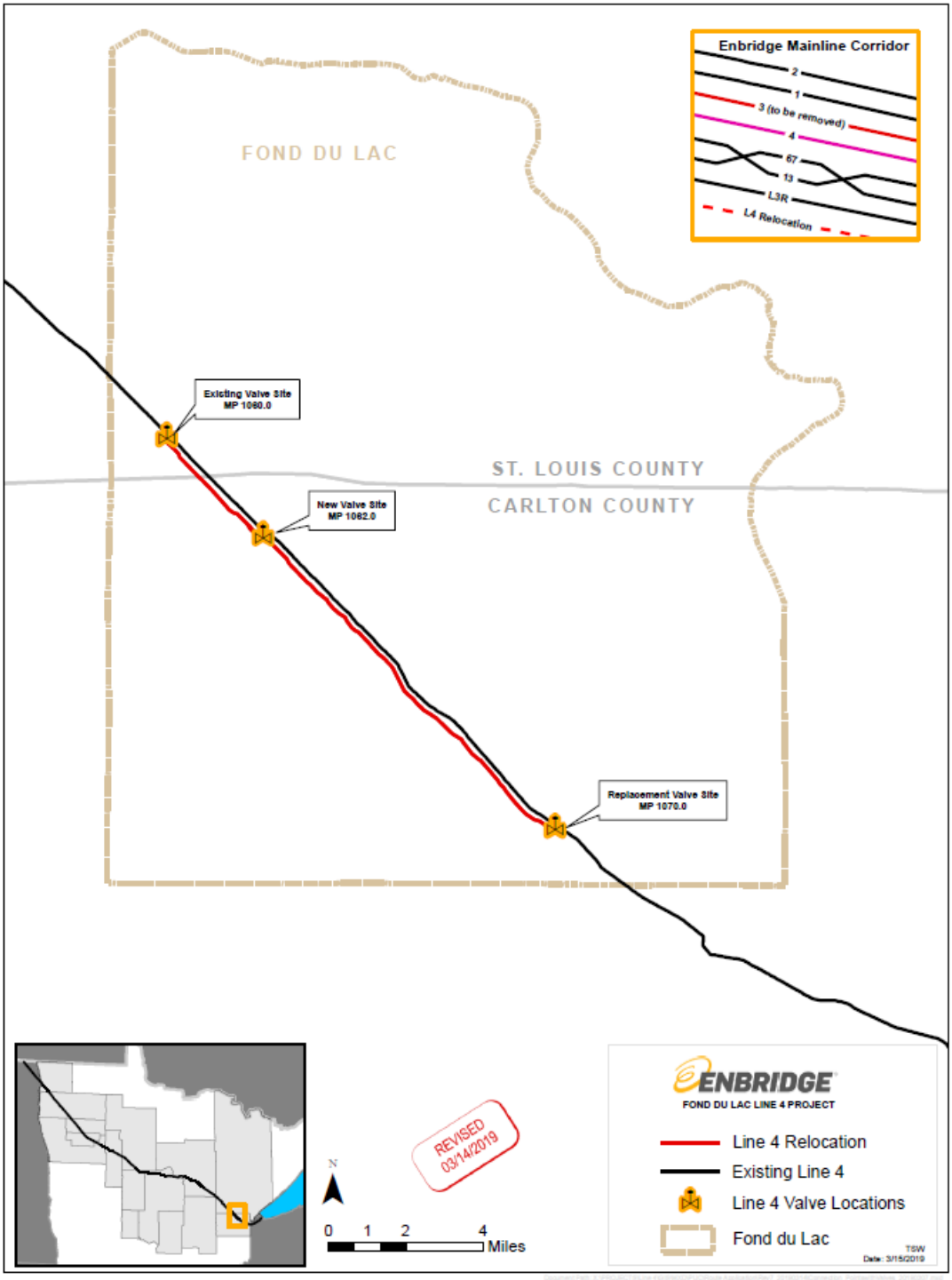

Figure 5.2-1 Project Geographic Requirements

In order to limit impacts to the environment and human settlement and provide the shortest pipeline route to reconnect to the existing Line 4 pipeline, Enbridge and the Fond du Lac Band determined that the relocated Line 4 section would need to be installed within the Fond du Lac Band Reservation and parallel the existing Enbridge Mainline Corridor. This paralleling route would also allow the new Line 4 pipeline to be incorporated into the easement for existing Enbridge pipelines on the Fond du Lac Band Reservation.

Enbridge and the Fond du Lac Band concluded that any route alternative that does not meet the geographic requirements described above, would not meet the purpose of the Project, and therefore such routes were not considered by Enbridge in the development of the Project's Preferred Route.

Other Routing Criteria Considered

After identifying the Project's geographic route requirements, Enbridge and Fond du Lac Band considered other routing criteria, including constraints, opportunities, and technical guidelines, as detailed below.

- **Constraints** - Constraints are features or conditions that could limit or prevent pipeline development. Enbridge works diligently to avoid these features and conditions if at all possible in the siting of its pipeline facilities. Constraints include areas where access or construction is restricted by regulations and areas where impacts on resources would be difficult to mitigate. For this Project, Enbridge tried to avoid: locally-designated environmental protection areas; sensitive habitats; areas with special legal status or where new Right-of-Way cannot be acquired and eminent domain may not be exercised, such as cultural resources; and public infrastructure.
- **Opportunities** - Opportunities are features or conditions that could facilitate project development and avoid or mitigate impacts on human and environmental features. For this Project, the ability to parallel existing Enbridge pipelines was a key consideration in the route selection.
- **Technical Guidelines** – Technical guidelines are the specific engineering requirements and objectives associated with the construction of the Project. For example, one engineering preference is the maintenance of at least 10 feet of separation between centerlines when paralleling existing Enbridge pipelines. Technical guidelines also include federal/state regulatory requirements and guidelines, applicable federal and/or state safety codes and best industry practices.

As demonstrated in this Application, the Project's Preferred Route follows the routing criteria, generally avoids constraints, incorporates opportunities, and applies appropriate technical guidelines.

5.3 Data Collection

Enbridge and Fond du Lac Band have been working together to determine how best to address areas of exposed pipe and above-grade pipe on Line 4 that is creating a barrier to the natural hydraulic flow across the Reservation. In evaluating options, Enbridge and Fond du Lac Band collected and analyzed publicly available environmental data as well as available field data to identify routing constraints and opportunities within the applicable geographic area. The data collection benefited significantly from survey efforts conducted for existing and planned Enbridge work in this area, and continues through various meetings with interested parties and/or consultation with permitting agencies. Such data primarily consists of Geographic Information System digital information layers from the following sources: U.S. Geological Survey (USGS) topographic maps land use database; U.S. Department of Agriculture (USDA) Farm Services Agency aerial photography and geographic information system (GIS) data; National Wetlands Inventory (NWI) maps; Minnesota Department of Natural Resources (MNDNR) National Heritage Information System data; Minnesota Department of Transportation (MNDOT) highway maps; USDA state soil geographic databases; and other natural feature databases obtained from state and federal sources. Enbridge and Fond du Lac Band both have considerable field data available given the proposed sharing of Right-of-Way and paralleling of existing Enbridge Mainline Corridor. All technical guidelines were gathered during the initial engineering design and development phases, and were then incorporated as part of the overall Project scope and continue to be updated as the final engineering design is completed for the proposed Project.

5.4 Evaluation of Relocation Options and Route Variations

As part of the route selection process, Enbridge and the Fond du Lac Band studied a variety of alternatives before selecting relocation along its Preferred Route for this Project. These alternatives consisted of engineering solutions and relocation options along route variations that satisfied the geographic limitations of this Project. During its assessment, Enbridge evaluated and compared several factors while ensuring that it still met the Project's objective in selecting its Preferred Route including:

- The ability to meet Project objectives;
- Constraints;
- Opportunities;
- Technical guidelines;
- Potential environmental impacts;
- Economic feasibility;
- Removal of mounded above-grade pipe; and
- Environmental restoration.

Project Options Considered:

Listed below are the relocation options considered and further evaluated in the Project's route selection process:

- **Option 1:** Relocate individual portions of the existing Line 4 pipeline through segment relocation (see Figure 5.4.1-1);
- **Option 2:** Remediate the existing segment of Line 4 in the same trench by lowering the existing pipe (see Figure 5.4.2-1);
- **Option 3:** Remediate the exposed sections of the existing segment of Line 4 by utilizing the mounding technique (See Figure 5.4.2-1);
- **Option 4:** Relocate the existing segment of Line 4 parallel to the existing Line 2 pipeline within the Fond du Lac Band Reservation (See Figure 5.4.4-1); and
- **Option 5 (Preferred Route):** Relocate the existing segment of Line 4 parallel to the Line 3 Replacement Project within the Fond du Lac Band Reservation (see Figure 5.4.5-1).

5.4.1 Option 1 - Relocate Portions of the Existing Line 4 Pipeline through Multiple Segment Relocations

The scope of this relocation option involves the relocation of three individual exposed pipe segments of existing Line 4 with a 48-inch diameter pipe adjacent to the Line 3 Replacement pipeline, followed by the removal of the original exposed segments of Line 4 (see Figure 5.4.1-1 below for general location). This relocation option does provide an opportunity for Enbridge to reduce the amount of construction needed within the approximate 10 mile segment, as it has contemplated that approximately 1.6 miles of exposed pipe would be relocated under this option. However, this option does not address Fond du Lac's concerns with removing the entire existing above-grade pipe installed on the Reservation. Further, this option, compared to the Preferred Route, creates additional construction constraints, operational risks, and safety risks that exceed any opportunities realized by reducing the amount of construction needed for relocating the pipeline. After applying the routing factors listed above and the criteria for pipeline route selection outlined in the Minnesota Rules Chapter 7852.0700, Enbridge concluded that the relocation of the existing Line 4 pipeline through multiple segment relocations is an inferior alternative and has been rejected for the following reasons.

One of the key drivers for this Project is that Fond du Lac has requested Enbridge remove the existing above-grade pipe from the Reservation. Option 1 would only mitigate the currently exposed sections of pipe and not completely remove the legacy pipe that was installed at the surface. Accordingly, the Fond du Lac Band Community would continue to be impacted by the existing mounded pipeline under Option 1. As noted in the Application the mounded pipeline creates a barrier to the natural water flow and, in some areas, impedes land access for the Band members. This was a significant concern to Fond du Lac Band, as members actively practice traditional activities in this area.

Further, within the Enbridge Mainline Corridor, Line 4 is located in the middle of the multi-pipeline Right-of-Way, where there are a total of six actively operating pipelines. As seen in Figure 5.4.2-2, this is a congested pipeline Right-of-Way where spacing typically ranges between 10-feet and 80-feet on the north side of Line 4, and typically ranges between 25-feet and 100-feet on the south side of Line 4 as it traverses through the Fond du Lac Band Reservation.[1] To relocate the segments of Line 4 to the outside of the corridor, multiple crossings of the other active pipelines would be required. Compared to the Preferred Route, Option 1 has three times more crossings of active pipelines. Option 1 increases the risk of damaging an operating pipeline through accidental contact with equipment, overloads on the surface above the pipelines, and cave-ins.

In addition, due to the limited workspace and the number of existing lines, heavy equipment and spoil would need to be placed directly on top of operating pipelines during construction. Some of these construction impacts could be mitigated by conducting them off the Right-of-Way, but this only shifts the construction impacts to a location outside the pipeline Right-of-Way. Also, some impacts cannot be moved off the Right-of-Way, and must be conducted along the pipeline trench, and at the additional pipeline crossings, which then creates the risk of overstressing the operating pipelines and the threat of accidental strikes from backfilling equipment. To mitigate this risk in upland areas, Enbridge would need to use mat decking or bridging along the Right-of-Way. This matting would be used for travel lanes along the Project work site or to shuttle the spoil over and across operating pipelines to a designated storage area outside the construction footprint. Figure 5.4.2-3 shows a sample of the construction footprint on the Fond du Lac Band Reservation where mat decking and bridging would be used for travel and ingress/egress to the Project's construction work site.

For all the reasons discussed above, this relocation Option 1 alternative was rejected.

[1] The pipeline spacing may be slightly different in regions where there are heavily saturated soils.

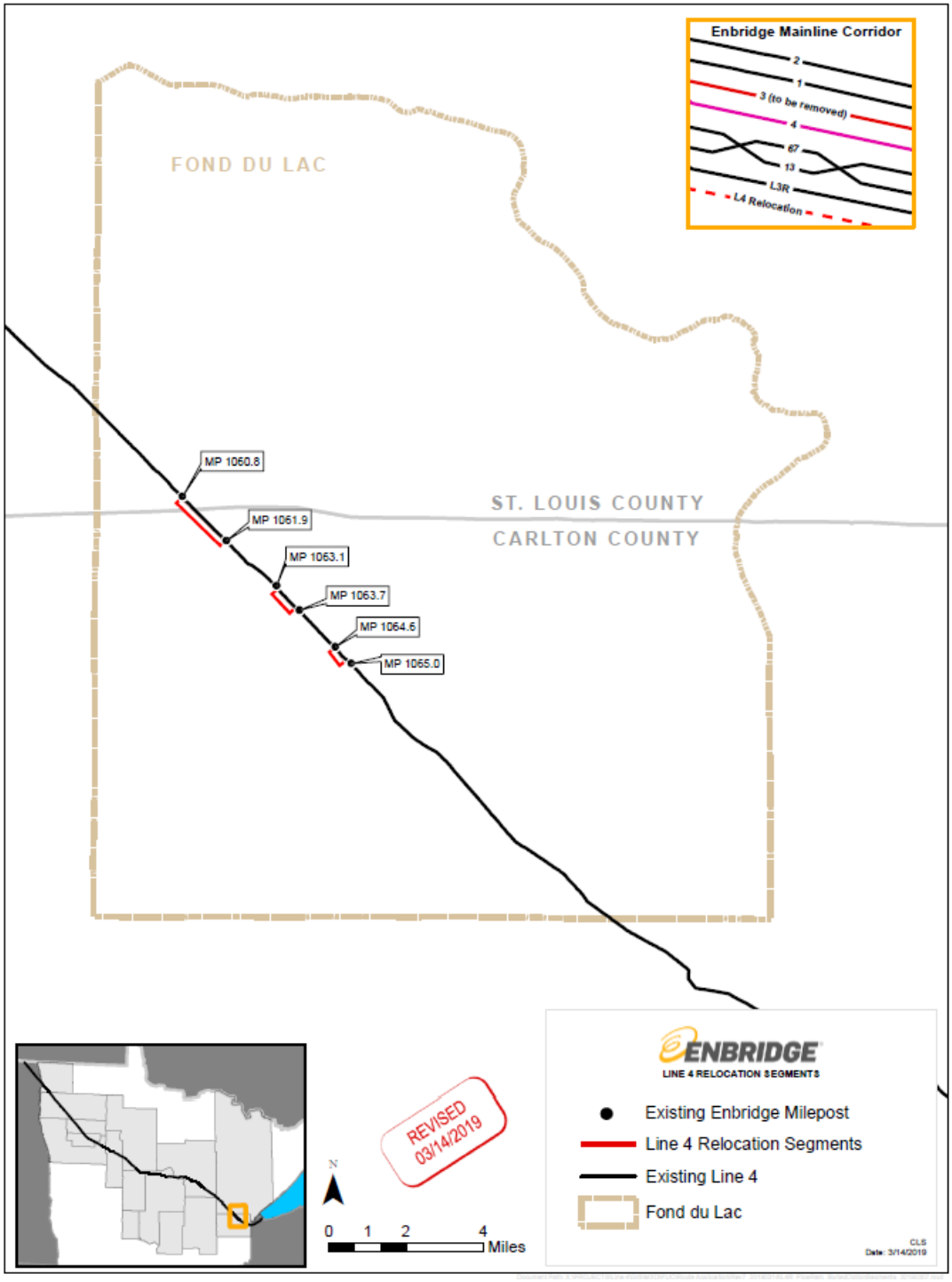

Figure 5.4.1-1 Option 1 Segment Relocation

5.4.2 Option 2 – Remediate Line 4 in the Same Trench by Lowering the Existing Pipe

Option 2 involves lowering the existing Line 4, 48-inch diameter pipe in the same pipeline trench (see Figure 5.4.2-1 for general location). Lowering the pipe would require the operating Line 4 pipe to be exposed, excavated under the pipe to the depth required, lowered to its final depth, backfilled, and restored. Option 2 would be located entirely within Line 4's existing pipeline Right-of-Way, and, if completed, would fall under the exclusion in Minnesota Rules Chapter 7852.0300 for replacement of an existing pipeline within an existing Right-of-Way. After applying the routing factors listed above and the criteria for pipeline route selection outlined in the Minnesota Rules Chapter 7852.0700, Enbridge concluded that the same trench lowering is not a feasible alternative and Option 2 has been rejected for the following reasons.

One of the primary reasons Option 2 was rejected is because the Line 4 pipeline was not originally designed to be lowered. The engineering factors and stress on the existing pipe would create additional and unnecessary risks with operating the pipeline. These design and operation concerns made Option 2 infeasible from Enbridge's viewpoint.

Another main reason that Option 2 was rejected is because Line 4 would need to be constructed in the same trench within the middle of the Enbridge Mainline Corridor (see Figure 5.4.2-2) making it very difficult for construction to occur within a restricted workspace.

Conducting heavy construction inside and over a multi-line pipeline corridor exposes the pipelines to risk that would otherwise not be present, thereby increasing the probability of damage. Also, there is an increased risk of damaging an operating pipeline through accidental contact with equipment, overloads on the surface above the pipelines, cave-ins, and adjacent pipe movement. In particular, Option 2 would operate heavy equipment over in-service high pressure pipelines and could overstress the operational pipelines. This also exposes the personnel performing the construction to dangers and the environment to potential impacts that are otherwise avoided in large part by constructing the relocation pipeline in the new Preferred Route location. Figure 5.4.2-3 below shows the typical construction footprint on the Fond du Lac Band Reservation, depicting the location of Line 4 within the congested six-pipeline Right-of-Way with limited spacing on either side of Line 4.

As described in Option 1, due to the limited workspace and the number of existing lines, heavy equipment and spoil would need to be placed directly on top of operating pipelines during construction. Some of these construction impacts could be mitigated by conducting them off the Right-of-Way, but this only shifts the impacts to a location outside the Enbridge Mainline Corridor. Also, some impacts cannot be moved off the Right-of-Way and must be conducted along the pipeline trench, which then creates the risk of overstressing the operating pipelines or posing the threat of accidental strikes from backfilling equipment. To mitigate this risk in upland areas, Enbridge would need to use mat decking or bridging along the entire Right-of-Way. This matting would be used to create travel lanes along the Project work site or to shuttle the spoil over and across operating pipelines to a designated storage area outside the construction footprint. The construction footprint on the Fond du Lac Band Reservation would

require mat decking and bridging for travel, and ingress/egress to the Project's construction work site.

Option 2 would increase environmental impacts since additional workspace will need to be obtained outside the Enbridge Mainline Corridor for equipment travel and spoil storage since the pipeline construction would be occurring over active pipelines. Specifically, Figure 5.4.2-3 shows the typical construction workspace where the construction work activities would be located on the south side of the Enbridge Mainline Right-of-Way on the Fond du Lac Band Reservation. The land requirements would be: **Uplands**: 268.5 feet in total, using 200 feet of existing Enbridge Right-of-Way and 68.5 feet of new temporary workspace area outside the Enbridge Mainline Corridor; and **Wetlands**: 243.5 feet in total, using 200 feet of existing Enbridge Right-of-Way and 43.5 feet of new temporary workspace area outside the Enbridge Mainline Corridor (a copy of this figure is enclosed as Appendix E). To put this in perspective, the Preferred Route (Option 5) is proposed to typically impact 140 feet in upland areas and 115 feet in wetlands and saturated wetland areas, with 20 feet of new temporary workspace outside the Enbridge Mainline Corridor.

Further, same trench pipe lowering poses greater environmental impacts on wetlands and waterbodies as it would take an extended period of time to excavate the deeper, wider trench within waterbodies and wetland crossings. To safely excavate under the existing pipeline, excavation would need to occur in several steps. In order to not damage the existing pipe, non-intrusive excavation methods would be required for all excavation activities. Hydrovacing and associated cribbing to support the pipe would be required for the entire length of existing pipeline such that a stress-free condition would be realized for the duration. Although difficult to quantify duration of open excavation for Option 2, the unit of measure would certainly be measured in months. A trench open for protracted periods of time increases construction risks due to the additional work that would likely be necessary to maintain a clear trench. The EPP recommends limiting the duration of open trenches to the equivalent of 3 days of welding production. Lowering of Line 4 in its current location would result in the trench being open for protracted periods, significantly longer than 3 days, as Enbridge would lower the existing pipe.

With Option 2, the entire section would need to be lowered at once, where new construction would allow the wetland or waterbody crossings to be completed in shorter sections. These shorter sections would impact less area within the wetland and waterbodies as you can dig a much narrow trench, compared to a wider trench needed for lowering the line.

For all the reasons discussed above, the line lowering Option 2 alternative was rejected.

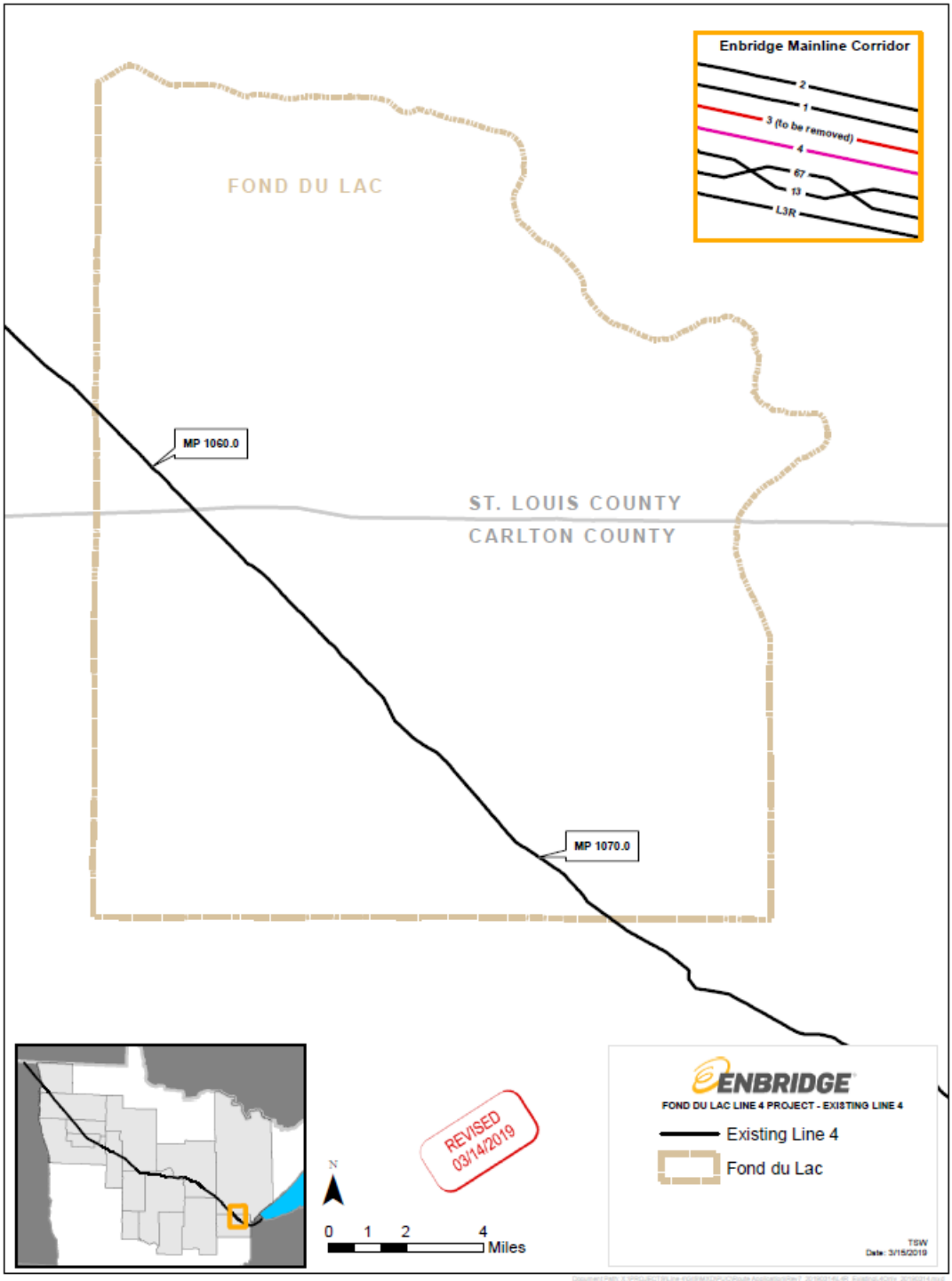

Figure 5.4.2-1 Option 2 Same Trench Line Lowering

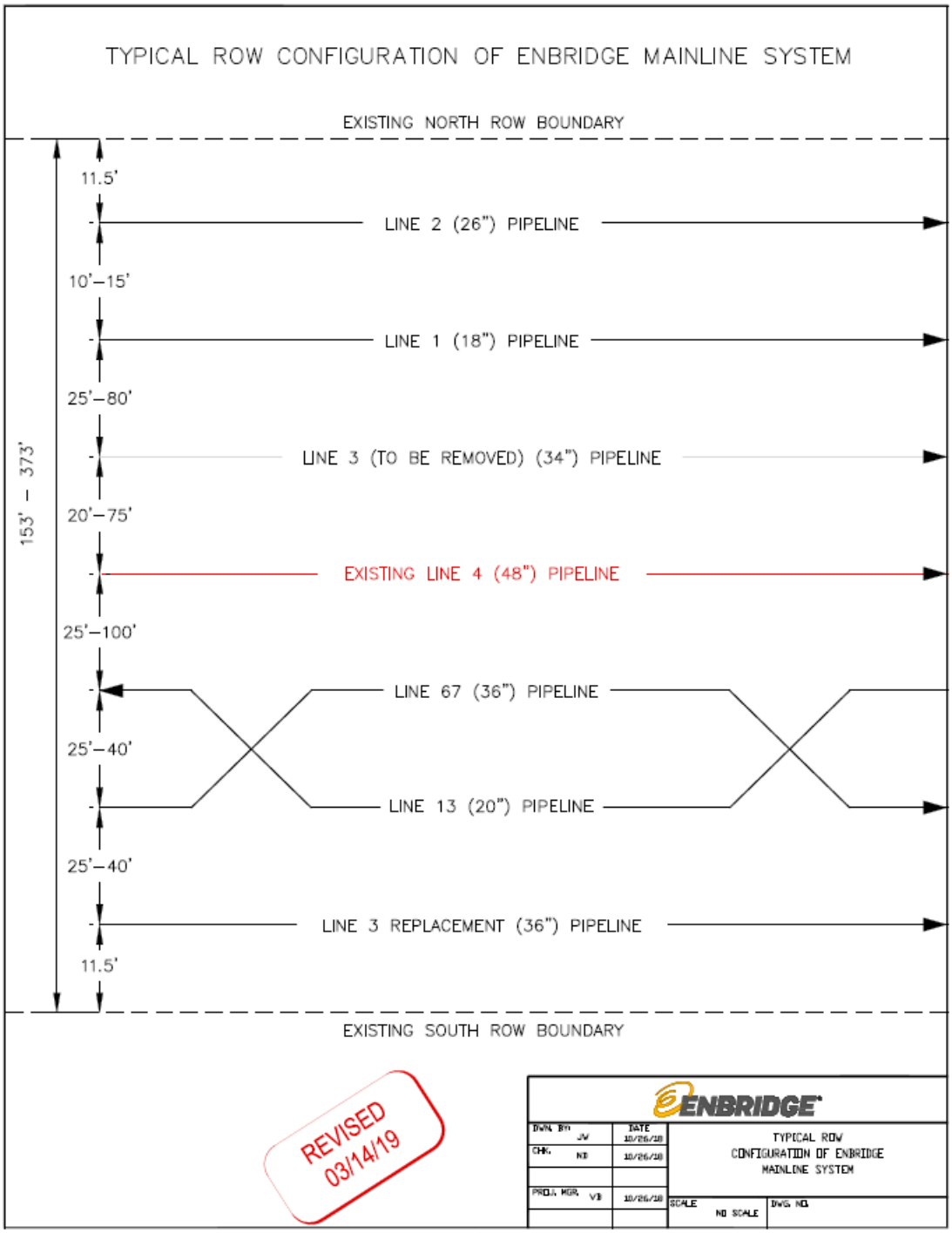

Figure 5.4.2-2 Typical ROW Configuration

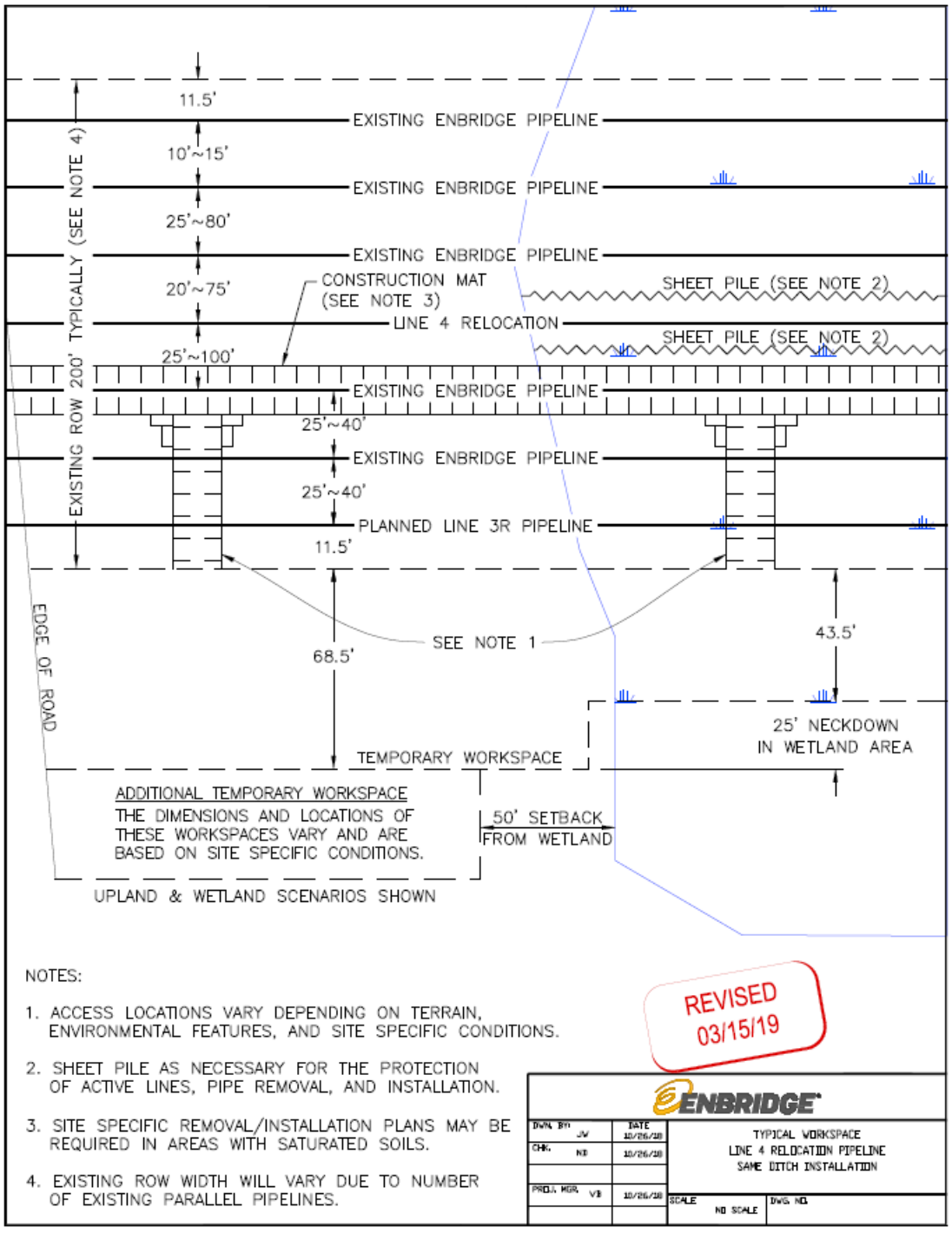

Figure 5.4.2-3 Option 2 Typical Construction Workspace in Fond du Lac Band Reservation – Same Trench Line Lowering Workspace in Uplands and Wetlands

5.4.3 Option 3 – Remediate the Exposed Sections of Line 4 by Utilizing the Mounding Technique

Option 3 would address the exposed areas of pipe by placing additional soil over the top of the existing 48-inch Line 4 (see Figure 5.4.2-1 above for general location). This option would reduce the amount of construction needed within the approximate 10 mile segment and utilize Line 4's existing pipeline Right-of-Way. However, this option does not address Fond du Lac's concerns with removing the existing above-grade pipe installed on the Reservation. After applying the routing factors listed above and the criteria for pipeline route selection outlined in the Minnesota Rules Chapter 7852.0700, Enbridge concluded that Option 3 is an inferior alternative and has been rejected for the following reasons:

One of the key drivers for the relocation of the Line 4 pipeline through the Fond du Lac Band Reservation is to mitigate the existing pipe, as it was installed on the surface of the ground using mounding techniques, with spoil placed on top to cover the pipeline. The mounding approach with Option 3 would only mitigate the exposure of the pipe and not remove the legacy pipe that was installed at the surface. Option 3 would exacerbate the restriction of natural water flow and damming that is currently occurring on the Reservation. Also, Option 3 could create an opportunity for both third party damage and long-term erosion of the mound that could leave the pipeline re-exposed. In addition, the Fond du Lac Band Community would continue to be impacted by the mounded pipeline as they actively practice traditional activities.

Option 3 would increase the risk to the environment and human population since the active pipeline would still be installed above-grade. In order to provide an acceptable amount of cover to the existing pipeline, approximately two feet of material would be installed over top of Line 4. This cover, on top of a pipe that was originally installed at the surface, would create a mound that is roughly six feet above the natural grade of the land. In order to create a smooth transition back to natural grade, the soil mounding would extend out roughly 25 feet on either side of the pipe. Construction of a large soil mound would permanently impact the wetlands it crosses by reducing the acreage of wetlands and impeding natural surface water flow.

To add material for mounding exposed Line 4 segments, a large footprint would be required to create an appropriate slope away from the top of the pipe, requiring that additional material be hauled in. Because this process would take place between and near multiple operating pipelines within a restricted workspace, there is increased risk of damaging an operating pipeline through accidental contact with equipment, overloads on the surface above the pipelines, cave-ins, and adjacent pipe movement due to the varying depths of cover, among other risks.

As described in Option 2, due to the limited workspace and the number of existing lines, heavy equipment and mounding material would need to be placed directly on top of operating pipelines during construction. Some impacts cannot be moved off the Right-of-Way and must be conducted along the pipeline centerline, which then creates the risk of overstressing the operating pipelines or posing the threat of accidental strikes from mounding equipment. To

mitigate this risk in upland areas, Enbridge would need to use mat decking or bridging along the Right-of-Way. This matting would be used for travel lanes along the Project work site or to shuttle the mounding material across operating pipelines to a designated storage area outside the construction footprint. Figure 5.4.2-3 shows a sample of the construction footprint on the Fond du Lac Band Reservation where mat decking and bridging would be used for travel and ingress/egress to the Project's construction work site.

For all the reasons discussed above, this relocation alternative was rejected.

5.4.4 Option 4 – Relocate Line 4 parallel to the existing Line 2 pipeline within Fond du Lac Band Reservation

Option 4 involves installing approximately 10 miles of new 36-inch pipeline, parallel and northeast of the Line 2 pipeline within the Fond du Lac Band Reservation, to relocate the existing Line 4 pipeline that will be removed following completion of the Line 3 Replacement Project. Where Enbridge's and Fond du Lac Band's Preferred Route would be constructed on the southwest side of the existing Enbridge Mainline Corridor, Option 4 would relocate Line 4 to the northeast side of the Enbridge Mainline Corridor.

Enbridge rejected Option 4 due to the significantly larger environmental impacts that would be realized with the installation of the Line 4 relocated segment on the Line 2 side of the Enbridge Mainline Corridor instead of the Line 3 Replacement side. There is an incremental increase in the planned new Line 4 Right-of Way impacts and new temporary workspace impacts for Line 4 from 40 feet for the Preferred Route to 93.5 feet for new temporary workspace within uplands; from 40 feet for the Preferred Route to 68.5 feet for new temporary workspace within wetlands; and from 60 feet for the Preferred Route to 83.5 feet for new temporary workspace within saturated wetlands (see Figures 5.4.4-1, 5.4.4-2, 5.4.4-3, 5.5.2, 5.5.3, and 5.5.4).

Option 4 would result in a total of approximately 116 acres of new Right-of-Way and temporary workspace impacts for Line 4. This is an additional approximately 52 acres of new impacts compared to the Preferred Route, which would impact a total of 64 acres of Line 4 temporary workspace and new Right-of-Way impacts.

For the reasons discussed above, Option 4 was rejected.

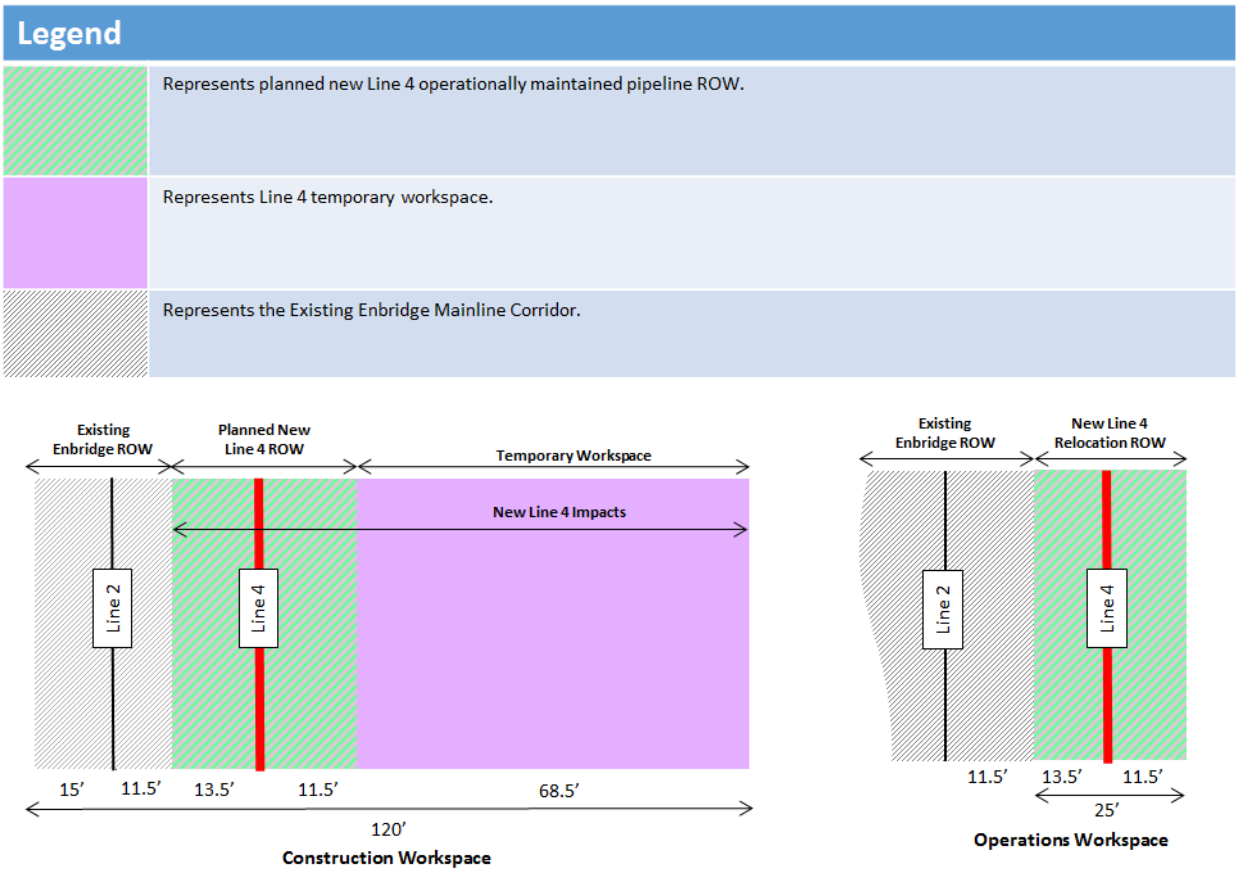

Figure 5.4.4-1 Option 4 Relocation of Line 4 adjacent to Line 2 – Workspace in Uplands

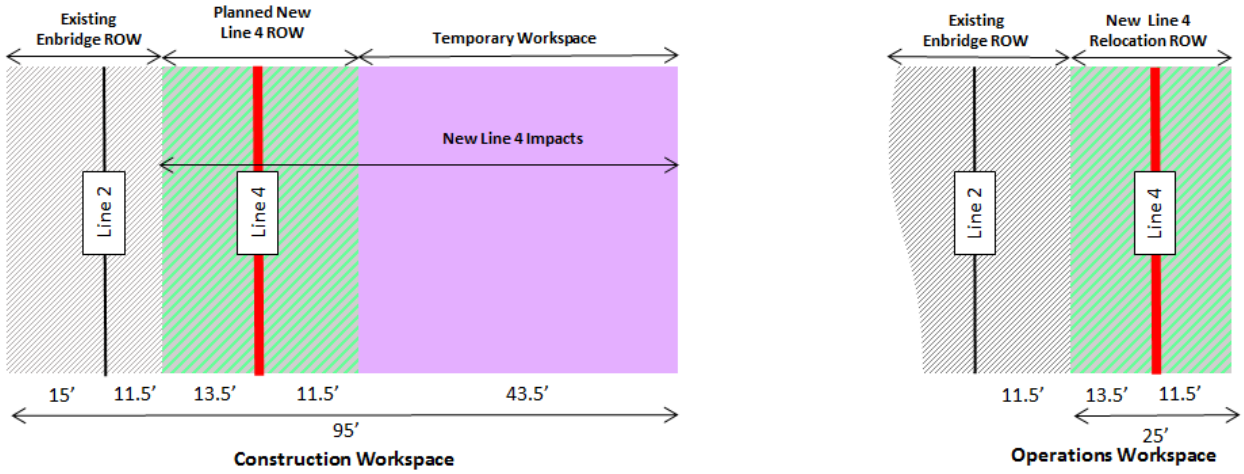

Figure 5.4.4-2 Option 4 Relocation of Line 4 adjacent to Line 2 – Workspace in Wetlands

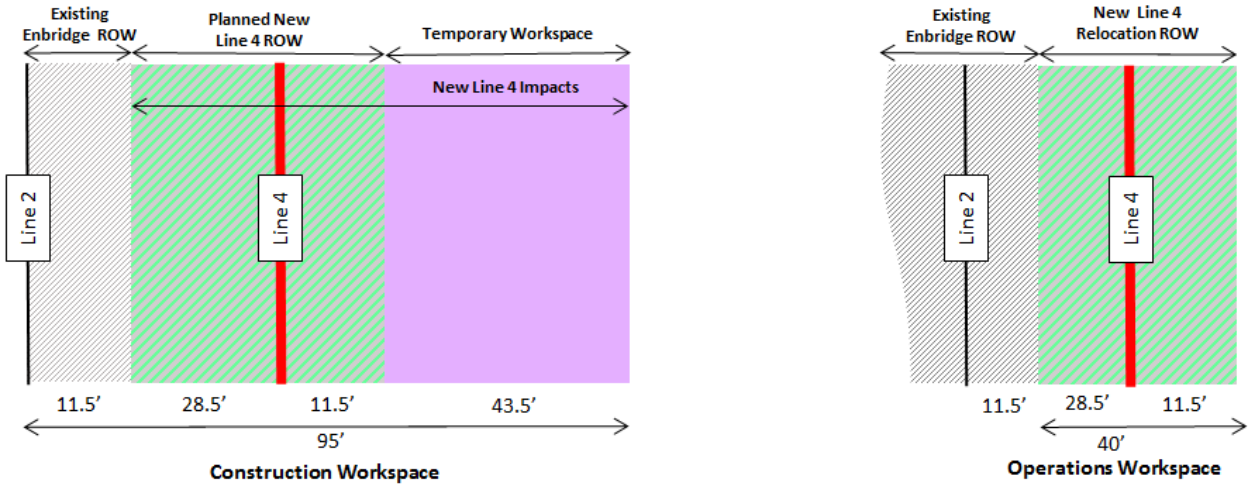

Figure 5.4.4-3 Option 4 Relocation of Line 4 adjacent to Line 2 – Workspace in Saturated Wetlands

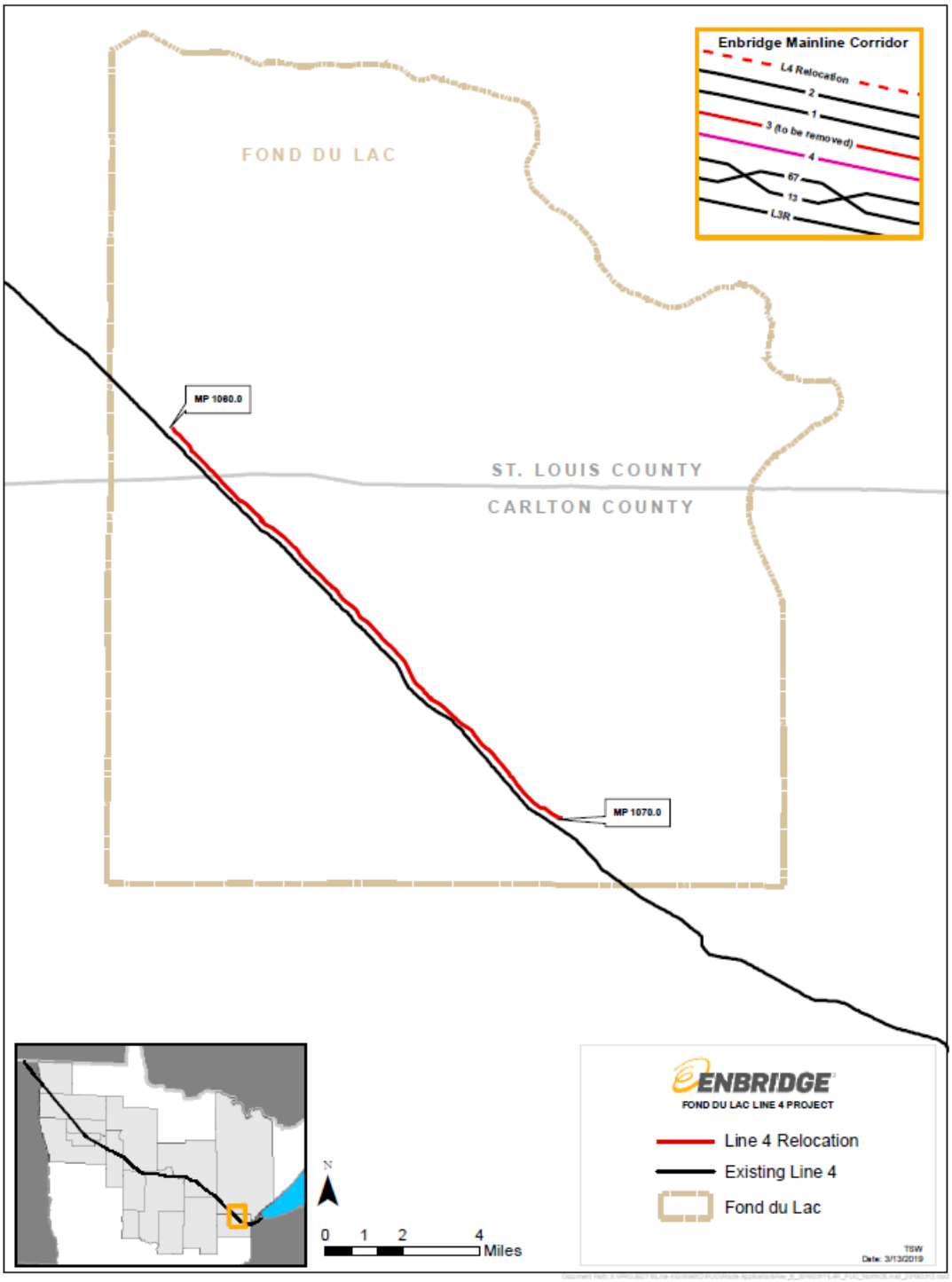

Figure 5.4.4-4 Option 4 Line 4 Relocation Adjacent to Line 2

5.4.5 Option 5 (Preferred Route) - Relocate Line 4 Parallel to the Line 3 Replacement Pipeline Within the Fond du Lac Band Reservation

The scope of this option involves installing approximately 10 miles of new 36-inch pipeline, parallel to the Line 3 Replacement pipeline within the Fond du Lac Band Reservation, to relocate a segment of the existing Line 4 pipeline that will be permanently deactivated following completion of the Project. After the 10-mile segment of pipe is relocated, the Line 4 pipe will be re-connected to the existing Enbridge Mainline System at the valve locations (MP 1060 & MP 1070) through mechanical excavation.

The Preferred Route enables partial sharing and/or paralleling of the existing Line 3 Replacement pipeline Right-of-Way along the Enbridge Mainline System (see Figure 5.4-5-1 below) as well as the co-construction with the Line 3 Replacement Project, minimizing the time of disturbance on the Fond du Lac Band Reservation.

The Preferred Route also shares and/or runs parallel to the Enbridge Mainline System on the Fond du Lac Band Reservation for its entire length. Fond du Lac Band has agreed to provide Enbridge new Right-of-Way for this relocation option. Additionally, the Preferred Route eliminates many of the constraints and technical difficulty identified in the options outlined above and also minimizes environmental impacts by sharing the authorized Line 3 Replacement Project workspace.

Constructing this Project to the south of the Line 3 Replacement pipeline would allow the majority of the construction activities to occur in a workspace that is free from multiple actively operating pipelines. While some workspace would need to be utilized for the storage of topsoil and other materials to the north of the proposed pipeline, much of the work would occur within a less restrictive workspace available to the south. A portion of the workspace would entail re-connecting the existing Line 4 pipeline at the valve locations (MP 1060 & 1070). This would result in approximately 150 feet of mechanical excavation work underneath three active pipelines.

Option 5 would avoid the need to first remove the existing pipeline since the relocation would occur outside the existing Line 4 Right-of-Way. This, in turn, would reduce the duration of construction through wetlands and other sensitive resources. Option 5 also minimizes the amount of time that trenches remain open and decreases construction risks. Specifically, trenches open for shorter durations minimize risk associated with changing weather conditions, such as frost and rain, which can severely weaken the trench wall, contributing to trench cave-in. Likewise, the less time the trench is open, the less groundwater that would need to be discharged out of the trench throughout the construction process.

Therefore, Enbridge, together with the Fond du Lac Band, have concluded that Option 5 best addresses the purpose and need for the Project while also minimizing human and environmental impacts. Option 5, identified as the Project's Preferred Route, is more fully described in Section 5.5. A detailed environmental analysis which complies with the Minnesota Rules Chapter 7852.0700 is provided in Section 6 of the Application.

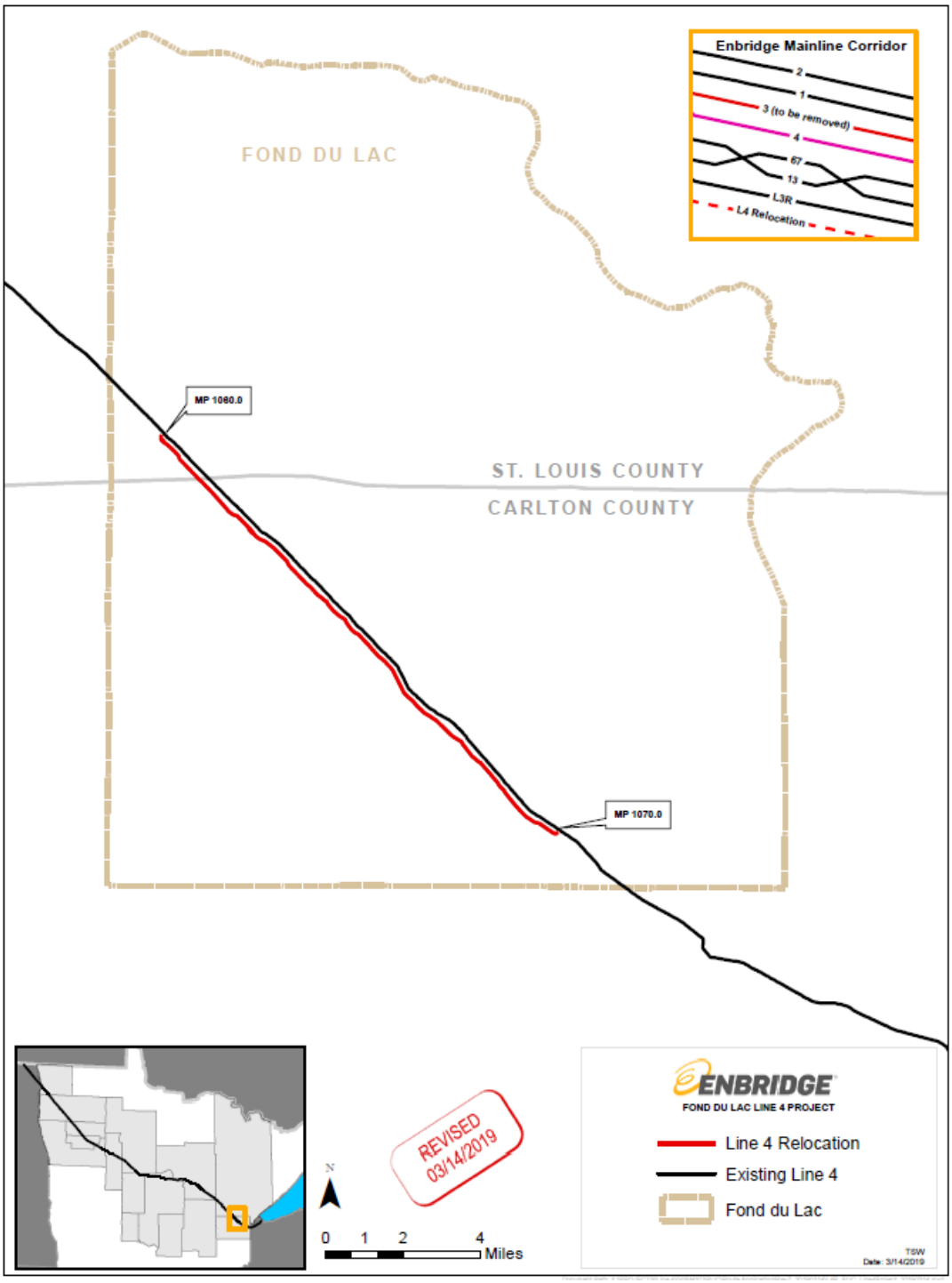

Figure 5.4.5-1 Option 5 Preferred Route

5.4.6 Summary of Project's Route Analysis

Enbridge and Fond du Lac Band agreed to relocate and bury the Project within the Reservation parallel to the existing Enbridge Mainline Corridor. Data collected for the routing analysis within the Fond du Lac Band Reservation shows that 100 percent of Option 5 would run parallel to the Enbridge Mainline System Right-of-Way (see details in Table 3.6.6-1).

In developing the Project's Preferred Route on the Fond du Lac Band Reservation, Enbridge studied a variety of engineering options and relocation alternatives before selecting its Preferred Route. Enbridge evaluated the geographic limitations of this Project, the criteria for pipeline route selection outlined in the Minnesota Rules Chapter 7852.0700, and compared routing factors including, but not limited to Constraints, Opportunities, Technical and economic feasibility, and potential environmental impacts for each of the alternative considered. Enbridge also utilized recent field survey data conducted within the reservation in developing the Preferred Route, to identify mitigation measures that will avoid or minimize potential impacts. Some of the advantages include:

- Meeting key goals of Fond du Lac Band;
- Meeting the Project's geographic requirements;
- Paralleling existing pipeline, utility, and transportation corridors;
- Feasibility from a construction and system perspective;
- Avoiding dense population centers and locating primarily in rural area; and
- Fewer disruptions to communities and recreational facilities.

It was further determined that Option 5 will have the least impact to existing residential and commercial areas because it would share and run parallel to the Enbridge Mainline System, which does not travel through heavily populated areas, as detailed in Section 6.5 of the Application. Also, Option 5 poses fewer construction challenges and technical difficulties than the same trench line lowering because the majority of the work activities would not occur within a congested pipeline corridor where pipeline spacing is limited as described above. For these reasons, Enbridge determined that the alternative which follows the Enbridge Mainline System and adjacent to the Line 3 Replacement pipeline is the best relocation option to meet the Project's objective while also minimizing human and environmental impacts. Thus, Enbridge and Fond du Lac Band selected Option 5 as the Project's Preferred Route.

Through this interactive process with stakeholders and the Fond du Lac Band, Enbridge has now identified the Project's Preferred Route as described in more detail in Section 5.5 of the Application.

5.5 Description of Preferred Route

The Project's Preferred Route begins near the Fond du Lac Band Reservation border in St. Louis County and extends approximately 10 miles near the end of the Fond du Lac Band Reservation border in Carlton County. Along this route, the Project will share and run parallel to the existing Enbridge Mainline System Right-of-Ways.

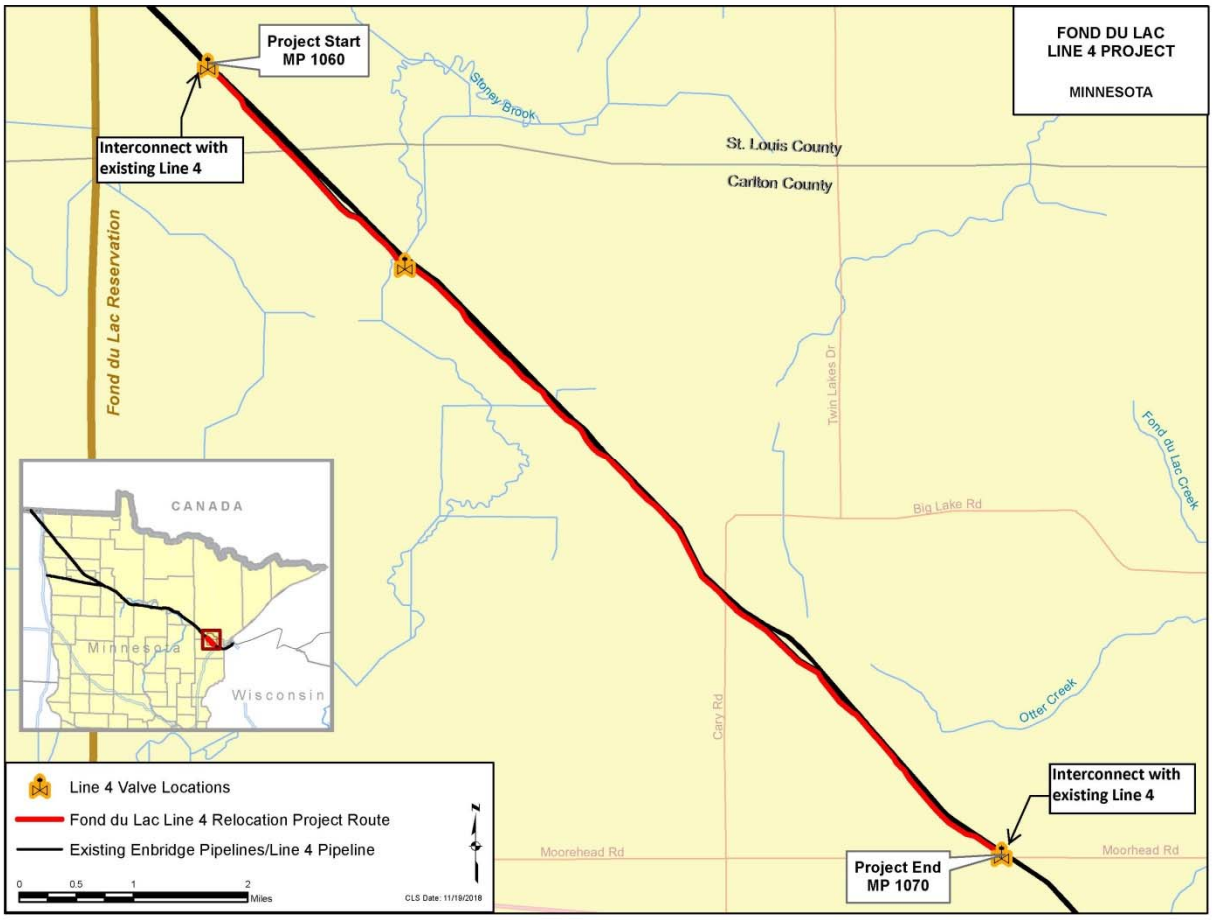

Figure 5.5-1 Option 5 Project Interconnections

In addition, Project maps containing USGS topographical maps and aerial photo maps have been developed to show the Preferred Route from near the Fond du Lac Band Reservation border in St. Louis County to near the end of the Fond du Lac Band Reservation border in Carlton County. The route maps are included in Appendix A to this application.

Figures 5.5.5 and 5.5.6 show the typical construction footprint on the Fond du Lac Band Reservation within the Preferred Route. As shown in Figures 5.5.2, 5.5.3, and 5.5.4, the typical land requirements for the Preferred Route would be: **Uplands**: 140 feet in total, using 20 feet of planned new Right-of-Way for Line 4, 40 feet of existing Enbridge Right-of-Way, 11.5 feet of planned new Line 3 Replacement Right-of-Way, 48.5 feet of shared temporary workspace with the Line 3 Replacement Project, and 20 feet of new temporary workspace impacts for Line 4; **Wetlands**: 115 feet in total, using 20 feet of planned new Right-of-Way for Line 4, 40 feet of existing Enbridge Right-of-Way, 11.5 feet of planned Line 3 Replacement Right-of-Way, 23.5 feet of shared temporary workspace with the Line 3 Replacement Project, and 20 feet of new temporary workspace impacts for Line 4; **Saturated Wetlands**: 115 feet in total, using 40 feet of planned new Right-of-Way for Line 4, 25 feet of existing Enbridge Right-of-Way, 26.5 feet of planned new Line 3 Replacement Right-of-Way, 3.5 feet of shared temporary workspace with the Line 3 Replacement Project, and 20 feet of new temporary workspace impacts for Line 4.

Overall, the amount of new Right-of-Way to be acquired is anticipated to be limited to 37 acres. In total, Project construction will affect approximately 168 acres of land. Of that total, 64 acres would be just the Line 4 temporary workspace and new Right-of-Way impacts. The rest of the total will be shared temporary workspace, new Right-of-Way workspace with the Line 3 Replacement Project, and workspace within the existing Enbridge Right-of-Way (104 acres).

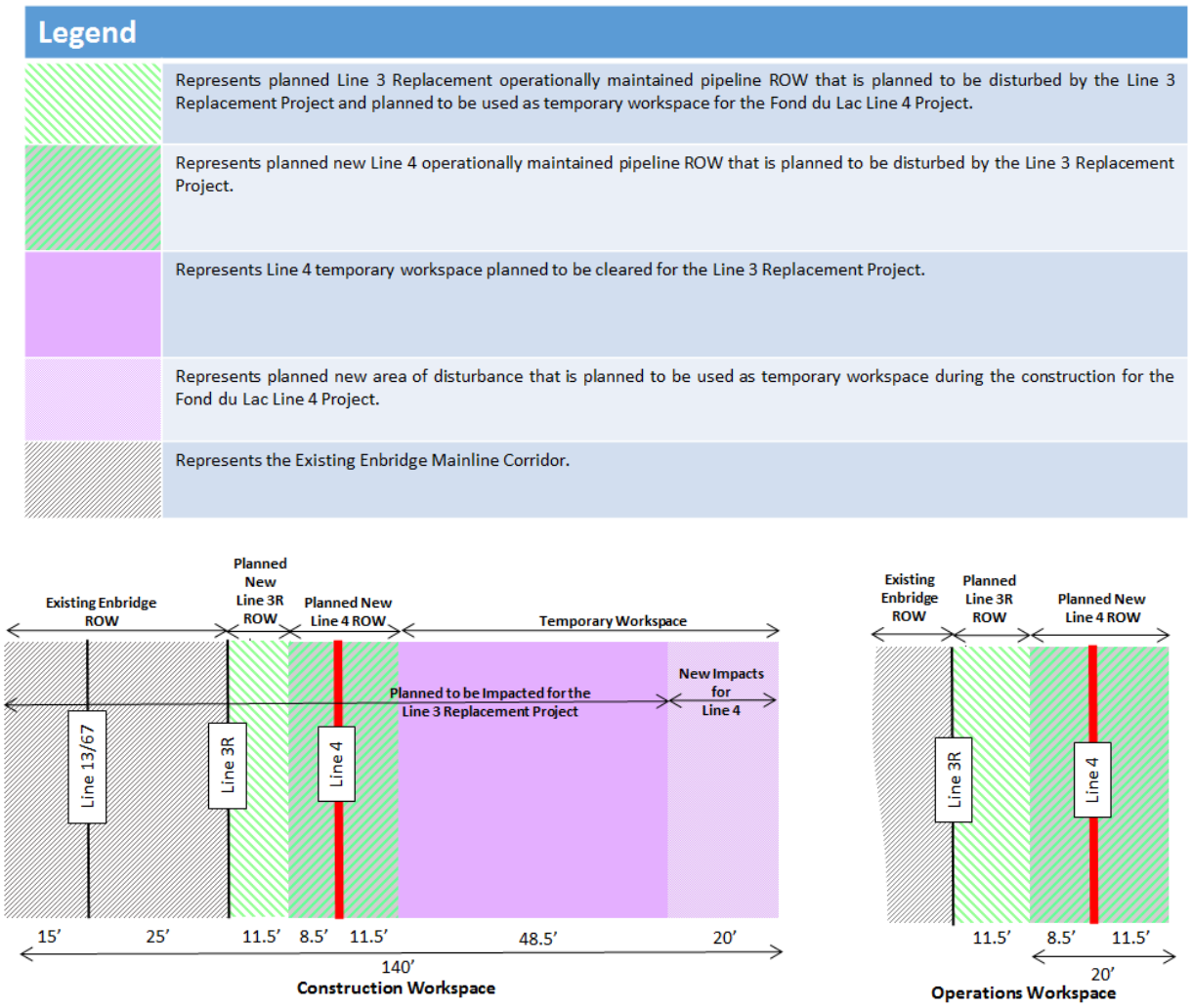

Figure 5.5-2 Option 5 Relocation of Line 4 Adjacent to Line 3 Replacement – Workspace in Uplands

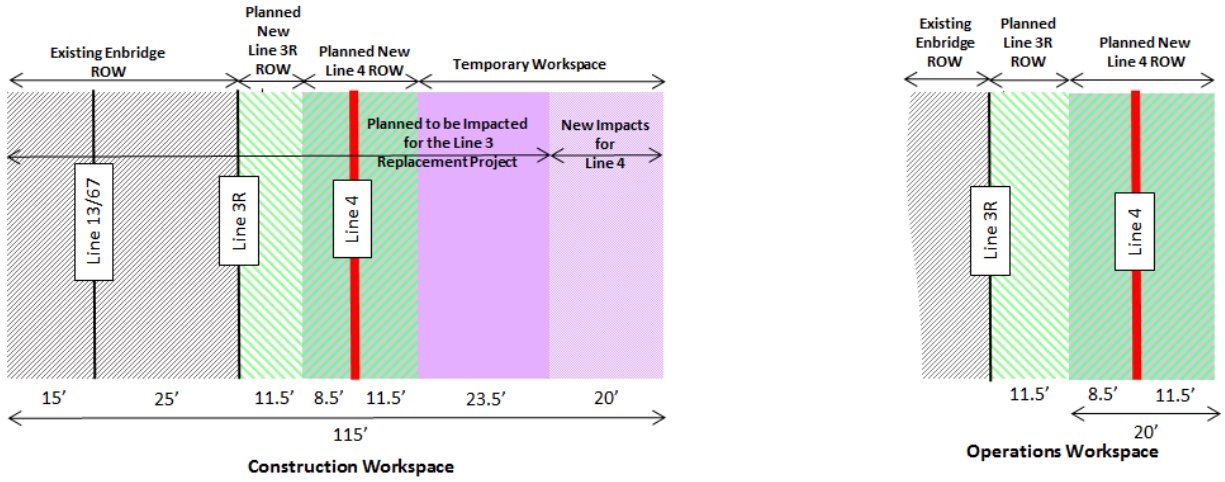

Figure 5.5-3 Option 5 Relocation of Line 4 Adjacent to Line 3 Replacement – Workspace in Wetlands

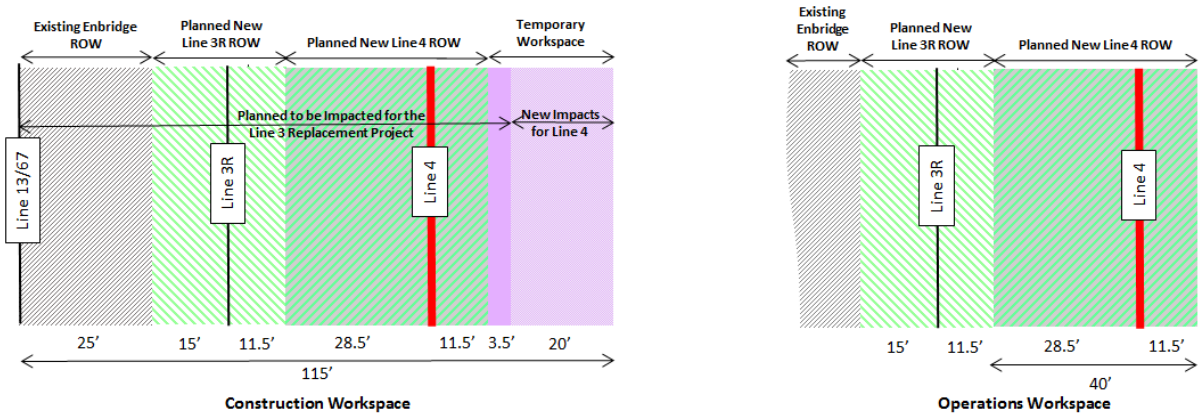

Figure 5.5-4 Option 5 Relocation of Line 4 Adjacent to Line 3 Replacement – Workspace in Saturated Wetlands

The Project's Preferred Route will generally follow the existing Enbridge Mainline Corridor and run parallel to the Line 3 Replacement Project's existing pipeline Right-of-Way. The Project is proposed be installed 20 to 40 feet away from the Line 3 Replacement pipeline as shown on the Project's typical Right-of-Way configuration on Figures 5.5-5 and 5.5-6.

The Line 4 relocated pipeline will generally be installed next to the Line 3 Replacement pipeline at a standard offset of 20 feet in both uplands and wetlands. However, there are saturated wetland areas that, because of poor soil-bearing strength and potential trench wall failure during construction, may result in a wider trench and additional spoil storage needs. In addition, waterbody crossings may result in a wider trench to accommodate deeper pipe depth requirements. Therefore, a pipe separation of 40 feet will be necessary in these areas to safely and efficiently construct the pipelines (refer to Figure 5.5.6).

The Project's Preferred Route will be co-located with and run parallel to the planned pipeline Right-of-Way of the Line 3 Replacement Project. For that reason, Enbridge has taken into consideration and used in its route selection processes all the survey work and constructability reviews performed by the Line 3 Replacement Project Execution Team as more fully described in Section 6 of this Application. Moreover, Enbridge has worked diligently with Fond du Lac Band to evaluate and adjust its Preferred Route to accommodate comments received from Fond du Lac Band. Consequently, the Project's Preferred Route has been well studied and thoroughly analyzed to ultimately provide a reasonable and financially viable route that avoids and/or minimizes impacts to the environment and human settlements.

Enbridge therefore respectfully submits that the Preferred Route is in the public interest as it balances all criteria required to be considered by the MPUC, environmental regulations, socioeconomic and human factors, as well as strict engineering standards.

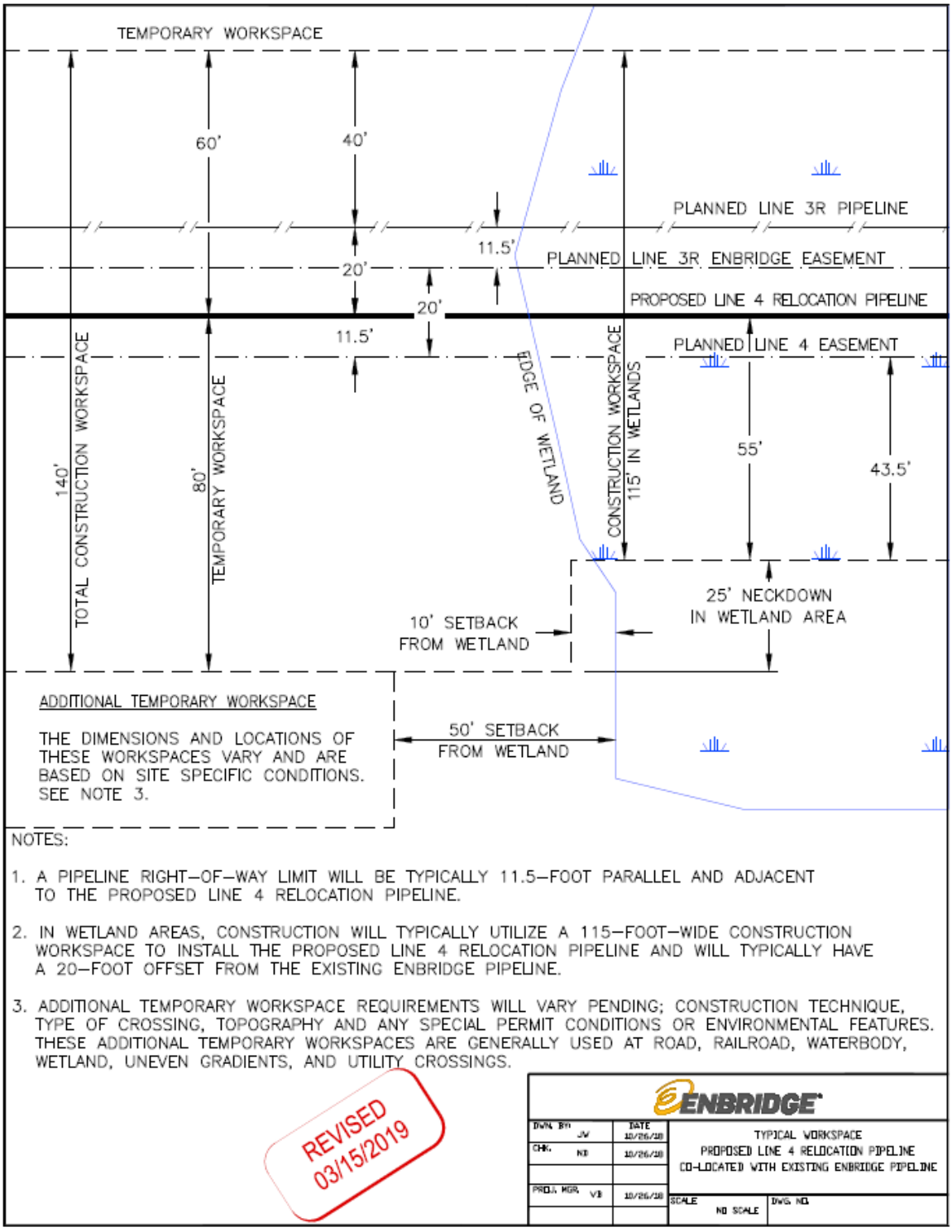

Figure 5.5-5 Option 5 Typical Construction Workspace Fond du Lac Band Reservation Preferred Route

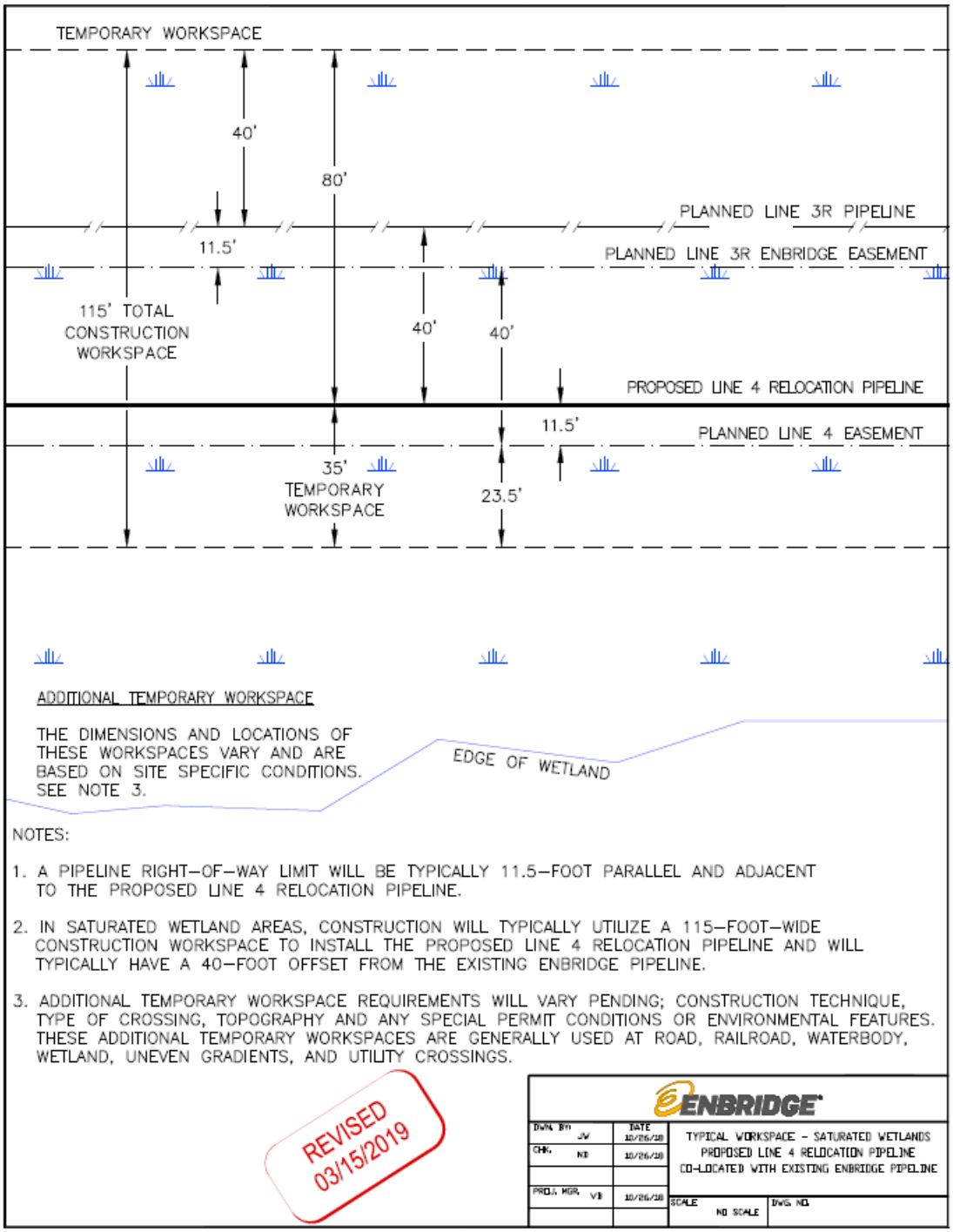

Figure 5.5-6 Option 5 Typical Construction Workspace Fond du Lac Band Reservation Preferred Route in Saturated Wetlands

6.0 Environmental Impact of Preferred Route

6.1 Introduction

This Project is being proposed in response to a request from Fond du Lac Band that Enbridge remediate an existing above-grade segment of Line 4. Fond du Lac Band has raised concerns that the above-grade Fond du Lac Band Line 4 segment creates a barrier to the natural water flow across the Reservation and, in some areas, impedes land access for the Band members to gather medicinal plants and other culturally important resources. Once completed, the Project will have human and environmental benefits following the planned future removal of the existing segment of Line 4, as it will provide enhanced access for Band members using the area and allow future environmental remediation of the natural environment in this portion of the Reservation.

This section of the Application also addresses the potential human and environmental impacts associated with construction and operations of the Preferred Route. Enbridge contracted with Environmental Resources Management, Inc. (ERM), to gather, examine, and analyze data on the following resources (in order of discussion below): the human settlement, transportation, noise, land use, public and designated lands, geology, soils, vegetation, wildlife, fisheries, threatened, endangered and sensitive species, groundwater resources, wetlands, waterbodies, cultural resources, and air quality. Each resource section within Section 6.0 contains a description of the existing environment, a discussion of construction impacts and mitigation, and a discussion of normal operating impacts and mitigation.

The proposed Fond du Lac Band Line 4 Project will not have significant impacts to humans or the environment. The Project is co-located with the existing Enbridge Mainline System, minimizing land use, environmental and human impacts. The Project passes through an area of sparse population density where the majority of the land cover is either wetland/open waters (approximately 49 percent) or forest (approximately 35 percent). Further, the Project will be co-constructed with the Line 3 Replacement Project. This co-construction will utilize workspace that is planned to be disturbed by the authorized Line 3 Replacement Project and will minimize the duration of disturbance on the Fond du Lac Band Reservation. In total the Project construction will affect approximately 168 acres of land with the relocation of an approximate 10-mile segment. Of that total, 64 acres are related to the Line 4 temporary workspace and new Right-of-Way. The remaining impacts (104 acres) will be temporary workspace, new Right-of-Way workspace shared with the Line 3 Replacement Project, and workspace within the existing Enbridge Right-of-Way. Enbridge will work with the Fond du Lac Band to establish restoration goals for the areas impacted by the Project including streambank restoration, reestablishing natural contours, reestablishing natural hydrology, and revegetating disturbed areas with appropriate species.

6.1.1 Agency Consultations and Commitments

In addition to gathering, examining, and analyzing environmental data, Enbridge has been or will be communicating with federal, Fond du Lac Band Tribal, state, and local regulatory agencies regarding potential environmental impacts resulting from construction and operations of the Project on the Preferred Route. Table 6.1.1-1 outlines the agencies that have been or will be consulted.

Table 6.1.1-1
Federal, State, and Local Regulatory Agency Consultations
Fond du Lac Band Line 4 Project

Agency
FEDERAL
United States Army Corp of Engineers (USACE) - St. Paul District
United States Fish and Wildlife Service (USFWS) – Twin Cities Ecological Services Field Office
Bureau of Indian Affairs
TRIBAL
Fond du Lac Band Resource Management Division
Tribal Historic Preservation Office (THPO)
STATE
Minnesota Department of Commerce
Minnesota Board of Water and Soil Resources (BWSR) – Duluth
Minnesota Department of Natural Resources (MNDNR) - Division of Water and Ecological Resources
MNDNR - Division of Lands and Minerals
MNDNR - Natural Heritage Information System
LOCAL
Wetland Conservation Act (WCA) Local Government Unit Exemption – St. Louis County
WCA Local Government Unit Exemption - Carlton County

Enbridge will continue to coordinate with agencies on items that arise from initial Project consultations.

6.1.2 Field Surveys

The proposed Fond du Lac Band Line 4 Project construction workspace will be located within the larger survey corridor developed as part of a comprehensive resource survey update along and adjacent to Enbridge's Mainline System within the Fond du Lac Band Reservation. Enbridge began conducting field surveys for several of the resources discussed in Section 6.0 in early 2018. As of January 2019, 71 of 78 tracts had been surveyed for wetland and waterbody features (approximately 91 percent). Tribal cultural surveys are currently in progress, as further discussed in Section 6.16, Cultural Resources. For the tracts where survey

access has not yet been granted, published databases were used to estimate resource impacts.

Enbridge coordinated with Fond du Lac approved crews to conduct a Tribal Cultural Resource Survey of the Project Route within the Fond du Lac Band Reservation in 2018 to identify historic and traditional cultural properties that could be affected during Project construction. In addition, as part of required state and federal historic properties review, Enbridge sponsored Tribal Cultural Resource Surveys and oral history interviews with Tribal Elders and Tribal Community members to gather information on potential tribal resources in the Project area. Enbridge will continue to assist in this effort and will coordinate with the Fond du Lac Band to support the Section 106 consultation required under the federal National Historic Preservation Act.

6.1.3 Impact Calculations

Because the Project is co-located within the Enbridge Mainline System and existing Right-of-Way, the majority of the Project construction workspace will occur in areas planned to be disturbed by the authorized Line 3 Replacement Project. To present different areas of impact of the Project, Enbridge presents the temporary and permanent impacts in the following categories:

- Disturbance in areas authorized for construction of the Line 3 Replacement Project but not yet disturbed within the current and planned Enbridge Mainline Corridor. These disturbances are outlined in Table 6.1.3-1 and in Figures 6.1.3-3, 6.1.3-4, and 6.1.3-5 as "New Line 4 Temporary Workspace and Planned Line 3R ROW", " Planned Line 4 ROW", and "Temporary Workspace Planned to be Cleared for the Line 3 Replacement Project."
- New disturbance exclusive to Line 4 construction in undisturbed areas outside the Enbridge Mainline Corridor (i.e., areas not disturbed by the planned Line 3 Replacement Project). This disturbance is outlined in Table 6.1.3-1 and Figures 6.1.3-3, 6.1.3-4, and 6.1.3-5 as "Temporary Workspace New for Line 4."

For the purpose of assessing environmental impacts, Enbridge differentiated the impact calculations into three different types as presented in Table 6.1.3-1: upland construction, wetland construction, and saturated wetland construction. Figure 6.1.3-1 outlines the current Enbridge Mainline Corridor within the Fond du Lac Band Reservation and Figure 6.1.3-2 outlines the proposed Enbridge Mainline Corridor with the relocated Line 4 and Line 3 pipelines within the Fond du Lac Band Reservation. Figures 6.1.3-3 through 6.1.3-5 illustrate how temporary (construction) and permanent (operations) impacts were calculated in both upland and wetland areas. Further details about resource-specific impacts are provided in Sections 6.5 (Land Use) and 6.14 (Wetlands). Temporary impacts may also result during Project operations from maintenance activities; however, the area of these impacts is not included in the calculations.

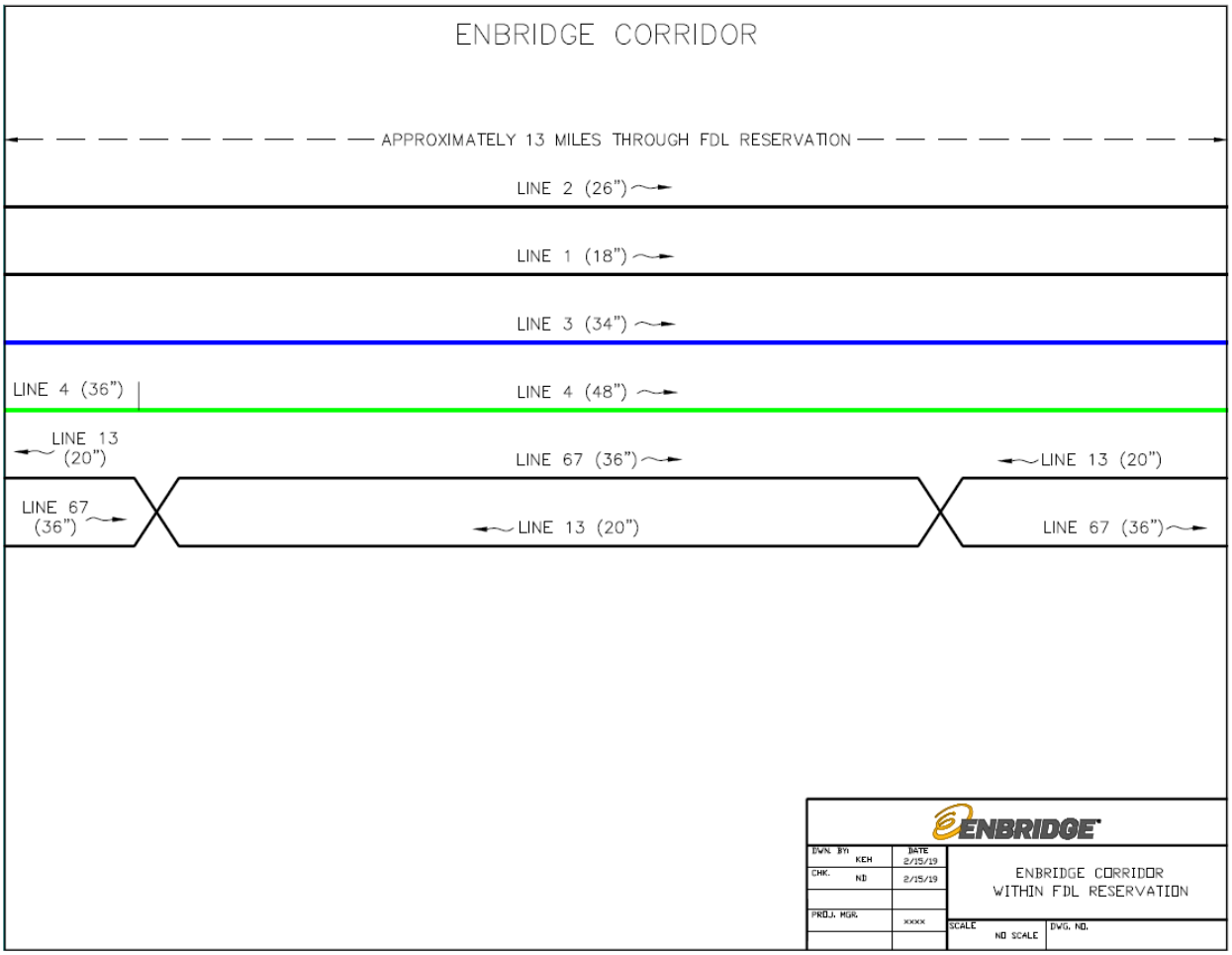

Figure 6.1.3-1 Enbridge Mainline Corridor within the Fond du Lac Band Reservation

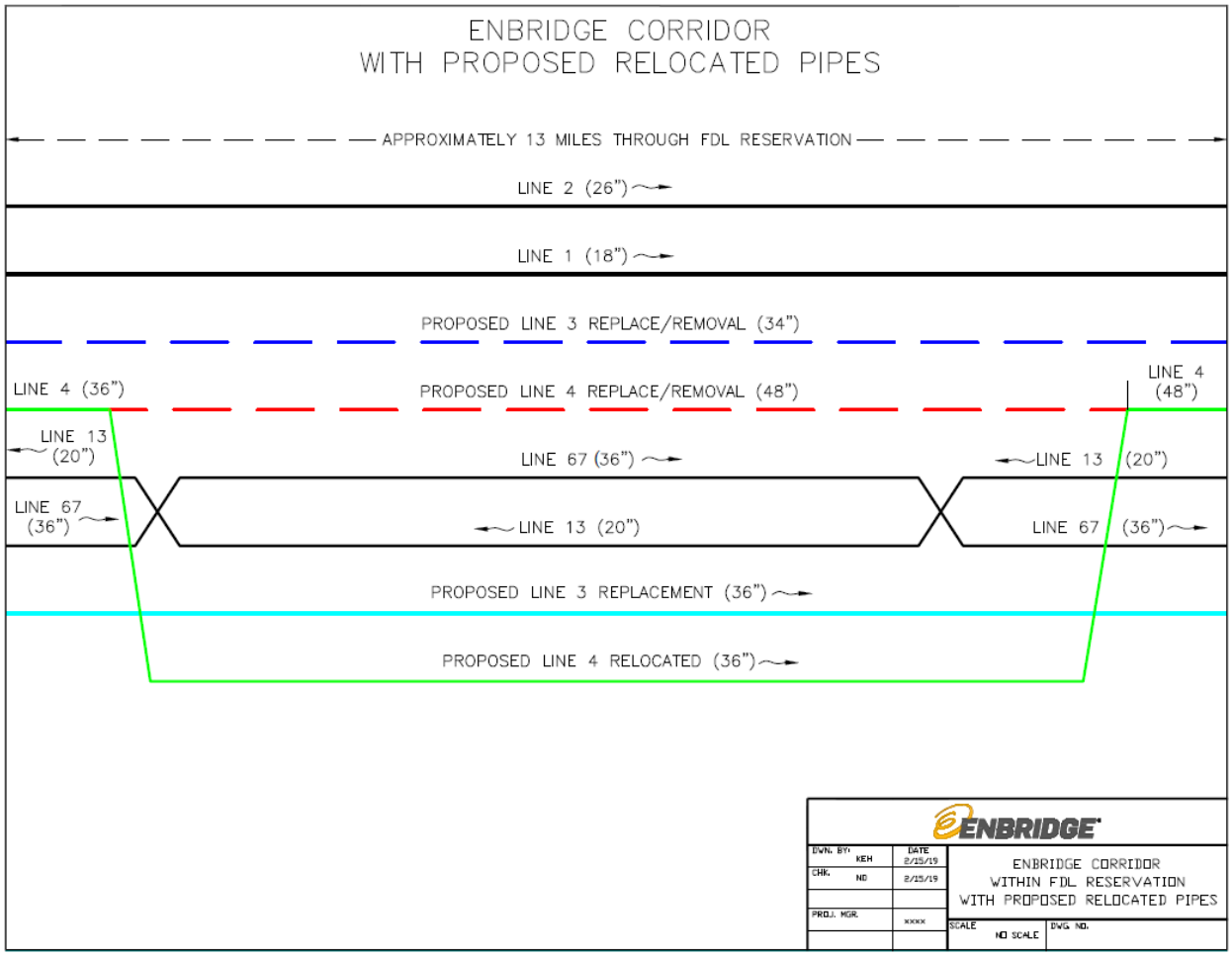

Figure 6.1.3-2 Proposed Enbridge Mainline Corridor within the Fond du Lac Band Reservation

Legend	
	Represents planned Line 3 Replacement operationally maintained pipeline ROW that is planned to be disturbed by the Line 3 Replacement Project and planned to be used as temporary workspace for the Fond du Lac Line 4 Project.
	Represents planned new Line 4 operationally maintained pipeline ROW that is planned to be disturbed by the Line 3 Replacement Project.
	Represents Line 4 temporary workspace planned to be cleared for the Line 3 Replacement Project.
	Represents planned new area of disturbance that is planned to be used as temporary workspace during the construction for the Fond du Lac Line 4 Project.
	Represents the Existing Enbridge Mainline Corridor.

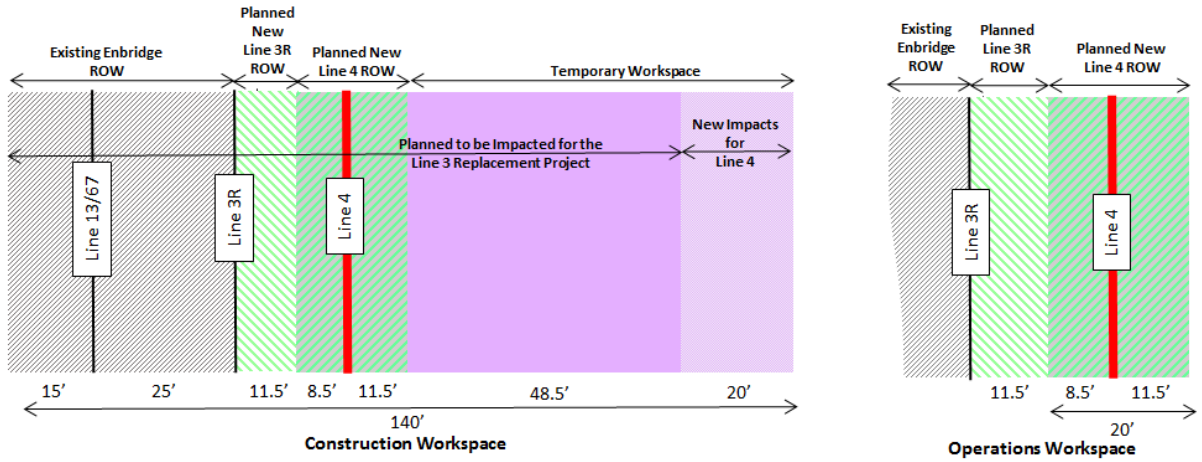

Figure 6.1.3-3 Workspace in Uplands

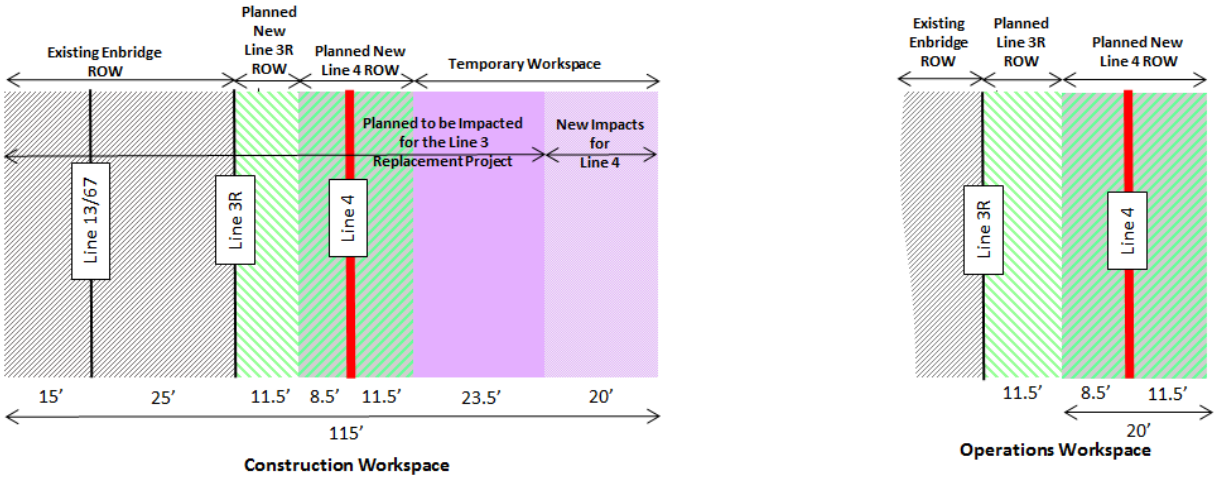

Figure 6.1.3-4 Workspace in Wetlands

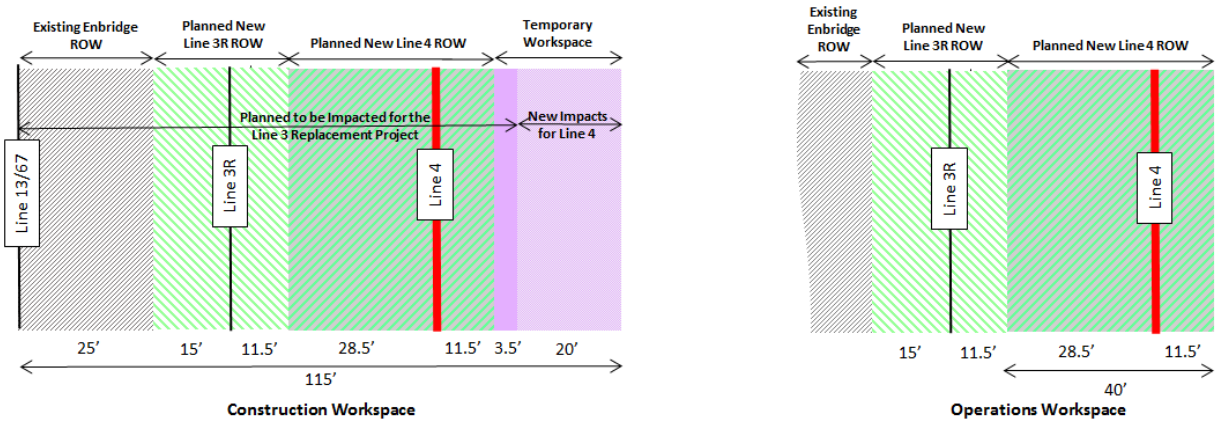

Figure 6.1.3-5 Workspace in Saturated Wetlands

Table 6.1.3-1
Summary of Impact Calculations

Calculation Type	Figure	Total Construction Workspace [a, c]	Planned Disturbance [b]				New Disturbance
			New Line 4 Temporary Workspace & Existing Enbridge ROW (Construction)	New Line 4 Temporary Workspace & Planned Line 3R ROW (Construction)	Planned New Line 4 ROW (Construction/ Operational)	Temporary Workspace Planned to be Impacted by the Line 3R Project (Construction) [c]	New Temporary Workspace For Line 4 (Construction) [c]
Upland Construction	6.1.3-3	140 feet	40 feet	11.5 feet	20 feet	48.5 feet	20 feet
Wetland Construction	6.1.3-4	115 feet	40 feet	11.5 feet	20 feet	23.5 feet	20 feet
Saturated Wetland Construction	6.1.3-5	115 feet	25 feet	26.5 feet	40 feet	3.5 feet	20 feet

[a] The construction workspace includes temporary workspaces and additional temporary workspaces (ATWS) as described in Section 3.6.
[b] Disturbance on the Enbridge Right-of-Way planned to occur for the Line 3 Replacement Project.
[c] These are typical widths and may vary along the Preferred Route.

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6.1.4 Operational Impacts

As noted in Section 6.1, this Application discusses impacts from normal operations and measures that minimize those impacts.

While potential impacts of a theoretical oil release during operations are a risk of any oil pipeline, the Project lessens the risk through the Fond du Lac Band Reservation as compared to existing Line 4. The risk will be lower because the Project buries the currently above-grade pipe, thereby reducing the risk of third party damage. In accordance with federal requirements (49 C.F.R. § 195.248), the depth of cover between the top of the pipe and the ground level, road bed, or river bottom can range between 18 to 48 inches, depending on the location of the pipe and the presence of rock. The majority of the Project, pursuant to the federal regulations, will be buried with a depth of cover of 30 inches.

In addition, the Project will utilize modern pipeline design, including design techniques, technical specifications for pipeline materials; operation and emergency protocols for pipelines; ongoing monitoring and inspection of pipelines; and preventative maintenance, all which reduce the risk of a release because the new pipelines would be built with better materials and technology. Enbridge will also meet all federal regulations for pipeline design, monitoring, and inspection safeguards to prevent spills from occurring.

For example, Enbridge has an internal safety requirement that utilizes a pre-startup safety review prior to commencing any linefill or actively starting up the pipeline. A field safety assessment on the pipeline is conducted to determine if the pipeline is ready to be placed into service. The pre-startup safety review provides in-the-field assessments of the safety systems, safety equipment, and the asset's integrity. The Project and Operations teams conduct a series of these field assessments or readiness reviews in the weeks leading up to the scheduled pipeline linefill. The safety reviews also consist of assessing the piping and equipment flanges, drains, and vents, to make sure they are tight in order to minimize the likelihood of an unplanned release. Pipeline startup is signed-off and approved by the Enbridge Operation team before placing the pipeline into service.

Further, in the event of a spill, Enbridge would coordinate with the Fond du Lac Band and follow procedures outlined in Section 10 of the EPP, the Enbridge Field Emergency Response Plan, and any Fond du Lac specific emergency plans and procedures, to quickly respond to and address a spill should one occur. In addition, there are numerous federal and state laws requiring cleanup to be completed to the satisfaction of the applicable agency, compensation for any affected parties and the Natural Resource Damage Assessment rules requiring mitigation for affected environmental resources, which were impacted. Therefore, the following operational impacts and mitigation descriptions only account for normal operating impacts due to pipeline maintenance, Right-of-Way clearing, and mowing activities.

6.1.5 Associated Facilities Impacts

As described in Section 3.0, Enbridge is proposing the following above-ground facility installations or modifications:

- Remove the existing 48-inch mainline valve at MP 1060 as it is no longer needed due the existing 36-inch mainline valve located immediately upstream, at the transition from 36-inch to 48-inch pipe.
- Install a new mainline valve at MP 1062, which will be co-located with a mainline valve for the Line 3 Replacement Project; and
- The existing Line 4 mainline valve at MP 1070 will be removed and replaced with a new 36-inch mainline valve. The location of the replaced mainline valve will be adjacent to, and co-located with, the planned Line 3 Replacement Project mainline valve site.

The installation and modifications at these mainline valve sites will have minor temporary and permanent impacts for this Project as described in Section 6.14 (Wetlands).

6.2 Human Settlement

6.2.1 Existing Environment

Human Population and Socioeconomics Conditions

The Preferred Route crosses through the Fond du Lac Band Reservation in Carlton and St. Louis Counties. The population estimates from the 2017 U.S. Census Bureau in Carlton County is 35,498 people and in St. Louis County 200,000 people (U.S. Census Bureau, 2017). Specifically, the American Indian and Alaska Native population from the 2017 population estimates U.S. Census Bureau in Carlton County is 2,122 and 4,711 in St. Louis County (U.S. Census Bureau, 2017). The Fond du Lac Band is one of six Chippewa Indian Bands that make up the Minnesota Chippewa Tribe and was established in the La Pointe Treaty of September 24, 1854. The Fond du Lac Band Reservation is 100,000 acres and includes over 4,200 members (Fond du Lac Band, 2013).

In general, the Preferred Route avoids population centers. Three municipal boundaries will be crossed by the Preferred Route (Table 6.2.1-1).

Table 6.2.1-1
Municipalities within One Mile of the Fond du Lac Band Line 4 Project

County	Municipality	Approximate Milepost	Population (2010)[a]
St. Louis	Arrowhead Township (city)	1060	223
Carlton	Perch Lake Township (city)	1069	892
Carlton	Progress Township (city)[b]	1061	Not Available

[a] U.S. Census Bureau, 2010
[b] Progress Township is an unorganized township within Carlton County and Census Bureau data is not available.

Economies along the Preferred Route include forestry, recreation, and tourism. No commercial or industrial operations are present along the Preferred Route. As discussed under Section 6.5, there are approximately 60 acres of forested land and no known agricultural land within the Preferred Route. The majority of this land will be disturbed with the MPUC-approved Line 3 Replacement Project. There are two identified census tracts of environmental justice concern along the Preferred Route.[2]

Mining resources located in the Project area and potential impacts to those resources are described in Section 6.7. With respect to recreational economies, the Project will not cross any federal parks or state parks; it will cross approximately 2.3 miles of state forest. As discussed in Section 6.6, the Project will not cross any recreational trails or any canoe or boating routes.

[2] Line 3 Replacement Project Final Environmental Impact Statement, Chapter 11, Section 11.1 (Minnesota Department of Commerce, 2018).

6.2.2 Construction Impacts and Mitigation

Human Populations and Socioeconomics

There are 176 residences within ½ of a mile of the Project who may be impacted directly through construction activities or indirectly through construction noise and traffic, which includes the associated access roads. Enbridge has been working with private landowners impacted by the Project to address their concerns through notification in writing, direct phone-calls, and in person meetings.

Enbridge anticipates that construction of the Project will provide temporary beneficial impacts to local economies during construction. Enbridge, through construction contractors and subcontractors, will hire local workers where the local workforce possesses the required skills. Enbridge is also committed to doing business with Indigenous contractors and suppliers. As a result, Enbridge plans to provide work commitments to the Fond du Lac Band for this Project. Construction of the Project will also benefit local economies through expenditures of construction worker wages, purchases of materials, and other services. The total project costs are expected to be at least $100M.

Enbridge has not identified any areas crossed by the Project that are in agricultural production. Further, construction of the Project will result in approximately 60.4 acres of impacts to forested areas, of which 10.7 acres are new temporary disturbance associated with the Line 4 pipeline construction. Of the 60.4 acres, 10.6 acres will be converted to permanent impacts for the new Line 4 Right-of-Way that will be maintained free of large-diameter trees and will be disturbed associated with the authorized Line 3 Replacement Project. Although construction of the Project will have temporary and permanent impacts on forested lands, Enbridge does not anticipate that the forestry industry will be impacted because the clearing of the Right-of-Way and workspaces areas will not appreciably reduce the lands available to forestry.

Environmental Justice

Enbridge initiated this Project in response to the request from the Fond du Lac Band, and this Project is intended to improve the environment for the Fond du Lac Band Community. One of the purposes of this Project is to meet environmental justice goals on the Fond du Lac Band Reservation.

6.2.3 Operations Impacts and Mitigation

Human Populations and Socioeconomics

Project operations and maintenance will have no long-term effects on human settlements or populated areas. Long-term benefits to the Fond du Lac Band Community will enable subsequent removal of the existing above-grade pipe to enable better land accessibility to the Fond du Lac Band Community, improving the use of this area to actively practice traditional activities.

The Project will be operated with current Enbridge staff. Long-term economic benefits associated with operation of the Project will include increased tax revenues at the state and county levels in the form of property and/or ad valorem taxes. The rough estimate tax benefit for St. Louis and Carlton County combined is at least $2M per year over and above the existing tax revenue from Line 4.

The Project will not have permanent economic impacts on forestry because, other than the new Right-of-Way, the construction workspace will be allowed to regenerate naturally.

Operation of the Project will not impact future mining activities at the two possible sand and gravel pits (see Section 6.7). Because Enbridge is not aware of other potentially recoverable mineral resources within the Preferred Route, Enbridge does not currently anticipate that the operation of the Project will otherwise impact mining operations.

Environmental Justice

In regards to Environmental Justice, Enbridge is doing this project at the request of the Fond du Lac Band, and the Project will be benefit to the Community.

6.3 Transportation

6.3.1 Existing Environment

Roads

The Project will cross county, city/township, and private roads. In total, the Preferred Route will cross 9 roads as detailed in Table 6.3.1-1.

Table 6.3.1-1
Roads Crossed by the Fond du Lac Band Line 4 Project

County	Milepost	Road Name	Road Type	Paved/ Unpaved	Township/ City	Road Crossing Type
St. Louis	1060.1	Arrowhead State Forest Road	Private	Unpaved	Arrowhead	Open Cut
Carlton	1062.5	Township Road 535	City/County	Unpaved	Perch Lake	Open Cut
Carlton	1064.2	Township Road 536	Private	Unpaved	Perch Lake	Open Cut
Carlton	1065.7	Ditchbank Road	City/County	Paved	Cloquet	Bore
Carlton	1066.3	Magney Drive	Township	Paved	Perch Lake	Open Cut
Carlton	1066.6	Cary Road/CR-7	City/County	Paved	Cloquet	Bore
Carlton	1067.3	Driveway	Private	Unpaved	Cloquet	Open Cut
Carlton	1068.5	Strand Road	Township	Unpaved	Perch Lake	Open Cut
Carlton	1069.5	Reponen Road	Township	Unpaved	Perch Lake	Open Cut

The road crossing methods include either open cut or bore method. The bore method road crossing is represented in Figure 25 of the EPP (Appendix B).

Railroads

The Project will not cross any active or inactive railroads.

Airports

According to data from MNDOT, there are no airports within a one-mile radius of the Preferred Route.

6.3.2 Construction Impacts and Mitigation

Roads

Construction activities could result in short-term impacts on transportation infrastructure and traffic. The traffic volume along roads close to the pipeline could increase due to the movement of construction equipment, material, and crews. Temporary road closures may be required; however, Enbridge will try to avoid road closures during peak-traffic periods. Impacts on local traffic levels during construction will be temporary and minor. Construction across any paved

roads, highways, or roadways will be subject to the requirements of the necessary road crossing permits. Enbridge will obtain these permits prior to the start of construction.

The pipeline will be installed under paved roads using the boring method as indicated in Table 6.3.1-1. This method will avoid disturbance of the road surface and allow traffic to continue to use the road unimpeded by the installation of the pipe. However, some local traffic congestion may result as passing motorists slow down to view the construction and when construction vehicles cross the road or park along the road near the Right-of-Way. These impacts will be temporary and localized, occurring only during construction.

The open-cut construction method typically will be used to cross unpaved roads as indicated in Table 6.3.1-1 (6 of the 9 road crossing will be unpaved roads). This construction method will require temporary closure and detours. If no reasonable detour is available, at least one traffic lane will be maintained, except for brief periods during installation of the pipe. Disturbances at each open-cut road crossing will typically be limited to one day and are not expected to have a substantial effect on local traffic patterns. Safety measures such as detours, warnings, traffic control, and safety signs will be implemented as needed and prescribed by local (county) departments of transportation. Enbridge will attempt to avoid road closures during peak-traffic periods.

Access to most of the construction workspace will be obtained using pre-existing public and private roads. Any damage to roads due to Project construction-related activities will be repaired by Enbridge to the extent practicable.

6.3.3 Operations Impacts and Mitigation

Roads

No long-term effects are expected on roads crossed by the Preferred Route. The function of roads will be restored after construction including, but not specifically limited to: full restoration of vehicular traffic that may have been impeded during construction; repair of damage to the road surface caused by construction; and removal and restoration of access points that were installed to facilitate ingress/egress to the construction workspace. Enbridge will also mitigate and restore any temporary road impacts that may result from subsequent Project maintenance activities.

6.4 Noise

6.4.1 Existing Environment

The Project will involve relocation of an existing pipeline segment. Because the Project does not involve the installation of pump stations, a baseline noise analysis was not completed. Typically, noise contributions come from the pump station equipment during operating conditions. Ambient noise levels are expected to range from 30-40 decibels on the A-weighted Scale (dBA), with higher baseline levels in more developed sections. Although some modifications to the station may be required, the noise levels will not change, and the Minnesota Pollution Control Agency (MPCA) Noise Standards will continue to be met.

6.4.2 Construction Impacts and Mitigation

The heavy equipment needed to construct the Project will have an intermittent and temporary impact on existing noise levels in the vicinity of the construction workspace. Typical pipeline construction equipment (including bulldozers, loaders, backhoes, and sideboom tractors) generate from 80 to 90 dBA within 50 feet of the equipment. The equipment noise will be limited to the period of construction. Because the Preferred Route crosses primarily rural and undeveloped areas, the general public should experience limited increases to existing noise levels. Band members would be impacted to a greater degree than the general public due to their use of the Reservation, but impacts would be temporary and limited to the period of construction. Equipment noise is expected to dissipate to levels within State daytime residential standards (<60 dBA) within 500 to 1,500 feet of the equipment depending on initial source level. Enbridge reviewed aerial photography and identified 33 noise sensitive receptors within 500 feet of the construction workspace, and 54 noise sensitive receptors between 500 feet and 1,500 feet of the construction workspace. The identified noise receptors were residential structures.

In the vicinity of residential areas, the contractor will take reasonable measures to control construction-related noise, including limited pipeline construction activities to daylight hours when possible, maintaining equipment in good working order, and utilizing manufacturer-supplied silencers when available.

6.4.3 Operations Impacts and Mitigation

Following construction, noise will not be generated by the pipeline during normal operations. Maintenance activities on the new Right-of-Way may generate some noise but these activities and the associated noise will be temporary and intermittent, consistent with noise levels experienced during normal maintenance activities on the existing Line 4 pipeline segment.

A small amount of operational noise will be generated at the valve sites; however, the sound level associated with the operation of the valve sites will be low and will not likely be perceptible outside of the new Right-of-Way during normal operations.

6.5 Land Use

6.5.1 Existing Environment

Land Ownership

As shown in Table 6.5.1-1 and Figure 6.5.1-1, the Preferred Route predominantly crosses private lands (approximately 43 acres or 25 percent), Tribal trust lands (approximately 48 acres or 29 percent), and Tribal fee lands (approximately 30 acres or 18%). The Preferred Route also crosses state lands owned and managed by various state agencies (approximately 28 acres or 17 percent), lands owned by the state but administered by the county (tax-forfeit lands) (approximately 12 acres or 7 percent) and county land (approximately 7 acres or 4 percent). The land ownership data was collected in the field and includes the pipeline construction footprint (168 acres). Public and designated lands are described in more detail in Section 6.6.

Table 6.5.1-1
Ownership and Cover of Lands Crossed by the Fond du Lac Band Line 4 Project

Ownership [a]	**Totals (acres)**	**Percentage**
Private Lands	43	25%
Tribal Trust	48	29%
Tribal Fee	30	18%
State Lands (state-administered)	28	17%
State Lands (county-administered)	12	7%
County Land	7	4%
Total	**168**	**100%**
Cover [b]	**Totals (acres)**	**Percentage**
Wetland/Open Water	85	49%
Forest Land	60	35%
Open Land	22	13%
Developed Land	6	3%
Total	**173**	**100%**

[a] Enbridge field collected data within the Line 4 pipeline construction footprint. Land ownership does not include access roads.

[b] Calculations in this table are based on Minnesota Land Cover Classification System digital data (MNDNR, 2018c) and Enbridge aerial interpretation and do not reflect information gathered from field surveys. Land cover includes both construction footprint and access roads.

Land Cover

Land cover along the Preferred Route was classified using Minnesota Land Cover Classification System (MLCCS) digital data (MNDNR, 2018c), as well as through interpretation of recent aerial photography for the pipeline construction footprint (168 acres) and access roads (5 acres). The MLCCS data set includes detailed vegetation and land use patterns for Minnesota, and includes natural/semi-natural or cultural (developed) land use types. For the Project, the land use classes in the data set were combined into the following four general categories based on prevalent land use and vegetation cover types: forest land, wetland/open water, open land, and developed land.

As shown in Table 6.5.1-1, the Preferred Route predominant land cover within the overall Project construction workspace crosses wetlands/open water covering approximately 85 acres (or approximately 50 percent). Forest land accounts for approximately 60 acres (or approximately 34 percent) of the overall Project construction workspace. Open land consists of approximately 22 acres (or approximately 13 percent) within the overall Project construction workspace. Developed comprises approximately 6 acres (or approximately 3 percent) within the overall Project construction workspace.

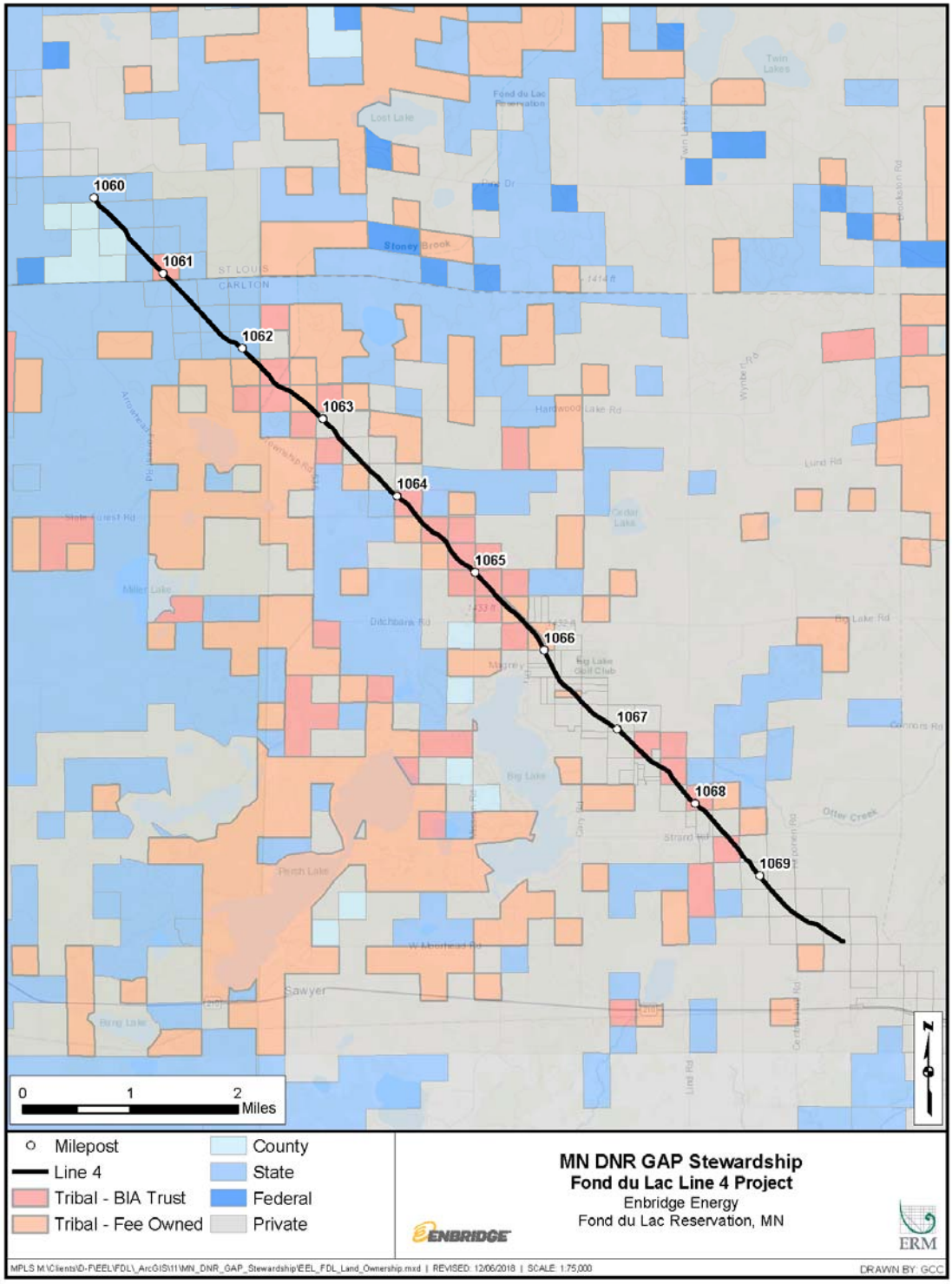

Figure 6.5.1-1 Fond du Lac Band Line 4 Project Land Ownership

Planned Land Use

Comprehensive land use plans have been established by both Carlton and St. Louis Counties, and the Fond du Lac Band has established a Reservation Strategic Plan. These plans acknowledge the need for and existence of utilities and infrastructure. Because the Project will not establish any new utility corridors but will be collocated with the existing Enbridge Mainline System, the Project will not conflict with these plans (St. Louis County, 2018; Carlton County, 2001; FDL, 2011).

The Fond du Lac Band manages land within the reservation through zoning ordinances. Zoning designations are available via the Fond du Lac interactive mapping tool, which indicates that the Project would cross mainly parcels zoned 'Natural Resource Management' with some parcels crossed zoned 'Residential', and one parcel zoned 'Cultural Preservation' (FDL, 2018b). The purpose of each of these zoning designations are as follows:

- Natural Resources Management - to allow for forest, wildlife, and fish management and to sustain and enhance areas for traditional hunting, fishing and gathering.

- Residential - to provide areas where residences are located in areas free of commercial and industrial activity, noise and pollution, or any activity that may threaten health and safety.

- Cultural Preservation - to sustain areas which have cultural, environmental, or historic significance to the Fond du Lac Band. Parcels with the Cultural Preservation zoning status are applied to wild rice lakes, sugar bush sites, gathering sites, or other sites deemed worthy of preservation by the RBC.

Pipelines are included under the Essential Services category of the Special Use Section of the Fond du Lac's Zoning Ordinance (FDL, 2007). This regulation indicates that the installation method and location of the pipeline must be designed to protect the natural environment to the maximum extent reasonable and feasible. As noted in Section 2.0, the Project is being proposed to address Fond du Lac Band concerns related to the existing Line 4 and has the support of the Fond du Lac Band. Further, as noted in Table 6.18-1, Enbridge has complied with Fond du Lac's Right of Way Ordinance (FDL, 2016).

Carlton County's public map service indicates the majority of the Project located within portions of the Fond du Lac Reservation cross parcels zoned A-1 (Agricultural/Forest Management), A-2 (Agricultural/Rural Residential) and R-1 (Recreational Residential) (Carlton County, 2019). According to Carlton County's Zoning Ordinance, regional pipelines are a conditional use of parcels zoned A-1 and A-2.

St. Louis County's County Land Explorer indicates that the Project is located within parcels zoned Forest Agricultural Management (FAM-1) with the exception of one parcel zoned

Multiple Use (MU-4) (St. Louis County, 2019). Utilities are allowed in FAM-1 zones with a conditional use permit and are allowed in MU-4 zones without the need of a permit.

6.5.2 Construction Impacts and Mitigation

Land Ownership, Land Cover, and Planned Land Use

Enbridge has been working with the Fond du Lac Band, private landowners, and the appropriate county, state, and federal land-managing agencies to ensure that the Project is designed and constructed in a manner that is consistent with the necessary easements, permits, or licenses to cross these lands. The Project will require new easements for the designated route. As of December 2018, easements have been acquired on 61 percent of the Preferred Route.

Table 6.5.2-1 summarizes the breakdown by land use category of the potential construction impacts of the Project. Calculations in Table 6.5.2-1 are based on MLCCS digital data (MNDNR, 2018c) and Enbridge aerial interpretation and do not reflect information gathered from field surveys. Temporary disturbance refers to temporary construction areas for the Preferred Route and is divided into the following categories: Planned disturbance associated with Enbridge's authorized Line 3 Replacement Project and areas of new disturbance associated with the Project. Permanent impacts are addressed in Section 6.5.3 below. Appendix G.1 provides a detailed breakdown by land use and county of the Project's potential construction impacts.

TABLE 6.5.2-1
Fond du Lac Band Line 4 Project Construction Impacts by Land Cover Type (acres)

Project Component	Land Use	Disturbance Type	Total [a]
Pipeline Construction	Developed	Planned Disturbance for Line 3R [b]	3.5
		New Disturbance [c]	1.4
	Forest Land	Planned Disturbance for Line 3R [b]	46.2
		New Disturbance [c]	10.7
	Open Land	Planned Disturbance for Line 3R [b]	20.7
		New Disturbance [c]	1.2
	Wetland/Open Water	Planned Disturbance for Line 3R [b]	70.0
		New Disturbance [c]	14.3
Pipeline Construction Total			**168.1**
Access Roads	Developed	Temporary	0.9
		Permanent	0.0
	Forest Land	Temporary	3.5
		Permanent	0.0
	Open Land	Temporary	0.4
		Permanent	0.0
	Wetland/Open Water	Temporary	0.5
		Permanent	0.0
Access Roads Total			**5.3**
Grand Total (acres)			**173.4**

[a] Calculations in this table are based on Minnesota Land Cover Classification System digital data (MNDNR, 2018c) and Enbridge aerial interpretation and do not reflect information gathered from field surveys.

[b] Areas of planned disturbance for Enbridge's Line 3 Replacement Project. Includes temporary construction workspace and new Right–of-Way.

[c] New disturbance for the Fond du Lac Band Line 4 Project. Includes temporary construction workspace.

Developed Land

The Project will result in approximately 5.8 acres of temporary impact to developed land, of which 1.4 acres are new temporary disturbed areas associated with pipeline construction (see Table 6.5.2-1). Based on examination of aerial photographs and GIS data, there are two residences within 50 feet of the construction workspace and 162 residences within a half mile of the construction workspace.

During construction, temporary land use impacts may occur to residential land due 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 workspace and access roads near residential areas will be sprayed with water as needed to control dust during active construction. After construction is completed, measures to stabilize and revegetate the Right-of-Way will prevent ongoing dust emissions. Planned disturbance of areas by other construction activities before the Line 4 Project may increase the likelihood of invasive species in these areas. Short-term increases in ambient noise levels will occur due to construction equipment used to install the pipeline. Further details regarding noise impacts are described in Section 6.4.

Forest Land

Construction of the Project will impact approximately 60.4 acres of forested areas, of which 10.7 acres are new temporary disturbance associated with pipeline construction (see Table 6.5.2-1). Of the 60.4 acres, 10.6 acres will be converted to permanent impacts for the new Line 4 Right-of-Way that will be maintained free of large-diameter trees. After construction, tree regeneration will be permitted to occur naturally in the cleared forest land outside the new Line 4 Right-of-Way and within the temporary construction workspaces.

Based upon information gathered from the Fond du Lac Band interactive mapping tool, the portions of the Project mapped as forested land use are zoned as Natural Resource Management parcels (Fond du Lac Band, 2019a). The purpose of the Natural Resources Management zoning status is to allow for forest, wildlife, and fish management and to sustain and enhance areas for traditional hunting, fishing, and gathering (Fond du Lac Band, 2019b). Construction impacts to forested areas would remove portions of these lands from their zoned land use. The majority would eventually return to their original land cover type following restoration.

Enbridge will compensate MNDNR for any merchantable timber loss on state-managed forest lands. Compensation for merchantable timber on private lands is agreed upon between Enbridge and the landowner during easement acquisition. The value of merchantable timber is determined through discussions with the landowner and appraisals as needed. The construction and operation of the pipeline will prevent future use of the new Right-of-Way to produce merchantable timber; however, landowners (including the state) will be compensated

for the value of the land within the new Right-of-Way. Enbridge will also acquire all applicable Fond du Lac Band Reservation permits for timber removal.

Open Land

Construction of the Project will result in approximately 22.3 acres of new temporary impact on open land, of which 1.2 acres are new temporary disturbed areas associated with pipeline construction (see Table 6.5.2-1). After final construction clean-up, the open land in upland areas will be restored. Planned disturbance of areas by other construction activities before the Line 4 Project may increase the likelihood of invasive species i21.n these areas. Restoration and revegetation measures are outlined in Section 4.2.9.

Wetland/Open Water

The Project will result in approximately 84.8 acres of temporary impact to wetlands and open water during construction, of which 14.3 acres are new temporary disturbed areas associated with pipeline construction (see Table 6.5.2-1). This is based on land cover data and is not based on the Enbridge's field delineation of wetlands and waterbodies. Enbridge has reduced the construction workspace width to 115 feet when crossing wetlands, waterbodies, and saturated wetlands to reduce impacts. Construction impacts associated with wetland and waterbody crossings are discussed in Sections 6.14 and 6.15.

Associated Facilities

The Project will involve the following valve site work: the removal of an existing mainline valve at the existing MP 1060 valve site; the installation of a new mainline valve at MP 1062; and the removal and replacement of an existing mainline valve at MP 1070. The majority of construction of these valves will be temporarily impacts of approximately 0.055 acre as the valve sites will already be constructed as part of the Line 3 Replacement Project. Approximately 0.03 acre will be permanent converted to upland area to accommodate a valve for the Project.

Planned Land Use

While Carlton and St. Louis Counties both allow utilities subject to conditional use permits, the Project is subject to Minn. Stat. § 216G.02, subd. 4, which provides that a route permit "is the only site approval required to be obtained by the person owning or constructing the pipeline. The pipeline routing permit supersedes and preempts all zoning, building, or land use rules, regulations or ordinances promulgated by regional, county, local and special purpose governments." Therefore, Enbridge is not required to seek permits or variances from local governments to comply with applicable zoning codes. Nonetheless, impacts to local zoning are impacts to human settlements, both current and planned.

The Project would result in both temporary and permanent changes to current land uses. The majority of the land use impacts associated with the Project will be temporary because most land uses would be allowed to revert to prior uses following construction. Because the Project

would not impair the Counties' or Fond du Lac's ability to effectuate the orderly development and use of land and water resources, impacts to local zoning are anticipated to be minimal.

6.5.3 Operations Impacts and Mitigation

Land Ownership, Land Cover and Planned Land Use

In general, land ownership will not change, but Enbridge will acquire easements necessary to construct and operate the Project. In some locations, Enbridge may acquire parcels in fee, such as for valve sites. Enbridge will also be acquiring Right-of-Way grant from the Bureau of Indian Affairs for crossing Tribal Trust and Allottee Trust Parcels. The Right-of-Way Application has been submitted and is currently being processed by the Bureau of Indian Affairs.

Operation of the Project will result in new permanent disturbance of 36.7 acres associated with the Line 4 new Right-of-Way. The predominant land use within the new Right-of-Way is wetland and open water, which covers 22.1 acres (or approximately 60 percent). Other land uses in the Right-of-Way are forest land 10.6 acres (or approximately 29 percent), open land 3.5 acres (or approximately 10 percent), and developed land 0.5 acre (or approximately 1 percent). As further discussed in Section 6.9, the new Right-of-Way will be maintained in an herbaceous state by removing woody shrubs, which will result in a conversion of 10.6 acres of forested area to open land for the life of the Project. All of the permanent conversion of forested land will be located in areas authorized for disturbance associated with the Line 3 Replacement Project. All other land cover types will revert to their previous cover type following restoration activities, with the exception of valve sites discussed below in Associated Facilities.

Temporary land cover impacts may also result from Project maintenance activities that require excavation. Access to forested areas, private land, and lands administered by MNDNR (see Section 6.6) will be maintained during operations and maintenance activities. Impacts to forest land and other vegetation types are discussed in Sections 6.9 and 6.10. Wetland and waterbody impacts are addressed in Sections 6.14 and 6.15.

Associated Facilities

Valves located along the Preferred Route will impact a total of 0.055 acre by installing a perimeter fenced in gravel area with task lighting. The valves will also include instrument building, valve stem, associated instrumentation, and electrical service meter within the fenced area.

Planned Land Use

As noted above, the Project would result in both temporary and permanent changes to current land uses. The majority of the land use impacts associated with the Project will be temporary because most land uses would be allowed to revert to prior uses following construction. Because the Project would not impair the Counties' or Fond du Lac's ability to effectuate the orderly development and use of land and water resources, impacts to local zoning are anticipated to be minimal.

6.6 Public and Designated Lands

Enbridge initiated Project consultation with the MNDNR as part of the Project. Enbridge will continue to communicate with the MNDNR and other permitting agencies on items that arise from the initial Project consultations as well as items that are ongoing from previous correspondence between the agencies and Enbridge.

6.6.1 Existing Environment

The Project will cross 2.3 miles of the Fond du Lac State Forest, of which approximately 1.0 mile is land, administered by MNDNR (see Table 6.6.1-1 and Figure 6.6.1-1). Enbridge will continue to work with MNDNR to acquire a license for the crossing of state lands.

Table 6.6.1-1
State Forest Crossed by the Fond du Lac Band Line 4 Project

County	State Forest	Milepost Range	Crossing Length (miles)
Carlton	Fond du Lac State Forest	1060.0 – 1062.3	2.3

The Preferred Route will not cross national parks, national natural landmarks, national wilderness areas, national wildlife refuges, national forests, scenic trails, or national waterfowl production areas. The Preferred Route will not cross any waterbodies listed on the U.S. National Park Service (USNPS) National Rivers Inventory (NRI) as designated or potentially designated National Wild and Scenic Rivers (USNPS, 2016); however, the Project will cross tributaries that flow into rivers listed on the NRI.

The Project will not cross any Wildlife Management Areas (WMAs), Aquatic Management Areas (AMAs), Scientific and Natural Areas (SNA), or designated State Recreational Areas. The Project will not cross any state-designated trails, but is within 0.2 mile of the Fond du Lac State Forest Trails near MP 1060.3. The Project will not cross Wild and Scenic Rivers, any canoe and boating routes or any county-administered parks. The Preferred Route will not cross any designated scenic byways, any conservation easements, or other types of public lands.

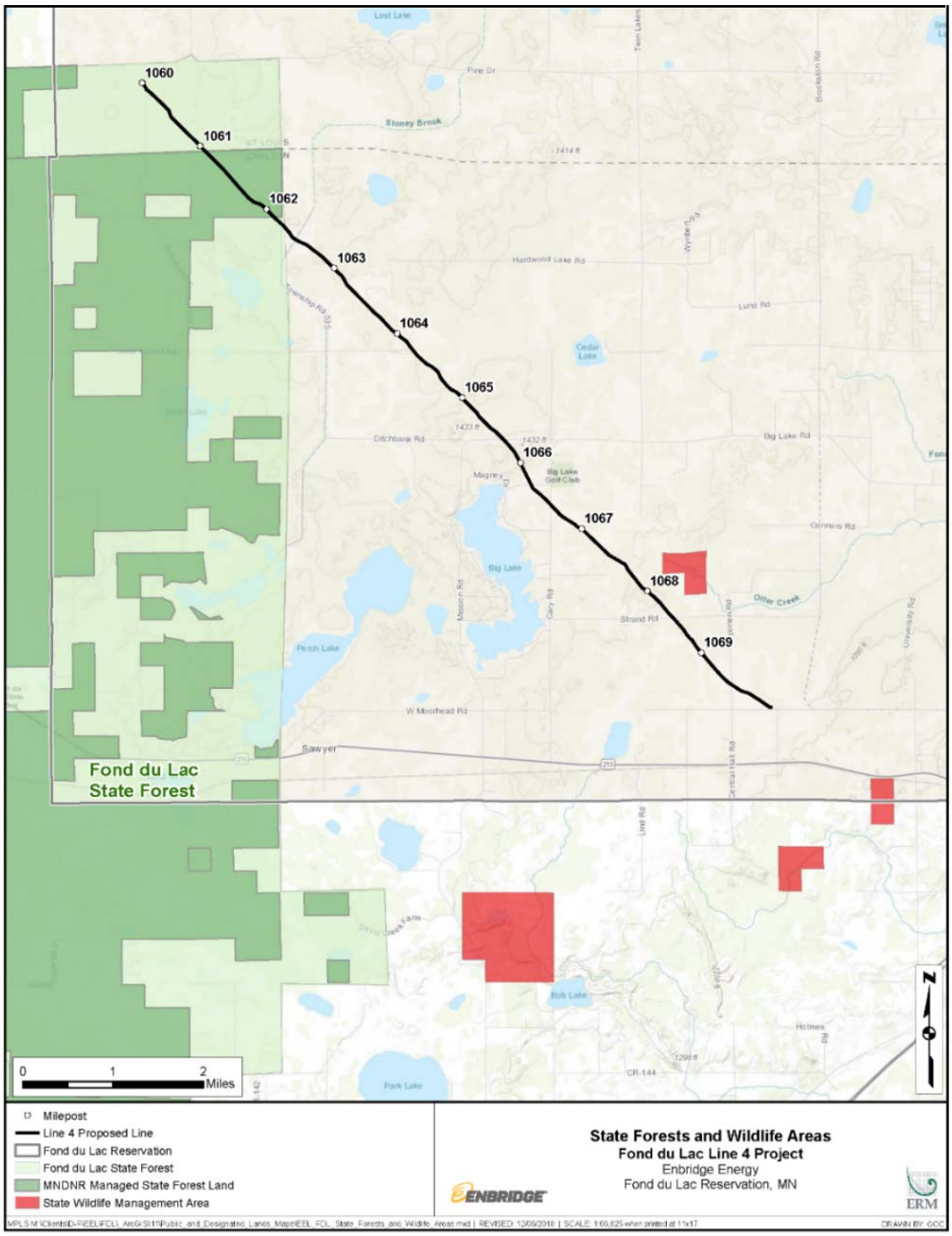

Figure 6.6.1-1 State Forest and Wildlife Areas

6.6.2 Construction Impacts and Mitigation

The Project will only cross the Fond du Lac State Forest and only minor and temporary impacts are expected on the state-designated recreational lands. As described in Section 5.0, the Preferred Route is 100 percent co-located with the existing Enbridge Mainline System and will therefore minimize potential impacts on public lands and recreational areas. In addition, Enbridge plans to construct the Project consecutively with the Line 3 Replacement Project, which will further minimize cumulative impacts associated with the Project.

Impacts on state recreational areas will involve temporary inconveniences and localized disturbances, including noise, dust, and visual intrusions associated with construction activities near recreational areas.

Enbridge will maintain public access to state-designated recreational areas during construction to the extent safe and practicable. Access to state recreational areas in the immediate construction areas may be limited or restricted during excavation and pipeline installation activities. Potential impacts on state recreational activities due to restricted access will be minimal and dependent on the timing of construction, the season in which the recreational activity occurs, and the construction methods used. Temporary closures of some areas may be necessary during construction. Enbridge will post signs as needed to notify the public of construction and will install safety fencing around open trenches at public access locations during periods of inactive construction as necessary. After construction is complete, state recreational areas will be restored to allow previous uses and recreational activities to continue.

6.6.3 Operations Impacts and Mitigation

Impacts on public and designated land areas during operations will involve localized disturbances, including temporary impacts associated with maintenance activities that require excavation, mowing, and visual intrusions associated with valve sites and new access roads.

Vegetation maintenance of the new Right-of-Way, as discussed in Section 6.9, may have visual impacts on public forest lands. Access to public recreational lands and recreational activities will not be restricted or impacted by Project operations or maintenance activities.

Following final restoration after installation of the pipeline, Enbridge will allow operational access across the pipeline for MNDNR vehicles and forest logging equipment for timber management as long as the crossings do not pose a risk to the safe operation of the pipeline. These crossings are expected to be existing roads that will be agreed upon by MNDNR and Enbridge.

Enbridge will continue coordinating with MNDNR to address the balance between resource impacts, landowner needs, and maintenance and safety considerations.

6.7 Geology

6.7.1 Existing Environment

Bedrock and Surface Geology

The topography crossed by the Project is relatively flat due to a long period of erosion and repeated glaciation. Elevations in the Project vicinity range from approximately 1,284 to 1,444 feet above mean sea level (Table 6.7.1-1).

Table 6.7.1-1
Elevation within the Fond du Lac Line 4 Project Vicinity

County	Elevation Above Mean Sea Level (feet)		
	Lowest	Average	Highest
St. Louis	1,299	1,333	1,359
Carlton	1,284	1,317	1,444

Regional maps of depth-to-bedrock generally lack sufficient resolution to identify areas where bedrock occurs at specific depths. Accordingly, the depth to bedrock in a specific location is difficult to determine without sampling. Generally, the bedrock along the Preferred Route is far below the surface and can exceed 400 feet in depth (University of Minnesota, 2018). Bedrock could also be encountered in areas where the pipeline is installed using HDD techniques. The HDD crossing method will not be utilized for this project and therefore bedrock should not be encountered.

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

Mineral Resources

Enbridge determined that 1,500 feet was a reasonable distance for evaluating mineral resources that could potentially be impacted by the Project, based on consideration of the potential for expansion of existing resources. The Preferred Route does not cross any mined or mineral resource areas but there are two sites, possibly associated with non-metallic resources (one gravel pit and one sand pit) that are approximately 1,500 feet from the construction workspace. Table 6.7.1-2 identifies possible mining and mineral resource areas within 1,500 feet of the Preferred Route.

Table 6.7.1-2
Mineral Resources within 1,500 Feet of the Fond du Lac Band Line 4 Project[1]

County	Milepost	Operation	Distance and Direction from ROW	Comments
Carlton	1065.8	Gravel Pit	1,500 ft NE	Located at the corner of Enger Rd. and Ditchbank Rd.
Carlton	1066.0	Sand Pit	1,500 ft W	Located 300 ft. North of Magney Drive

[1] Data collected from MNDNR Aggregate Resources Web Map

The Project will not cross any metallic mineral exploration tracts through the Fond du Lac Band Reservation. Enbridge is not aware of any other county- or state-owned metallic mineral rights crossed by the Project that are actively leased to exploration or production companies. Similarly, the Preferred Route will not cross any bedrock greenstone belt terrain. Greenstone belt terrain is primarily located in northwestern Minnesota and 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.

Enbridge initiated Project discussions with MNDNR regarding early coordination review of the Project. Enbridge expects that this consultation will, among other things, identify any additional crossings of Public Lands and/or Public Waters that will need further encumbrance determinations for metallic, aggregate, and/or peat resources. Enbridge will continue to coordinate with MNDNR on items that arise from the initial Project consultations as well as items that are ongoing as they pertain to the Project.

Paleontology

Based on the thickness of the unconsolidated glacial material in the vicinity of the Project, significant paleontological resources are not likely to be encountered during construction. Enbridge consulted with the Minnesota Geological Survey and confirmed that paleontological finds are not common in the northern half of Minnesota.

6.7.2 Construction Impacts and Mitigation

Bedrock and Surface Geology

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

After the pipe is installed, Enbridge will backfill the trench with native material and return surface contours to pre-construction conditions. In some cases, surface geology can affect how a pipeline is installed. Because the Project will not cross any known bedrock outcrops or shallow bedrock areas, Enbridge does not anticipate any blasting will be required.

After the trench is backfilled, Enbridge will stabilize the Right-of-Way with erosion control measures as necessary (e.g., installation of slope breakers, temporary sediment barriers, and permanent trench breakers, as well as the revegetation and mulching of the construction workspace). Refer to Sections 1.9, 1.17, and 7.0 of the EPP (Appendix B) for additional information on erosion control measures.

6.7.3 Operations Impacts and Mitigation

Bedrock and Surface Geology

Operational impacts to bedrock or surface geology will be limited to temporary impacts associated with maintenance activities that require excavation. If such excavations are required they will be in areas previously impacted by pipeline construction. Moreover, these areas will be restored when the excavations are complete. There is minimal risk of earthquake-related impacts on the pipeline during operations due to the limited potential for large, seismically induced ground movements. As such no additional mitigation beyond designing the pipeline to currently accepted industry specifications is required to operate the pipeline.

6.8 Soils

6.8.1 Existing Environment

General Soil Composition

The Project will cross Land Resource Region (LRR) K: Northern Lake States Forest and Forage Region. Within this region it will cross two Major Land Resource Areas (MLRA) 90A: Wisconsin and Minnesota Thins Loess and Till, Northern part; and 93A: Superior Stony and Rocky Loamy Plains and Hills, Western part. A landscape description of these MLRA and the dominant soil types of the MLRA is included in Table 6.8.1-1. The location of these MLRA relative to the pipeline route is shown on Figure 6.8.1-1.

Table 6.8.1-1
MLRA Crossed by the Fond du Lac Band Line 4 Project

MLRA Name	Landscape Description	Dominant Soil Types
Wisconsin and Minnesota Thin Loess and Till, Northern part (90A)	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.	Alfisols, Entisols, Histosols, and Spodosols
Superior Stony and Rocky Loamy Plains and Hills, Western part (93A)	Dominated by drumlin fields, moraines, small glacial lake plains, outwash plains and bedrock-controlled uplands.	Entisols, Inceptisols, and Histosols

The above-mentioned MLRA generally range from somewhat poorly drained soils with sandy to clayey textures to well or excessively drained soils. (USDA Natural Resources Conservation Service [NRCS], 2006).

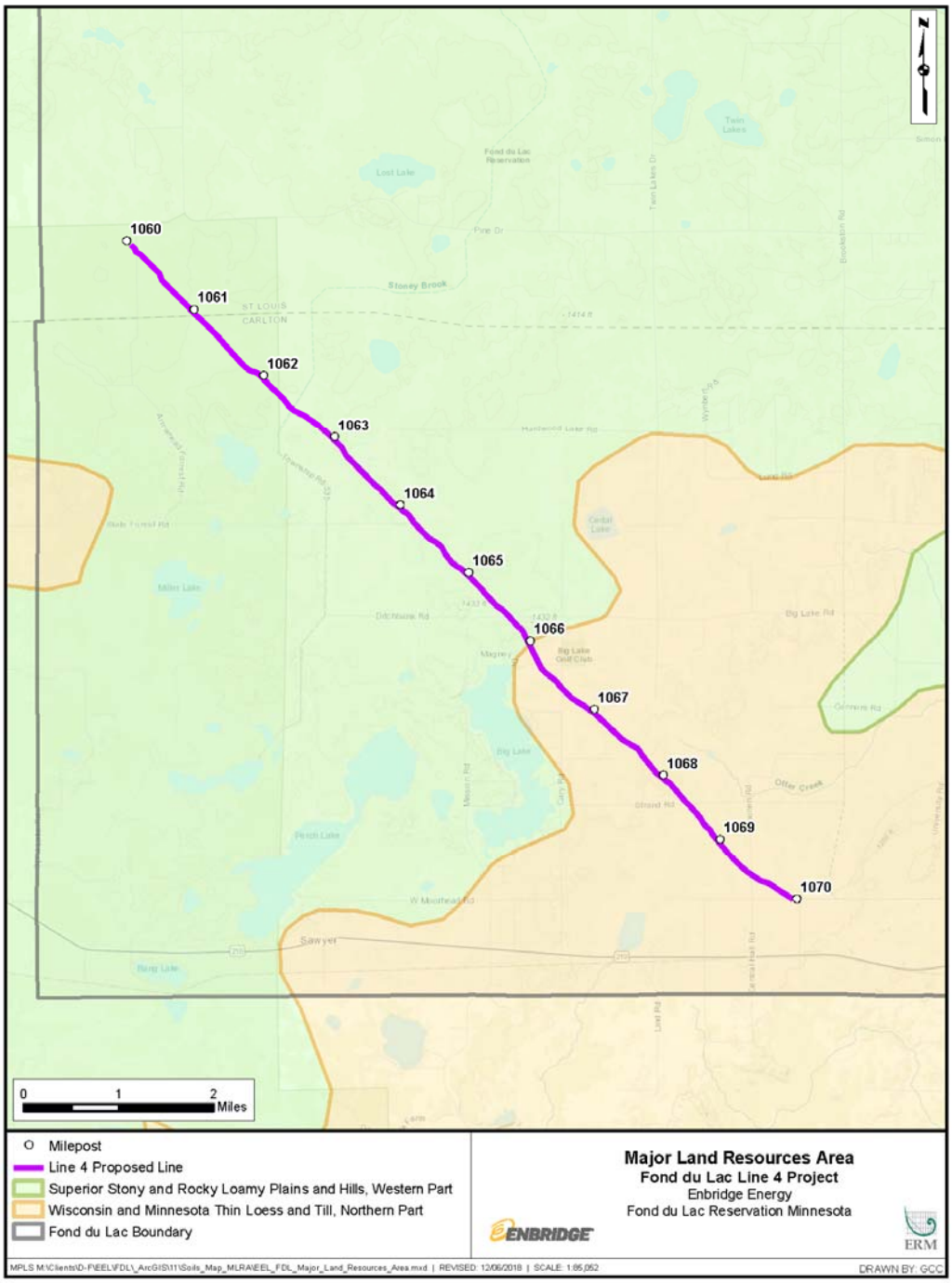

Figure 6.8.1-1 Major Land Resource Areas

Soil Characteristics and Assessments

Enbridge digitized and overlaid the Preferred Route onto SSURGO[3] database data to identify soil mapping units within the Project construction workspace. Based on that analysis, Enbridge identified soil characteristics that could affect or be affected by Project construction. These characteristics include highly erodible soils, prime farmland, hydric soils, compaction-prone soils, presence of stones and shallow bedrock, droughty soils, depth of topsoil, and percent slope.

Table 6.8.1-2 provides a summary of significant soil characteristics identified along the Preferred Route by county according to the SSURGO database. Individual soil characteristics are discussed separately in the following sections.

Table 6.8.1-2
Soil Characteristics within the Fond du Lac Band Line 4 Project

County	Total Acres in County [a]	Prime Farm-land [b]	Farmland of Statewide Importance	Hydric Soils	Compact Prone	Highly Erodible		Droughty	Stony/ Rocky	Shallow Bedrock
						Water	Wind			
	Acres									
St Louis	22.2	0.0	12.1	16.7	9.7	0.0	4.4	0.0	14.1	0.0
Carlton	151.2	4.1	52.0	63.5	5.7	34.6	36.8	54.6	51.6	0.0
Total [c]	**173.4**	**4.1**	**64.1**	**80.2**	**15.4**	**34.6**	**41.2**	**54.6**	**65.7**	**0.0**

[a] Acreage is based on the construction workspace dimensions as discussed in Table 6.1.3-1 and Figures 6.1.3-3 through 6.1.3-5 in Section 6.1.

[b] Includes prime farmland soils and soils considered prime farmland if limiting factors are mitigated. All soils classified as prime farmland are 'prime farmland if drained.

[c] The total of all categories is greater than the total acres of the Project workspace due to the SSURGO dataset having overlapping features, causing some areas to be over-represented.

6.8.2 Construction Impacts and Mitigation

The Preferred Route crosses approximately 64.1 acres (approximately 37 percent) of soils classified as farmland of statewide importance (Table 6.8.1-2). Section 1.10 of the EPP describes mitigation measures that will be implemented during construction to minimize impacts to soils classified as farmland of statewide importance.

The Project also crosses approximately 54.6 acres (approximately 31 percent) of soils classified by USGS as droughty soils (see Table 6.8.1-2). Enbridge will minimize the impacts of construction on droughty, non-cultivated soils by timely reseeding using species tolerant of dry

[3] Soil Survey Geographic (SSURGO) database (USDA NRCS, 2014). The SSURGO database is a digital version of county soil surveys developed by NRCS for use with GIS.

conditions and by applying mulch to conserve soil moisture. Enbridge will work with NRCS and Fond du Lac to review seed mixes proposed in the EPP (Appendix B), and seeding dates adapted to the Project, including droughty soil areas.

To minimize topsoil disturbance and topsoil/subsoil mixing associated with construction, Enbridge will remove and segregate topsoil in hay fields, pasture, residential areas, and other areas as requested by the landowner or as specified in the Project plans, commitments, and/or permits. The maximum depth of topsoil stripping will be 12 inches. If less-than-specified maximum depths of topsoil are present, the topsoil will be segregated 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 workspace. Implementation of proper topsoil segregation will aid in successful post-construction revegetation, and minimize the potential for long-term erosion problems.

The Preferred Route crosses approximately 15.4 acres (approximately 9 percent) of soils that are prone to compaction (see Table 6.8.1-2). Enbridge will minimize compaction and rutting impacts by constructing from timber mats or using low-ground-weight equipment where warranted (e.g., in saturated wetland soils). Enbridge will also take steps to mitigate the effects of compacted soils. In uplands this may include deep tilling and/or plowing soils where compaction has been noted. If subsequent construction and cleanup activities result in further compaction, additional measures will be undertaken to reduce soil compaction. See Section 1.18 of the EPP (Appendix B) for additional information on compaction minimization techniques.

The majority of the Preferred Route is underlain by soils that are not likely to be susceptible to water erosion. Water erosion soils makes up approximately 34.6 acres (approximately 20 percent) of the Preferred Route (see Table 6.8.1-2); these soils are generally found on terrain with slopes that are less than or equal to five percent. In addition, approximately 41.2 acres (approximately 24 percent) of the soils along the Preferred Route are considered susceptible to wind erosion.

Enbridge will implement erosion control measures to minimize erosion both during and after construction activities as necessary. These measures may include construction of silt fences, installation of slope breakers, temporary sediment barriers, permanent trench breakers, revegetation, and mulching of the construction workspace. Erosion and sediment controls will be inspected and maintained as necessary until final stabilization is achieved. Enbridge will also implement dust mitigation measures, including the use of water trucks to moisten the construction Right-of-Way, as needed, to reduce impacts from wind erosion.

During construction, there is a potential for soil contamination if there is an equipment spill and/or leakage of fuel, lubricant, or coolant. Enbridge's implementation of the practices outlined in the EPP (Appendix B) will help avoid or minimize this risk and any other operational impacts on soils.

Associated Facilities

Valves proposed for the Project are located within the construction workspace and will account for approximately 0.055 acre of disturbance.

6.8.3 Operations Impacts and Mitigation

Operations impacts to soils will be limited to sporadic and temporary disturbance during maintenance activities in discrete locations. If excavation is required during maintenance activities, soils will be restored to pre-maintenance conditions as soon as is reasonable following completion of the maintenance work. Right-of-Way clearing and mowing activities performed during maintenance activities have a very low potential to compact soils due to the small size of the equipment and minimal number of passes across a given area. During operations, there is a potential for soil contamination if there is an equipment spill and/or leakage of fuel, lubricant, or coolant. Enbridge's implementation of the practices outlined in the EPP (Appendix B) will help avoid or minimize this risk and any other operational impacts on soils.

Associated Facilities

Valves proposed for the Project are located within the new Right-of-Way and will account for approximately 0.055 acre of disturbance.

6.9 Vegetation

6.9.1 Existing Environment

Cover Types

Section 6.5 (Land Use) provides further details regarding cover types, which also provides estimates of impacts to each cover type to be affect by Project construction and operation. This section further details potential impacts to vegetation associated with these cover types associated with construction and operation of the Project, as well as proposed mitigation measures.

Ecological Classifications

Based on Minnesota's Ecological Classification System (MNDNR, 2018a), the Project is located in the North Shore Highlands Subsection of the Laurentian Mixed Forest Province. The North Shore Highlands Subsection occupies the area adjacent to Lake Superior, and is underlain by soils formed in red and brown glacial till (see Section 6.8 for more information on soils). Pre-settlement vegetation was forest and consisted of white pine, red pine, jack pine, balsam fir, white spruce, and aspen-birch.

Sensitive Plant Communities

Native Plant Communities

Enbridge evaluated the occurrence of sensitive plant communities and wild rice waters along the Preferred Route using publicly available data layers from MNDNR, including Native Plant Communities (NPC), Minnesota Biological Survey (MBS) data, designated Calcareous Fens, and Railroad Right-of-Way Prairies. MBS data included a combination of publicly available Sites of Biodiversity Significance (SOBS) data and draft SOBS data provided directly to Enbridge by MNDNR. Enbridge also used interpretation of aerial photography by professional plant surveyors approved by MNDNR to identify sensitive plant communities. There are no wild rice waters crossed by the Project. Further, the only NPC crossed by the Preferred Route is the Northern Poor Fen (APn91), an acidic peatland system.

Fond du Lac Band Tribal Species of Concern

Enbridge completed surveys to identify tribal species of concern occurring within the Project. Further information regarding the results of the surveys and species identified are contained in Section 6.12.3.

Sites of Biodiversity Significance

Through the MBS program, MNDNR systematically collects, interprets, and delivers baseline data on the distribution and ecology of rare plants, rare animals, native plant communities, and functional landscapes to guide decision making. SOBS rankings are based on MBS data, which

MNDNR reviews before finalizing and making the data public. SOBS crossed by the Project are listed in Table 6.9.1-1.

Table 6.9.1-1
Sites of Biodiversity Significance Crossed by the Fond du Lac Band Line 4 Project

Site Name	SOBS Rank	County
Central Ditchbank Woods	Moderate[a]	Carlton
East of Bog Lake	Moderate[a]	St. Louis
Hasty Brook Wetlands	High[b]	St. Louis
Hasty Brook Wetlands	High[b]	Carlton
Rice Portage Wetlands	Moderate[a]	Carlton
West of Big Lake	Moderate[a]	Carlton
Wild Rice Lake Peatlands[c]	Moderate[a]	Carlton

[a] MNDNR defines Moderate as: Sites contain occurrences of rare species moderately disturbed native plant communities, and/or landscapes that have strong potential for recovery of native plant communities and characteristic ecological processes.

[b] MNDNR defines moderate High as: Sites contain very good quality occurrences of the rarest species, high-quality examples of rare native plant communities, and/or important functional landscapes.

[c] The Wild Rice Lake Peatlands is associated with Wild Rice Lake, located approximately 1.1 mile south of the Project. The Project will not cross any wild rice waters.

Due to the co-location of the Project with the Line 3 Replacement Project, the information gathered for NPC, SOBS, and other data on the Line 3 Replacement Project were used to identify sites for rare plant field surveys for the Fond du Lac Band Line 4 Project. These surveys included SOBS with a ranking of moderate or high crossed by the Preferred Route survey corridor. These areas were surveyed for rare and sensitive plant species. For results of the 2018 surveys, see Section 6.12 – Threatened, Endangered, and Sensitive Species.

Enbridge has not identified any sensitive forest resources within the Project area.

6.9.2 Construction Impacts and Mitigation

Herbaceous Areas

The clearing of herbaceous vegetation during construction will result in short-term vegetation impacts. Enbridge will seed disturbed areas following installation of the pipeline. This active revegetation measure and the anticipated rapid colonization of disturbed areas by annual and perennial herbaceous species will restore most of the herbaceous vegetative cover within the first growing season after construction.

Enbridge will revegetate disturbed areas in accordance with Section 7.0 of the EPP (Appendix B) unless otherwise directed by landowners, Fond du Lac Band, or land managing agencies. To the extent it is practicable to vegetate immediately after pipe placement, Enbridge will do so.

However, this may not be feasible if Enbridge constructs in winter conditions, or if the Right-of-Way is too wet to replace topsoil. Per Section 7.15 of the EPP (Appendix B), Enbridge will delay seeding during frozen ground conditions until the applicable spring seeding period or will complete dormant seeding where conditions allow (i.e., no snow cover). Timely restoration of the construction workspace and reseeding with an appropriate seed mix will minimize the duration of disturbance to herbaceous areas. Impacts on vegetation adjacent to the construction workspace will be minimized through adherence to soil erosion control specifications and by confining clearing activities to the approved Right-of-Way and extra workspaces.

Forested Areas

The clearing of woody shrubs and trees will be the primary long-term impact of the Project on vegetation. Woody shrubs and trees will be allowed to recolonize within the temporary construction workspace. However, recolonization of disturbed areas by woody shrubs and trees will be slower than recolonization by herbaceous species. As natural succession proceeds in these areas, it is anticipated that forested communities will eventually reestablish after a number of years.

Clearing could also affect undisturbed forest vegetation growing along the edges of the cleared areas. To prevent damage to adjacent trees, Enbridge will fell trees toward the cleared Right-of-Way. However, the creation of a new edge will expose some edge trees to elevated levels of sunlight and wind, which could increase evaporation rates and the probability of tree blowdowns. Where increased light levels penetrate the previously shaded interior, shade-intolerant species may be able to grow, and the species composition of the newly created forest edge may change. Clearing may 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 cleared Right-of-Way.

Noxious Weeds and Invasive Plant Species

Noxious weeds are defined in Minnesota Statutes as annual, biennial, or perennial plants injurious to public health, the environment, public roads, crops, livestock, or other property. The MNDNR maintains a list of state and federally-listed noxious weeds (MNDNR, 2018b). In addition, the Fond du Lac Band has developed a list of invasive species of concern within the Fond du Lac Band Reservation. Enbridge would address noxious and invasive species in accordance with the EPP (specifically Section 1.6 and Appendix B) and the Band's Invasive Species Management Plan. Further, Enbridge is working directly with the Fond du Lac Band regarding additional control and management of noxious and invasive plant species.

To minimize the introduction and increase of noxious and invasive plants, Enbridge will implement Best Management Practices (BMPs) including minimizing the time between final grading and permanent seeding, cleaning construction equipment, and preparing a seeding supplement to prevent the spread of noxious weeds and invasive plants. Section 1.6 of

Enbridge's EPP (Appendix B) describes these measures in more detail. This section of the EPP also explains topsoil segregation and conservation practices, which play a role in preventing the spread of noxious weeds and invasive plants. Finally, Enbridge has conducted surveys for terrestrial noxious weeds and invasive plant species in advance of construction activities. This survey information will provide background information to assist in implementing mitigation measures during construction.

Sensitive Plant Communities

Although no state-listed plant species occurrences are known within the Project based on Enbridge's consultations with the MNDNR for the Line 3 Replacement Project (Natural Heritage Information System search), the Project does cross through an area designated as Northern Poor Fen. Enbridge has completed surveys for rare and sensitive plants along the Preferred Route through this area. No rare or sensitive plant species were documented within the Project workspace located within the Northern Poor Fen.

6.9.3 Operations Impacts and Mitigation

Revegetation will take place following restoration, and seed mixes will be selected in accordance with Section 7.1 of Enbridge's EPP (Appendix B) and through consultation with the Fond du Lac Band, landowners, or land managing agencies. Use of compatible species and high-quality revegetation methods will help disturbed ground to blend in with the surrounding landscape.

Enbridge will maintain the new Line 4 Right-of-Way in a herbaceous state by removing woody shrubs and trimming branches overhanging the Right-of-Way approximately every five years. Vegetation that grows so that it obscures the visibility of the Right-of-Way for federally required surface condition inspections will be mechanically removed. These practices will result in the new Right-of-Way maintenance of approximately 10.6 acres of impacted forest land authorized as part of the Line 3 Replacement Project. The remaining areas of forest land temporarily impacted by construction of the Project will be seeded and then allowed to regrow naturally, which over time will reestablish the forest habitat.

Herbicides may be used during operations in limited situations, such as to control weedy species. If used, herbicides will be applied by properly licensed individuals and coordinated with the necessary regulators and landowners.

6.10 Wildlife

6.10.1 Existing Environment

Species and Habitats

The Project will be constructed through several ecosystem types, including deciduous forest, coniferous forest, wetland, and shrub land. Much of the Project will be developed within an existing Right-of-Way that consists of open grasslands and emergent wetlands. Wildlife habitats within these ecosystems are diverse. Existing wildlife resources along the Preferred Route are described below.

Agricultural Areas

No areas within the Project footprint are currently used for agricultural purposes such as hayfields, pastures, and row crop production.

Open Lands

Open lands affected by the Project consist primarily of grasslands with some scrub-shrub areas. 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 varied prey. Other common wildlife species that may use open areas include ground squirrels, eastern cottontail rabbits, white-tailed jackrabbits, white-tailed deer, striped skunks, raccoons, weasels, and Virginia opossum. Common invertebrates that may occupy open areas include bees, grasshoppers, and butterflies.

Forested Areas

Forested areas are present along the edge of the existing Enbridge Mainline Corridor for the entire length 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.

Wetland and Riparian Areas

Wetlands affected by the Project consist primarily of woody wetlands, emergent herbaceous 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 and riparian areas provide additional habitat for terrestrial wildlife, such as white-tailed deer, moose, gray wolves, black bears, and a variety of small mammals and songbirds.

Sensitive Wildlife Areas

The Project crosses aquatic and terrestrial habitat cores and corridors within Minnesota's Wildlife Action Network, which was formulated and detailed in Minnesota's Wildlife Action Plan 2015-2025 (MNDNR, 2016). Enbridge plans to consult with MNDNR regarding minimization of impacts to aquatic and terrestrial habitat areas within Minnesota's Wildlife Action Network.

The Project does not cross any Minnesota Audubon-designated Important Bird Areas or any state-designated WMAs.

6.10.2 Construction Impacts and Mitigation

As described in Section 6.9, construction will involve the temporary removal of vegetative cover within the construction workspace. The clearing activities will cause temporary displacement of wildlife species along the Preferred Route. The construction workspace will remain relatively clear of vegetation until the Project is completed. Some smaller and 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 Right-of-Way during construction. Displaced individuals may temporarily occupy adjacent, undisturbed areas, possibly causing increased competition with other individuals in those areas. It is expected that individual wildlife will 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.

As noted in Section 5.0, the Preferred Route would enable partial sharing and/or paralleling of the existing Line 3 Replacement Project Right-of-Way along the Enbridge Mainline System, as well as the co-construction with the Line 3 Replacement Project. This would minimize the time of disturbance on the Fond du Lac Band Reservation and the amount of new temporary workspace that would need to be obtained for the Project. The majority of the temporary workspace along the Preferred Route will be shared and cleared by the permitted Line 3 Replacement Project. Therefore, environmental impacts will be reduced for this Project along the Preferred Route.

Species and Habitats

Open Lands

The clearing of herbaceous and shrub communities in upland areas of the construction workspace will have a short-term impact on open habitat, but the effect will be minimized by the reestablishment of the plant species that comprise these communities. Open lands that are disturbed by construction will be seeded following the completion of pipeline construction, and it is expected that pre-existing herbaceous and shrub habitats will quickly recolonize the affected areas. It is also expected that the wildlife species that use these habitats will also return relatively soon after construction. Enbridge will employ BMPs to avoid and/or limit the

introduction or spread of noxious weeds and invasive plant species, which can degrade habitat quality (see Section 1.6 of the EPP in Appendix B and also Section 6.9).

Forested Areas

Clearing of trees in the construction workspace will have similar impacts as the clearing of other vegetation in terms of the potential for direct mortality and temporary displacement of wildlife species. Tree clearing will have longer-term impacts than the temporary removal of herbaceous and shrub species because recolonization of trees will be slower than the recolonization of other vegetation. As natural succession is allowed to proceed in these areas, it is expected that forested communities will eventually reestablish. As described in Section 6.9, however, recolonization may have some long-term effects on forested areas along the edge of the Preferred Route by triggering changes in nearby forest structure and species composition. The ability of wildlife to reoccupy the forested areas will depend on the characteristics of the reestablished forests and the specific habitat requirements of wildlife species. The overall impacts will be minimized by co-location of the Project with the existing Enbridge Mainline System.

Wetland and Riparian Areas

Construction-related wetland and waterbody impacts are discussed in Sections 6.14 and 6.15. As described above for wildlife that occupy other habitats, smaller and less mobile animals may experience direct mortality during construction activities in wetland areas, and larger and more mobile animals will disperse from the Project Right-of-Way during construction.

Similar to upland areas, clearing of herbaceous and shrub communities in wetland areas of the construction workspace will cause a short-term impact to wildlife until vegetation is reestablished. Enbridge will employ BMPs as necessary to limit the introduction or spread of noxious weeds and invasive plant species, which can degrade habitat quality.

Enbridge will minimize impacts on riparian habitats by employing BMPs as described in Section 2.5 of its EPP (Appendix B), such as maintaining vegetative buffers on each stream bank during wet trench, dam and pump, and flume stream crossing methods. The clearing of forested and brushy areas for ATWS will also be avoided as much as possible. Typically, woody vegetation in wetlands and riparian areas will not be cleared for the purpose of ATWS unless approved by appropriate regulatory agencies as stipulated in permits issued for the Project. By maintaining vegetative buffers along stream corridors, Enbridge will help reduce exposure of prey species to predators and provide shade that maintains cooler stream temperatures during construction.

6.10.3 Operations Impacts and Mitigation

Species and Habitats

Open Lands

The open lands that are affected by construction will be permanently revegetated with herbaceous species. During restoration, disturbed soils will be seeded with species determined through consultation with agencies and landowners. This active seeding program and Enbridge's implementation of other BMPs will accelerate the reestablishment of herbaceous habitat and minimize the potential for the introduction or spread of noxious weeds and invasive plant species. Taken together, these measures are expected to minimize impacts on wildlife species in herbaceous and shrub habitats during Project operations. Maintenance activities such as mowing in the new Right-of-Way and activities that require excavation may cause intermittent, temporary impacts on wildlife such as direct mortality or displacement, but these activities and potential effects will be infrequent, and in the case of mowing essential to maintain the open habitat on the Right-of-Way.

Forested Areas

After the pipeline is constructed, the new Right-of-Way for Line 4 will be maintained free of larger-diameter trees, which will result in the permanent conversion of approximately 10.6 acres of forested land associated with the construction workspace. The remaining areas of forest land temporary impacted by construction of the Project will be seeded and then allowed to regrow naturally, with the exception of the portion of the construction workspace that overlaps with the Line 3 Replacement Project maintained Right-of-Way. Over time, these areas will reestablish the forest habitat.

The Right-of-Way maintenance of approximately 10.6 acres of impacted forest land within the new Right-of-Way will result in permanent impacts on forest wildlife, as this area will be converted to non-forested habitat for the life of the Project. The nature of the impacts will depend on the characteristics of the forest land that is cleared; for example, any trees cleared within the existing, operationally maintained Enbridge Mainline System represent low-quality forest habitat because of previous clearing activities. The nature of the impacts will also depend on species-specific habitat requirements.

Enbridge's utilization and overlap with existing Rights-of-Way would reduce the total amount of forest clearing required and limit the disturbance to the edge of existing forestlands, leaving larger adjacent forest patches intact.

Wetland and Riparian Areas

Operation-related wetland and waterbody impacts are discussed in Sections 6.14 and 6.15. Because of wetland revegetation practices and measures taken to minimize impacts on riparian habitats as described above, Project operations are not expected to impact wildlife that occupy wetland and riparian areas. The Right-of-Way maintenance of approximately 13.7 acres of

impacted forest and scrub-shrub wetlands within the new Right-of-Way will result in permanent conversion of forest and scrub-shrub wetlands to non-forested emergent wetlands for the life of the Project. In addition, one of the valves will result in a conversion of 0.03 acre of scrub-shrub wetland to upland area.

Mitigation measures are outlined in Section 6.14 for the permanent conversions of forest and scrub-shrub wetlands. By maintaining vegetative buffers along stream corridors, Enbridge will help reduce exposure of prey species to predators and provide shade that maintains cooler stream temperatures during operations and maintenance activities.

6.11 Fisheries

6.11.1 Existing Environment

Species and Habitats

Representative Fish Species

As described in Section 6.15, the Project will cross three waterbodies, including one stream and two tributaries (see Table 6.15.1-2 in Section 6.15, Waterbodies). One of the three waterbodies is designated as a public water by MNDNR. The Preferred Route will not cross any Aquatic Management Area (AMA) or designated trout streams. Game fish species possibly found in waterbodies in the vicinity of the Project are listed in Table 6.11.1-1 (MNDNR, 2018d). The majority of fish in the streams crossed by the Preferred Route will be warm-water game fish, although some cold-water species, including trout, may be present in Stoney Brook, depending on the season.

Table 6.11.1-1
Game Fish Species in the Fond du Lac Band Line 4 Project Area

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

Sensitive Fisheries Areas

Designated Trout Streams

Stoney Brook is designated as a trout stream by the Fond du Lac Band.

6.11.2 Construction Impacts and Mitigation

Temporary Disturbances and Sediment Loads

As described in Section 6.15, Enbridge's intention is to execute the primary crossing method (dry crossing method) for each of the three waterbodies including the dam-and-pump and/or flume method. Both of these methods involve the installation of temporary dams upstream and downstream of the crossing area and the use of either an active (pump(s)) or passive (flume(s)) mechanism to isolate the waterbody flow and convey it across the work area without impeding normal downstream flows. If at the time of construction, the contractor, in coordination with

Fond du Lac Band and Enbridge, determines that the primary crossing method is not attainable due to site conditions, the secondary crossing method (wet crossing method) will be utilized.

The disturbances associated with installation of the pipeline, and in the case of dry crossings the dams, pumps, or flumes, across or in streams may temporarily impact movement of fish upstream and downstream of crossing sites, but this effect would be limited and of short duration. 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 from the construction workspace during trenching. Noise disturbances upstream and downstream of the sites will temporarily deter fish that may otherwise inhabit the area.

Sediment loads may temporarily increase downstream during open-cut wet stream crossings. These increased loads may temporarily affect the more sensitive fish eggs, fish fry, and invertebrates inhabiting the downstream area. To minimize impacts, Enbridge will complete the crossings as quickly as possible so that suspended sediment levels return to pre-construction levels in a short amount of time after the in-stream work is completed. Enbridge will also implement erosion and sediment control measures at each waterbody as necessary. Section 1.9 of the EPP (Appendix B) includes discussion of temporary erosion controls, including temporary stabilization, erosion control blankets, mulch, cat tracking, and temporary slope breakers. Additionally, Enbridge will comply with in-water work exclusion dates as necessary per MNDNR guidance.

Sensitive Fisheries Areas

Stoney Brook provides some fishing opportunities and is designated as a trout stream by the Fond du Lac Band. Enbridge will implement its EPP, which includes stream crossing mitigation measures that will minimize in-water impacts during construction. Refer to Section 6.15 and Enbridge's EPP (Appendix B) for more detailed information on waterbody crossing construction methods.

Riparian Habitats

As described in Section 6.10, Enbridge's BMPs minimize impacts on riparian habitats. These practices include minimizing clearing of forested and brush habitat along river and creek corridors, which helps provide shade that maintains cooler stream temperatures. In addition, pending landowner and environmental agency approval, Enbridge will likely replant suitable woody species in the affected riparian areas that are characteristic of the ecological zone of the waterbody crossings, and that, over time, may achieve heights of up to 15 feet.

6.11.3 Operations Impacts and Mitigation

During operations, Enbridge will maintain the new Right-of-Way by removing woody shrubs and trimming branches overhanging the Right-of-Way approximately every five years. Additional temporary impacts to woody shrubs and branches overhanging the Right-of-Way may result from maintenance activities. The changes in the light and possibly temperature characteristics at some stream crossings caused by this removal of vegetation could affect the behavioral patterns of fish, including spawning and feeding activities. However, due to the limited width of the maintained stream banks, associated effects would be highly localized and is not expected to impact the overall temperature or light conditions of the streams crossed by this Project.

6.12 Threatened, Endangered, and Sensitive Species

In December 2018, Enbridge initiated consultations with the U.S. Fish & Wildlife Service (USFWS) and MNDNR for the Fond du Lac Band Line 4 Project. In addition, due to the co-location of the Project with the Line 3 Replacement Project, the information gathered for the Line 3 Replacement Project was also used to assess potential impacts of the Fond du Lac Band Line 4 Project. Enbridge will continue to coordinate with these agencies and the Fond du Lac Band on protected species issues as warranted for the Project.

The sections below provide information for sensitive species that could occur within one mile of the Project ("the Project area") and include relevant regulations, geographic ranges, biological and habitat characteristics, primary threats, agency consultation status, and survey findings. The following groups of listed species are discussed in this section: Federally listed species, State listed species, Fond du Lac Band Tribal species of concern, and bald and golden eagles.

6.12.1 Federally Listed Species

Enbridge identified federally listed species under the federal Endangered Species Act (ESA) that could occur within the Project area by using the USFWS Information for Planning and Consultation online tool, which produces a list of species based on the Project footprint. An official list was requested through the tool and provided by the Minnesota-Wisconsin Ecological Services Field Office (USFWS, 2018a). One endangered species and three threatened species have the potential to occur in the Project area (Table 6.12.1-1). No critical habitat is located within the Project area. Further information on the species listed in Table 6.12.1-1 is provided in the sections below.

Table 6.12.1-1
Federally Listed Species that Potentially Occur within the Fond du Lac Band Line 4 Project Area

Species Name	Federal Status	State Status	Habitat
Canada Lynx (*Lynx canadensis*)	Threatened	Special Concern	Northern forest
Gray Wolf (*Canis lupus*) – Western Great Lakes Distinct Population Segment	Threatened	None	Northern forests and areas with a matrix of forest and agriculture
Northern Long-eared Bat (*Myotis septentrionalis*)	Threatened with 4(d) Rule	Special Concern	Caves and mines during hibernation; forested areas during active season
Piping Plover (*Charadrius melodus*)	Endangered	Endangered	Sandy beaches with areas of gravel and little to no vegetation

6.12.1.1 Canada Lynx

Existing Environment

The Canada lynx (*Lynx canadensis*) is a federally threatened species and a species of special concern in Minnesota.

Construction Impacts and Mitigation

Construction activities may affect Canada lynx by potentially diverting individuals from the workspace area due to noise or presence of humans and equipment involved in construction activities. Due to the extensive range of the Canada lynx and extensive habitat near the Preferred Route, disturbance is expected to be temporary and localized. Construction activities may also impact Canada lynx habitat, which in turn may affect foraging and sheltering behaviors of individual lynx. Due to the abundance of habitat near the Preferred Route, these potential impacts are expected to be localized.

Enbridge will minimize potential impacts on Canada lynx individuals and habitat through general Project-based conservation and mitigation measures. For example, Enbridge has minimized impacts on the species due to habitat loss and fragmentation by co-location of the Project with the existing Enbridge Mainline System. In addition to these general Project-based conservation and mitigation measures, Enbridge will implement the following species-specific conservation measures, as appropriate:

- Contractors and inspectors will be trained to identify and immediately report sightings of Canada lynx to USFWS.
- If a Canada lynx is sighted by Enbridge's contractor or Environmental Inspector within the construction workspace, Enbridge will cease construction activities until the individual(s) have left the area.

Operations Impacts and Mitigation

During operations, Enbridge will maintain the new Right-of-Way by removing woody shrubs and trimming branches overhanging the Right-of-Way approximately every five years. Other maintenance activities may occur as necessary. Noise and presence of humans and equipment during operations activities may divert Canada lynx from the Right-of-Way; however, any impacts will be temporary and localized. Enbridge will not remove any additional lynx habitat during operations beyond the minimal amount of new Right-of-Way that will be maintained in free of woody vegetation. Thus, no impacts on Canada lynx or their habitat are anticipated during Project operations.

6.12.1.2 Gray Wolf

Existing Environment

The Western Great Lakes Distinct Population Segment of the gray wolf (*Canus lupus*) is federally threatened; the gray wolf has no state-level special status in Minnesota. The threatened status for the gray wolf in the Western Great Lakes Distinct Population Segment was reinstated under the ESA on December 19, 2014 (USFWS, 2018b).

Construction Impacts and Mitigation

Construction activities may affect the gray wolf by potentially diverting individuals from the workspace area due to noise or presence of humans and equipment involved in construction activities. Due to the range of the gray wolf and extensive habitat near the Preferred Route, disturbance is expected to be temporary and localized. Additionally, due to the co-location of the Project with an existing Right-of-Way, temporary and permanent impacts to forested habitat that may be used by gray wolves will be minimized.

Enbridge will minimize potential impacts on gray wolves through general Project-based conservation and mitigation measures. In addition to these general Project-based conservation and mitigation measures, Enbridge will implement the following species-specific conservation measures, as appropriate:

- Contractors and inspectors will be trained to identify and immediately report sightings of gray wolves to USFWS.
- If a gray wolf is sighted by Enbridge's contractor or Environmental Inspector within the construction workspace, Enbridge will cease construction activities until the individual(s) have left the area and coordinate with the Fond du Lac Band Reservation Business Committee.

Operations Impacts and Mitigation

During operations, Enbridge will maintain the new Right-of-Way by removing woody shrubs and trimming branches overhanging the Right-of-Way approximately every five years. Other maintenance activities may occur as necessary. Noise emissions and presence of humans and equipment during operations activities may divert gray wolves from the Right-of-Way; however, any impacts will be temporary and localized. Enbridge will not remove any additional gray wolf habitat during operations. Thus, no impacts on gray wolf or their habitat are anticipated during Project operations.

The Fond du Lac Band has an ongoing wolf monitoring program on the Reservation, and Enbridge is working with Band to understand specifics for the program to ensure that the Project doesn't conflict with the plan's objectives, both during construction and operation.

6.12.1.3 Northern Long-eared Bat

Existing Environment

The northern long-eared bat (NLEB; *Myotis septentrionalis*) is listed as a state species of special concern in Minnesota. The NLEB was listed as threatened under the ESA on May 4, 2015, and the USFWS issued a 4(d) rule that became effective on February 16, 2016 (81 Federal Register 1900-1922).

Suitable NLEB habitat includes forest stands in riparian areas, forested ponds, and woodlots made up of potential roosts (i.e., snags and/or live trees ≥3 inches diameter at breast height with exfoliating bark, cracks, crevices, and/or cavities). Wooded corridors and other linear features (such as fencerows) and non-forested habitats (including emergent wetlands and adjacent edges of agricultural fields and pastures) are also used by NLEBs for foraging and hunting (USFWS, 2014). Enbridge will identify NLEB maternity roost trees prior to construction and will implement mitigation measures as needed in accordance with the NLEB 4(d) rule (USFWS, 2018c).

Construction Impacts and Mitigation

Potential impacts to NLEB may occur if clearing of forested habitat for construction workspace takes place at locations where individuals are breeding, foraging, or raising pups. Bats may be injured or killed if occupied trees are cleared during this active window. NLEB may be disturbed during clearing or construction activities due to noise or human presence.

Enbridge will minimize potential impacts on NLEB and habitat through general Project-based conservation and mitigation measures. For example, Enbridge has minimized impacts on the species due to habitat fragmentation by co-location of the Project with the existing Enbridge Mainline System. If maternity roost trees are identified, Enbridge will implement the following mitigation measures:

- Clearing of known maternity roost trees and trees within 150 feet of known maternity roost trees will not occur between June 1 and July 31; and
- No trees will be removed within 0.25 mile of a known hibernacula at any time of the year, and Project activities will not be conducted within known hibernacula (although it is acknowledged that no NLEB hibernacula currently exist within the Reservation).

Operations Impacts and Mitigation

During operations, Enbridge will maintain the new Right-of-Way by removing woody shrubs and trimming branches overhanging the Right-of-Way approximately every five years. Enbridge will not remove any additional NLEB habitat during operations. Furthermore, routine clearing will prevent woody vegetation from growing, thus preventing NLEB occupation within the maintained Right-of-Way. By preventing NLEB from occupying the Right-of-Way, the species will not be affected by operation or maintenance activities.

6.12.1.4 Piping Plover

Existing Environment

Minnesota is home to piping plovers from both the Northern Great Plains and Great Lakes populations, and the species was listed as a state endangered species in 1984 (MNDNR, 2018e). The Project is located within the area of the Great Lakes population, and the rest of this section will focus on that population of the piping plover.

Construction and Operations Impacts and Mitigation

No potentially suitable habitat for the piping plover exists within the Project footprint or the immediate surrounding area, and the species is not expected to occur within the Project area. Therefore, it is anticipated there will be no impact to the piping plover or its habitat as a result of construction or operation of the Project.

6.12.2 State Listed Species

Enbridge requested a review of the Minnesota Natural Heritage Information System (NHIS) data by the MNDNR in December 2018 and is awaiting a response to this request. Enbridge reviewed the NHIS database search results associated with the Line 3 Replacement Project from March 2015 requested by Merjent. Table 6.12.2-1 lists NHIS Element Occurrences (EO) of state-listed sensitive species within one mile on either side of the Preferred Route, including access roads and temporary workspace. Enbridge will update this information as needed based upon the results of the most recent NHIS for the Project area. Table 6.12.2-1 also lists state listed species observed during vegetation studies conducted by Enbridge in 2018 within the Fond du Lac Band Reservation.

Minnesota's Endangered Species Statute and the associated Rules impose a variety of restrictions, a permit program, and several exemptions pertaining to species designated as endangered or threatened. Species of special concern are not protected by Minnesota's Endangered Species Statute or the associated Rules. Additional information on the species in Table 6.12.2-1 is provided in the sections below.

Table 6.12.2-1
State Listed Element Occurrences in Minnesota's Natural Heritage Information System within One Mile of the Preferred Route Work Space

Species	State Status [a]	Habitat
BOTANICAL RECORDS		
Least Moonwort [b] (*Botrychium simplex*)	Special Concern	Prairies, wetlands, and interior forests
Narrow Triangle Moonwort [c] (*Botrychium lanceolatum*)	Threatened [d]	Moist, shady, mature northern hardwood forests
Pale Sedge [c] (*Carex pallescens*)	Endangered	Low, moist, grassy, and rocky habitats at the edge of fire-dependent forests where there is partial sunlight
Slender Naiad [b] (*Najas gracillima*)	Special Concern	Ponds and lakes with good water quality
Torrey's Mannagrass [c] (*Torreyochloa pallida*)	Special Concern	Wetland habitats including streams, lakes, vernal ponds, and beaver ponds
ZOOLOGICAL RECORDS		
Northern Goshawk [b] (*Accipiter gentilis*)	Special Concern	Forests

[a] The state status of all species reflects updates published by the Minnesota Department of Natural Resources on August 19, 2013 (MNDNR, 2013c)
[b] State Listed Element Occurrences in Minnesota's Natural Heritage Information System within One Mile of the Preferred Route Workspace (MNDNR, 2015)
[c] Species observed during Enbridge's 2018 vegetation surveys (Enbridge, 2018).
[d] *Botrychium lanceolatum* ssp. *angustisegmentum* is the subspecies listed in the state of MN.

6.12.2.1 Least Moonwort

Existing Environment

There are three varieties of the least moonwort (*Botrychium simplex*) in Minnesota. The species as a whole was listed as a state species of concern in 1996. No known conservation efforts have been directed towards this species in Minnesota. *B. simplex* var. *simplex* is the most common and widespread of the three and appears to be adapted to a wide variety of habitats – primarily in open sites, including prairies, wetlands, and abandoned mine sites – and occurs at various locations across the northern half of the state. *B. simplex* var. *tenebrosum* is the least common and also appears to be the most habitat-specific of the three, occurring over a much smaller range in the north central part of the state, preferring forest interiors, especially low and moist spots in mesic hardwood forests. The third variety, *B. simplex* var. *compositum*, is poorly known in Minnesota but appears to occur in the northwestern prairie counties (MNDNR, 2018f).

6.12.2.2 Narrow Triangle Moonwort

Existing Environment

The narrow triangle moonwort (*Botrychium lanceolatum* var. *angustisegmentum*) was listed as a threatened species in Minnesota in 1996. The species occurs from Minnesota, south and east to Tennessee and North Carolina, and north to Quebec, Canada. In Minnesota, the narrow triangle moonwort prefers moist, shady, mature northern hardwood forests, particularly in low areas, with a rather open understory and sparse ground cover. The species appears to be very sensitive to habitat disturbance, with threats including loss of the humus layer caused by non-native earthworms, damage caused by timber harvesting and road building, and land use changes that affect drainage (MNDNR, 2018g).

6.12.2.3 Pale Sedge

Existing Environment

The pale sedge (*Carex pallescens*) has been listed as endangered in Minnesota since 1996. It is primarily an eastern species with rare or infrequent occurrences in the Great Lakes region. The only place where pale sedge has been found in Minnesota is near the shore of Lake Superior, where only a few sites are currently known to support the plant. Minnesota populations occur on the margin of fire-dependent forests of pine (*Pinus* spp.), spruce (*Picea* spp.), aspen (*Populus* spp.), and birch (*Betula* spp.), adjacent to the lake shore. The species prefers low, moist, grassy, or rocky habitats at the edge of the forest where it receives partial sunlight, but may also occur in roadside ditches.

6.12.2.4 Slender Naiad

Existing Environment

Slender naiad (also known as the slender waternymph; *Najas gracillima*) was listed as a state species of special concern in 1996. It is a delicate plant and not usually found where exposure to significant wave action may occur. The plant is most often found rooted in sand or silt and in relatively shallow water, often less than 1 meter (3.3 feet) deep. Declining water quality appears to be the biggest threat to the species (MNDNR, 2018g).

6.12.2.5 Torrey's Mannagrass

Existing Environment

Torrey's Mannagrass (*Torreyochloa pallida*) was listed as a special concern species in Minnesota in 1996. Two varieties occur in Minnesota. *T. pallida* var. *fernaldii* is found across portions of Canada and south through the upper Great Lakes states to greater New England. *T. pallida* var. *pallida* occurs primarily in the northeastern U.S. and Canada, occurring west to Manitoba and Minnesota and south to Missouri and Georgia. The species is known to occur in swamps, marshes, bogs, margins of lakes and streams, wet hollows in woods, alder thickets, and cattail marshes, often in shallow water. As of 2008, Torrey's Mannagrass had been reported in over 100 locations. The majority of these occurrences are from the Arrowhead region of Cook, Lake, and St. Louis counties, although the species is also known to occur in Itasca, Otter Tail, and Carlton counties.

6.12.2.6 Impacts to State Listed Plant Species

Construction Impacts and Mitigation

Enbridge has been working throughout Project design to avoid construction in areas where state threatened or endangered plant species are known to occur. If state threatened or endangered plants are unavoidable, Enbridge will apply for an incidental take permit.

Operations Impacts and Mitigation

Enbridge does not anticipate any effects of Project operations on state-protected flora.

6.12.2.7 Northern Goshawk

Existing Environment

The northern goshawk (*Accipiter gentilis*) is a state species of special concern. The goshawk can be found across North America and occurs year round in northern Minnesota. The species is a large forest-dwelling hawk generally associated with mature deciduous, coniferous, or mixed forests. Nests are typically found in mature to old-growth forests consisting primarily of large trees with high canopy closure (60-90 percent). The northern goshawk breeds in northeastern and north central Minnesota, and is an irruptive migrant and winter visitor throughout the state.

Construction Impacts and Mitigation

Potential impacts to northern goshawk may occur if clearing of forested habitat for construction workspace takes place at locations where individuals are breeding or foraging. The species may be disturbed during clearing or construction activities due to noise or human presence. Due to the abundance of habitat near the Preferred Route, these potential impacts are expected to be localized. Enbridge will minimize potential impacts to the northern goshawk and habitat through general Project-based conservation and mitigation measures. For example,

Enbridge has minimized impacts on the species due to habitat fragmentation by co-location of the Project with the existing Enbridge Mainline System.

Operations Impacts and Mitigation

During operations, Enbridge will maintain the new Right-of-Way by removing woody shrubs and trimming branches overhanging the Right-of-Way approximately every five years. Enbridge will not remove any additional goshawk habitat during operations. Routine clearing will prevent woody vegetation from growing, thus preventing northern goshawk from nesting within the maintained Right-of-Way. It is possible the goshawk could nest near or immediately outside the new Right-of-Way, and the species may use the Right-of-Way for foraging. During Right-of-Way maintenance activities, the species may avoid the area due to noise or human presence but would likely utilize surrounding areas and habitats. Therefore, no impacts to northern goshawk are anticipated to result from operations activities.

6.12.3 Fond du Lac Band Tribal Species of Concern

Field surveys completed in 2018 have identified the following Fond du Lac Band Tribal species of concern occurring within the Project Right-of-Way: black ash (*Fraxinus nigra*), lowbush blueberry (*Vaccinium angustifolium*), sugar maple (*Acer saccharum*), white birch (*Betula papyrifera*), white cedar (*Thuja occidentalis*), and wild rice (*Zizania palustris*). Enbridge is currently working with the Fond du Lac Band regarding specific mitigation.

6.12.4 Bald and Golden Eagles

Existing Environment

Bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are not listed under the ESA or in Minnesota. However, the Bald and Golden Eagle Protection Act (BGEPA) protects and conserves bald and golden eagles from intentional take of an individual bird, chick, egg, or nest, including alternate and inactive nests (USFWS, 2007). BGEPA prohibits disturbance that may lead to biologically significant impacts, such as interference with feeding, sheltering, roosting, and breeding, including abandonment of a nest (USFWS, 2007). The breeding season for bald eagles in Minnesota is generally January 1 – July 31 (MDNR, 2019). The disturbance distance for active bald eagle nests in Minnesota is 0.125 mile (USFWS, 2007).

Golden eagles typically nest on cliffs but may also nest in large trees or on the ground (DeLong, 2004). Golden eagles typically do not breed within the Project area. They may winter in the Project area and may migrate through portions of the survey area in the spring and fall (Kochert et al., 2002). The Project is anticipated to have no impact on golden eagles, and the remainder of this section will focus on bald eagles.

Bald eagles may be present and nest throughout Minnesota in areas with suitable habitat (Buehler, 2000). Bald eagles commonly nest in trees but may also nest in other tall structures, such as rocky outcrops, cliffs, utility poles, and communication towers. They typically nest near bodies of water. Bald eagle breeding pairs may have more than one nest and may alternate use

of these nests from year to year. Bald eagles may roost communally during migration, winter, and summer (USFWS, 2007).

Bald eagle nest aerial surveys were conducted within 0.25 mile of the Line 3 Replacement Project Preferred Route in 2014 and 2015 in accordance with the 2014 Bald and Golden Eagle Nest Survey Protocol. Enbridge also conducted surveys in 2018. No eagle nests were identified within 0.25 mile of the Fond du Lac Band Line 4 Project during these surveys.

Construction Impacts and Mitigation

Potential impacts to bald eagles may occur if clearing of forested habitat for construction workspace takes place at locations where individuals are breeding or foraging. The species may be disturbed during clearing or construction activities due to noise or human presence. Due to the abundance of habitat in the vicinity of the Preferred Route, these potential impacts are expected to be localized. Enbridge will minimize potential impacts to the eagles and habitat through general Project-based conservation and mitigation measures. For example, Enbridge has minimized impacts on the species due to habitat fragmentation by co-location of the Project with the existing Enbridge Mainline System. Additional mitigation measures may include surveying trees for nests prior to removal.

Operations Impacts and Mitigation

During operations, Enbridge will maintain the new Right-of-Way by removing woody shrubs and trimming branches overhanging the Right-of-Way approximately every five years. Enbridge will not remove any additional eagle habitat during operations. Routine clearing will prevent woody vegetation from growing, thus preventing eagles from nesting within the maintained Right-of-Way. It is possible eagles could nest near or immediately outside the new Right-of-Way, and the species may use the Right-of-Way for foraging. During Right-of-Way maintenance activities, the species may avoid the area due to noise or human presence but would likely utilize surrounding areas and habitats. Therefore, no impacts to bald eagles are anticipated to result from operations activities.

6.13 Groundwater Resources

The primary source of water for private, public, commercial, and industrial uses near the Project is groundwater pumped from wells. Most lakes, rivers, and many wetlands near the Project are hydraulically connected with the water table and are typically a surface expression of the water table. The Project traverses glaciated terrain dominated by thick glacial drift deposits of glacial till and outwash, overlying primarily Precambrian crystalline bedrock. Although groundwater is present in both the glacial drift and underlying bedrock, the glacial drift tends to be the most widely used for water production in the vicinity of the Project due to its greater accessibility and the presence of permeable sediments.

6.13.1 Existing Environment

Aquifers

An aquifer is a geologic unit (or a combination of geologic units) that is capable of yielding usable quantities of water. Aquifers are typically composed of thick, laterally continuous deposits of permeable sand, gravel, or bedrock composed of permeable sandstone or limestone, or is highly fractured.

Glacial Aquifers

Many lakes and streams near the Project are in direct hydraulic connection with the surficial glacial aquifers and the open water of these features are typically at the same elevation as the water table. Groundwater from surficial aquifers discharges to lakes and rivers, a portion of which then evaporates into the air. Evapotranspiration from plants is also a mechanism of discharge.

Precambrian Aquifers

The Preferred Route is located over Precambrian aquifers comprised of undifferentiated granite, greenstone, and slate. 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 one and 25 gallons per minute (Adolphson et al., 1981).

Wells

Water Supply Wells

The Minnesota County Well Index (CWI) (2018) is the most complete record of well construction and location in Minnesota and is kept up-to-date and maintained by the Minnesota Geological Survey, in cooperation with the Minnesota Department of Health (MDH). This index and the USGS National Water Information System Mapper were consulted for this analysis. A review of these resources identified one drilling record of wells within 150 feet of the Preferred Route construction workspace (Table 6.13.1-1). This well is approximately 85 feet from the proposed workspace. The CWI also identified a well within the existing Enbridge Right-

of-Way near MP 1065.6; however, the home which this well served is no longer present. Enbridge believes this well would have been sealed as part of the previous Enbridge Line 67 Project and is no longer functional. Enbridge 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. Further, the Minnesota Department of Health Administrative Rules 4725.4450 states that water-supply well must be no less than 100 feet from a pipeline. While Enbridge does not anticipate that the Project would impact the well listed in Table 6.13.1-1, all wells within 100 feet of the operational Right-of-Way would be replaced.

Table 6.13.1-1
Wells and Boreholes Identified within 200 Feet of the Fond du Lac Band Line 4 Project

Unique Well Number	County	Milepost	Distance from Construction Workspace (feet)	Direction from Construction Workspace	Use	Road Crossing Type
731993	Carlton	1067.4	85	E	Domestic	Open Cut

Public Water Supply Wells

The Project will not cross any Environmental Protection Agency (EPA)-designated sole-source aquifers or any of the Fond du Lac Band Wellhead Protection Areas. The Project will not encounter any surface water intakes for drinking water.

Contaminated Groundwater

The MPCA database was assessed to identify sites with known or potential contamination within 0.5 mile of the Project (MPCA, 2018).

Two sites with potential contamination were identified within 0.5 mile of the Project Preferred Route. Both sites were determined to be more than 500 feet from the Preferred Route centerline and therefore are not anticipated to impact or be impacted by the Project.

6.13.2 Construction Impacts and Mitigation

Construction of the Project is not expected to have long-term impacts on groundwater resources. Construction activities, such as trenching, backfilling, and dewatering, that encounter shallow surficial aquifers may result in minor short-term and localized fluctuations in groundwater levels within the aquifer. Ground disturbance associated with pipeline construction is limited to surface and very shallow ground layers and only temporary, minor impacts to groundwater are anticipated.

Construction dewatering may temporarily impact groundwater levels in proximity to the dewatering location. Dewatering techniques are detailed in the EPP (Attachment B). In addition, any applicable water appropriations and use permits required under Fond du Lac Band, federal or state law would be obtained prior to utilizing groundwater resources. Once the construction

activity is complete, the groundwater levels are expected to recover quickly to preconstruction levels. Because Enbridge does not anticipate the need for blasting, the Project is not anticipated to affect bedrock aquifers.

As discussed in Section 6.13.1, there is one water well located within 85 feet of the proposed workspace. Enbridge will confirm the exact location of this well and its proximity to the operational Right-of-Way during the civil survey. If necessary, Enbridge will work with the landowner to replace the well if it is found to be within 100 feet of the operational Right-of-Way.

No blasting is anticipated near the well, but the groundwater that supplies the well could be impacted by a spill of hazardous material. 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. Spill-related impacts from pipeline construction are primarily associated with fuel storage, equipment refueling, and equipment maintenance. Section 10.0 of Enbridge's EPP (Appendix B) outlines measures that will be implemented to prevent accidental releases of fuels and other hazardous substances. Sections 10.7 and 10.8 of the EPP also describe response, containment, and cleanup procedures. Enbridge's implementation of the protective measures, as set forth in the EPP, will minimize the potential for any groundwater contamination due to construction activities. Moreover, Enbridge will work with the Fond du Lac Band and the affected landowner to develop a site-specific plan to avoid any impacts on the well that is near the proposed workspace.

No known or suspected buried glacial aquifers (i.e., aquifers with artesianal properties) will be crossed by the Preferred Route. This conclusion is supported by well log data in the CWI database.

In addition, Enbridge developed a Contaminated Sites Management Plan (Appendix H), which outlines procedures if impacted soil or groundwater is encountered during pipeline construction.

6.13.3 Operations Impacts and Mitigation

Routine operations and maintenance is not expected to affect groundwater resources. During operations, potential minor short-term groundwater quality degradation is possible from maintenance equipment and vehicle spills and maintenance activities that may require excavation. Although there is potential for dewatering of shallow groundwater aquifers and potential changes in groundwater quality (such as increases in total suspended solids (TSS) concentrations) during trenching, excavation, and backfilling maintenance activities, these changes are expected to be temporary. Shallow groundwater aquifers generally recharge quickly because they are receptive to recharge from precipitation and surface water flow.

6.14 Wetlands

6.14.1 Existing Environment

The major drainage basins and watershed districts crossed by the Project are described in Section 6.15.

In Minnesota, wetland crossings are regulated by the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act. Wetland impacts associated with the Project will also be regulated by Fond du Lac Band through the Tribe's Standard Wetland Activity Permit under the Fond du Lac Band Wetlands Protection and Management Ordinance (WPMO). Since 1996, the Band has had "Treatment in the Same Manner as a State" under the federal Clean Water Act (CWA) for water quality, in addition to its inherent tribal authority to regulate water quality on the Reservation. The Fond du Lac Band has a comprehensive water quality monitoring program, which includes a water quality monitoring strategy (last updated 2012) and an EPA-approved Quality Assurance Project Plan (Fond du Lac Band RMD, 2018). The Water Quality Standards for the surface water resources of the Reservation set contaminant criteria and designating uses for 24 lakes and eight streams within the Reservation boundaries, and identify Outstanding Reservation Resource Waters. Public Waters are regulated by the MNDNR. Wetlands are also regulated by Minnesota Board of Water and Soil Resources (BWSR) and local governmental units through the Wetland Conservation Act (WCA); however, wetland impacts associated with utilities, including pipelines and associated facilities are exempt from WCA wetland replacement requirements if certain requirements are met as outlined in Minnesota statues and rules. Enbridge has initiated Project consultations with USACE, Fond du Lac, and MNDNR related to wetland and waterbody permitting and with BWSR and WCA local governmental units to confirm the Project exemption from WCA wetland replacement requirements. Enbridge will continue to coordinate with these agencies on items that arise from the initial Project consultations, as well as items that are ongoing as they pertain to the Project. Through a USEPA Direct Implementation Tribal Cooperative Agreement, the Fond du Lac Band Office of Water Protection staff obtains credentials through the USEPA to conduct wetland permit inspections on the Environmental Protection Agency's behalf.

Wetlands

Wetlands are areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of wetland vegetation typically adapted for life in saturated soil conditions (Cowardin et al., 1979). The following wetland types are found in the Project area:

- Palustrine emergent (PEM) wetlands consist of sedge- and rush-dominated wetlands adjacent to waterbodies, sedge meadows along existing pipeline ROWs, and shallow marsh communities dominated by cattails and reed canary grass. Emergent wetlands can also include widely scattered small, ephemeral pools that support a variety of emergent hydrophytes.

- Palustrine scrub-shrub (PSS) wetlands are primarily comprised of shrub-carr communities, with a mix of other hydrophytic species common to emergent wetlands.
- Palustrine forested (PFO) are wetlands dominated by a forest plant community. PFO wetlands comprise several distinct communities, including floodplain forest, hardwood swamp, coniferous swamp, and coniferous bog.
- Palustrine unconsolidated bottom (PUB) are wetlands and deepwater habitats with a vegetative cover less than 30 percent.

Enbridge will acquire the necessary wetland permits for the Project from local, state, federal, and Fond du Lac Band agencies, as needed. As part of the permitting requirements for USACE, and Fond du Lac Band, Enbridge will avoid and minimize impacts on wetlands to the extent possible, restore temporary impacts to wetlands on-site, and provide compensatory mitigation as required by permits.

Wetland Delineations

Enbridge conducted wetland delineation surveys along approximately 91 percent of the Preferred Route to identify the wetlands that will be affected during Project construction. The majority of the numbers represents information gathered from field surveys in this section. Wetlands were identified and mapped in general accordance with the Northcentral and Northeast Regional Supplements of the 1987 Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987). Enbridge will conduct wetland delineations along the remaining nine percent of the Preferred Route when it is granted permission for survey access.

Along the nine percent of the route where Enbridge was unable to obtain field-verified survey data, Enbridge used NWI data in digital format obtained from MNDNR to identify potential wetlands (MNDNR, 2013a). Through a combination of NWI and 2018 field data, Enbridge determined that the Preferred Route will cross a total of 37 wetlands (based on feature IDs) with a combined wetland crossing length of approximately 6.16 linear miles. Summaries of the wetland types crossed, the total length of each crossing, and the areas affected by construction and operations are presented in the sections below.

The Project does not cross wetlands (Public Water Wetlands) or basins (Public Water Basins) listed on the MNDNR Public Waters Inventory (MNDNR, 2013b), nor does it cross any Outstanding Resource Value Waters (ORVW) designated by the MNDNR.

6.14.2 Construction Impacts and Mitigation

Based on review of field data collected through 2018, supplemented by NWI data where field data were not available, Enbridge has determined that approximately 6.16 linear miles of wetlands will be crossed by the Project. Construction across wetlands for the pipeline will result in wetland impacts totaling approximately 96.5 acres (including construction impacts and access roads). Enbridge reduced the construction workspace width within unsaturated wetlands and saturated wetlands to 115 feet.

Table 6.14.2-1 summarizes the construction impacts breakdown by wetland type along the Project. Construction impacts are divided into the following categories: Planned disturbance associated with Enbridge's authorized Line 3 Replacement Project and areas of new disturbance associated with the Project. Impacts are calculated based on the construction area proposed at the time of this filing. Appendix G provides a breakdown by wetland type.

Table 6.14.2-1
Temporary Construction Impacts of the Fond du Lac Band Line 4 Project

Wetland Type	Area of Planned Disturbance for Line 3R (acres) [a]	Area of New Proposed Disturbance (acres)[b]	Project Total (acres)
PEM	41.0	3.9	44.9
PFO	16.6	8.1	24.7
PSS	19.9	3.6	23.5
PUB	2.0	0.4	2.4
Total	***79.5***	***16.0***	***95.5***

Note: PEM – Palustrine Emergent; PSS – Palustrine Scrub-Shrub; PFO – Palustrine Forested; PUB – Palustrine Unconsolidated Bottom
Totals may not add due to rounding.
[a] Areas planned to be disturbed for Enbridge's Line 3 Replacement Project. Includes temporary construction workspace and new Right-of-Way.
[b] New Disturbance for the Fond du Lac Band Line 4 Project. Includes temporary construction workspace and new Right-of-Way.

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. Further, invasive species were observed within some saturated wetlands within the Right-of-Way. Enbridge would follow procedures outlined in the EPP (Appendix B) to prevent the spread of invasive species, to the extent possible, within the construction corridor.

Approximately 45.0 acres of PEM wetland and 2.4 acres of PUB wetland will be temporarily affected by construction of the proposed Project. Of those acres, 3.9 acres of PEM wetland and 0.4 acre of PUB wetland will be newly disturbed as part of the Project. Enbridge 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 vegetate naturally in these areas, which Enbridge anticipates will occur quickly.

Approximately 23.5 acres of PSS wetland and 24.7 acres of PFO wetland will be affected by construction of the Project. Of those acres, 3.6 acres of PSS wetland and 8.1 acres of PFO wetland will be newly disturbed as part of the Project. Approximately 10.1 acres of PEM and 0.7 acre of PUB will be located within the proposed Line 4 new Right-of-Way and will be temporarily impacted as the wetlands will be restored back to preconstruction conditions. Approximately 7.6 acres of PFO and 6.1 acres of PSS will also be located within the proposed Line 4 new Right-of-Way and will be permanently impacted as a result. This is further described in the Operations Impacts and Mitigation section below. The temporary 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 construction workspace after restoration.

Typical 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 Section 4.0. Posting of signage noting environmental features such as wetlands during construction is described in Section 6.15.

Enbridge's reduction of the temporary construction workspace by 20 feet will minimize impacts on wetlands and saturated wetlands. Additionally, Enbridge's co-location of the pipeline with the authorized Line 3 Replacement Project will limit the amount of new disturbance in unaffected wetland areas.

Enbridge will also minimize impacts on wetlands by implementing the mitigation measures specified in USACE permits and the Fond du Lac Band WPMO, including the purchase of wetland mitigation credits or other agreed upon compensatory mitigation. Wetlands crossing general requirements are included in Section 3.0 of the EPP (Appendix B).

USACE and BWSR have designated ten Wetland Bank Service Areas (BSAs) throughout the state. The Project crosses BSAs 1 and 6 (see Figure 6.14.2-1 and Table 6.14.2-2). Fond du Lac Band will require the Project to establish compensatory wetland mitigation as per § 310 of the WPMO. The WPMO requires compensatory wetland mitigation be pursued and rejected on-Reservation, for both permanent and temporary wetland impacts, before off-Reservation wetland banking can be pursued. Enbridge is working with the Fond du Lac Resource Management Division to develop appropriate compensatory wetland mitigation for the Project.

Table 6.14.2-2
Wetland Bank Service Areas Crossed by the Fond du Lac Band Line 4 Project

Bank Service Area	Major Watershed Name	Major Watershed Number	Crossing Length (miles)
1	St. Louis River	3	8.3
6	St. Croix River	35	1.7
		PROJECT TOTAL	**10.0**

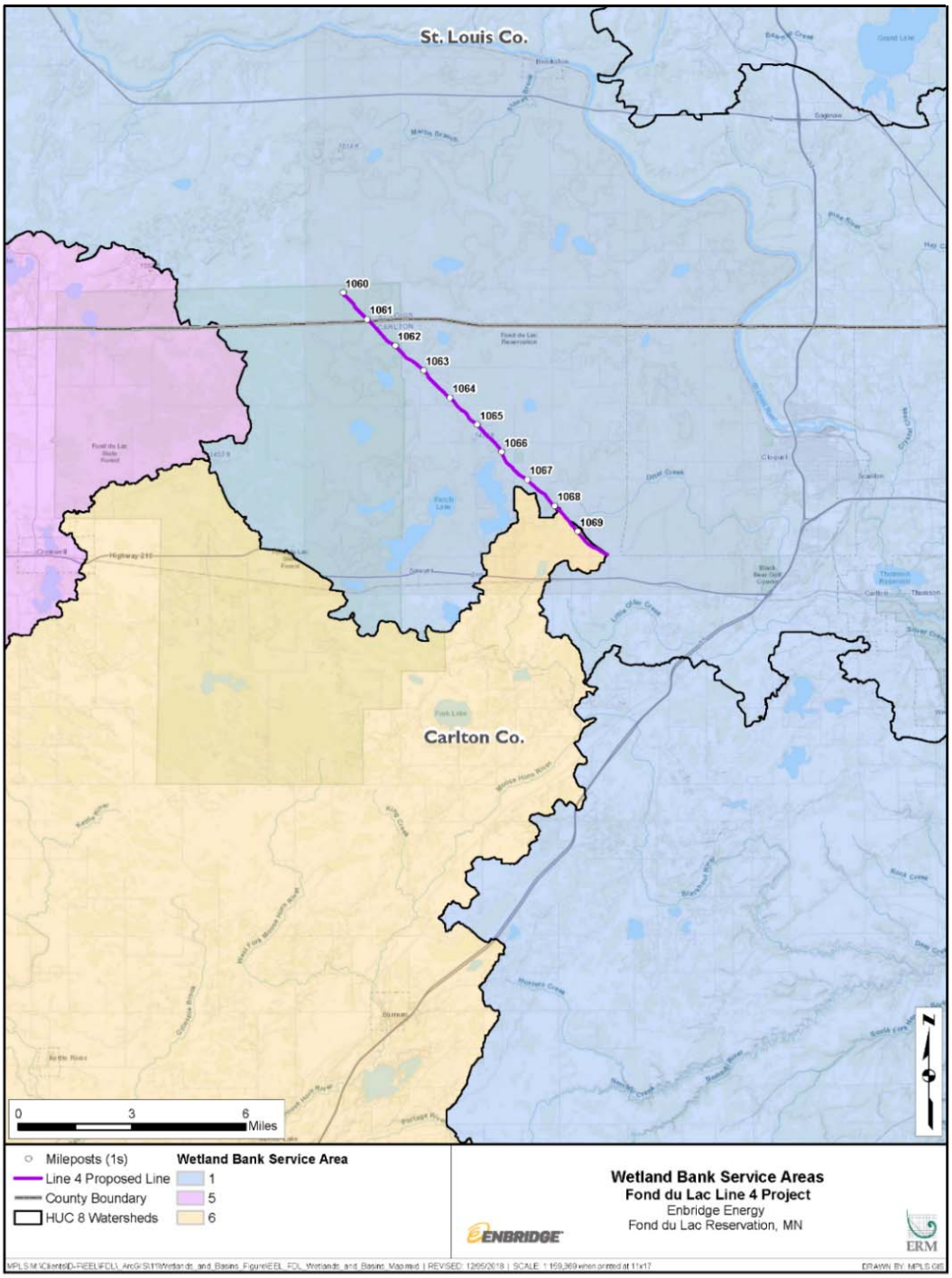

Figure 6.14.2-1 Wetland Bank Service Areas

Access Roads

Enbridge conducts the same level of environmental survey for access roads that require improvement as it does for the construction workspace. It does this to avoid and minimize access road impacts on sensitive resources, including wetlands. A majority of access roads that will be utilized for the Project are existing roads, which will require some widening. Impacts on wetlands will be temporary and will be limited to the extent possible during construction. Access road construction impacts to wetlands are depicted in Table 6.14.2-3. Any proposed access roads that included wetland crossings were reviewed to determine if these wetlands could be avoided, and if unavoidable, what could be done to minimize the impacts on these areas.

Table 6.14.2-3
Access Road Construction Impacts of the Fond du Lac Band Line 4 Project

Access Road/Wetland Type	Total Area (acres)
PEM	0.4
PFO	0.0
PSS	0.2
PUB	0.0
Total	**0.6**

Notes: PEM – Palustrine Emergent; PSS – Palustrine Scrub-Shrub; PFO – Palustrine Forested; PUB - Palustrine Unconsolidated Bottom Wetlands

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. Temporary erosion control measures and, where necessary, timber mats will be installed to minimize impacts to wetlands during construction.

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 be employed (e.g., set on the pipeline) to provide negative buoyancy and prevent movement of the pipeline once it is buried.

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, topsoil segregation is often infeasible and the pipe cannot be strung and welded up within the wetland. In these instances the trench will be dug by a backhoe working across the wetland on timber mats, and the pipe will be assembled in an upland area and floated across the wetland using the "push-pull" and/or "float" techniques. When the pipeline is in position, the floats (if used) will be removed, and the pipeline will settle into the trench.

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 restored after the trench is 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 of wetlands will begin as soon as practical after the trench is backfilled and topsoil is restored. Enbridge will restore wetland crossings in accordance with permit conditions. The goal of cleanup and rough grading is to restore wetland hydrology and soils and avoid permanent impacts. Enbridge will restore affected wetland to pre-construction elevations and remove any timber mats that may have been used. Disturbed wetland areas will then be revegetated in accordance with the EPP (Section 7.0 in Appendix B), unless standing water is prevalent or as otherwise directed by landowners or regulatory agencies. No fertilizer, lime, or mulch will be applied in wetlands.

6.14.3 Operations Impacts and Mitigation

After the pipeline is constructed, the new Right-of-Way for Line 4 will be maintained free of larger-diameter trees and will limit the reestablishment of the scrub-shrub wetlands and forested wetlands. Therefore, based on the Right-of-Way widths and overlap with other existing and authorized corridors, Enbridge has determined that the Project will result in the permanent impacts of approximately 7.6 acres of forested wetland and 6.1 acres of scrub-shrub wetland as these wetland types will be converted to emergent wetland (see Table 6.14.3-1). Approximately 0.03 acre of PSS wetland will be permanent impacts converted to upland area to accommodate the valve installation at MP 1062 (see Table 6.14.3-1). Additional temporary impacts to wetlands may result from maintenance activities that require excavation.

Table 6.14.3-1 summarizes the permanent wetland conversion type (PFO and PSS) within the Project.

Table 6.14.3-1
Permanent Wetland Conversion Impacts of the Fond du Lac Band Line 4 Project

Wetland Type	Wetland Impact (Type Conversion) – Proposed New Line 4 Operational ROW (acres) [a]	Permanent Wetland Fill (acres)[b]
PEM	0.0	0
PSS	6.1	0.03
PFO	7.6	0
PUB	0.0	0
Total	***13.7***	***0.03***

Note: PEM – Palustrine Emergent; PSS – Palustrine Scrub-Shrub; PFO – Palustrine Forested; PUB – Palustrine Unconsolidated Bottom
Totals may not add due to rounding.

[a] Proposed operational new Right-of-Way to be maintained as Enbridge's proposed Fond du Lac Band Line 4 Project. PSS and PFO wetland type will be converted to emergent wetland within the proposed Line 4 ROW.

[b] Permanent wetland fill associated with the valve installation at MP 1062.

Planned future removal of the existing segment of Line 4 in Fond du Lac Band Reservation will provide enhanced access to Fond du Lac Band lands by removing the above-ground pipe. The Project will allow water to move naturally across the Enbridge Mainline Corridor and restore the wetland hydrology to allow for the long-term restoration of the temporary impacted PEM, PFO, and PSS wetlands.

6.15 Waterbodies

6.15.1 Existing Environment

Surface waters crossed by the Preferred Route are located within the St. Louis River and St. Croix Watersheds (USGS, 2013) (Figure 6.15.1-1). Table 6.15.1-1 summarizes the watersheds crossed by the Project (USGS, 2013). Enbridge reviewed information on the Minnesota Board of Water & Soil Resources website to identify any potential Watershed Districts crossed by the Project. No watershed districts will be crossed by the Project (Minnesota Board of Water & Soil Resources, 2019).

Table 6.15.1-1
Major Watersheds Crossed by the Fond du Lac Band Line 4 Project

Major Watershed Name	Major Watershed ID Number	Crossing Length (miles)
St. Louis River	3 (HUC 040102)	8.3
St. Croix	35 (HUC 070300)	1.7
	PROJECT TOTAL	**10.0**

Waterbody Crossings

Enbridge conducted waterbody field surveys in 2018 to identify the locations and characteristics of the waterbodies (i.e., lakes, streams, rivers, and drainage ditches) crossed by the Preferred Route. By the end of the 2018 field season, 91 percent of the route was accessible and surveyed. The remaining nine percent will be surveyed upon being granted survey access. Based on a review of hydrographic spatial data, there do not appear to be any waterbodies in the parcels yet-to-be surveyed. Upon completion of the waterbody field surveys, Enbridge will evaluate any additional resources surveyed and conduct agency consultations, as appropriate.

The pipeline will cross three waterbodies. Waterbodies crossed by the Project are detailed in Table 6.15.1-2.

Table 6.15.1-2
Waterbody Crossings – Fond du Lac Band Line 4 Project

Waterbody Name (Feature ID)	Approximate Milepost	Flow Regime	State Status [a]	Federal Status [b]	Primary Crossing Type	Secondary Crossing Type
Stoney Brook (s-49n18w6-aa)	1062.5	Perennial	PWI	N/A	Dry Crossing	Wet Open Cut
Unnamed Tributary to Stoney Brook (w-49n18w17-x)	1064.2	Perennial	N/A	N/A	Dry Crossing	Wet Open Cut
Unnamed Ditch (s-49n18w17-aa)	1064.8	Perennial	N/A	N/A	Dry Crossing	Wet Open Cut

[a] MNDNR (2018h); Designated a Trout Stream, per Minnesota Rules 6264.0050, Subp. 4
[b] USACE (2018)

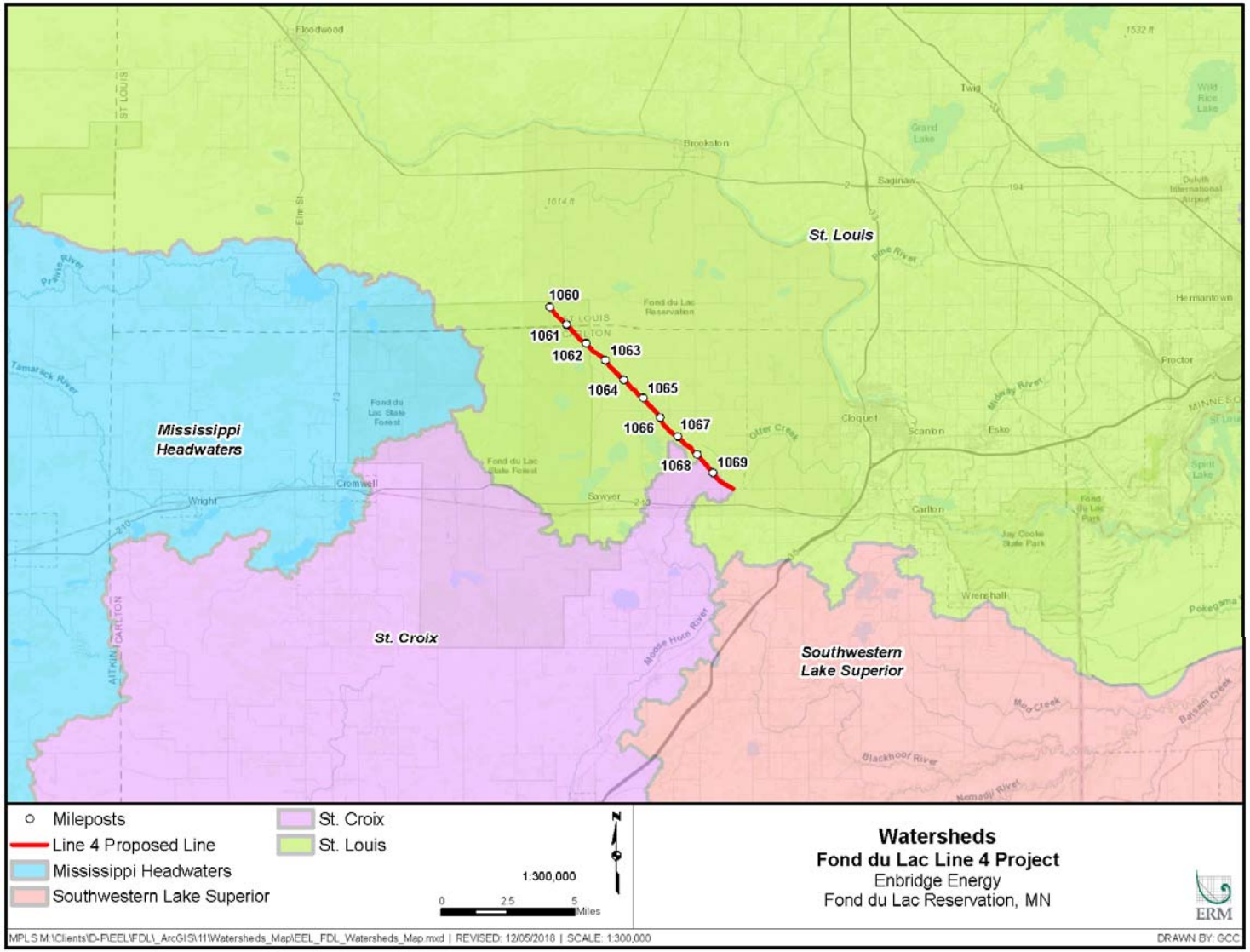

Figure 6.15.1-1 Watersheds

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Special Designated and Sensitive Waterbodies

The Project will cross one watercourse, Stoney Brook, listed on the MNDNR Public Water Inventory (PWI) (MNDNR, 2018h). This watercourse is regulated as a public water under the MNDNR's Public Waters Permit Program. Enbridge will prepare and submit an application to MNDNR to obtain a License to Cross Public Waters permit for this public water crossing.

No waterbodies crossed by the Project are considered navigable waters, as defined under Section 10 of the Rivers and Harbors Act of 1899 (USACE, 2018). The Project will not cross any waterbodies meeting ORVW criteria. The Project will not cross any river segments that are listed on the National Rivers Inventory (NRI) as designated or potentially designated National Wild and Scenic Rivers. The Project will not cross any river segments that are listed as state-designated canoe and boating routes (MNDNR, 2018i).

Wild rice, known to the Anishinaabeg as manoomin, is a culturally significant plant harvested by the Fond du Lac Band. Hand-harvested wild rice is a traditional staple food of the Band that provides irreplaceable cultural and nutritional benefits. Links to land and food are important components of culture and health to the Ojibwe people; within the Anishinaabe worldview, the health of wild rice and the health of the people are inseparable (Fond du Lac Band of Lake Superior (LFDL), 2004; Fond du Lac Band of Lake Superior Chippewa Health Impact Assessment (Fond du Lac Band HIA), 2019). Additionally, the physical activity associated with traditional food gathering, combined with the high nutritional value may offer great benefits to decreasing risks of chronic disease (LFDL, 2004; Fond du Lac Band HIA, 2019). Within the Reservation boundaries, there are five primary wild rice producing waterbodies. These include Perch Lake, Mud Lake, Rice Portage Lake, Jaskari Lake, and Deadfish Lake. These lakes are not located within the Project area and are not expected to be impacted by the Project. Additional discussion regarding wild rice resources is included in Section 6.16.

Water Quality

The Fond du Lac Band Environmental Program developed, and the Reservation Business Committee (RBC) adopted, a set of Water Quality Standards for the surface water resources of the Reservation, setting contaminant criteria and designating uses for 24 lakes and eight streams within the boundaries, and identifying Outstanding Reservation Resource Waters. As discussed in Section 6.14.1, the Band has Treatment-in-the-Same-Manner-As-a State under the CWA and inherent tribal regulatory authority. As a critical tool for implementing these standards, the Fond du Lac Band has a comprehensive water quality monitoring program, which includes a water quality monitoring strategy (last updated 2012) and an EPA-approved Quality Assurance Project Plan (Fond du Lac Band RMD, 2018).

Enbridge consulted the final USEPA 2016 and draft 2018 303(d) impaired waters lists to identify impaired waterbodies potentially crossed by the Project. The Project does not cross any rivers or streams listed on the USEPA's 303(d) list. Enbridge reviewed the waterbodies crossed by the

Project against the October 26, 2018 MNDNR Designation of Infested Waters (MNDNR, 2014). No waterbodies crossed by the Project were included on the Infested Waters list.

6.15.2 Construction Impacts and Mitigation

Enbridge's routing analysis and proposed construction procedures minimize wetland and surface water impacts to the maximum extent practicable. All in-stream work activities required for pipeline installation would be minimized to the extent practicable. In-stream trenching would be conducted during periods permitted by the appropriate regulatory agencies and applicable permits. Stream crossings would be designed as close to perpendicular to the axis of the stream channel as engineering and routing constraints allow, creating the shortest crossing length.

Direct temporary impacts to surface waters crossed by pipeline segments and indirect temporary impacts to downstream surface waters may occur during the construction period due to soil erosion resulting from vegetation clearing, trenching, and other construction-related activities. Potential impacts on waterbodies will be minimized along the Preferred Route by implementing BMPs described in Enbridge's EPP (Appendix B). Stream banks will be protected from erosion through the use of temporary and permanent soil stabilization techniques. Examples of erosion control techniques include placement of erosion control blankets, mulch, straw bales, bio-logs, silt fence, and prompt seeding following construction activities. Stream banks will be restored to pre-construction grades when practicable and revegetated with appropriate vegetation. Placement of rock rip-rap, geotextile fabric, and other bioengineering techniques may be implemented to stabilize sites inherently unstable.

Waterbody Crossings

The following subsections describe the waterbody crossing methods for each of the three waterbodies. It is Enbridge's intention to execute the primary crossing method for each of the three waterbodies. If at the time of construction, the contractor, in coordination with Fond du Lac Band and Enbridge, determines that the primary crossing method is not attainable due to site conditions, the secondary crossing method will be utilized.

Enbridge will first clear the existing vegetation at the three waterbodies from the construction workspace as necessary to prepare for excavation. A minimum 20-foot buffer of undisturbed non-woody vegetation will be maintained on the stream banks until the trenching begins at the stream crossing. Woody vegetation within this buffer, if present, will be cut and removed during initial clearing of the Right-of-Way.

Once the woody vegetation has been removed from the stream banks, Enbridge will install temporary bridges across the streams to allow the passage of equipment along the construction workspace. Construction equipment, with the exception of clearing/bridge installation equipment, will be required to use the bridge to cross over the waterbody. 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 the potential for loose soil that has fallen off passing equipment from entering the stream. A list of bridge types is described in Section 2.4.1 of the EPP (Appendix B).

Grading will be completed on each side of the waterbody, as necessary, to establish a safe, level working area for construction personnel and equipment and to accommodate limitation on pipe bending. Any grading that is necessary will be directed away from the waterbody to reduce the potential for material to enter the waterbody. Prior to grading, the appropriate soil erosion and sediment control measures such as silt fence and/or staked straw bale structures will be installed for spoil containment and to minimize the potential for sediment to migrate into the waterbody as discussed in Section 1.9 of the EPP (Appendix B). Further, any additional temporary workspaces that are needed for the waterbody crossings will be set typically 50 feet back from the water's edge if topographic and other site conditions permit.

Primary Crossing Methods

After initial clearing and grading is complete, the pipeline will be installed across the three waterbodies using one of the two primary dry crossing methods: dam-and-pump or flume method, as discussed in Section 2.5 of the EPP (Appendix B). These methods are described below. Enbridge will comply with the in-water work exclusion dates specific to MNDNR's Northeast and Northwest Regions.

Dam-and-Pump Method

The dam-and-pump method (see Section 2.5.2 of the EPP in Appendix B) is a dry crossing method used for sensitive streams with low gradients and flow, or sensitive streams with meandering channels. Prior to in-stream excavation, stream flow will be diverted by means of a dam-and-pump system. This method isolates the construction work area from the stream flow. Temporary dams are installed, generally consisting of sandbags, plastic sheeting, and/or steel bulkheads, across the waterbody upstream and downstream of the crossing prior to excavation. Stream flow is actively pumped around the in-stream construction work area to maintain downstream flow. The discharge point downstream will have additional soil erosion and sedimentation control measures to reduce any potential stream channel scouring (e.g. filter bag or dewatering structure). The dam and pump system will remain in place until the pipeline is installed, the ditch is backfilled, and the banks are restored. The temporary dams will then be removed and natural stream flow restored to the channel.

Flume Method

The flume method (see Section 2.5.3 of the EPP in Appendix B) is a dry crossing method used for sensitive, relatively narrow waterbodies free of large rocks and bedrock at the trench line and that have a relatively straight channel across the construction workspace. The flume method is generally not appropriate for wide, deep, or heavily flowing streams. Similar to the dam-and-pump method, stream flow is isolated from the construction work area by diverting the natural flow into a flume or multiple flume pipes extending across the work area. These

flumes remain in place throughout the in-stream construction process and until the pipe is installed, backfilled, and the banks have been restored.

Secondary Crossing Method

Open Cut Wet Trench Method

This method is a secondary crossing type for the three waterbodies and will be used to cross the waterbodies were flumed or dam and pumped methods is not attainable due to site conditions. The open-cut wet trench method (see Section 2.5.1 of the EPP in Appendix B) 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.

Waterbody Restoration

After the pipeline is installed, the streambed will be restored and the banks will be reconstructed and stabilized with erosion control materials. Temporary erosion control measures will be re-installed if they were removed during the pipe installation, and will be maintained until permanent erosion control measures are installed and effective. Permanent slope breakers will also be installed, where needed, across the full width of the Right-of-Way during final cleanup. After installation and while the pipe section is being tied-in into the pipeline, should trench dewatering be 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 as identified in Section 5.0 of the EPP (Appendix B).

Stream banks disturbed during construction will be restored as near as practicable to pre-construction conditions unless the slope is determined to be unstable. As necessary, erosion control blankets (curlex, jute, or equivalent) will be placed on slopes over 30 percent or that are a continuous slope to a sensitive resource area (e.g., wetland or waterway) to ensure revegetation and slope stabilization (to preconstruction conditions) in these sensitive areas. Mitigation measures such as bioengineering, rock riprap, or reshaping the banks may be utilized to prevent slumping. Enbridge will work closely with MNDNR, USACE, and the Fond du Lac Band Tribe to identify waterbodies where bioengineering practices could be used as a method of bank stabilization. Rock riprap may be used in areas where other stabilization methods are not effective. Enbridge recognizes that site-specific coordination and approval with the Fond du Lac Band will be necessary in the event riprap is required to achieve bank stabilization.

Once the banks have been stabilized, the erosion control devices (ECDs) will be reinstalled. Temporary slope breakers may be installed on sloped approaches to streams in accordance with the spacing requirements specified in Section 1.9.5 of the EPP (Appendix B). A temporary seed mix approved by the landowner and the Fond du Lac Band, and mulch and/or erosion control blankets will be installed within a 50-foot buffer on either side of the stream. Silt fence

or functional equivalent as approved in advance by Enbridge will be installed upslope of the temporary seeding area (Section 2.5.1 of the EPP in Appendix B).

Where necessary for access, the travel lane portion of the construction workspace and the temporary bridge will remain in place until final cleanup activities are completed. These temporary bridges and travel lanes will be removed when they are no longer needed, at which time the areas disturbed by these bridges and lanes will be restored, seeded and mulched as specified in the EPP (Appendix B). The temporary erosion control measures will be removed after vegetation has been re-established.

Special Designation and Sensitive Waterbodies

Enbridge will post signs for environmental features such as wetlands, waterbodies, drainages/drain tiles, buffer zones, rare plant or ecological community sites, invasive species and noxious weed locations, regulated wildlife habitat, cultural resources, and erosion-prone or steep slopes.

Public Water Watercourses

The Stoney Brook crossing has been identified as a sensitive crossing and is listed by the MNDNR as a Public Watercourse. Enbridge will not conduct instream work within this brook between April 1 and June 30 without written approval from MNDNR. Enbridge will prepare a site-specific plan for this crossing and will continue to work with MNDNR to permit proposed and alternate crossing methods at the public waterbody.

Water Quality

It is anticipated that any impacts to water quality from construction of the Project will be temporary. The following measures from the EPP (Appendix B) addresses water quality issues.

- Section 1.9 requires installation of temporary ECDs at the edge of the construction workspace to slow water leaving the site and prevent siltation of waterbodies and wetlands downslope. It also requires riparian buffers to be maintained to provide an additional barrier to prevent sedimentation.
- Section 10.0 addresses planning, prevention, and control measures to minimize the potential for and consequences of spills of fuels, petroleum products, or other regulated substances as a result of construction. Sections 10.9.1 and 10.10 states that if a spill should occur during refueling operations, operations shall stop until the spill can be controlled and the situation corrected.
- Section 10.6.3 requires that the storage of petroleum products, refueling, maintenance, and lubricating operations take place in upland areas that are more than 100 feet from wetlands, streams, and waterbodies (including drainage ditches), and water supply wells.

- Section 10.6.5 prohibits the discharge of concrete wash water, grindings, and slurry to wetlands, waterbodies, or storm sewer systems, or the drainage of any of these materials onto adjacent properties.

Enbridge will implement BMPs described in Enbridge's EPP (Appendix B) to maintain existing designated water uses and prevent the degradation of water quality in accordance with the Fond du Lac's water quality standards.

Hydrostatic Testing

Enbridge will hydrostatically test the new pipe to verify its integrity prior to placing the pipeline in service. Enbridge plans on utilizing water from Big Lake (near MP 1066) as a source for appropriating hydrostatic test water. Enbridge will obtain the applicable water appropriation and discharge permits for hydrostatic testing activities.

Water used for hydrostatic testing will be discharged on land or returned to the waterbody from which it was appropriated, in accordance with EPA's National Pollutant Discharge Elimination System (NPDES) permit requirements for the Project and Fund du Lac water quality standards. 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. Enbridge will develop a site-specific discharge plan for each waterbody that will receive hydrostatic test discharges. At this time, Enbridge does not anticipate the use of test water additives, and no chemicals will be used to dry the pipeline following the hydrostatic testing.

Enbridge will comply with all requirements of the individual NPDES hydrostatic test discharge permits issued for the Project, including working with the Fond du Lac Band regarding the type and location of any required discharge structures. Further, Enbridge will work with the Fond du Lac Band regarding water appropriations to ensure that impacts to historical and culturally important springs are avoided and minimized. Additional details regarding hydrostatic test discharges are included in Environment Hydrotest Discharge Authorization & Documentation located in Appendix D of the EPP (Appendix B). In addition, new procedures are in place to measure discharge flows. The total volume of water discharged and the discharge rate will be verified with a flow meter (or equivalent), or as required by the individual NPDES permit. The total volume of water discharged and the discharge rate will not exceed that specified in the individual NPDES permit (refer to Section 5.2.5 of the EPP).

Enbridge intends to use the MNDNR's General Permit 1997-0005 for water appropriations over 10,000 gallons per day. Per guidance from MNDNR, Enbridge will select an appropriation site (or sites if needed) that will meet MNDNR's criteria of "doing no harm." All appropriation sites will be reviewed by MNDNR prior to issuance of a Water Appropriations Permit. The MNDNR General Permit further states that water withdrawals must have a minimal potential for

impacts on groundwater resources and must not adversely impact trout streams, calcareous fens, or other significant environmental resources. Enbridge may request withdrawal from impaired waters if use of the water will not impact the impairment for which the waterbody is listed. In the event that Enbridge must use water from a surface water source that is designated as infested, Enbridge will apply for an Infested Waters Diversion or Transportation Permit and will comply with all requirements of that permit.

6.15.3 Operations Impacts and Mitigation

Impacts on water quality due to operations and maintenance activities are expected to be temporary (e.g., excavation, mowing), minimal, and site-specific. Disturbed areas at crossings will be restored and stabilized as soon as practical after pipeline installation. Impacts could result from alteration of stream banks and maintenance clearing of woody vegetation as needed, approximately every five years within the Right-of-Way.

6.16 Cultural Resources

6.16.1 State Regulations, Policies, and Executive Orders

Minnesota state policy is to engage in formal government-to-government tribal consultation on Projects that affect Minnesota tribes and their lands, as provided in Executive Order 13-10.

Under Minnesota Rules Chapter 7852.0700, subpart 3(C), Project analysis the Commission must consider impacts to archaeological sites "lands of historical, archaeological, and cultural significance," which includes tribal resources on public lands and the protection of human remains and burials. The State Historic Preservation Office (SHPO) consults with applicants, as well as tribal, state, and federal government agencies, to identify historic properties and ways to avoid or reduce adverse effects on those properties, and this includes tribal historic and cultural properties. Applicable laws include, but may not be limited to, Minnesota Statutes sections 138.31-138.42; the Private Cemeteries Act (Minnesota Statutes 307.08); and others.

6.16.2 Federal Regulations, Policies, and Executive Orders Relating to Historic Properties and Tribal Consultation

Federal executive orders, policies, and memoranda also provide for consultation by the federal government with American Indian tribes, along with some components of federal legislation. Some of the federal regulations also allow for the preservation and management of cultural resources, largely pertaining to those that are archaeological or historic in nature. Among these are Executive Order 13175, Consultation and Coordination with Indian Tribal Governments (November 6, 2000); Presidential Memorandum (November 5, 2009); Executive Order 13007, Indian Sacred Sites; Presidential Memorandum Government-to-Government Relations with Native American Governments (April 29, 1994); National Historic Preservation Act of 1966 (NHPA); Archaeological and Historic Preservation Act of 1974; American Indian Religious Freedom Act of 1978; Native American Graves Protection and Repatriation Act of 1990 (NAGPRA); Antiquities Act of 1906; Historic Sites Act of 1935; and Archaeological Resources Protection Act of 1979, among others.

Certain, tribal consultation required under state and federal law can only take place upon the submission of the final Tribal Cultural Resources survey (discussed below). Because the survey has been conducted by the Fond du Lac Band, however, and will meet all Tribal Historic Preservation Office (THPO) requirements, and due to the Band's support for the Project, it is anticipated that consultation will be completed in accordance with the planned construction schedule.

6.16.3 Archaeological and Tribal Cultural Resource Surveys

Enbridge has completed a traditional, archeological historic properties review for the Line 3 Replacement Project, which includes an evaluation of what also encompasses the Line 4 corridor across the Reservation. However, the standard interpretation of the archeological

record usually does not recognize sites of cultural, religious, and historic significance to Indian tribes and is insufficient to meet all federal legal requirements.

Cultural resources consist of archaeological resources (e.g., sites and isolated finds), historic resources (e.g., objects, buildings, structures, or districts), and sacred places (including traditional cultural properties (TCPs), as defined by NHPA and related regulations, and landscapes). Cultural resources may also include tribal, usufructuary rights resources both within reservation boundaries and ceded lands by treaty (e.g., traditional hunting and fishing areas) and treaty areas. For the purposes of this discussion, these resources are referred to collectively as cultural resources. Cultural resources are finite and non-renewable; once destroyed they and the information they provide are lost. Federal laws and regulations provide standards for cultural resources identification, evaluation, and mitigation of impacts.

The NHPA requires tribal consultation and evaluation of TCPs as part of required, Section 106 review, in addition to other types of historic properties review, for on-reservation projects, and state law likewise requires review of project impacts on these and other types of certain types of cultural resources historic properties. Federal guidance and best practice dictate that tribal historic properties review be led by tribes, and that has guided the review here. The Fond du Lac Band has assumed Section 106 responsibilities on the Reservation and has established a THPO. Enbridge has worked with the THPO to design and conduct comprehensive tribal historic properties review intended to comply with Section 106 and other federal requirements. The Band, as Enbridge's fiscal agent under Section 106 and contractor, has led a tribal historic properties assessment on the Reservation (as part of a larger assessment along the entire Line 3 corridor). Federal tribal consultation, fieldwork, interviews, literature review, mapping, avoidance, and mitigation planning are nearing completion. The Band will issue a final, comprehensive written Tribal Cultural Resources report for the Reservation Right-of-Way before any construction begins, with appropriate protections to preserve confidentiality.

Enbridge and the Fond du Lac Band have agreed upon procedures for conducting all aspects of the TCR Survey, as well as for handling unanticipated discoveries on the Reservation. Enbridge will continue to consult on these matters throughout every phase of the Project.

Additionally, the Fond du Lac Band has competed field work, interviews, and literature review for the TCR Survey. There is one historic feature adjacent to the proposed route that Enbridge has committed to avoid. Therefore, the Fond du Lac Band has informed Enbridge that the preliminary conclusion is that no TCPs or other historic sites will be impacted by the Project.

6.16.4 Natural Resources as Cultural Resources; Manoomin

Enbridge understands that, for American Indian tribes, cultural resources have evolved in concert with natural resources, such that one is dependent on the other. In this manner, and that no distinction is present between what is considered a cultural resource and a natural resource (Stults et. al. 2016). Therefore, a natural resource is also one of cultural and spiritual

value. Traditional American Indian cultural belief considers all elements of an ecosystem to be interconnected and that certain species of wildlife and plants are relatives and spiritual messengers. Based on the sovereign, inherent right to self-determination, tribes collectively oversee sacred responsibilities to the land, waters, and people.

Wild rice, known to the Anishinaabeg as manoomin, is a culturally significant plant harvested by the Fond du Lac Band (and other tribes in parts of the United States and Canada). Hand-harvested wild rice is a traditional staple food of the Band that provides irreplaceable cultural and nutritional benefits. Links to land and food are important components of culture and health to the Ojibwe people; within the Anishinaabe worldview, the health of wild rice and the health of the people are inseparable (Fond du Lac Band Health Impact Assessment, Fond du Lac Band HIA, 2019). Additionally, the physical activity associated with traditional food gathering, combined with the high nutritional value may offer great benefits to decreasing risks of chronic disease (Fond du Lac Band HIA, 2019). For these reasons, wild rice waters, medicinal plant sites, and other natural resources will be included in the Fond du Lac Band BIA Right-of-Way Survey (and wild-rice producing waters near the Right-of-Way are further discussed in Section 6.15).

6.16.5 Unanticipated Discoveries

Enbridge has also developed an Unanticipated Discoveries Plan (Appendix F) for use during all Project construction activities. The Unanticipated Discoveries Plan prescribes actions to be taken in the event that previously unrecorded archaeological or historic site or human remains are discovered during construction activities, which sets forth the guidelines to be used in the event archaeological resources (including both prehistoric and historical resources) or human skeletal remains are discovered during construction activities. If any cultural resources are identified within the construction corridor possible archaeological and cultural materials or suspected human skeletal remains are identified during ground disturbing activities within the construction corridor, Enbridge would work with THPO representatives and any other applicable authorities to establish a mitigation strategy for pipeline construction and operation. Moreover, there will be Tribal Monitors, approved and trained by the Band, present during construction to ensure no sites are disturbed.

6.17 Air Quality

6.17.1 Existing Environment

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, which were developed by the EPA to protect human health and the environment. The criteria pollutants include carbon monoxide (CO), lead (Pb), nitrogen oxides (NO_X), ozone (O_3), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), particulate matter less than 10 microns in diameter (PM_{10}), and sulfur dioxide (SO_2). Criteria pollutant emissions from pipeline systems are predominantly limited to volatile organic compounds (VOC) from transferring crude oil to and from storage tanks and fugitive VOC emissions from piping components (such as valves, flanges, and pump seals). VOC is a precursor of ozone, which is one of the criteria pollutants. The Project will relocate a segment of the existing Line 4 pipeline that connects to the existing Clearbrook Terminal. No operational changes are proposed to the Clearbook Terminal associated with the Project; therefore, the Project will result in no operational emission changes.

6.17.2 Construction Impacts and Mitigation

Construction of the Project is not expected to have a substantial impact on air quality. Construction of the pipeline 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 amount of fugitive dust emissions would depend on the moisture content and texture of the soils that are disturbed. Generally, however, emissions from construction are not expected to cause or significantly contribute to a violation of any 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).

Enbridge will minimize dust generated from construction activities. The contractor will take reasonable steps to control dust near residential areas and other areas as directed by Enbridge. 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 such as high wind events. The use of these dust suppression techniques will minimize fugitive dust emissions during construction, and minimize potential air quality impacts on nearby residential and commercial areas.

In addition to combustion emissions and fugitive dust, the Project's disturbance of wetlands during construction has the potential to temporarily release greenhouse gasses (GHG), in the form of carbon dioxide (CO_2) to the atmosphere. Peatlands (i.e., bogs, fens, and marshes) represent the single largest terrestrial carbon stock in the state of Minnesota. Undisturbed

peatland areas contain large, thick deposits of organic materials that have accumulated over long periods of time in saturated conditions where decomposition is minimal. Drainage and disturbance of these wetland areas introduces the accumulated organic material to oxygen resulting in comparatively rapid decomposition and a rapid release of CO_2 to the atmosphere. Enbridge's restoration of the wetlands following construction has the potential to sequester carbon from the atmosphere. This sequestration process would occur much more slowly than the carbon release associated with wetland disturbance but may ultimately result in total carbon accumulation that is comparable to an undisturbed wetland of a similar type. Peatlands in Minnesota have been accumulating carbon for on the order of 5,000 years, and peatlands can continue to accrue carbon for millennia. Because carbon accumulation in wetlands occurs gradually and over long periods of time, a restored wetland must be preserved over very long timescales to offset carbon released due to disturbance.

Based on the carbon cycle in wetlands and the potential impacts of the Project, construction activities will result in temporary carbon cycle impacts ranging from possible decreases in wetland carbon sequestration or partial loss of accumulated carbon to total loss of accumulated wetland carbon. Different wetland types will experience different levels of carbon release during construction and re-sequestration after restoration. It would be very difficult to predict with any certainty what the release or re-sequestering values will be.

6.17.3 Operations Impacts and Mitigation

Emissions of criteria pollutants at the Clearbrook Terminal will continue to be regulated under an air emissions permit. Emissions will not increase at the facility because there is no increase in throughput as a result of the Project. Indirect criteria and GHG emissions will be generated as a result of using purchased electricity to run the pumps at Enbridge's existing Line 4 pump stations, which may require some modification as part of the Project but will not increase GHG emissions.

Minnesota GHG Reduction Goals

The operation of crude oil pipelines generates very little direct GHG emissions. Direct GHG emissions may be generated from trace amounts of methane contained in the crude oil as it is transferred through tankage at the terminals. Indirect GHG emissions will be generated by utility companies that provide electricity to Enbridge. Enbridge uses electricity to operate electric pumps that transport the crude oil through the pipeline. These pumps are located at pump stations along the pipeline at locations that are determined by a variety of factors including engineering design, terrain, power availability, and delivery needs.

Enbridge understands that Minnesota has GHG reduction goals as set out in Minnesota Statutes, Section 216H.02. Enbridge's pipelines are currently designed to operate efficiently, which minimizes demand for electricity (and as a result minimizes indirect GHG emissions). Because operation of the pipeline does not directly produce significant amounts of GHG emissions,

operating the pipeline in the most efficient manner possible is the best way that Enbridge can help meet Minnesota's GHG reduction goals.

6.18 Permit Table

Table 6.18-1 lists the government agencies or authorities, title of each permit or certificate, anticipated application and decision dates, and status of the permit or certificate Enbridge must file for the Fond du Lac Band Line 4 Project. Enbridge will work with all regulatory agencies with permitting authority over the Project and will satisfy all permit requirements of those agencies.

Table 6.18-1
Preliminary List of Government Authorities and Titles of Permits/Approvals
(Fond du Lac Band Line 4 Project)

Name of Agency	Title of Permit/ Approval	Date of Application [a]	Date of Decision	Status
United States Army Corps of Engineers – St. Paul District and Minnesota Pollution Control Agency	Section 404 Regional General Permit	January 2018	Pending	Pending submittal
United States Fish and Wildlife Service	Section 7 Endangered Species Act Consultation (Federal endangered species)	December 2018	Pending	Initial consultation in December 2018. Further consultation pending
Bureau of Indian Affairs	Grant of Right-of-Way	February 2019	Pending	Initial consultation meeting October 2018. Pending submittal.
United States Protection Agency	Hydrostatic Test Water Discharge Permit	February 2019	Pending	Pending submittal
Fond du Lac Band	Standard Wetland Activity Permit	January 2019	Pending	Initial consultation meeting October 2018. Pending submittal.
	Land Use Permit	February 2019	Pending	Initial consultation meeting October 2018. Pending submittal.
	401 Water Quality Certification	January 2019	Pending	Initial consultation meeting October 2018. Pending submittal.
	Threatened and Endangered Species Consultation	October 2018	Pending	Initial consultation meeting October 2018. Pending submittal.

Table 6.18-1
Preliminary List of Government Authorities and Titles of Permits/Approvals
(Fond du Lac Band Line 4 Project)

Name of Agency	Title of Permit/ Approval	Date of Application [a]	Date of Decision	Status
Fond du Lac Band	Timber Removal Permit	February 2019	Pending	Initial consultation meeting October 2018. Pending submittal.
	Right-of-Way Ordinance Consent	December 2018	February 2019	Complete
Minnesota Public Utilities Commission	Pipeline Routing Permit	February 2019	Pending	Pending submittal
Minnesota Department of Natural Resources	License to Cross Public Waters	February 2019	Pending	Initial consultation in December 2018. Pending submittal
	License to Cross Public Lands	February 2019	Pending	Initial consultation in December 2018. Pending submittal
	Water Appropriation General Permit (hydrostatic test water and trench dewatering)	February 2019	Pending	Pending submittal
	State Endangered Species Consultation	December 2018	Pending	Initial consultation in December 2018.
Tribal Historic Preservation Office	Cultural Resources Consultation, NHPA Section 106 Clearance	October 2018	Pending	Initial consultation in October 2018. Further consultation pending
Minnesota Department of Transportation	Road Crossing Permits	April 2019	Pending	Pending Submittal
Carlton County	Wetland Conservation Act Utility Exemption	February 2019	Pending	Pending Submittal
Carlton County	Conditional Use Permits[b] and Road Crossing Permits	Pending	Pending	Pending submittal

Table 6.18-1
Preliminary List of Government Authorities and Titles of Permits/Approvals
(Fond du Lac Band Line 4 Project)

Name of Agency	Title of Permit/ Approval	Date of Application [a]	Date of Decision	Status
St. Louis County	Wetland Conservation Act Utility Exemption	February 2019	Pending	Initial consultation in December 2018. Further consultation pending
St. Louis County	Conditional Use Permits[b] and Road Crossing Permits	Pending	Pending	Pending submittal
Arrowhead Township	Road Crossing Permits	Pending	Pending	Pending submittal
Perch Lake Township	Road Crossing Permits	Pending	Pending	Pending submittal
Progress Township	Road Crossing Permits	Pending	Pending	Pending submittal

[a] Actual date of initial consultation/anticipated dates for submission.
[b] If facilities are located outside the MPUC Designated Route.

6.19 Cumulative Potential Effects

Pursuant to Minn. R. 7852.0700, subp. 3(I), the Commission will consider the "cumulative potential effects of related or anticipated future pipeline construction." Because both the Project and the Line 3 Replacement Project are planned to be constructed during similar timeframes and will both require the acquisition of new rights-of-way and temporary workspace, this section discusses the cumulative temporary and permanent impacts of the Project and the Line 3 Replacement Project, as well as the ways that the projects minimize impacts. Enbridge is not aware of any other anticipated future pipeline construction in the vicinity of the Project, other than ongoing operations and maintenance on the Enbridge Mainline System as further described in Section 7.3.

With respect to temporary impacts, the Projects will use a temporary construction workspace that varies from 115 feet wide to 140 feet wide, depending on the terms of existing easements and the current alignment of existing pipelines or utilities within existing easements. The Project construction workspace will overlap the Line 3 Replacement Project construction workspace to the extent practicable, and will require an additional 20 feet of temporary workspace not used during construction of the Line 3 Replacement Project. The temporary workspaces will also overlap with, or be contiguous to, Enbridge's existing Mainline Corridor to the extent practicable. With the exception of minimal valve site fill impacts, wetland impacts associated with both projects would be limited to temporary impacts during construction and long-term conversion of the forested and scrub-shrub wetland vegetative cover within the associated operationally maintained rights-of-way. Emergent wetland habitats affected by these Projects are expected to rapidly reestablish after workspaces are restored. Similar temporary impacts are associated with clearing of upland forest for construction workspace.

With respect to permanent impacts, construction of both the Fond du Lac Line 4 Project and the Line 3 Replacement Project within the Fond du Lac Reservation would result in an incremental widening of the operational Mainline Corridor Right-of-Way through the Fond du Lac Reservation. The Line 3 Replacement Project would expand the existing Mainline Corridor operational easement up to 26.5 feet. The Fond du Lac Line 4 Project would incrementally expand the operational easement by up to 40 additional feet. This will result in the conversion of forested and scrub-shrub wetlands to emergent wetlands and the conversion of upland forests to herbaceous habitat within the expanded Mainline Corridor operational right-of-way. It would also impact upland forested land. Because both projects are located adjacent to the existing Enbridge Mainline Corridor, impacts would primarily affect the forest edge through expansion of the existing right-of-way corridor. The forest edge, and associated vegetative strata reflective of microhabitat conditions therein, is expected to shift with right-of-way expansion. A shifting forest edge is not anticipated to have significant effects on plant diversity or wildlife because the landscape level habitat variety remains stable.

The design and routing of both projects minimizes potential temporary and cumulative impacts. For example, land requirements have been minimized by the Project's Preferred Route, which

was selected in coordination with the Fond du Lac Band to primarily share and/or run parallel to the existing Enbridge Mainline Corridor. Enbridge has designed both projects to use workspace within or adjacent to the Enbridge Mainline Corridor and largely within areas previously disturbed as part of past Enbridge projects (existing Lines 1, 2, 3, 4, 13, and 67), which have been in operation since 1950, 1954, 1963, 1973, 2009, and 2009, respectively. The Fond du Lac Line 4 Project and the Line 3 Replacement Project collectively would impact similar, and in some cases many of the same, resources that were impacted in the past by previous Enbridge projects. However, given the age of the majority of the past impacts and the subsequent period of restoration of affected resources, the impacts associated with the Fond du Lac Line 4 Project and Line 3 Replacement Project are considered incremental to the historical impacts of prior Enbridge projects.

New resource disturbance has been further minimized by Enbridge's proposed construction schedule and workspace overlap with the Line 3 Replacement Project. As previously stated, Enbridge intends to construct the Fond du Lac Line 4 Project immediately following the construction of the Line 3 Replacement Project and use the same construction workspace, to the extent practicable, to minimize overall resource disturbance. In addition, forest fragmentation is reduced when linear projects are co-located, although a wider corridor may result in greater difficulty for some species to cross the corridor.

Based on this analysis, the extent of the combined impacts from the Fond du Lac Line 4 and Line 3 Replacement Projects would not contribute to significant cumulative resource impacts.

7.0 Removal of Existing Line 4

After the Project goes into service, the existing Line 4 segment will be removed from the Fond du Lac Band Reservation after it has been disconnected and deactivated and upon approvals from appropriate permitting authorities such as the MNDNR, USACE, and the Fond du Lac Band. The process by which the pipeline segment will be permanently taken out of service is designed to adhere to the applicable environmental rules and regulations, and to ensure the protection of the public, the environment, current land use, and adjacent Enbridge pipelines.

Fond du Lac Band has raised concerns that the above-grade Fond du Lac Band Line 4 segment creates a barrier to the natural water flow across the Reservation and, in some areas, impedes land access for the Band members. Planned future removal of the existing segment of Line 4 in Fond du Lac Band Reservation will provide enhanced access to Fond du Lac Band lands by removing the aboveground pipe. The Project will allow water to move naturally across the Enbridge Mainline Corridor, provide better land accessibility for the Fond du Lac Band Community, and improve the usability of this area for traditional purposes. The Project will also better protect Line 4 against third party damage.

7.1 Project Timing

Planned future removal of the existing Line 4 pipe will occur after installation of the Project. Timing depends on the receipt of required regulatory approvals and permits.

In addition, existing Line 3 and existing Line 4 lie adjacent to one another. To reduce risk of damaging an operating Line 3 pipeline, removal of Line 4 is planned to occur after Line 3 is relocated to the outside of the Enbridge Mainline Corridor and existing Line 3 is deactivated.

7.2 Pipeline Removal Process

Removing the segment of existing Line 4 that will be relocated may include the following activities:

- Purging: The existing segment of Line 4 will be purged of all oil.
- One call: Enbridge contacts the Gopher One Call system to locate where all of the third party utilities exist within the areas where work will be completed.
- Locate and 4 way sweeps: A 4 way sweep is when Enbridge locates its own pipelines and verifies the locations of any third party utilities as previously marked via the Gopher One Call system. This is done using electronic pipe locators to find, trace, and map underground.
- Visual indicators, such as lathe or flags, will be installed and monitored to ensure the safety of existing utilities.
- Potholing: Is an excavation method, typically done using a hydrovac truck, which creates a test hole to expose underground infrastructure to determine the horizontal and

vertical location of the facility. Per Enbridge's ground disturbance standards, visual confirmation of adjacent and crossed utilities (including other Enbridge pipelines) will be completed by way of exposing the pipeline in spot areas to confirm alignment.

- Rght-of-way access: Access roads will be developed to accommodate equipment travel and delivery and removal trips of materials, equipment, and pipe.
- Timber mat placement: the removal of a pipeline within a multi-pipe corridor necessitates the placement of timber mats over the active pipelines to ensure safe distribution of weight created by heavy construction equipment. Construction equipment then uses these mats as a working and travelling surface when excavating and removing the deactivated pipe.
- Installation of environmental protection equipment listed in Enbridge's Environmental Protection Plan (i.e., silt fence) (Appendix B).
- Dewatering structures/equipment are installed and utilized to abate the risk of soil instability to directly adjacent lines caused by water intrusion/events.
- Sheet piling: Installation of sheet piling may be required in areas where pipelines are in close proximity to other infrastructure or where there are slope stability concerns due to differences in either ground elevation, wet soils, saturated wetlands, or depth of cover.
- Inspections of existing utilities will be continuous throughout this process to ensure soil is stable throughout removal activities and to ensure there is no unplanned movement of the utility causing unsafe stresses.
- Topsoiling: Topsoil will be stripped and stockpiled. Topsoil will be removed, and subsequently stockpiled onsite, from areas above the to-be-removed pipeline and where heavy truck/equipment travel is predicted. Topsoil will be stored adjacent to the trench, or in designated areas nearby if conditions do not allow for local storage.
- Excavation: Soil around the pipeline, referred to as "ditch spoil," will be removed and stockpiled to accommodate safe access to the pipe for subsequent steps. Ditch spoil will be stored adjacent to the trench, or in designated areas nearby if conditions do not allow for local storage.
- Removal of existing set-on weights: where set-on weights are present, bolt-on weights will be unbolted, lifted from trench, and removed from site.
- First cutting of existing pipe: The pipe will be cut into long sections, inclusive of cuts around existing valves, and at crossings.
- Staging of existing pipe and valves: Long sections of pipe and valves will be lifted out of the trench and placed upon matting.

- Second cutting of pipe: Long sections will be further cut into shorter sections to accommodate lengths short enough to transfer and stack upon removal truck trailers.
- Removal of pipe and valves: Staged pipe and valves will be loaded onto trucks and removed from site.
- Pipe removal at crossings: Pending approval from the crossing authority, pipe will be removed via open cut, which was originally how the Line 4 pipe was installed. Each crossing removal will need to be engineered to ensure public safety and environmental protection. Where open cut is not possible or permitted by the crossing authority, the pipe will remain in place.
- Hauling of replacement fill: Fill will be hauled onsite and placed in the trench to fill in the space left when the pipe is removed. The trench width for the removal of the 48-inch pipe will be approximately 6 feet wide at the bottom of the trench and 12-15 feet wide at the top of the trench.
- Sheet piling removal: Sheet pile will be removed and hauled offsite.
- Trench backfill/grading: Trench will be backfilled and graded by using stockpiled trench spoil.
- Mat removal: Construction matting will be removed.
- Topsoil replacement/grading: Areas where topsoil was previously stripped will have stockpiled topsoil replaced and graded.
- Initial/final restoration and clean-up: Depending upon seasonality/conditions, site will be fully restored with appropriate seeding or will be stabilized until which time conditions allow for final restoration.

7.3 Continued Maintenance of the Right-of-Way

The existing Line 4 segment that will be removed is mostly located in the center of the Enbridge Mainline Corridor within the Fond du Lac Band Reservation. Therefore, where removal occurs and pipelines continue to operate within the existing easement and adjacent to and on both sides of the removal location, the removed Line 4 segment land will continue to be maintained within the Enbridge Mainline Corridor.

Fond du Lac Band and Enbridge have also agreed to complete additional maintenance activities within the Enbridge Mainline Corridor Right-of-Way through the Fond du Lac Band Reservation once the Line 4 Project is complete. This work will include lowering portions of Line 1, among other efforts. Line 1 lowering work will be done pursuant to the exemption in Minnesota Rule 7852.0300 and additional environmental and tribal approvals will be obtained as required.

These Projects will allow the Fond du Lac Band to meet important restoration goals on the Reservation. For example, at least three large formerly forested wetlands have been affected by altered hydrology as a direct result of the Line 4 above-ground exposures. In these areas, water on one side of the pipeline has been ponded for decades, causing the trees to die over time. This ponding has occurred off the Right-of-Way to affect 10s to 100s of acres of once-coniferous swamp or bog. In attempt to restore these areas to former forested wetland, the following steps will be undertaken by the Fond du Lac Band:

- Once the old Line 4 is removed, a period of hydrology "draw down" would begin, which in some cases, may take several years.
- At least in one location, a stream would have to be restored for proper draw down to be successful.
- At least in one location, a series of beaver dams would have to be removed for proper draw down to be successful.
- Once hydrology has stabilized at each restoration location, tree planting can begin, which would also take several years at some locations.
- Monitoring of the restorations would also be part of the Project.

The Fond du Lac Band has also identified several other stream channel reconnects/improvements that could be accomplished as part of Enbridge's access roads.

In summary, and as stated in Section 2.0 above, the purpose of this Project is to meet the Fond du Lac Band's concerns over current Line 4 on the Reservation. The Project will meet four important goals: (1) protection of Line 4 from third-party damage; (2) restoration of wetlands and other remediation; (3) improved land accessibility and access for timber management; and (4) elimination of exposed pipe segments. The Fond du Lac Band believes that the Project will benefit its Community by meeting each of these goals; Enbridge agrees.

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Fond du Lac Line 4 Project

Application for Pipeline Routing Permit and Partial Exemption

Minnesota Public Utilities Commission

Appendix A.1

Project Overview Preferred Route Maps

REVISED: March 15, 2019

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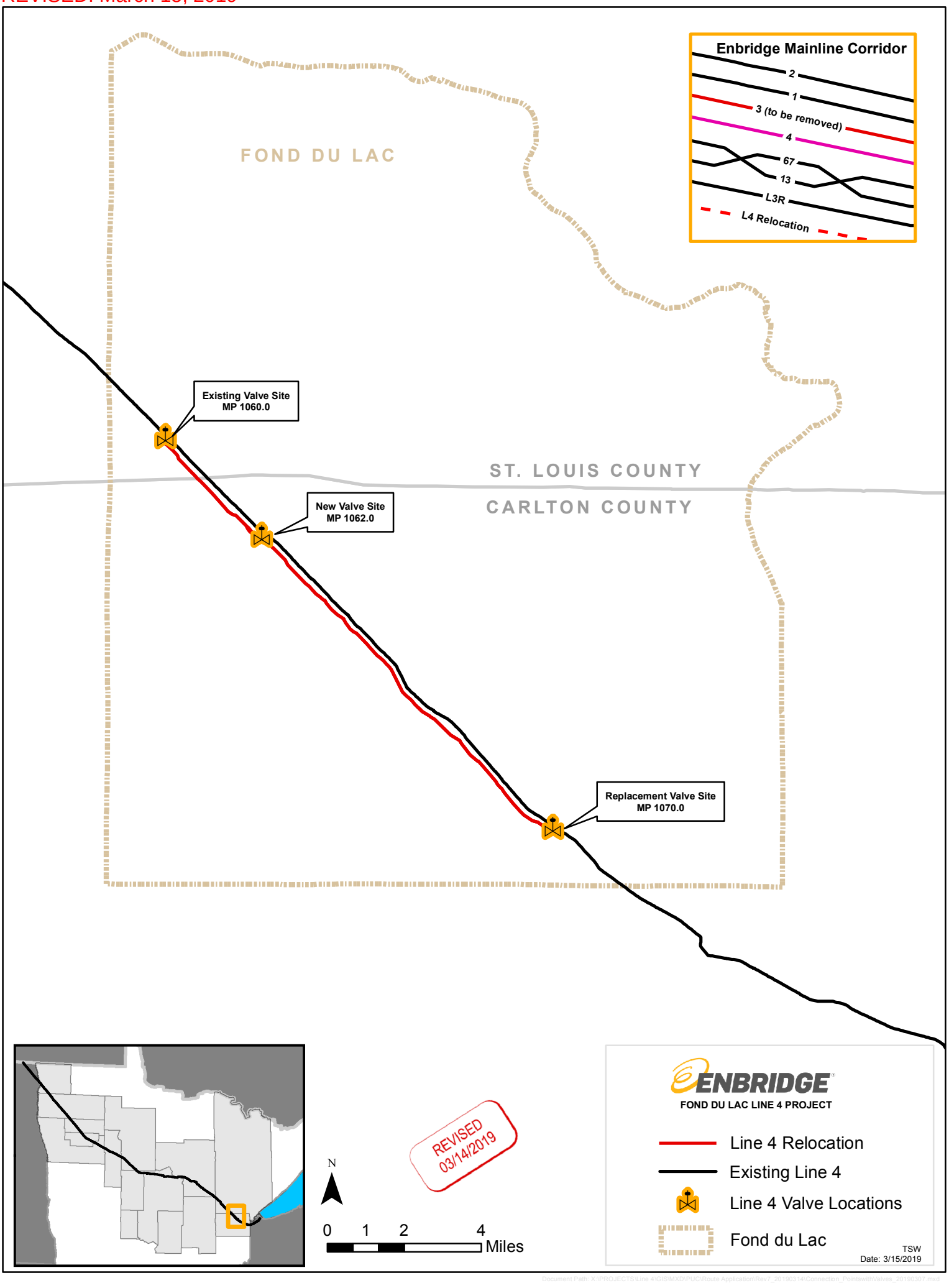

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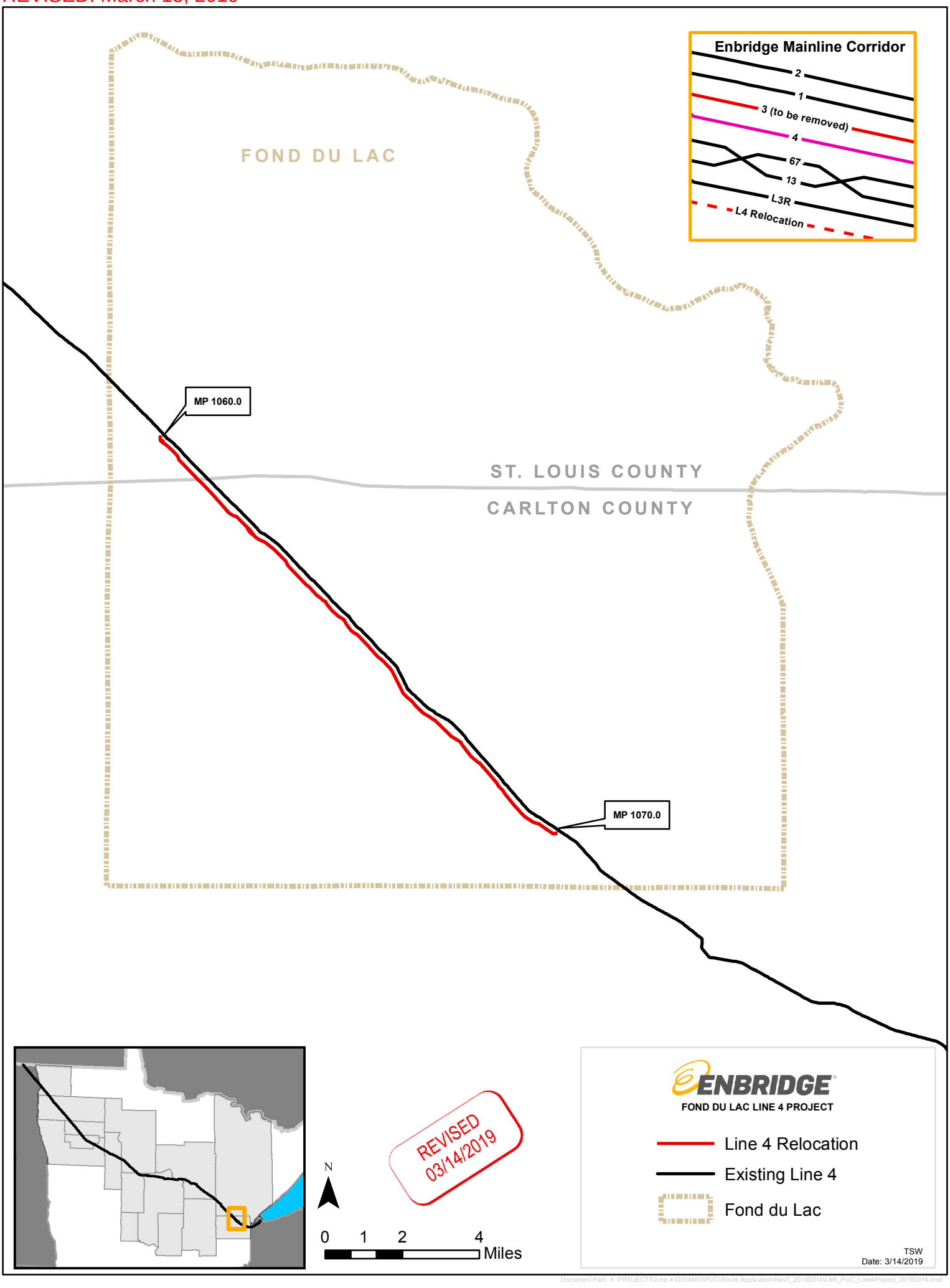

Fond du Lac Line 4 Project

Application for Pipeline Routing Permit and Partial Exemption

Minnesota Public Utilities Commission

Appendix A.2

Project County Maps

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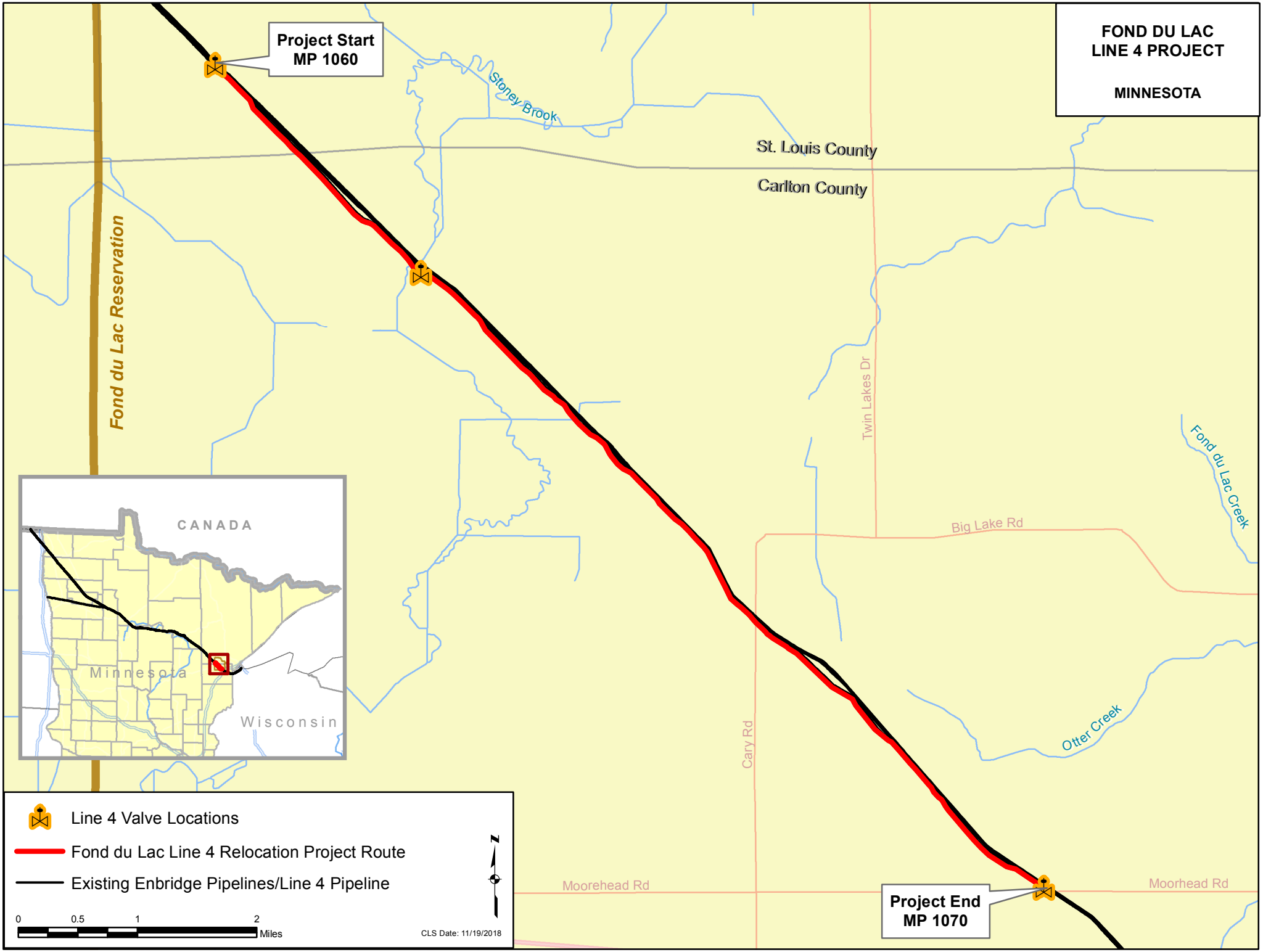
FOND DU LAC
LINE 4 PROJECT
MINNESOTA
Project Start
MP 1060
Project End
MP 1070
Stoney Brook
St. Louis County
Carlton County
Fond du Lac Reservation
Twin Lakes Dr
Fond du Lac Creek
Big Lake Rd
Otter Creek
Cary Rd
Moorehead Rd
Moorhead Rd
CANADA
Minnesota
Wisconsin
Line 4 Valve Locations
Fond du Lac Line 4 Relocation Project Route
Existing Enbridge Pipelines/Line 4 Pipeline
N
0
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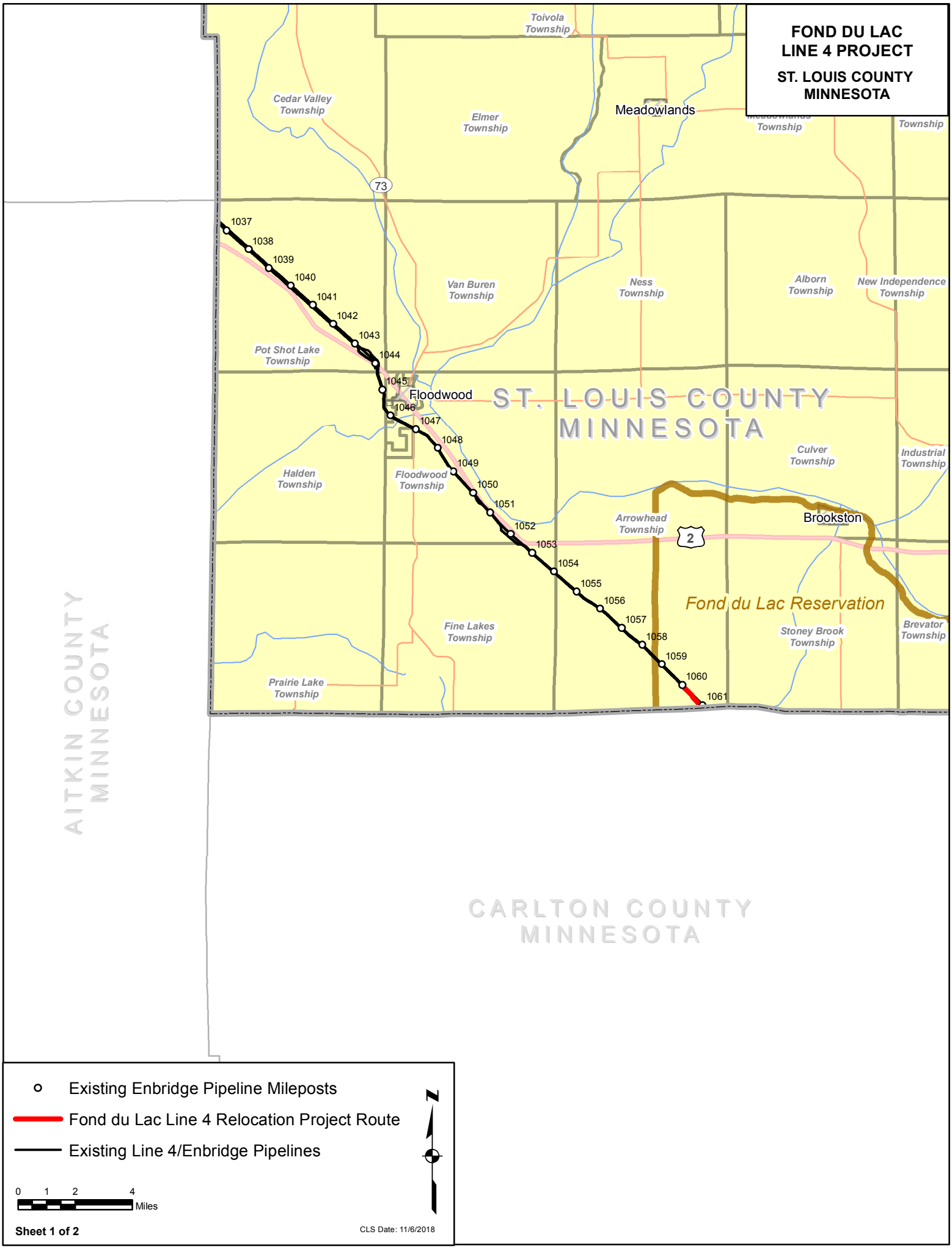
1
2
Miles
CLS Date: 11/19/2018


FOND DU LAC
LINE 4 PROJECT
ST. LOUIS COUNTY
MINNESOTA
Toivola Township
Cedar Valley Township
Elmer Township
Meadowlands
Township
Township
73
1037
1038
1039
1040
1041
1042
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1044
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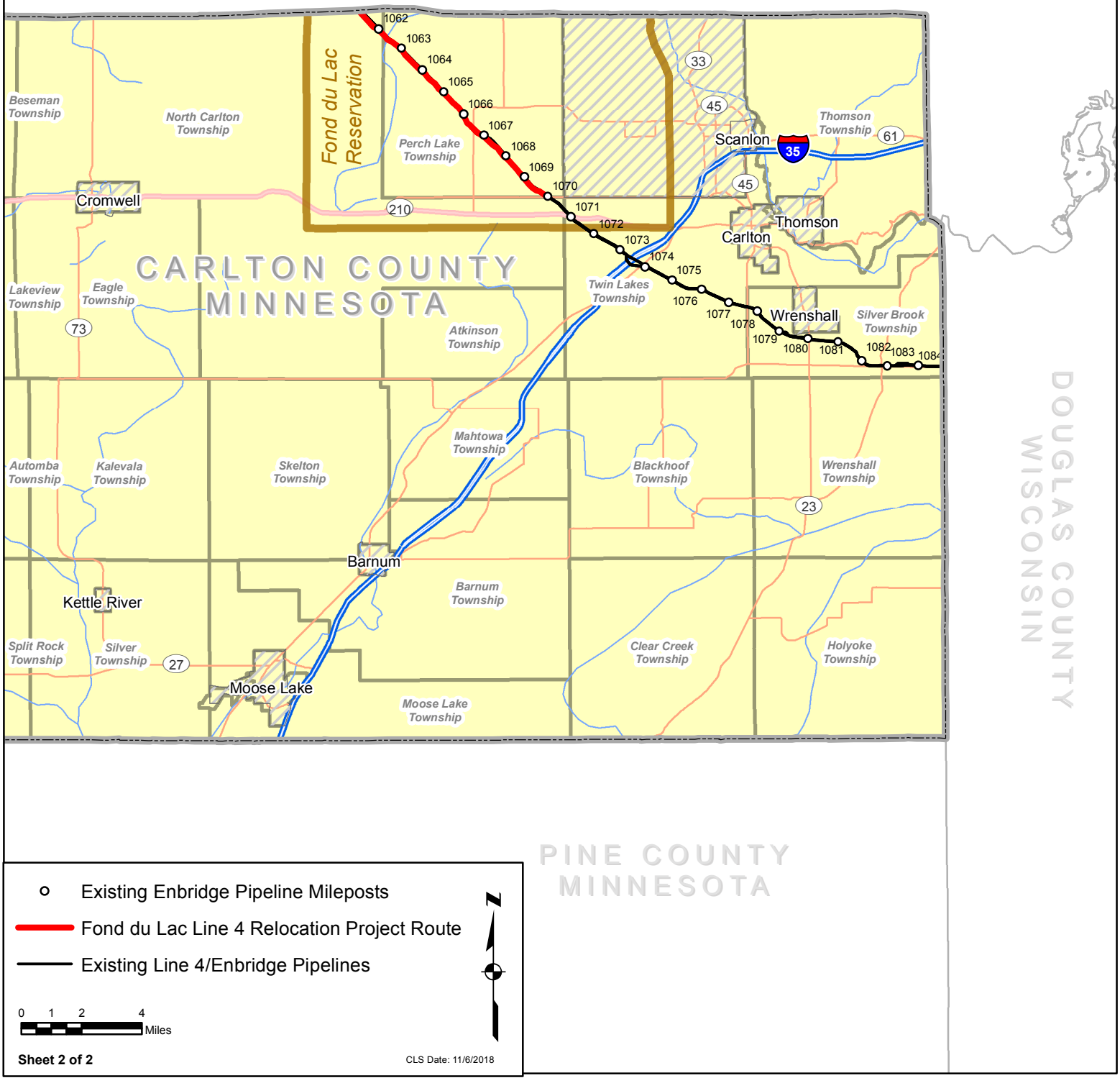
1061
Van Buren Township
Ness Township
Alborn Township
New Independence Township
Pot Shot Lake Township
Floodwood
ST. LOUIS COUNTY
MINNESOTA
Culver Township
Industrial Township
Halden Township
Floodwood Township
Arrowhead Township
2
Brookston
Fond du Lac Reservation
Fine Lakes Township
Stoney Brook Township
Brevator Township
Prairie Lake Township
AITKIN COUNTY
MINNESOTA
CARLTON COUNTY
MINNESOTA
Existing Enbridge Pipeline Mileposts
Fond du Lac Line 4 Relocation Project Route
Existing Line 4/Enbridge Pipelines
N
0 1 2 4
Miles
Sheet 1 of 2
CLS Date: 11/6/2018

FOND DU LAC LINE 4 PROJECT

CARLTON COUNTY MINNESOTA



Existing Enbridge Pipeline Mileposts

Fond du Lac Line 4 Relocation Project Route

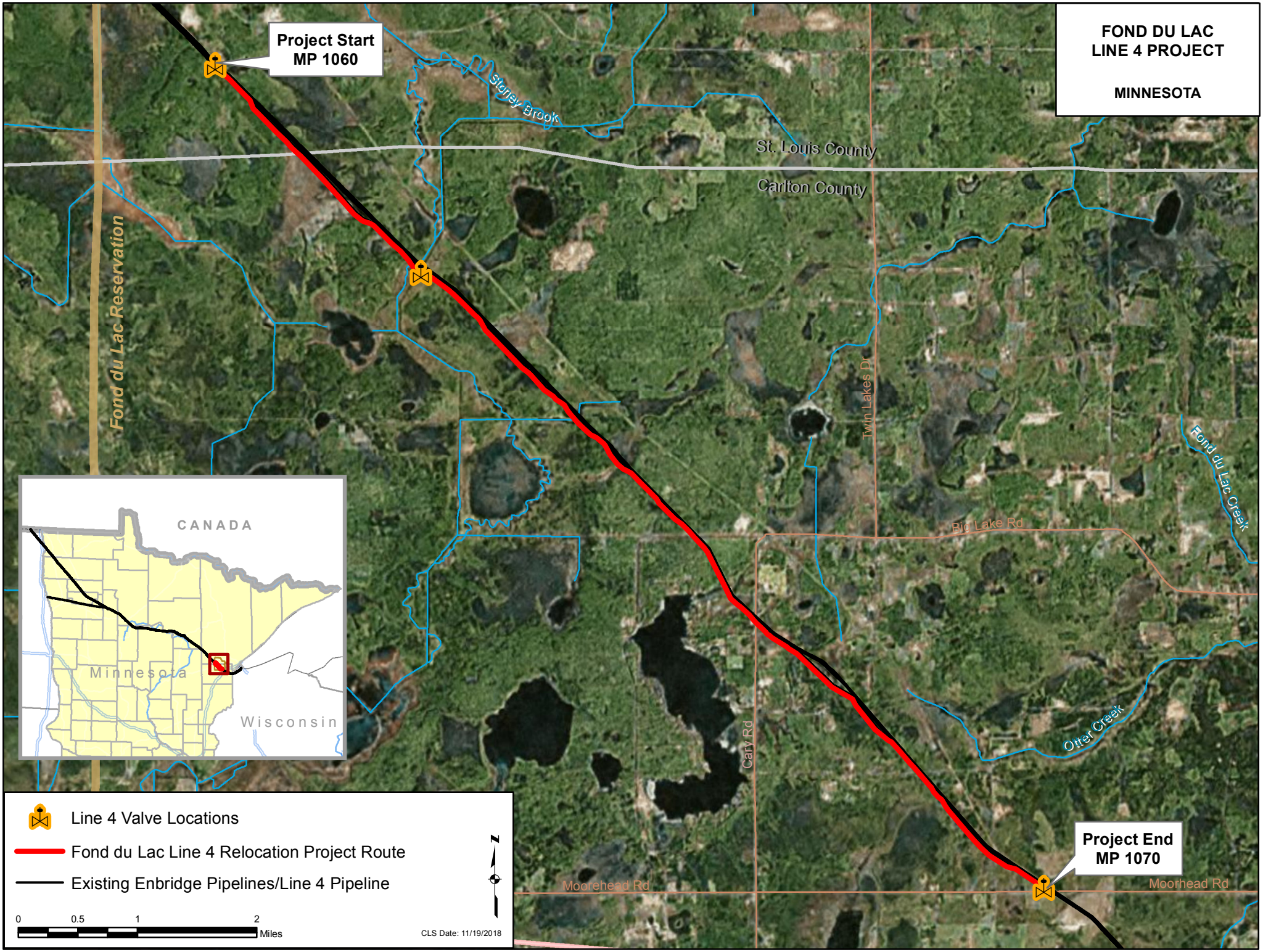
Existing Line 4/Enbridge Pipelines

0 1 2 4 Miles

N

Sheet 2 of 2

CLS Date: 11/6/2018


FOND DU LAC
LINE 4 PROJECT
MINNESOTA
Project Start
MP 1060
Project End
MP 1070
Stoney Brook
St. Louis County
Carlton County
Fond du Lac Reservation
Twin Lakes Dr
Fond du Lac Creek
Big Lake Rd
Otter Creek
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Moorehead Rd
Moorhead Rd
CANADA
Minnesota
Wisconsin
Line 4 Valve Locations
Fond du Lac Line 4 Relocation Project Route
Existing Enbridge Pipelines/Line 4 Pipeline
N
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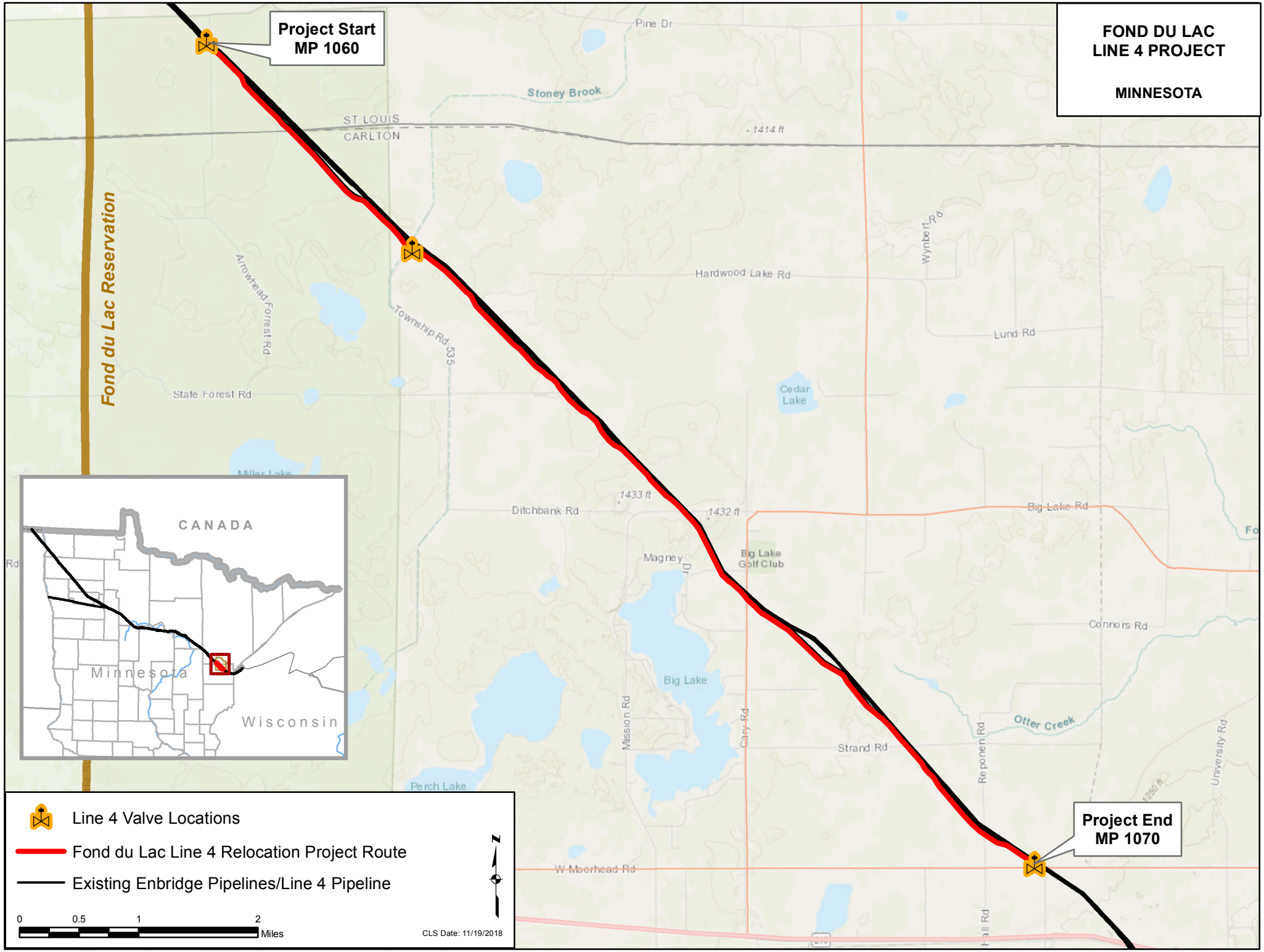
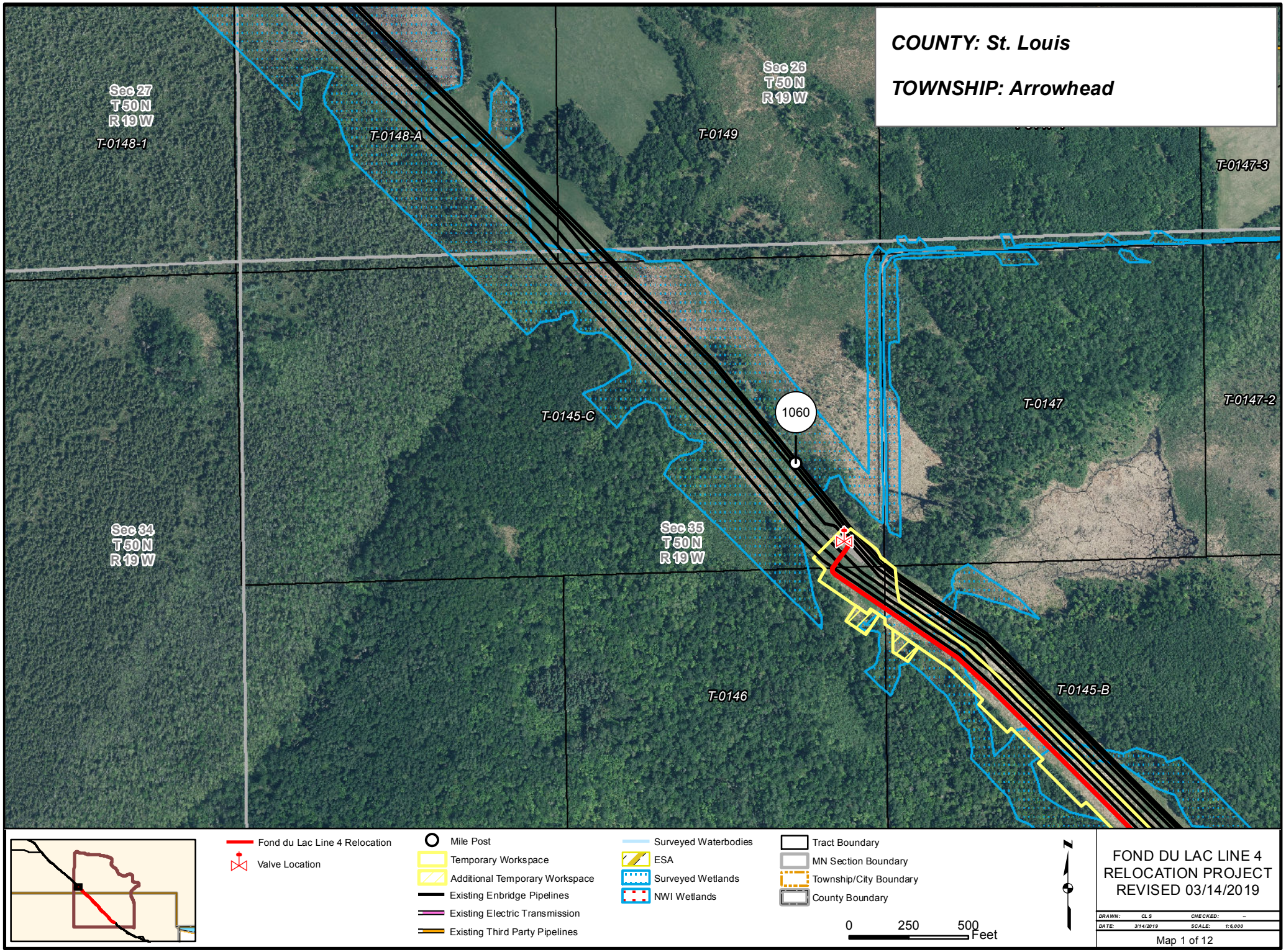
0.5
1
2
Miles
CLS Date: 11/19/2018


FOND DU LAC
LINE 4 PROJECT
MINNESOTA
Project Start
MP 1060
Project End
MP 1070
Fond du Lac Reservation
ST LOUIS
CARLTON
Stoney Brook
Pine Dr
1414 ft
Hardwood Lake Rd
Wynbert Rd
Lund Rd
Arrowhead Forrest Rd
Township Rd 535
State Forest Rd
Cedar Lake
Miller Lake
Ditchbank Rd
1433 ft
1432 ft
Big Lake Rd
Magney
Big Lake Golf Club
Connors Rd
Big Lake
Mission Rd
Cary Rd
Otter Creek
Strand Rd
Reponen Rd
University Rd
Perch Lake
W Moorhead Rd
Hall Rd
CANADA
Minnesota
Wisconsin
Line 4 Valve Locations
Fond du Lac Line 4 Relocation Project Route
Existing Enbridge Pipelines/Line 4 Pipeline
0
0.5
1
2
Miles
N
CLS Date: 11/19/2018

REVISED: March 15, 2019



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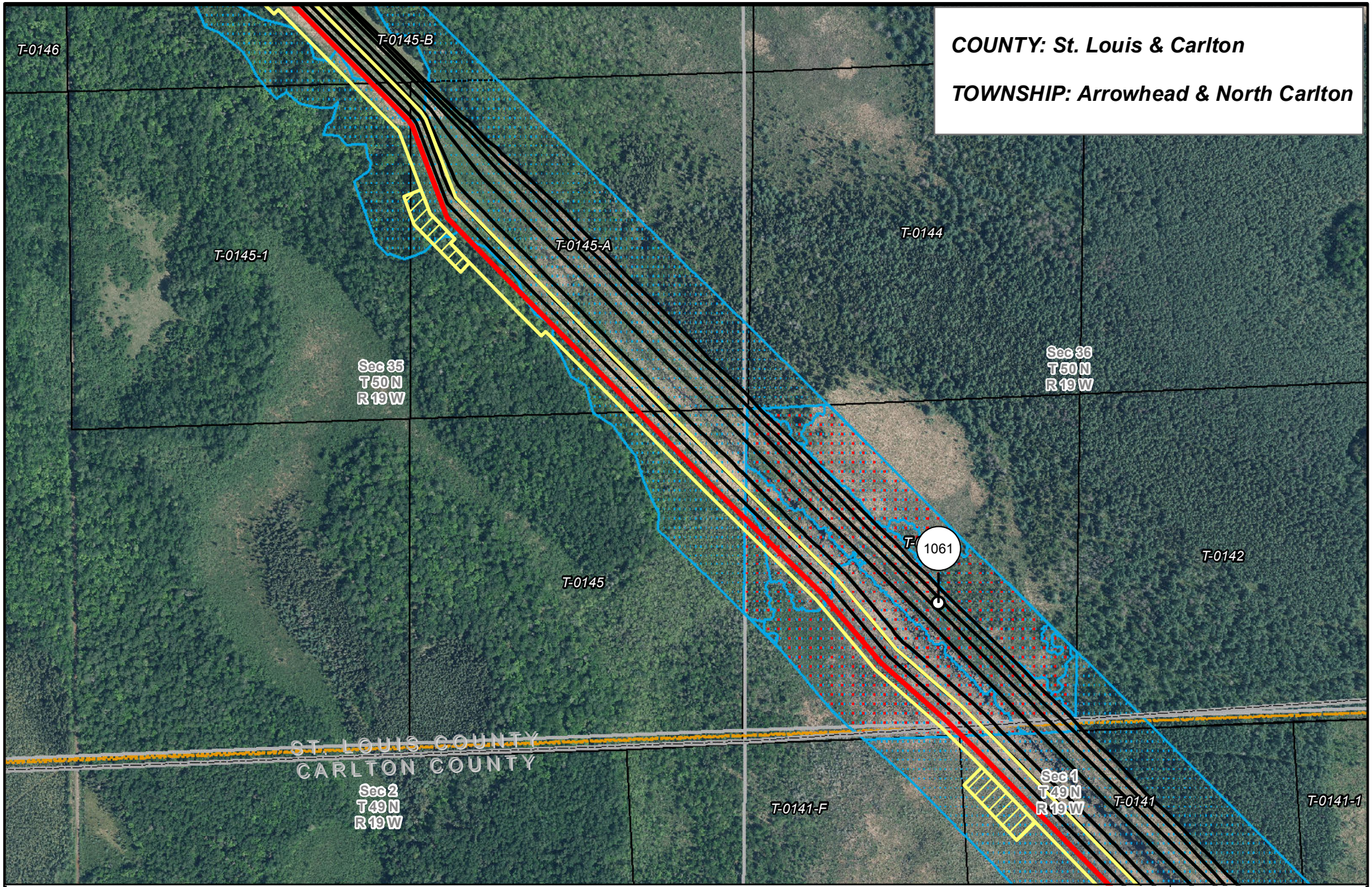

FOND DU LAC LINE 4
RELOCATION PROJECT
REVISED 03/14/2019

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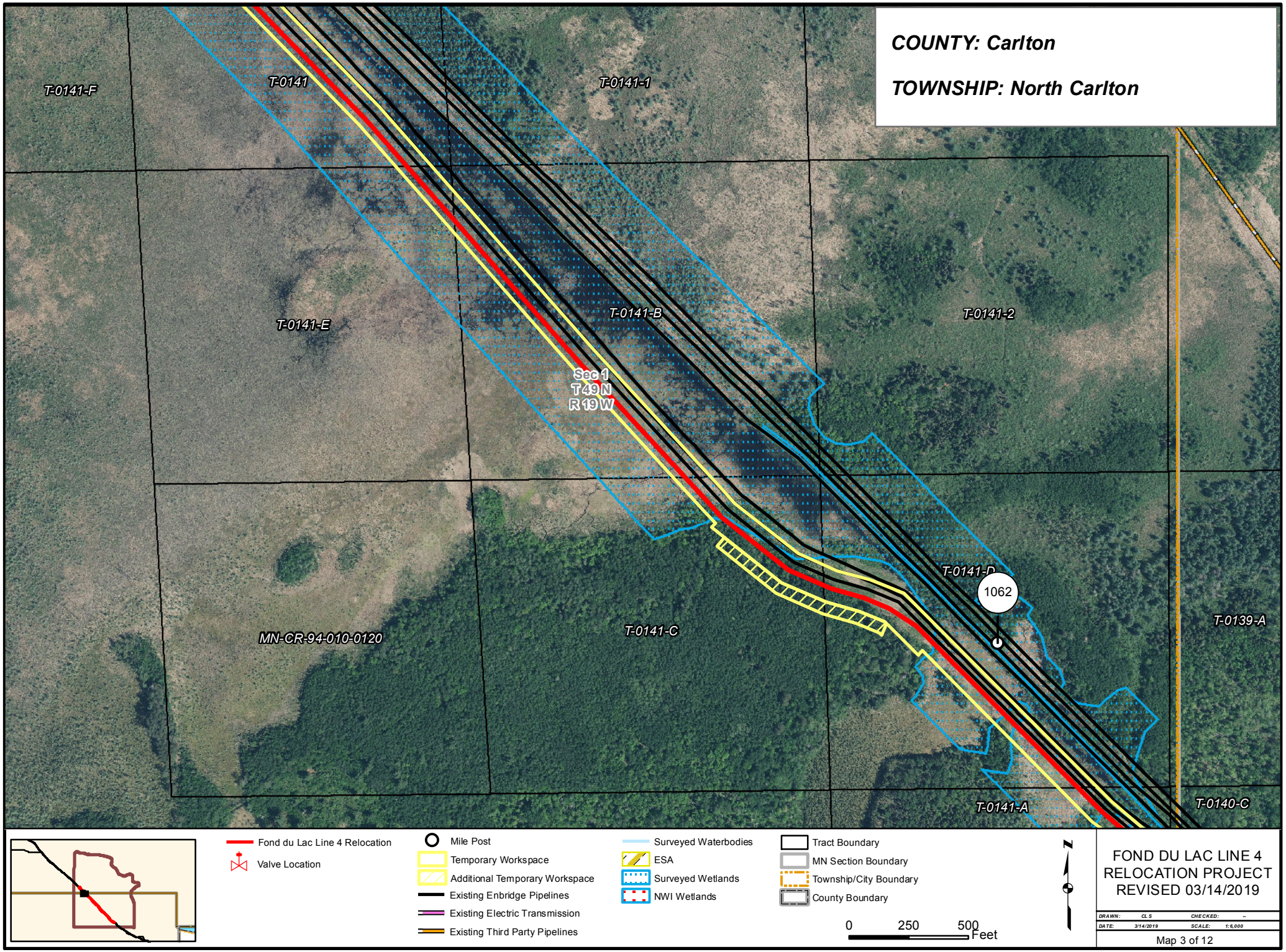
Map 2 of 12

REVISED: March 15, 2019



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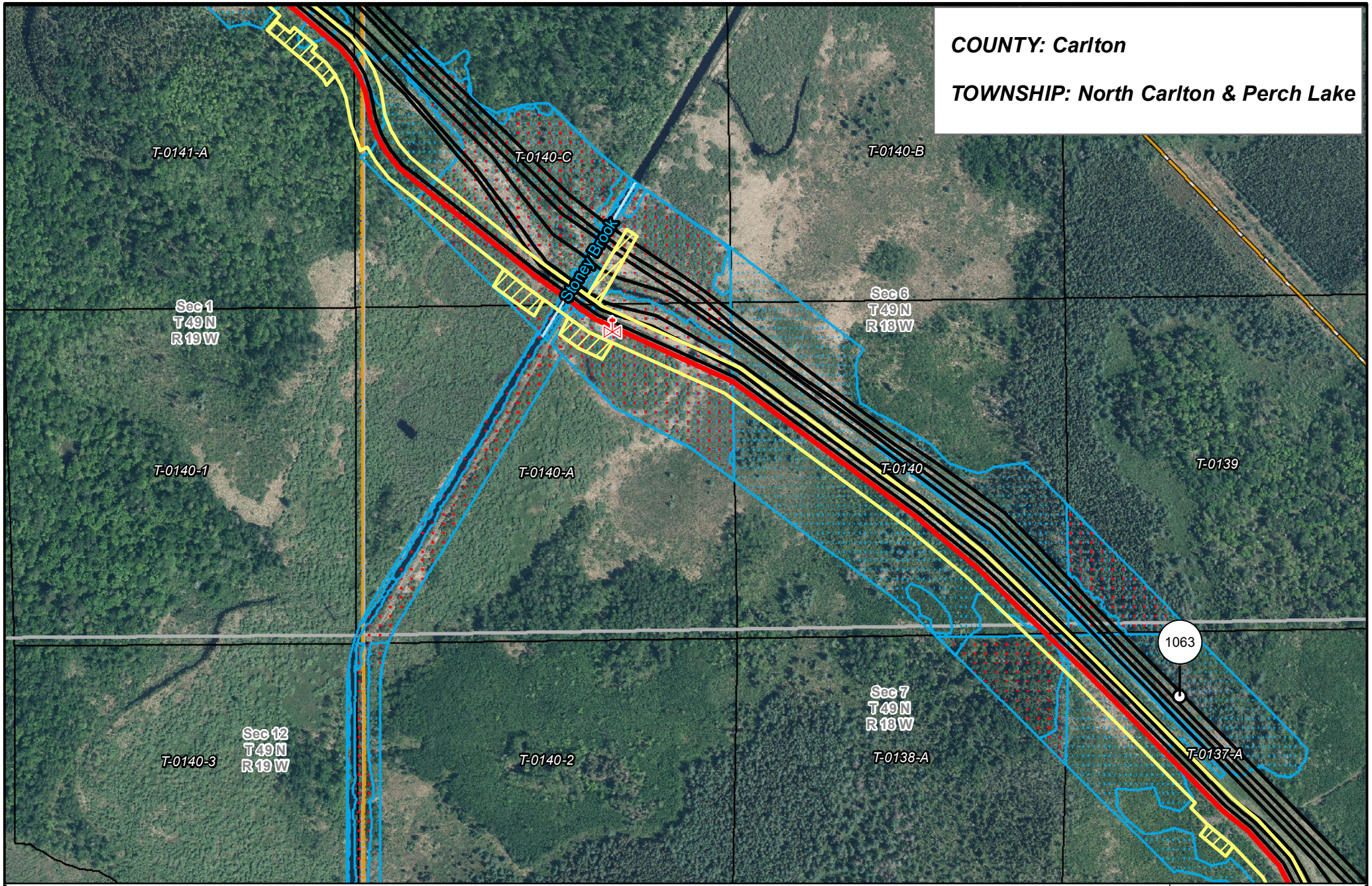

FOND DU LAC LINE 4 RELOCATION PROJECT
REVISED 03/14/2019

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Map 4 of 12

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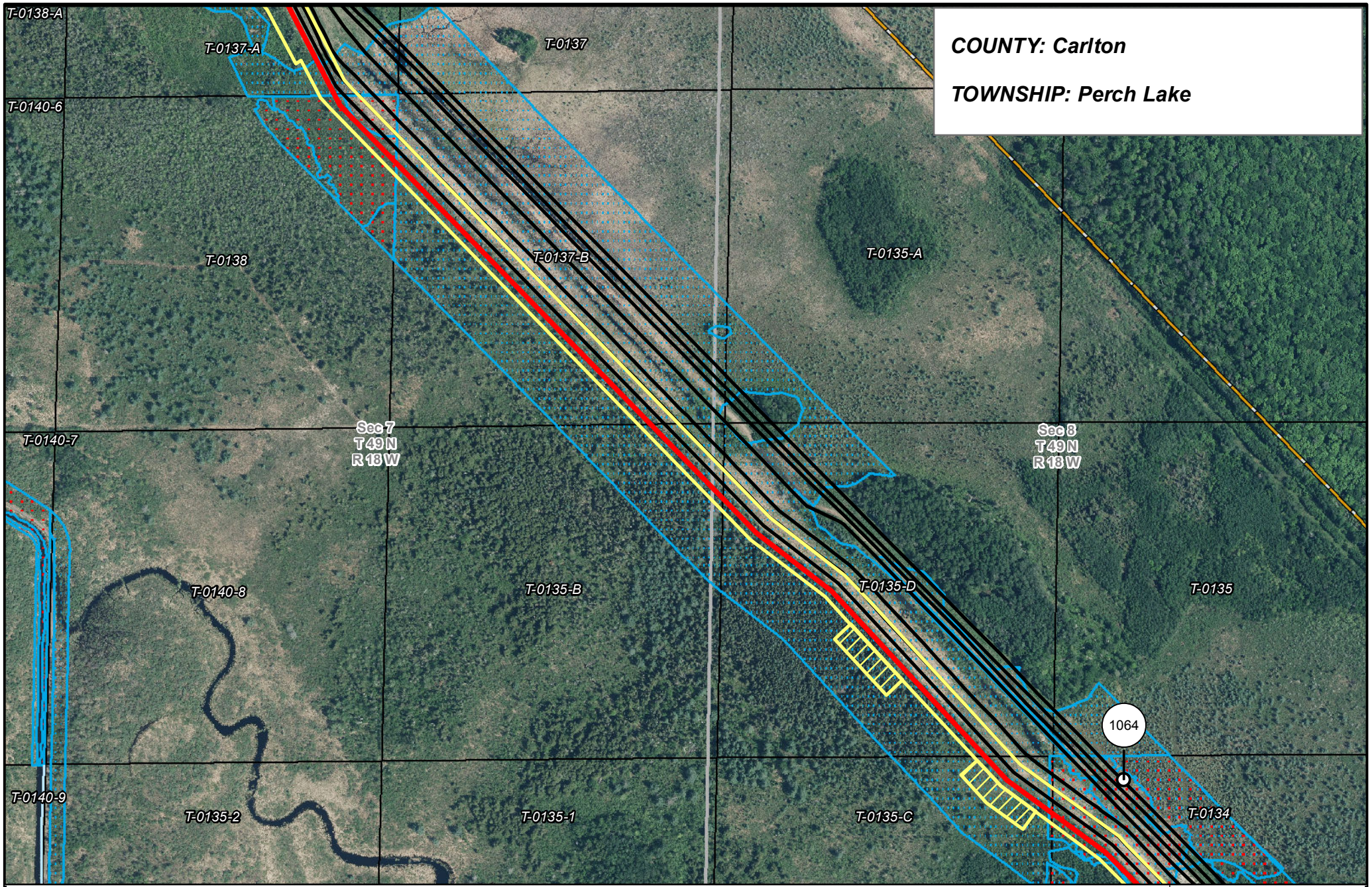

FOND DU LAC LINE 4 RELOCATION PROJECT
REVISED 03/14/2019

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Map 5 of 12

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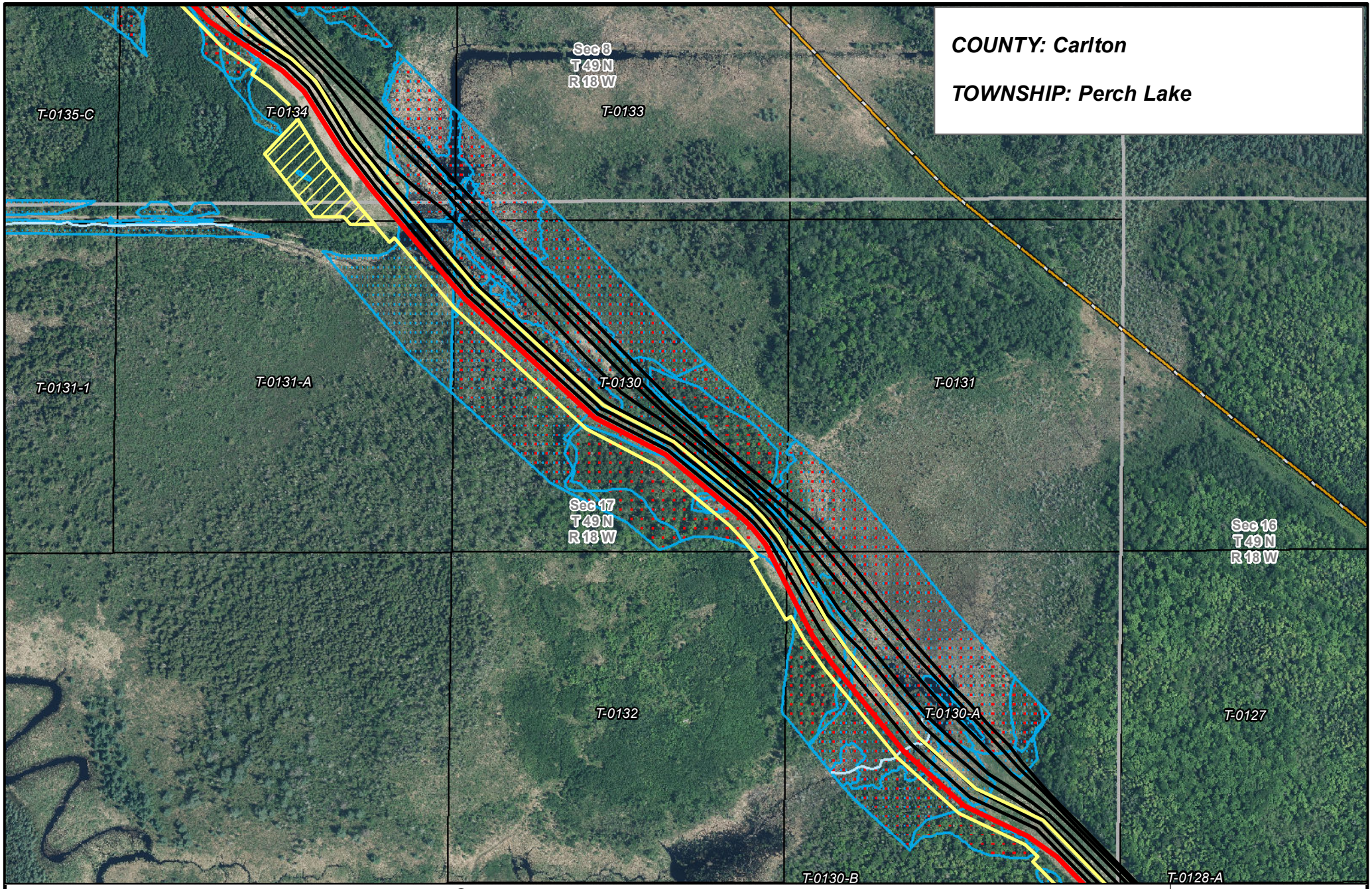

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Map 6 of 12

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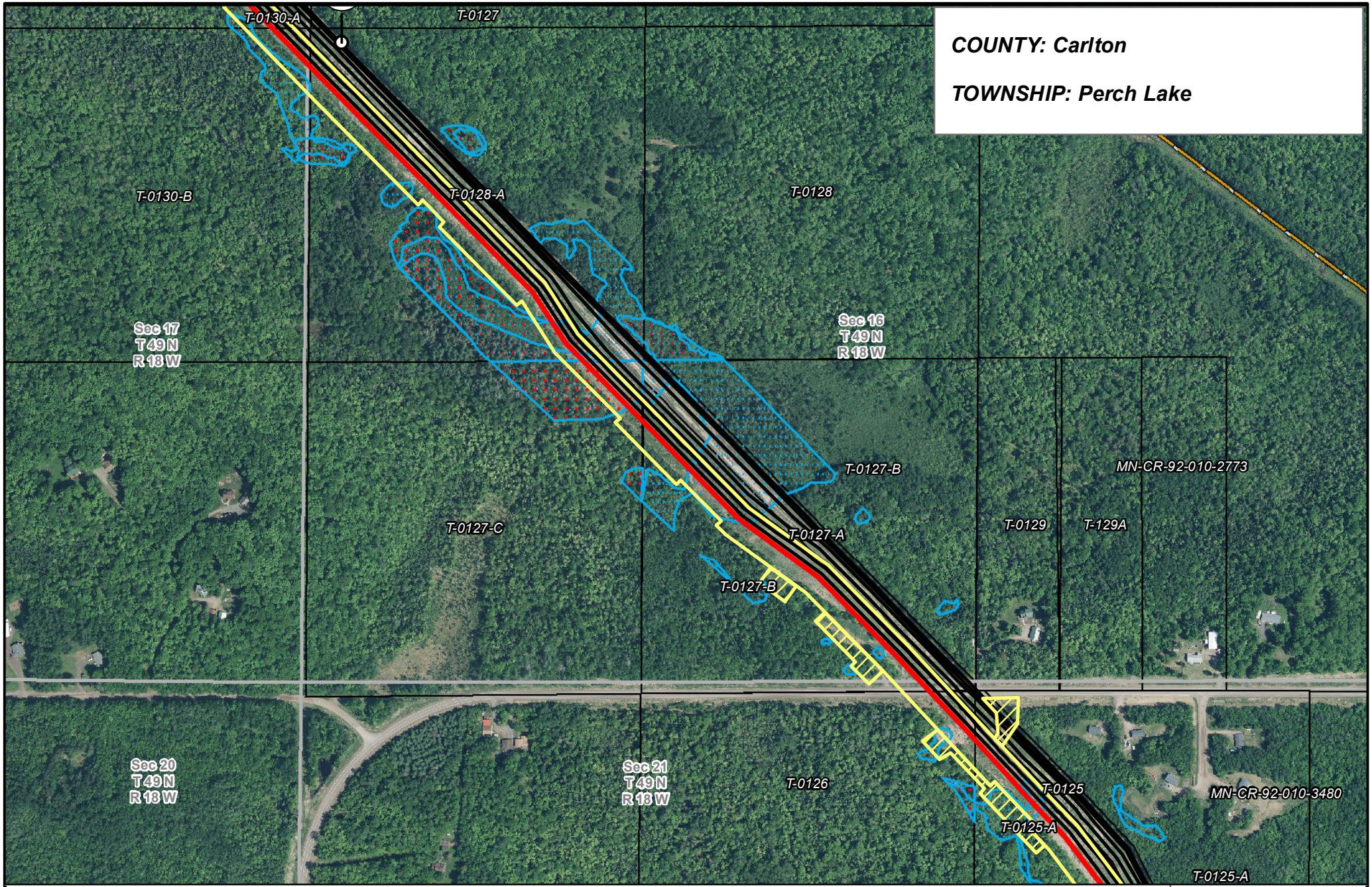

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Map 7 of 12

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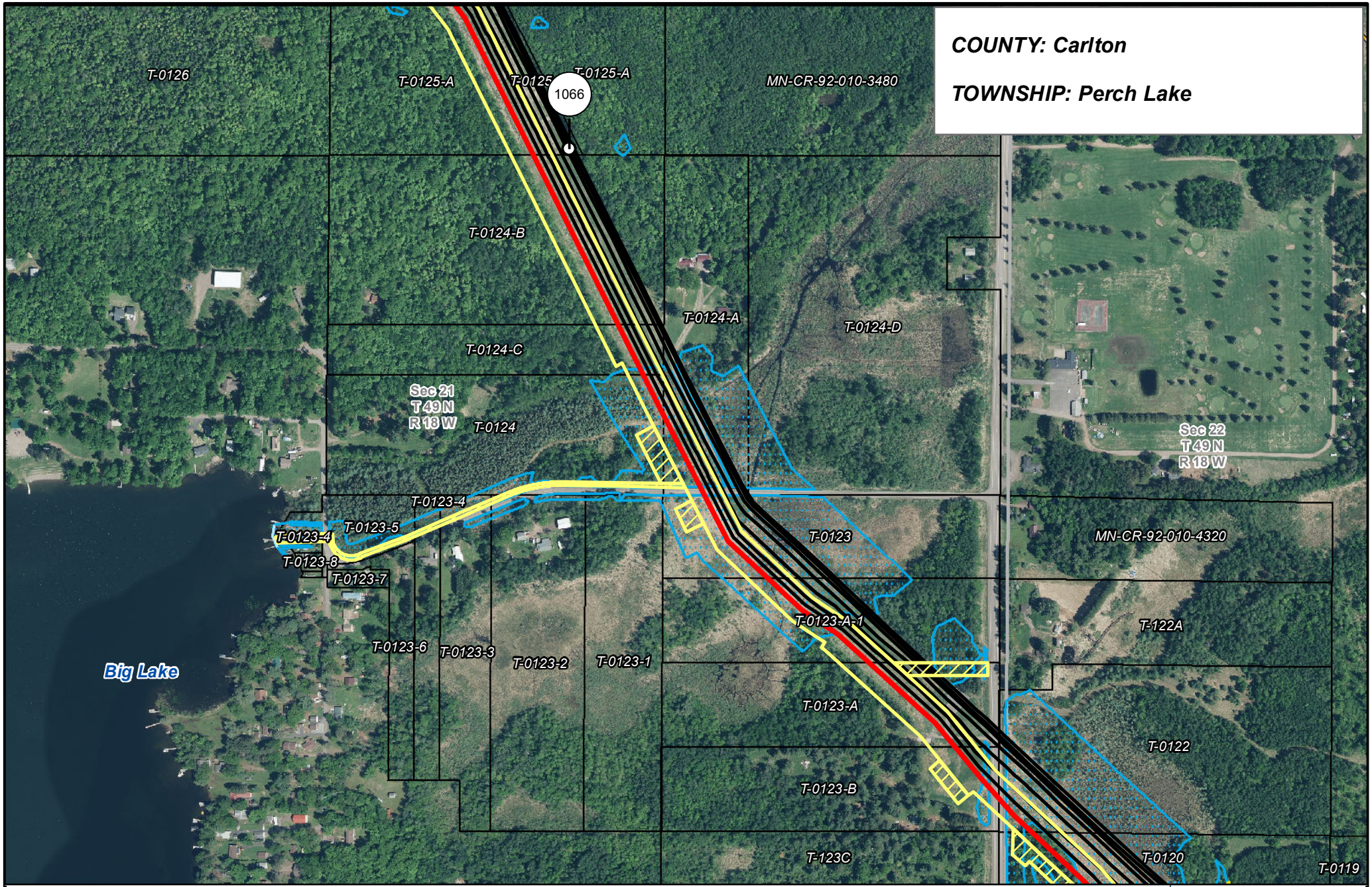

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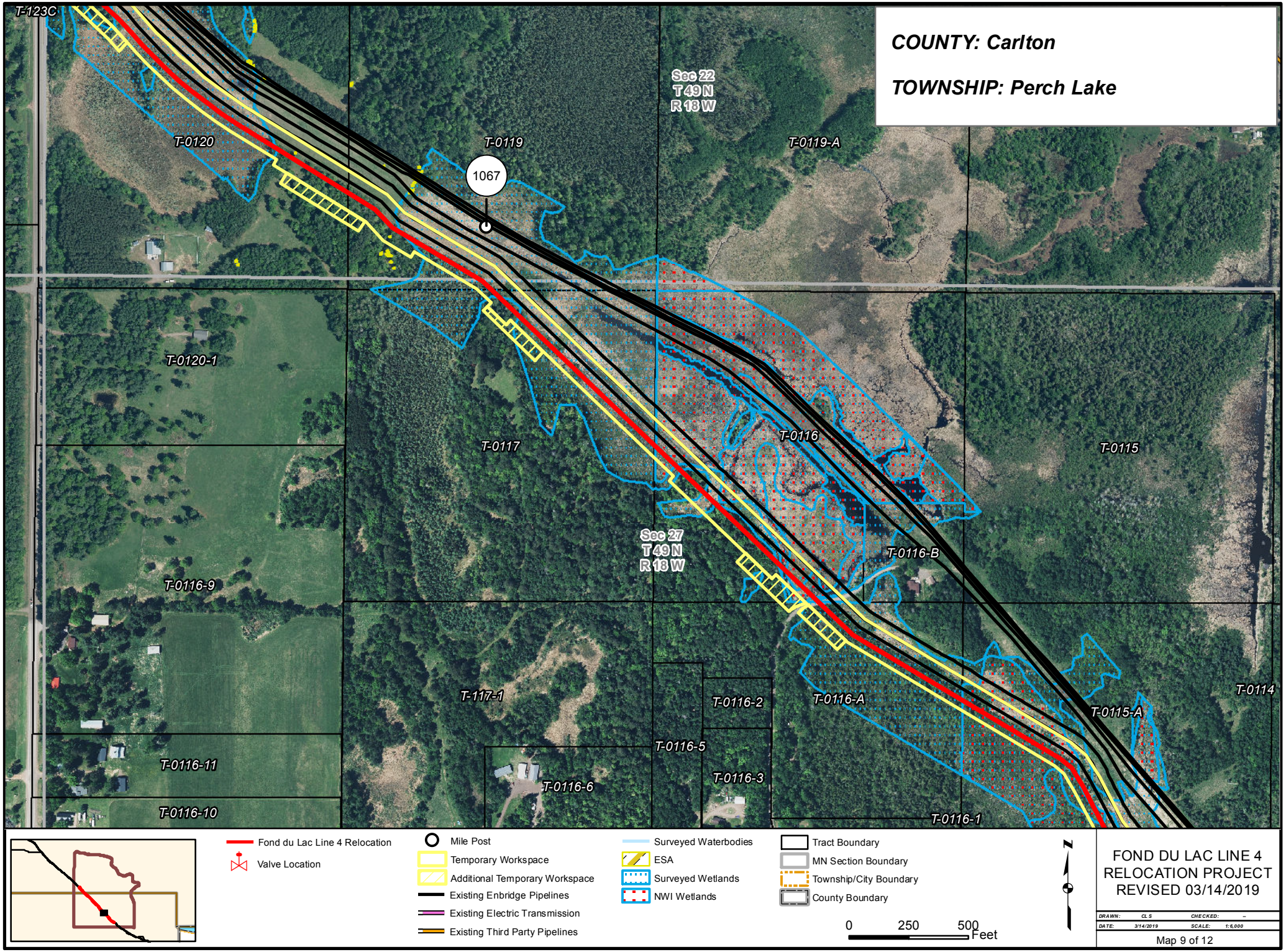

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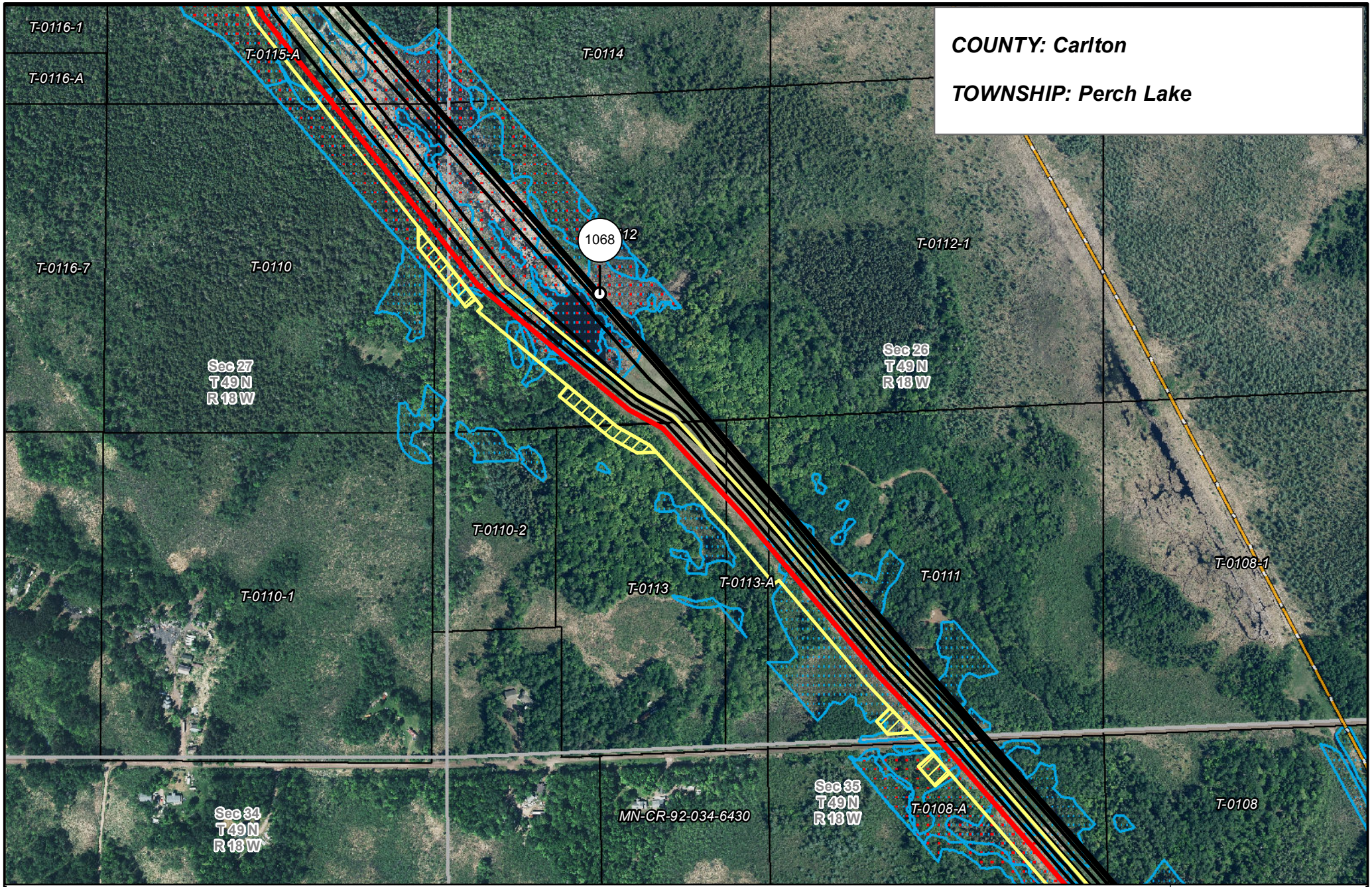

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Map 10 of 12

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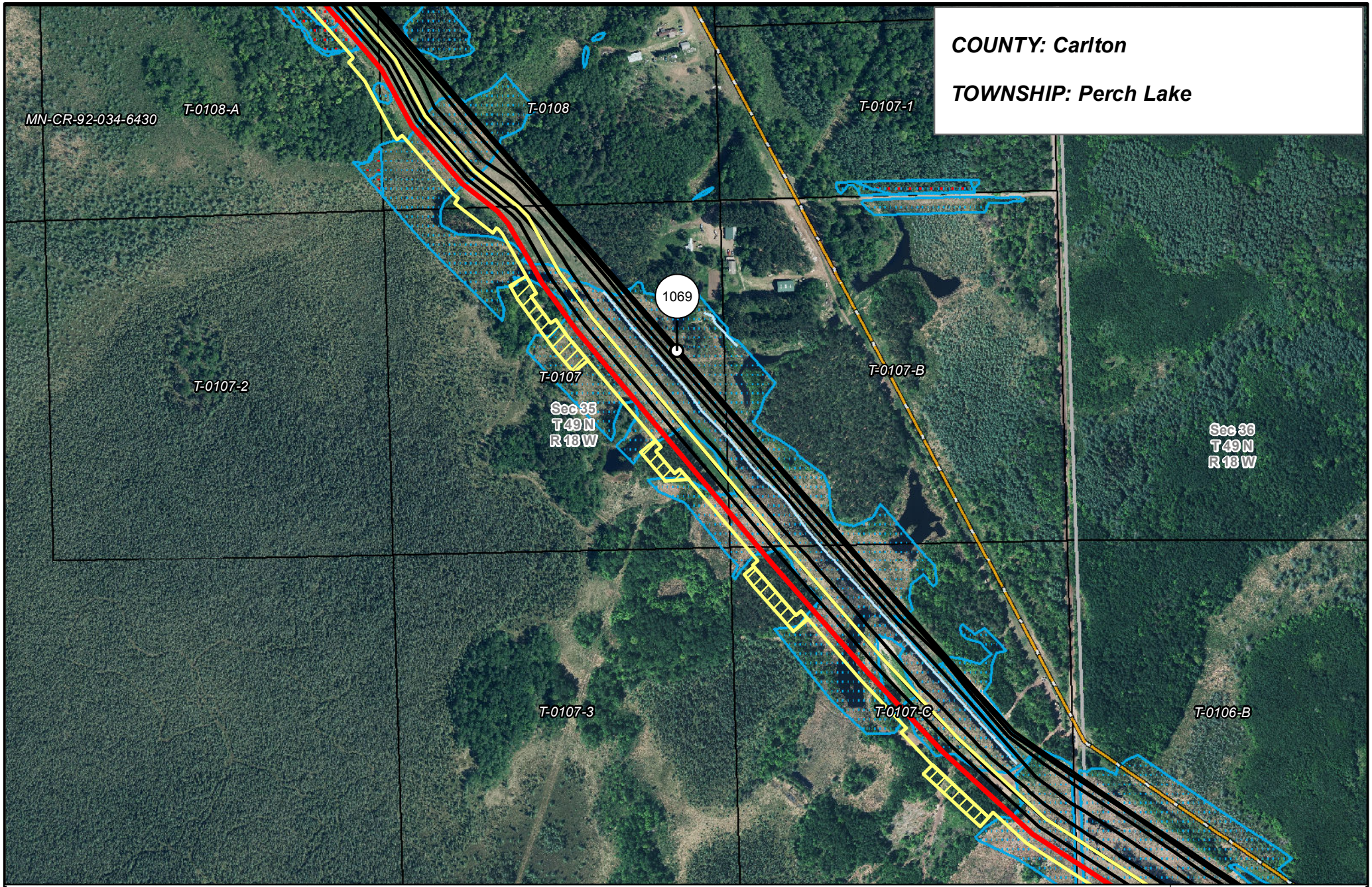

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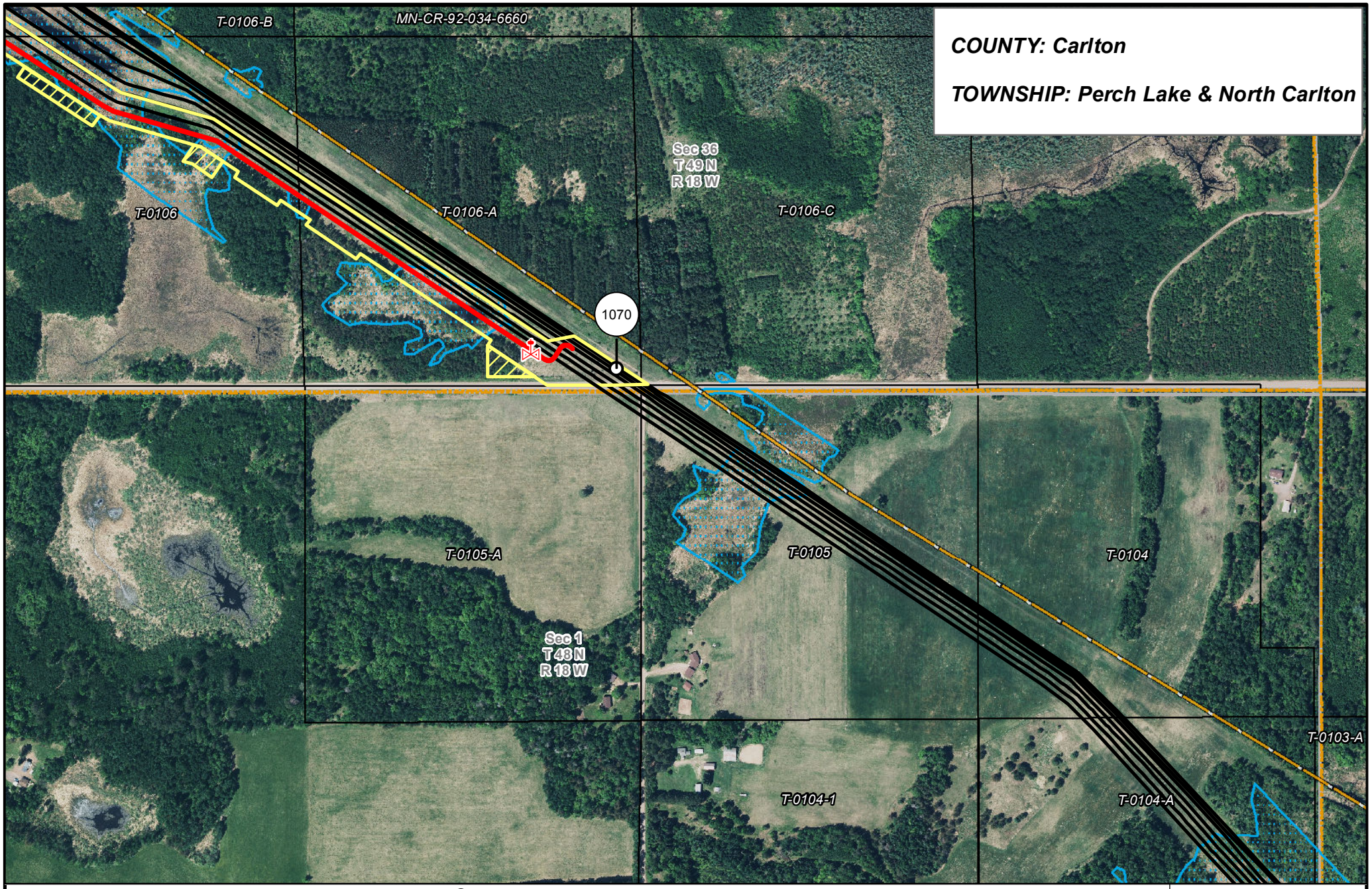

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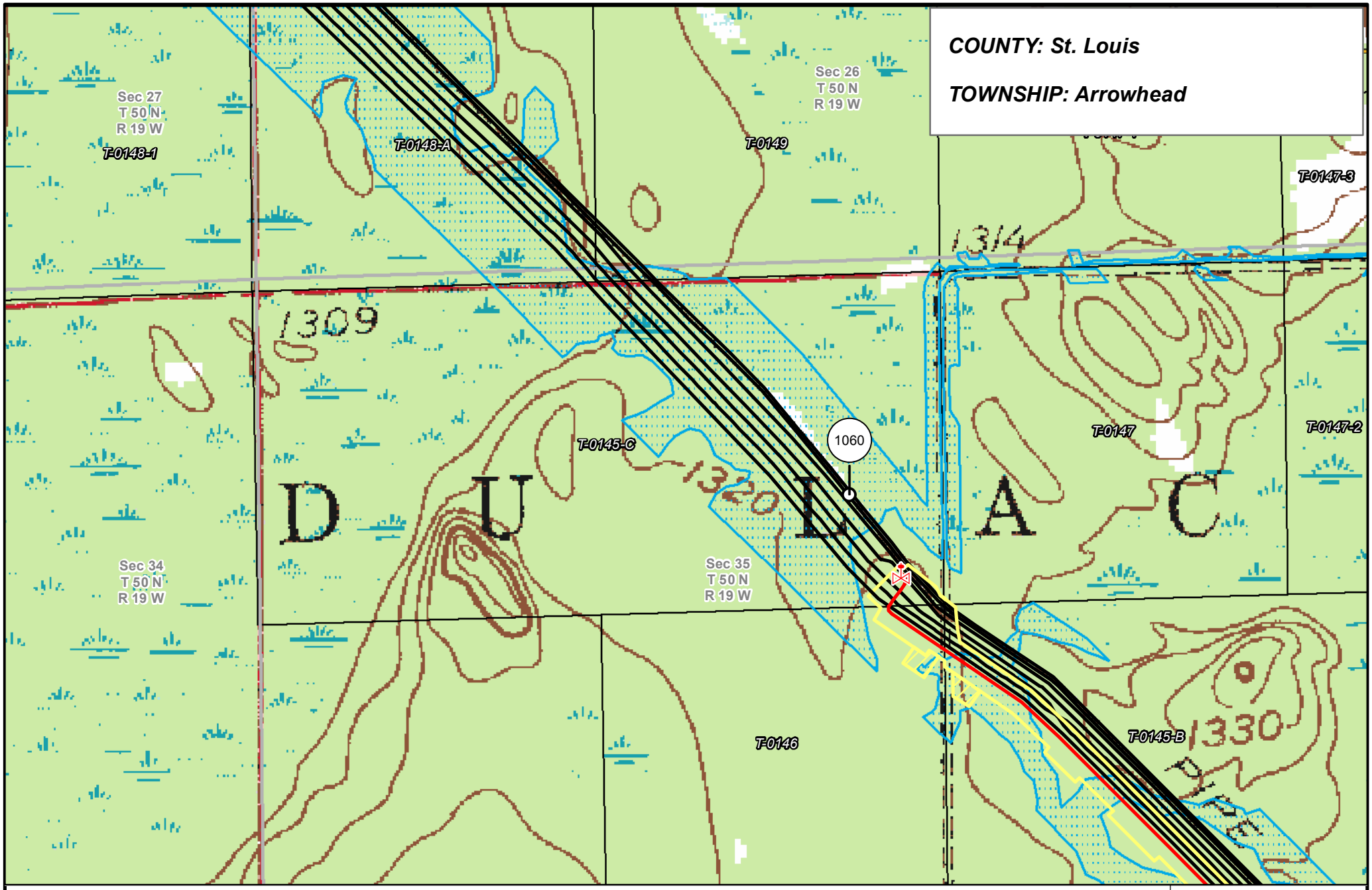

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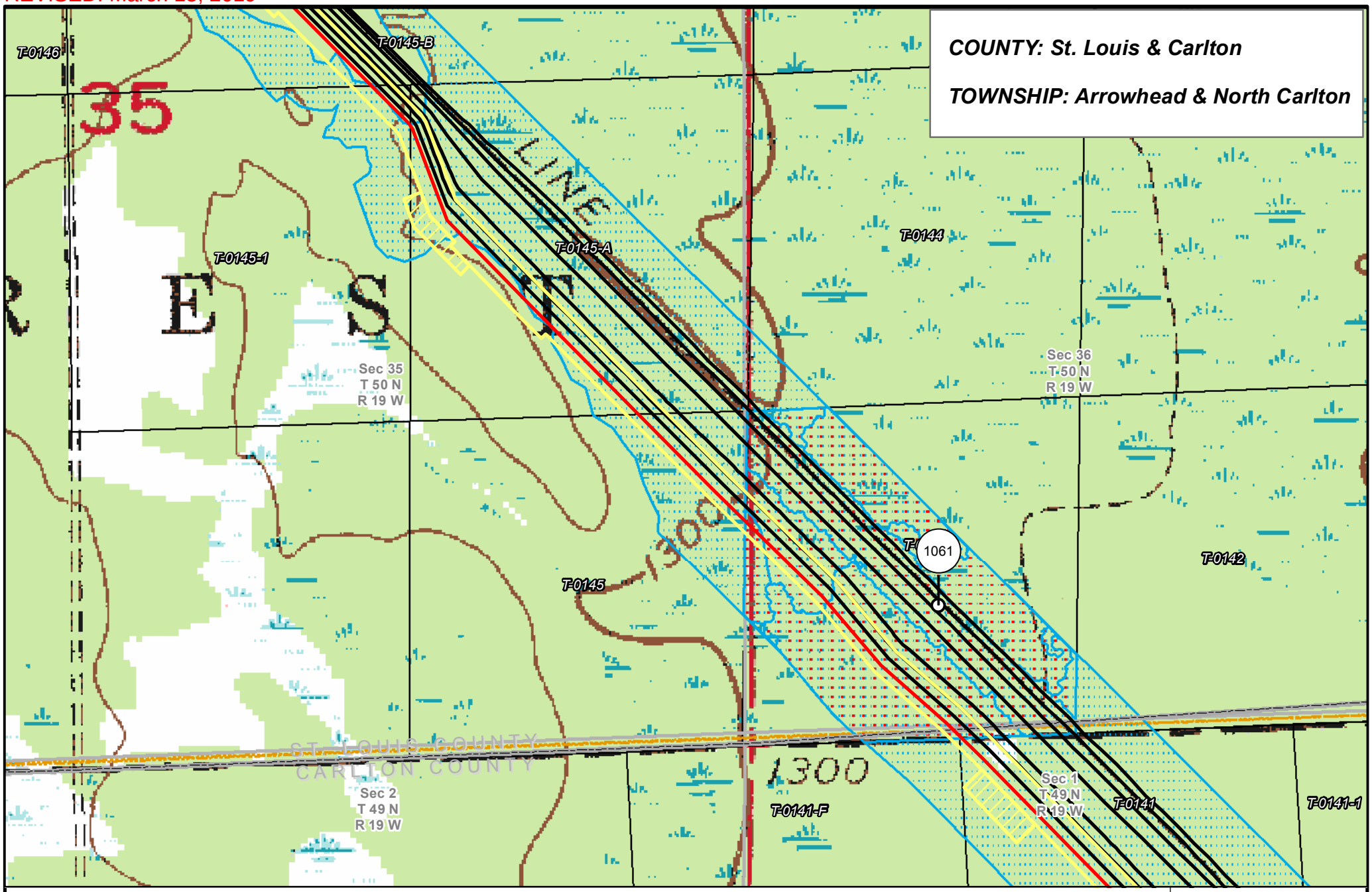

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Map 2 of 12

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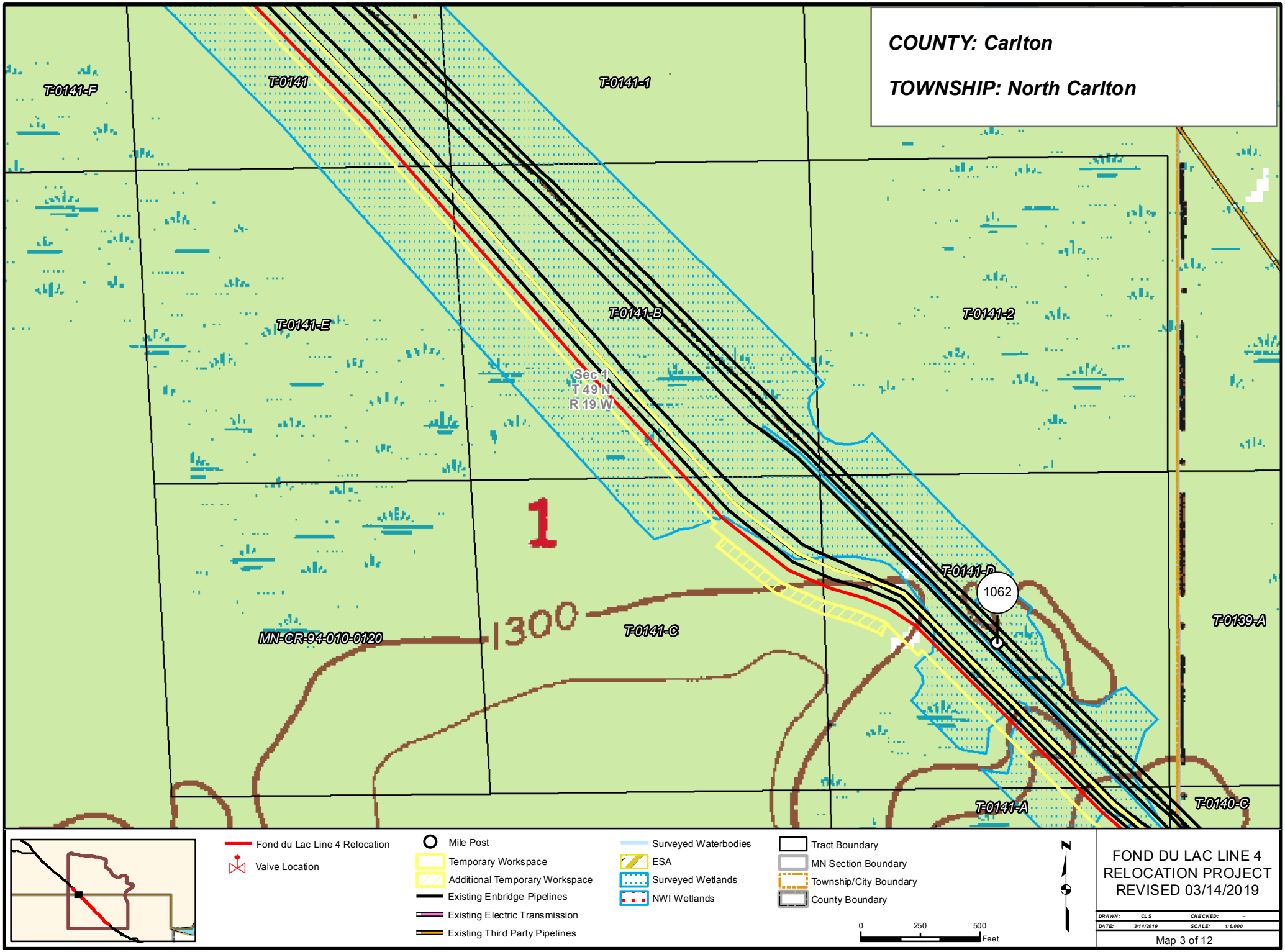

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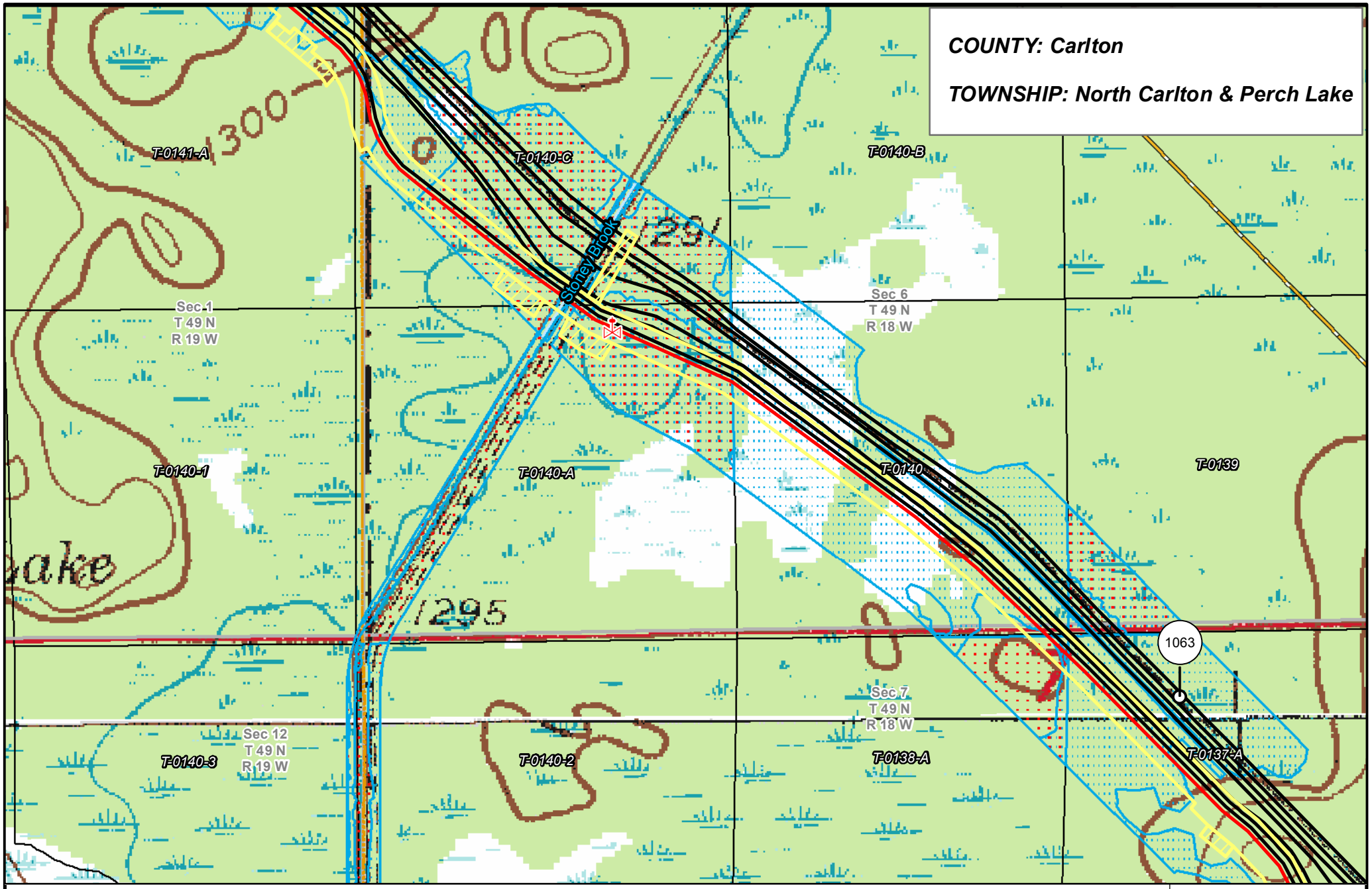

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Map 4 of 12

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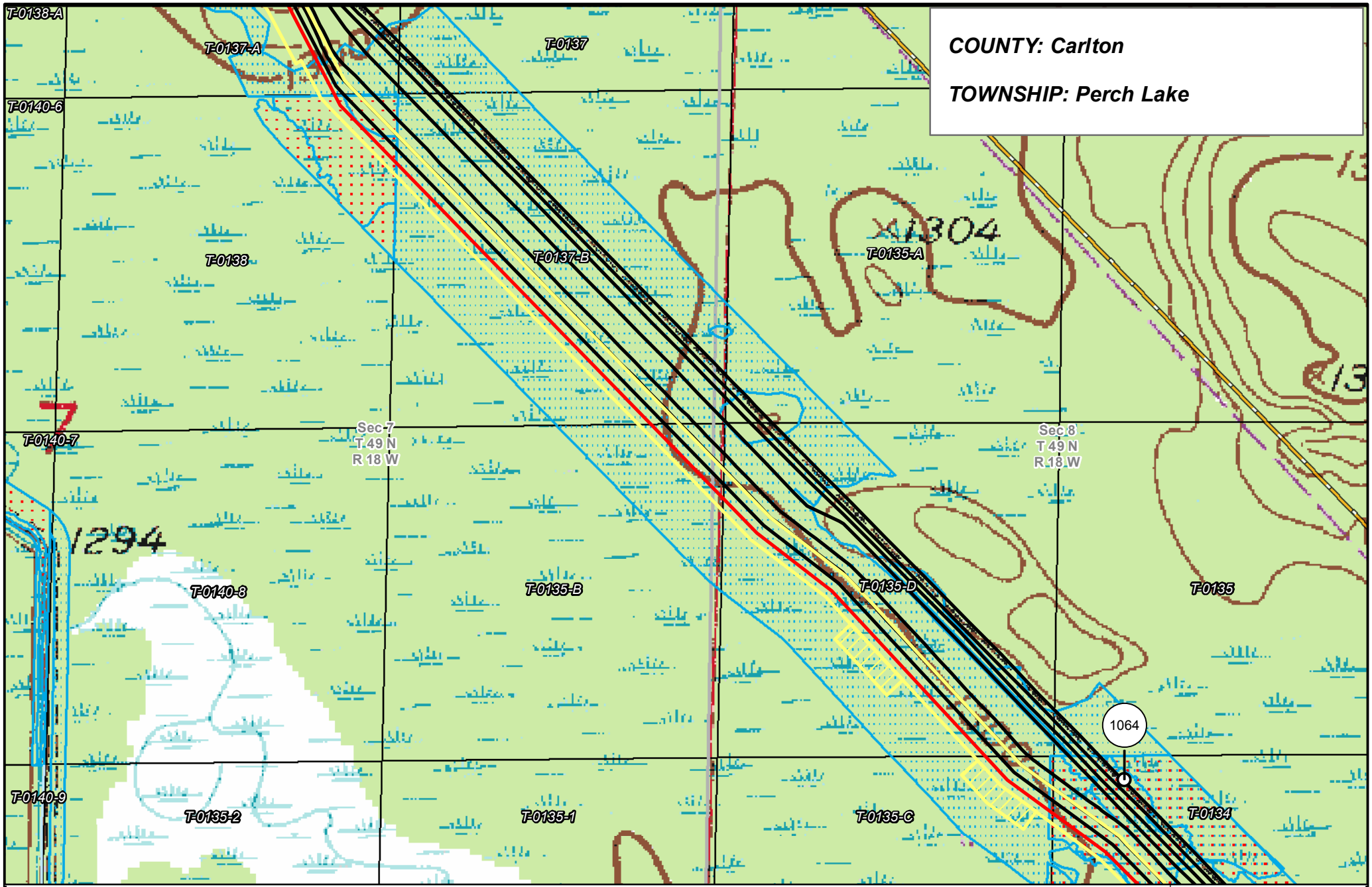

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Map 5 of 12

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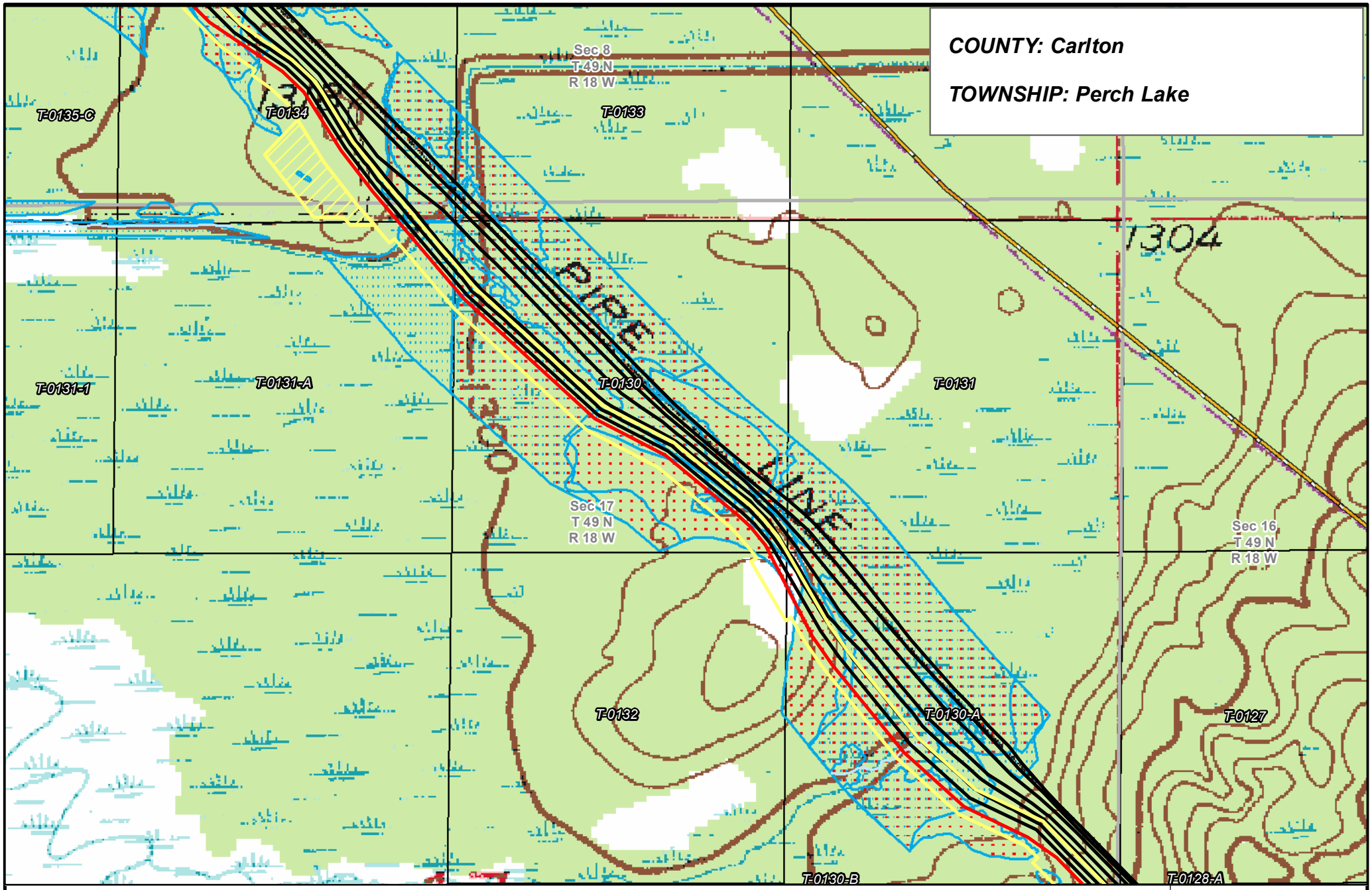

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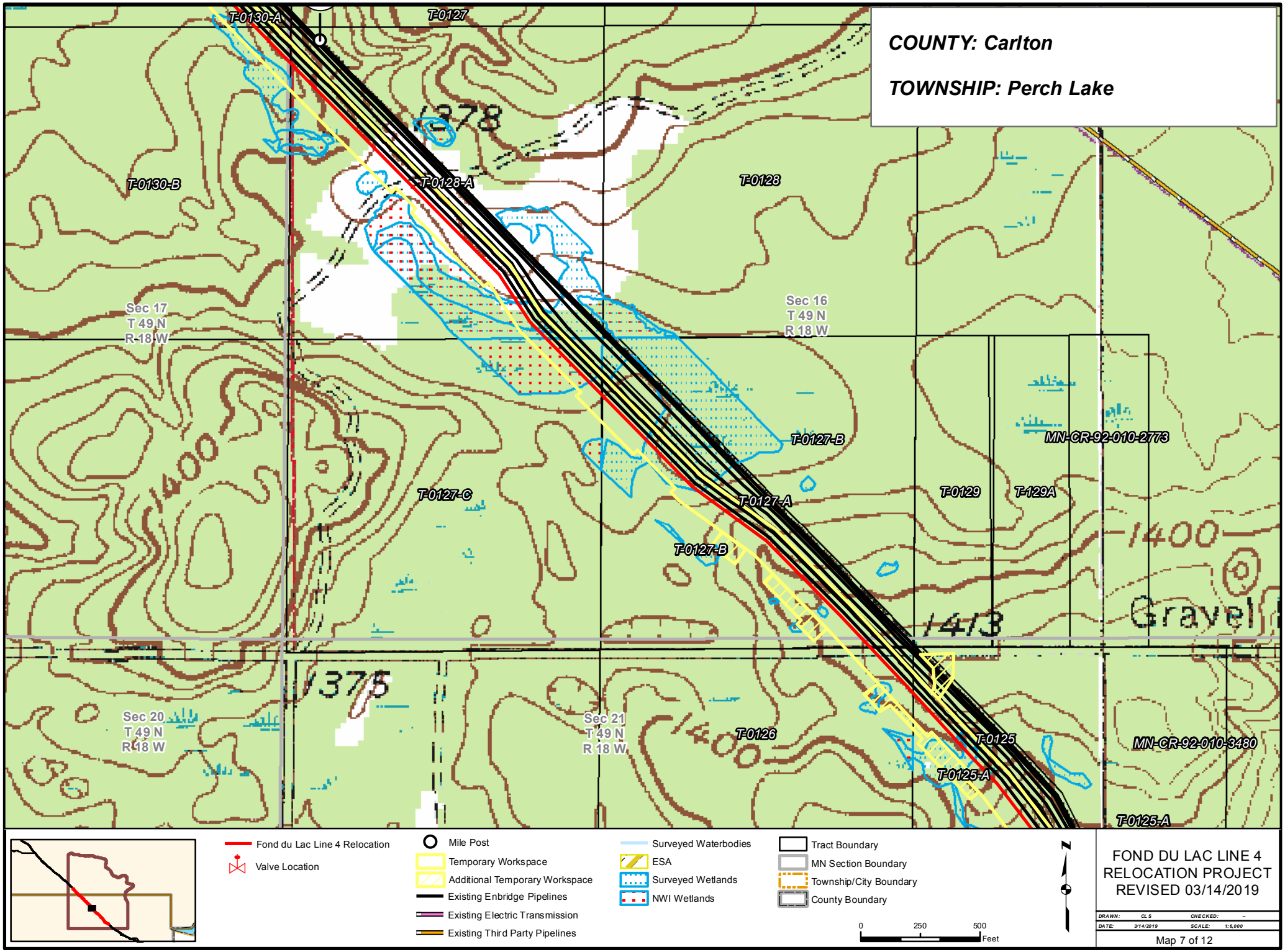

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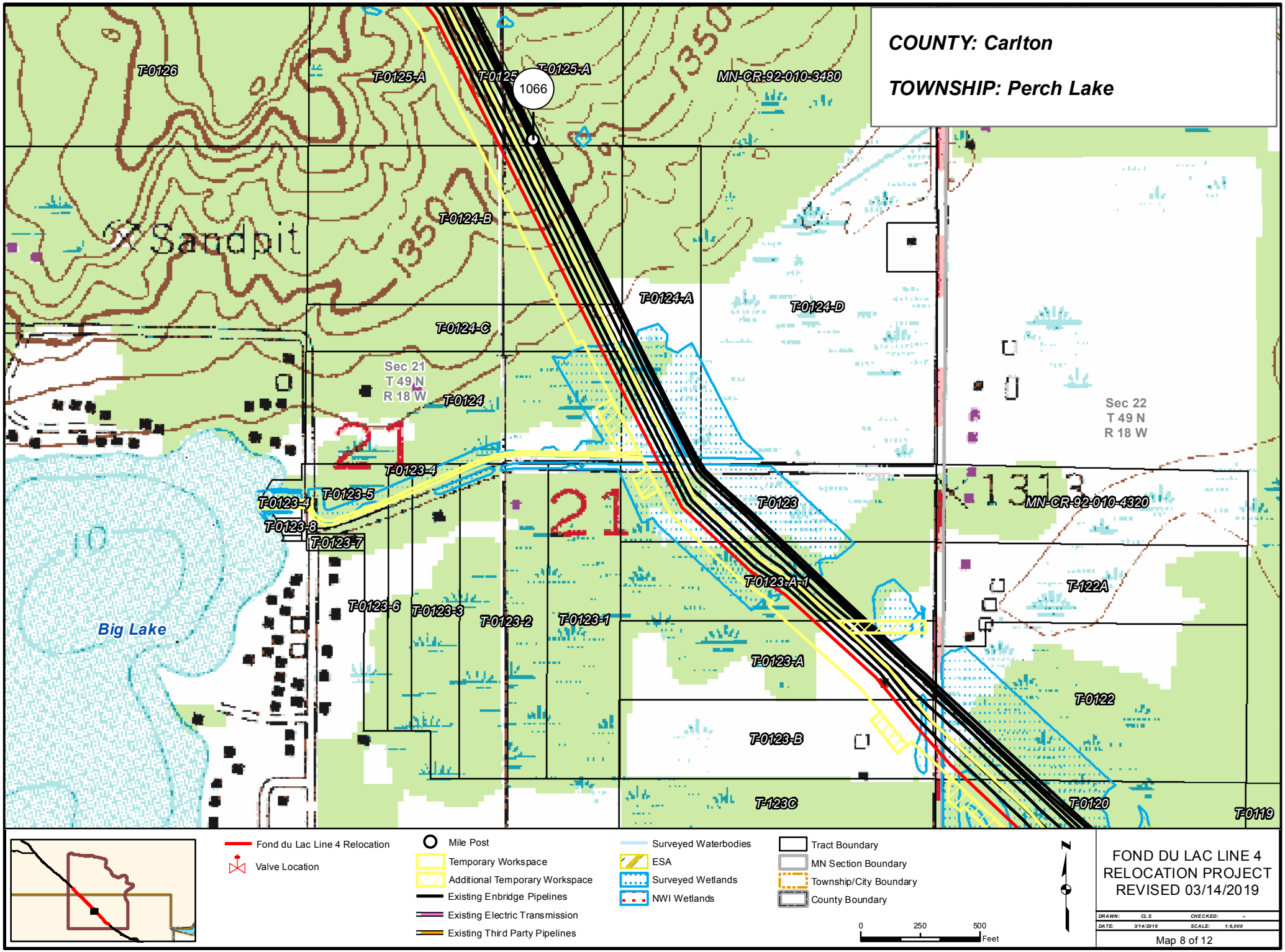

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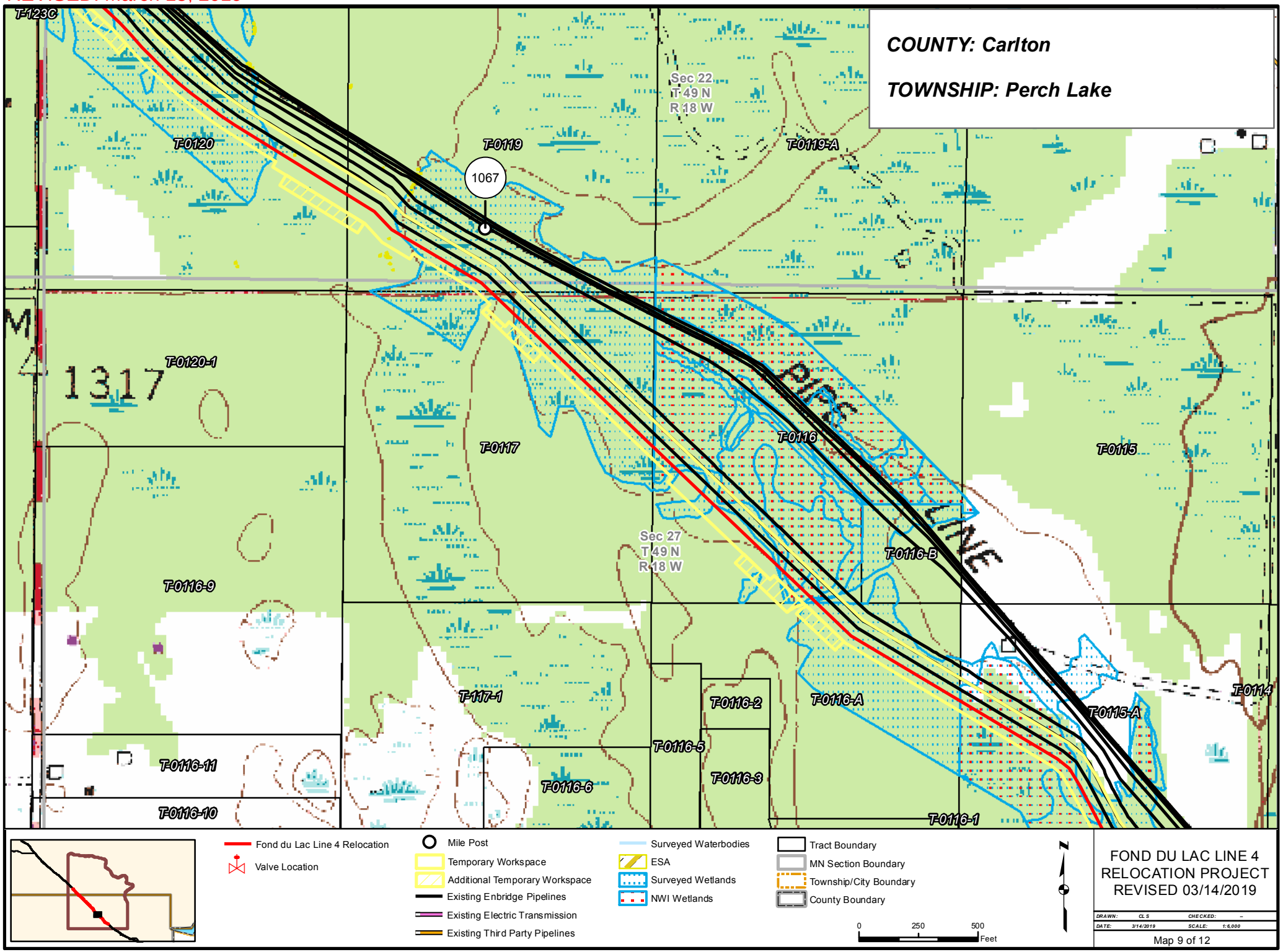

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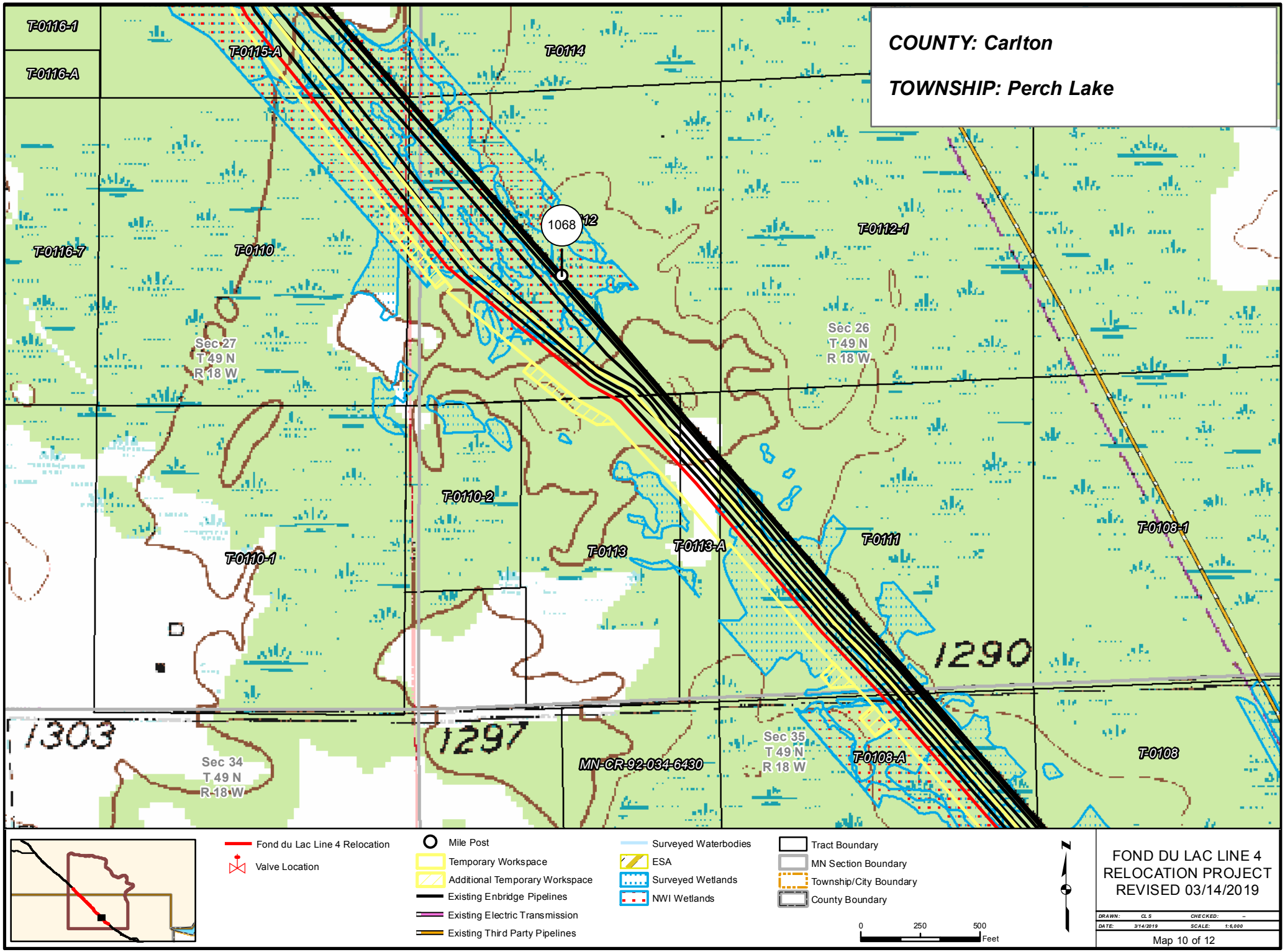

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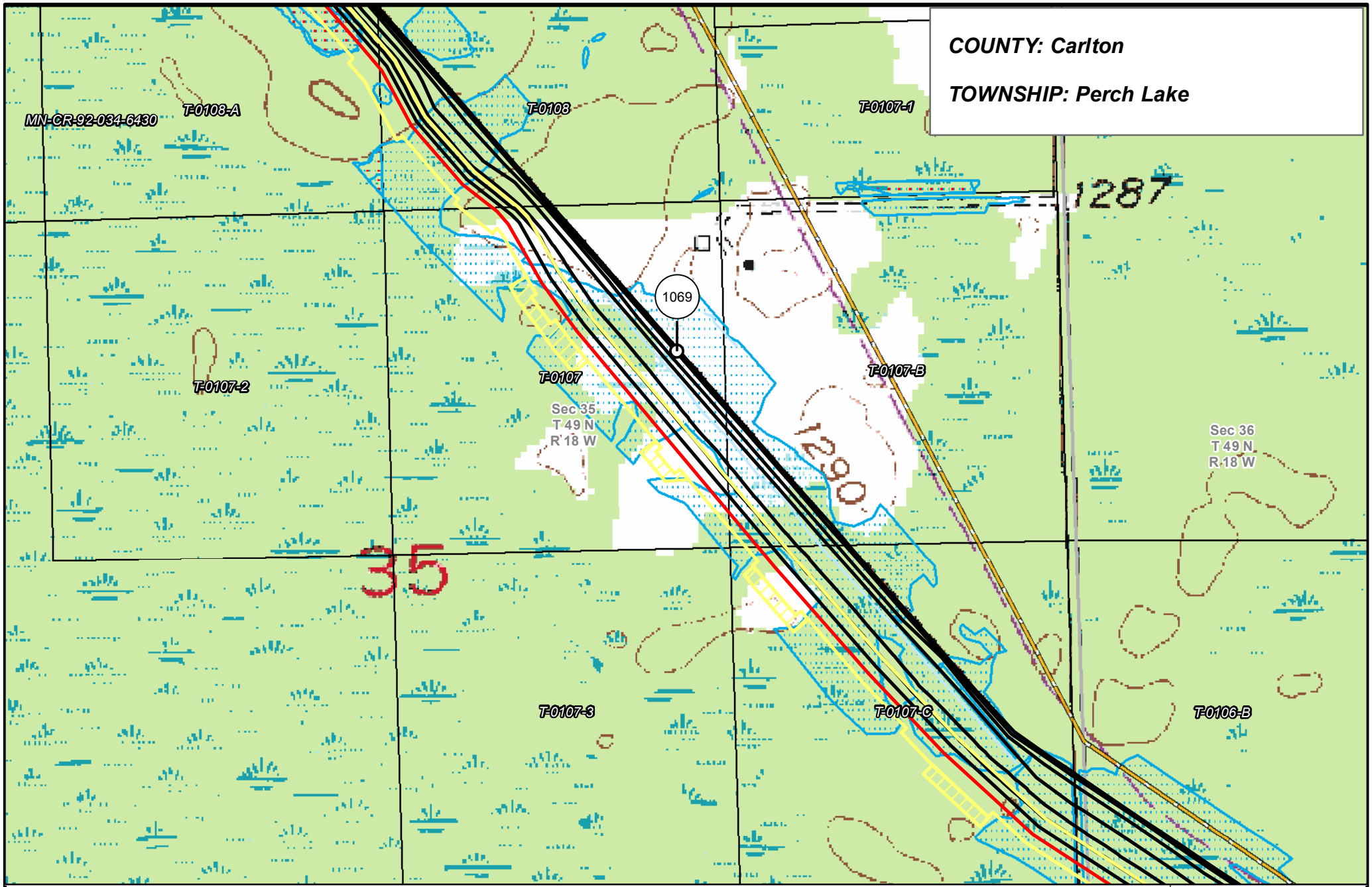

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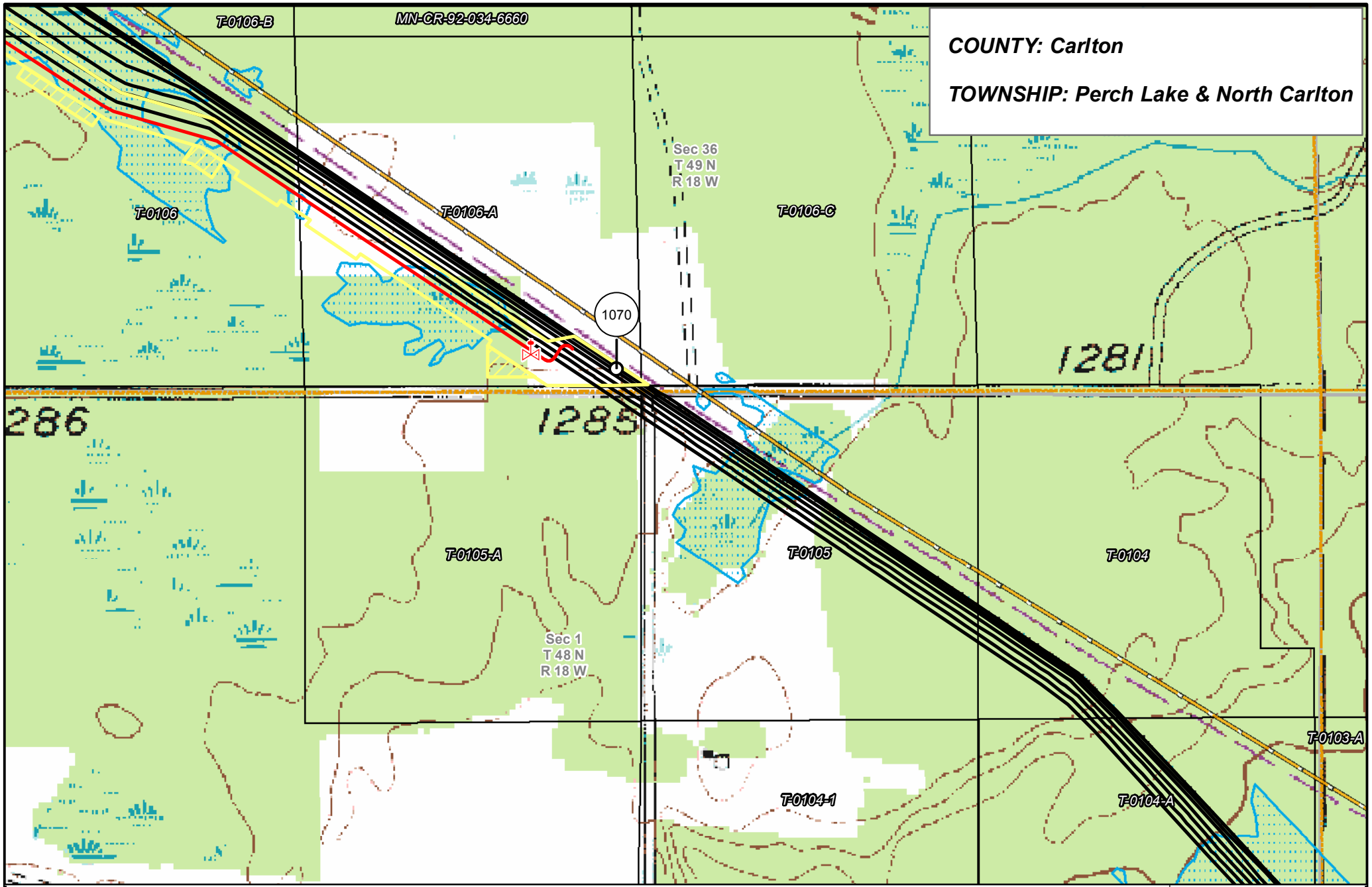


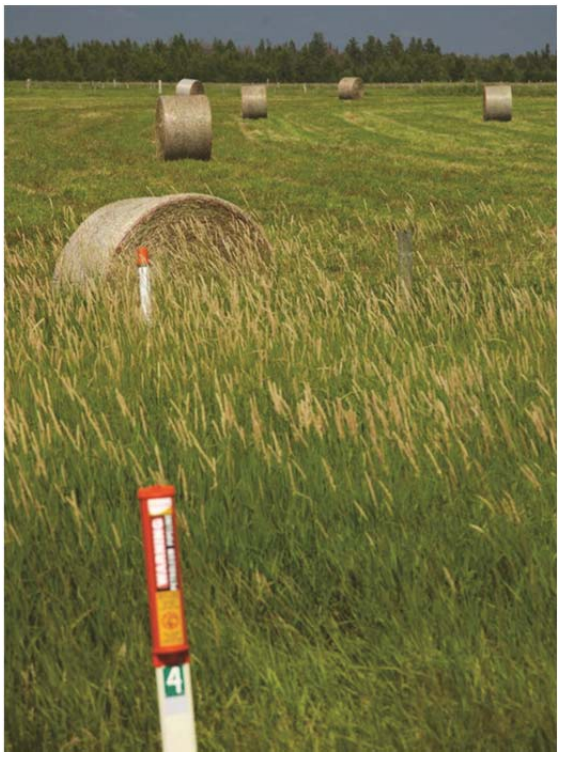
Fond du Lac Line 4 Project

Application for Pipeline Routing Permit and Partial Exemption

Minnesota Public Utilities Commission

Appendix B

Enbridge Environmental Protection Plan



Environmental Protection Plan

Enbridge Energy, Limited Partnership • Fond du Lac Line 4 Project

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TABLE OF CONTENTS

FIGURES

APPENDICES

Appendix A	Noxious and Invasive Weed Species
Appendix B	Equipment Cleaning Log
Appendix C	Seed Mixes
Appendix D	Enbridge Environment Hydrostatic Test Discharge Authorization & Documentation
Appendix E	Emergency Response Contractors/Disposal and Treatment Facilities
Appendix F	Spill Report Form
Appendix G	Spill Reporting-Agency Contacts

ACRONYMS AND ABBREVIATIONS

ATWS	additional temporary workspace
BMP	best management practices
CLL	Construction Line List
Contactor	construction Contractor
CRP	Conservation Reserve Program
DOT	Department of Transportation
ECD	erosion and sediment control device
EI	environmental inspector
Enbridge	Enbridge Energy, Limited Partnership
EPP	Environmental Protection Plan
HDD	horizontal directional drilling
NFPA	National Fire Protection Association
NRCS	Natural Resources Conservation Service
OHWL	ordinary high water level
OHWM	ordinary high water mark
PLS	Pure Live Seed
ROW	right-of-way
TWS	temporary workspace
UFC	Unified Facilities Criteria

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INTRODUCTION

This Environmental Protection Plan ("EPP") outlines construction-related environmental policies, procedures, and protection measures Enbridge Energy, Limited Partnership ("Enbridge") developed as a baseline for construction. This EPP was developed based on Enbridge's experience implementing Best Management Practices ("BMPs") during construction as well as the Federal Energy Regulatory Commission's Upland Erosion Control, Revegetation, and Maintenance Plan (May 2013 Version) and Wetland and Waterbody Construction and Mitigation Procedures (May 2013 Version). It is intended to meet or exceed federal, state, tribal, and local environmental protection and erosion control requirements, specifications and practices. The EPP is designed to address typical circumstances that may be encountered along the Project. Project-specific permit conditions and/or landowner agreements may supersede the general practices described in this document.

This document includes the following sections:

- Section 1.0 describes general mitigation measures, including soil erosion and sedimentation control procedures, to be implemented during upland construction and upland restoration;
- Section 2.0 describes stream and river construction, crossing, and restoration;
- Section 3.0 describes practices for wetland construction, crossings, and restoration;
- Section 4.0 describes highway, road, and rail crossings;
- Section 5.0 describes construction dewatering;
- Section 6.0 outlines water appropriation practices;
- Section 7.0 addresses revegetation measures;
- Section 8.0 addresses winter construction issues;
- Section 9.0 addresses waste management issues;
- Section 10.0 addresses construction equipment-related spill prevention, containment and controls; and
- Section 11.0 addresses containment, response, and notification procedures for inadvertent releases of drilling fluid.

Alternative construction procedures implemented in lieu of this EPP will provide an equal or greater level of protection to the environment, and will be approved in writing by Enbridge.

Unless otherwise specified, the construction Contractor ("Contractor") is responsible for implementing the requirements of this EPP.

Enbridge will provide appropriate construction oversight to confirm and document compliance with the measures of this EPP and requirements of applicable federal, state, tribal, and local permits. Enbridge's Environmental Inspectors ("EIs") will assist the Contractor in interpreting and implementing the requirements of the EPP, and verify compliance with these procedures for Enbridge. Enbridge will employ experienced EIs to manage unforeseen situations that are not directly addressed by project documents. Enbridge relies on the experience and judgment of the

EIs, through coordination and consultations with project management staff, to address unforeseen situations should they occur in the field. The EIs will be expected to use judgment in the field to interpret environmental conditions and requirements, but will not be authorized to make major modifications or changes without the prior written approval of Enbridge. The EI, in consultation with Enbridge Environment staff, will have the authority to stop activities and order corrective mitigation for actions that are not in compliance with the measures in this EPP, landowner agreements, or environmental permit requirements. The EI will maintain appropriate records to document compliance with these and other applicable environmental permit conditions.

Enbridge has also committed to applicable agencies to fund a comprehensive third-party monitoring program to be deployed during Project construction. Enbridge has constructed numerous projects with the oversight of third-party monitors and accepts the recommendation by state agencies regarding their use. Enbridge will work with the agencies to define the role and qualifications of proposed third-party monitors to ensure they are experienced in the type of construction they will be observing and knowledgeable regarding the resources that may be impacted.

1.0 GENERAL MITIGATION MEASURES

1.1 IDENTIFICATION OF AVOIDANCE AREAS

The EI will post signs for environmental features such as wetlands, waterbodies, drainages/drain tiles, buffer zones, rare plant or ecological community sites, invasive species and noxious weed locations, regulated wildlife habitat, cultural resources, and erosion-prone or steep slopes.

1.2 CONSTRUCTION LINE LIST AND PERMITS

Enbridge will provide the Contractor with a Construction Line List ("CLL") that describes special requirements (e.g., timber salvage, topsoil segregation, restoration measures, fencing requirements) as agreed upon with landowners provided the special requirements conform to project permits. The Contractor will comply with these special requirements and/or permit conditions.

The CLL identifies requirements and comments provided by landowners; however, it is not a comprehensive list of construction requirements. The CLL will be considered in conjunction with other project documents and permits.

1.3 WET WEATHER SHUTDOWN

During construction, certain activities may be suspended in wet soil conditions, based on consideration of the following factors:

- extent of surface ponding;
- extent and depth of rutting and mixing of soil horizons;
- areal extent and location of potential rutting and compaction (i.e., can traffic be rerouted around wet area); and
- type of equipment and nature of the construction operations proposed for that day.

The Contractor will cease work in the applicable area until Enbridge determines that site conditions are such that work may continue. The EIs, in collaboration with Enbridge construction management, will ultimately decide if wet weather shutdown is necessary in a given location.

1.4 RIGHT-OF-WAY ACCESS

Access to the right-of-way ("ROW") will be from public roadways and Enbridge-approved private access roads only. Existing roads are generally in a condition that can accommodate construction traffic without modification or improvement. Some roads will require improvements such as widening and/or grading and the placement of timber mats or gravel.

Enbridge is responsible for posting signs or other methods to identify approved access roads in the field and to ensure that access is confined to only the approved roads. Vehicle tracking of soil from the construction site will be minimized by installation and implementation of BMPs such as stone pads, timber mats, reducing equipment/vehicle access to the construction ROW

where practicable (off-ROW parking), or equivalent. Installation of stone or timber mat access pads will be in accordance with applicable permits and state/federal specifications. If such BMPs are not adequately preventing sediment from being tracked onto public roads, street sweeping, or other equivalent means of collecting sediment, will be used. If soil is tracked onto a roadway, the contractor will remove accumulated material from the road and return it to the construction ROW within an upland area as soon as possible, but in no circumstances more than 24 hours after discovery. In addition, soil on roadways cannot be broomed, washed, and/or graded into the road ditch or onto the shoulder.

After construction, Enbridge will return improved roads to their pre-construction condition unless the landowner or land-managing agency requests that the improvements be left in place. Enbridge will maintain permanent access roads to aboveground facilities (e.g. pump stations, mainline valves) throughout project operation.

1.5 RIGHT-OF-WAY REQUIREMENTS

All construction equipment and vehicles will be confined to the approved construction ROW and additional temporary workspace ("ATWS"). Prior to commencement of clearing operations, the outer limits of the construction ROW and ATWS areas will be marked with distinctive stakes and flagging by Enbridge. Construction activities are restricted to the approved designated areas.

The construction ROW (i.e., construction workspace) for the Project will vary and may include a portion of Enbridge's existing corridor, new permanent corridor, permitted temporary workspace ("TWS"), and site-specific extra workspaces as defined below and shown in Figures 1 through 3. The construction ROW width will be reduced in selected locations (e.g., wetlands, waterbodies, and forested shelterbelts), in accordance with applicable permit conditions, as indicated on the Project construction alignment sheets and in the field by the use of staking.

(a) ROW (Permanent)

Enbridge's existing permanent ROW varies in width. Additional footage may be added, depending on the location of the new pipeline(s) in relation to the existing pipelines. The permanent ROW is maintained to facilitate access and aerial inspection of the pipeline system.

(b) TWS

In addition to the ROW/permanent corridor, construction will require TWS. The TWS will be located adjacent to and contiguous with the proposed ROW/permanent corridor and will be identified on the construction alignment sheets and by distinctive staking of construction limits prior to clearing.

(c) ATWS

Site-specific ATWS locations, (construction work areas beyond the permanent corridor and TWS previously described), will be required at select locations such as steep slopes, road, waterbody, railroad, some wetland crossings, and where it is necessary to cross under the existing pipelines or foreign utilities. ATWS will typically be located in uplands adjacent to the construction ROW and set at least 50-feet back from sensitive resource boundaries where site-specific field conditions allow. However, to complete

work safely, Enbridge may need to locate ATWS within a wetland or within the 50-foot setback from a wetland or waterbody based on site-specific conditions. ATWS adjacent to waterbodies and/or wetlands is addressed further in Sections 2.0 and 3.0, respectively.

1.6 CONTROLLING SPREAD OF UNDESIRABLE SPECIES

It is Enbridge's intent to minimize the potential introduction and/or spread of undesirable species (i.e., invasive species, noxious weeds, or crop diseases) along the construction ROW due to pipeline construction activities. However, it is not practicable for Enbridge to eradicate undesirable species that are adjacent to the construction ROW. Enbridge will minimize the potential for the establishment of undesirable species by minimizing the time duration between final grading and permanent seeding.

In consultation with the applicable agencies, Enbridge will identify plant species that are considered noxious weeds and/or invasive plants that may occur within the counties being crossed by the pipeline corridor (refer to Appendix A).

1.6.1 Prevention and Control Measures

To prevent the introduction of identified noxious weeds and invasive species into the Project areas from other construction sites, construction equipment and mats will be cleaned prior to arriving on site. This cleaning consists of removing visible dirt from the equipment and mats and blowing loose material from equipment using compressed air. Equipment designated for use within waterbodies will be washed and dried prior to use. Purge and clean all pumps before proceeding from one location to the next if designated noxious weeds or invasive plants or infested waters (e.g. zebra mussels, Eurasian milfoil) are known to be present in the area. Known locations of noxious or invasive plant infestations and infested waters will be identified in the appropriate permits. If the EI identifies aquatic invasive species in an area not previously identified as an infested water, the EI will contact the Minnesota Department of Natural Resources. The Contractor(s) will keep logs documenting the cleaning history of each piece of equipment and make the logs available to the EI upon request. Contractors may use the equipment cleaning log provided in Appendix B or an equivalent form approved by Enbridge. Equipment found to be in non-compliance with the cleaning requirement will not be allowed on the Project sites until it has been adequately cleaned.

Prior to clearing and grading of the construction ROW and pending landowner permission, major infestation areas identified during surveys or by Enbridge's EIs may be treated with the herbicides. All proposed herbicides will be reviewed and approved by Enbridge's Environment Department through consultation with Minnesota Department of Agriculture and U.S. Environmental Protection Agency and as recommended through consultation with local authorities prior to use. Selective foliage or basal application will be used when practicable. Alternatively, full construction ROW topsoil segregation may be implemented for weed control to allow equipment to work through the area after topsoil has been stripped, as long as equipment stays on the subsoil (clearing, grading, and restoration equipment will still be cleaned). The Contractor(s) will obtain necessary permits and/or certifications for the use of the applicable herbicides, is responsible to limit off-ROW overspray, and will comply with state laws regarding the use of those herbicides. Contractor(s) will keep proper documentation of the locations where the herbicides have been used and provide such documentation to Enbridge within 3 days of

completing the work. Weed control spraying will be restricted near certified organic farms and prohibited on certified organic farms.

Treatment of known infestation areas will be completed in accordance with applicable chemical contact times (as specified by the manufacturer) in advance of clearing and grading within the construction ROW. Treatment may be restricted in areas that are not readily accessible, such as areas where access is limited by topography or other site conditions such as saturated/inundated soils. In the event that an area is determined to be inaccessible, the EI will be notified and a site-specific alternative treatment method will be developed.

If additional noxious weed infestations are identified subsequent to herbicide applications, mechanical means (scrape down/blow down) may be used to remove weeds from tracked equipment and mats prior to leaving the infested area. High pressure water wash stations may be established in select areas if the above measures do not adequately remove soil and vegetation debris from construction equipment. Enbridge will determine where this practice will be implemented. The Contractor(s) will keep logs documenting the cleaning history of each piece of equipment and make the logs available to the EI or other Enbridge Representative upon request. Any equipment found to be in noncompliance with the cleaning requirement will be removed from the Project sites until it has been adequately cleaned.

To prevent the spread of noxious weeds and invasive species during construction, mulch used on the Project will be composed of weed-free material. Certified weed-free mulch may also be required at site-specific locations. The Contractor(s) will be responsible for identifying and acquiring sources of weed-free and certified weed-free mulch. Sources will be approved by Enbridge prior to purchase. As discussed further in Section 1.8.3, tree stumps outside the ditch line will be ground below normal ground surface or completely removed and hauled off to an approved disposal facility. Stumps within the ditch line will be completely removed, ground, and/or hauled off to an approved disposal facility. Enbridge will consult with the appropriate agency to determine the appropriate treatment for felled infested and diseased trees.

In the case that a healthy oak tree adjacent to the construction ROW is damaged or wounded during construction activities in counties where the oak wilt fungus is present, Enbridge will treat the cut surface with water-based paint, a pruning/wound sealer, or shellac to prevent further spread of the disease. Treated trees will be inspected by the EI.

1.6.2 Pesticide Use and Application

Enbridge does not typically authorize use of pesticides on the construction or permanent ROW or at Enbridge facilities. However, should pesticide use be required to control the spread of undesirable pests and/or at the request of an agency, Enbridge will only utilize those pesticides and methods of application approved by the Minnesota Department of Agriculture, Minnesota Department of Natural Resources, and the U.S. Environmental Protection Agency in the state of Minnesota. Selective foliage or basal application will be used when practicable. All pesticides will be applied in a safe and cautious manner so as not to damage adjacent properties including crops, orchards, tree farms, apiaries, or gardens. Enbridge will contact the landowner or designee to obtain approval for the use of pesticide at least 14 days prior to any application on their property. The landowner may request that there be no application of pesticides on any part of the site within the landowner's property. Enbridge will provide notice of pesticide application to affected landowners and known beekeepers operating apiaries within three miles of the site at least 14 days prior to such application.

1.7 POTHOLING/HYDROVAC SLURRY

Hydrovac excavation is used to positively identify pipelines and other buried utilities. The Contractor will construct an unlined but bermed containment area or identify comparable containment (e.g., open top tank) to hold the hydrovac slurry in an Enbridge and landowner-approved upland area within the construction workspace or dispose of the material off-site at a licensed disposal facility. Once the slurry is drained and dry, it may be incorporated with the subsoil in an Enbridge and landowner-approved upland area within the construction workspace. Discharging hydrovac slurry on to topsoil is not permitted as the material will degrade the quality of the topsoil and potentially affect revegetation.

1.8 UPLAND CLEARING

The initial stage of construction involves the clearing of brush, trees, and tall herbaceous vegetation from the ROW. Clearing may be accomplished with chain saws, mowers, and hydraulic tree-cutting equipment.

1.8.1 Disposal of Non-Merchantable Timber

Unless otherwise directed by Enbridge, non-merchantable timber and slash will be disposed of by mowing, chipping, grinding, and/or hauling off site to an approved disposal facility or used in stabilizing erodible slopes or construction entrances. In non-agricultural, non-wetland areas, chips, mulch, or mechanically cut woody debris may be uniformly broadcast across the ROW where the material would ultimately be incorporated into the topsoil layer during grading activities, with landowner approval (coordinated through Enbridge ROW agents). Burning of non-merchantable wood may be allowed only where the Contractor has acquired all applicable permits and approvals (e.g. agency, tribal, and landowner) and in accordance with all tribal, state, and local regulations. The Contractor will provide Enbridge with copies of these permits and/or approvals prior to initiating burning.

1.8.2 Disposal of Merchantable Timber

All merchantable timber will be managed in accordance with Enbridge contract specifications.

1.8.3 Upland Grading and Stump Removal

To facilitate proper cleanup and restoration in upland areas, tree stumps outside the ditch line will be ground below normal ground surface or completely removed and hauled off to an approved disposal facility. Stumps in the ditch line will be completely removed, ground, and/or hauled off to an approved disposal facility.

1.9 TEMPORARY EROSION AND SEDIMENT CONTROLS

Temporary erosion and sediment control devices (“ECDs”) include, but are not limited to, slope breakers, sediment barriers (silt fence, straw bales, bio-logs, etc.), stormwater diversions, trench breakers, mulch, and revegetation subsequent to seeding of exposed soils (refer to Figures 4 through 11). The Contractor will maintain erosion and sediment control structures as required in the Project construction documents and as required by all applicable permits. Non-functional erosion and sediment controls will be repaired, replaced, or supplemented with functional materials within 24 hours after discovery, or as otherwise specified in project permits. ECDs will

be installed after initial clearing but before grading activities and will be replaced by permanent erosion controls as restoration is completed.

Temporary ECDs will be installed after clearing and prior to grubbing and grading activities at the base of sloped approaches to streams, wetlands, and roads. Temporary ECDs will also be installed at the edge of the construction ROW as needed, and/or in other areas determined by the EI to slow water leaving the site and prevent siltation of waterbodies and wetlands down slope or outside of the construction ROW (e.g., swales and side slopes). Temporary ECDs will be placed across the entire construction ROW at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from tile line inlets, drainage ways, wetlands, and/or waterbodies until the area is revegetated and there is no potential scouring or sediment transport to surface waters. Adequate room will be available between the base of the slope and the sediment barrier to accommodate ponding of water and sediment deposition.

If silt fence is used, when the depth of sediment reaches about one-third of the height, the sediment will be removed. Non-functional ECDs will be repaired, replaced, or supplemented with functional structures within 24 hours after discovery, or as otherwise specified in project permits.

Temporary ECDs installed across the travel lane may be removed during active daytime construction; however, ECDs will be properly reinstalled after equipment passage, or activities in the area are completed for the day. These ECDs will also be repaired and/or replaced prior to inclement weather when forecasted.

1.9.1 Temporary Stabilization

Installation of temporary seeding, mulch (straw or hydromulch), and erosion control mats may be required by Enbridge in certain locations (including topsoil piles) if there are construction delays within a spread of at least 14 days. The Contractor may be required by Enbridge to install temporary stabilization materials sooner based on site conditions, or as required in project permits.

1.9.2 Erosion Control Blanket

The appropriate class of erosion control blanket will be installed in accordance with manufacture recommendations and/or state Department of Transportation (“DOT”) specifications on slopes greater than 5 percent that would be exposed over the winter and drain to surface waters (refer to Figures 8 and 9). The Contractor will attempt to install erosion control blankets on the exposed slopes prior to snowfall; however, construction progress and/or seasonal weather variations may prevent installation prior to the first snowfall. Installation of erosion control blankets and additional BMPs, as applicable based on site conditions, is required after the first snowfall to protect slopes prior to spring melt and runoff. Erosion control blankets will be installed running parallel (up and down) with the direction of the slope (not perpendicular).

1.9.3 Mulch

Mulch (weed-free straw, wood fiber hydromulch, or a functional equivalent) will be applied to disturbed areas (except for actively cultivated land and wetlands) if requested by the landowner or land managing agency, if specified by the applicable permits or licenses, or as required by Enbridge. Mulch will specifically be required on:

- slopes greater than 5 percent; and
- dry, sandy areas that can blow or wash away (field decision).

Mulch will be free of noxious weeds as listed in applicable state laws. Certified weed-free mulch may also be required at site-specific locations. The Contractor will be responsible for identifying and acquiring sources of weed-free and certified weed-free mulch. Sources will be approved by Enbridge prior to purchase.

Mulch will be applied at a rate of 2 tons per acre to cover at least 75 percent of the ground surface unless otherwise stipulated by permit conditions. Mulch will be uniformly distributed by a mechanical mulch blower, or by hand in areas not accessible to the mulch blower. Mulch will be anchored/crimped using a mulch-anchoring tool or disc set in the straight position to minimize loss by wind and water, as site conditions allow. In areas not accessible to a mulch-anchoring tool or too steep for safe operation, the mulch may be anchored by liquid tackifiers, with advance written approval from Enbridge. The manufacturer's recommended method and rate of application will be followed.

Hydro-mulch and liquid tackifier can be used in place of straw or weed-free hay mulch with prior approval from Enbridge. All hydromulch and liquid tackifier products used will be on the applicable state DOT product list. Application rates will be at the manufacturer's recommended rate, equal to or greater than 2 tons per acre of straw mulch.

1.9.4 Cat Tracking

Cat tracking, also known as horizontal slope grading, may be implemented based on site conditions (sandy or silt soils) to reduce erosion potential. Cat tracking is achieved by driving a bulldozer vertically up and down the slope which results in the tracks being oriented horizontally; creating small speed bumps for water (refer to Figure 11).

1.9.5 Temporary Slope Breakers

Temporary slope breakers will be installed to minimize concentrated or sheet flow runoff in disturbed areas in accordance with the following maximum allowable spacing unless otherwise specified in permit conditions.

Slope (%)	Approximate Spacing (ft)
3-5	250
5-15	200
15-25	150
>25	<100

If the length of the slope is less than the distance of the required spacing, slope breakers are not required unless a sensitive resource area (e.g., wetland or public roadway) is located immediately down slope, or as requested by the EI. Temporary slope breakers may be constructed using earthen subsoil material, silt fence, straw bales, or in non-agricultural land, rocked trenches may be used. On highly erodible slopes, slope breakers in the form of earthen berms will be used whenever possible.

Temporary slope breakers will be constructed according to the following specifications (refer to Figures 4 and 5):

- straw bales used as slope breakers will be trenched in and staked so as to not allow spacing between bales or allow flow underneath the bales;

- the outfall of temporary slope breakers will be directed off the construction ROW into a stable well-vegetated upland area or into an appropriate energy-dissipating sediment control device (e.g., silt fence, straw bales, rock aprons) to prevent the discharge of sediments (refer to Figure 4);

- proper slope breaker outfalls will be established where topsoil segregation and/or grading has created a barrier at the edge of the construction workspace; and

- gaps will be created through spoil piles where necessary to allow proper out letting of temporary berms.

1.10 UPLAND TOPSOIL SEGREGATION

Upland areas where topsoil will be stripped includes cropland, hay fields, pasture, residential areas, and other areas as requested by the landowner or as specified in the project plans, commitments, and/or permits. Topsoil will not be used to construct berms, trench breakers, temporary slope breakers, improving or maintaining roads, or to pad the pipe. Berms used for stacking pipe in pipe yards may be constructed using topsoil if landowner permission and necessary approvals are obtained. Gaps will be left and ECDs installed where stockpiled topsoil and spoil piles intersect with water conveyances (i.e., ditches, swales, and waterways) to maintain natural drainage.

Topsoil Segregation Methods

The following topsoil segregation methods may be employed during construction:

- Full Construction ROW (refer to Figure 1)

- Trench-Line-Only (refer to Figure 2)

- Modified Ditch-Plus-Spoil Side (refer to Figure 3)

The Full Construction ROW topsoil segregation technique will typically be used in active cropland, which will consist of stripping topsoil from the spoil storage area, ditch line, and the primary travel lane. The Trench-Line-Only topsoil segregation method may be used where Enbridge determines that the width of the construction ROW is insufficient for other methods to be used. Enbridge may also use the Trench-Line-Only topsoil segregation method in areas where there is a thick sod layer such as in hay fields, pastures, golf courses, and residential areas, unless otherwise requested by the landowner. Alternative topsoil segregation methods, such as Modified Ditch-Plus-Spoil Side, may be used on a site-specific basis or as requested by the landowner. Topsoil is not typically segregated in standing water wetlands unless specifically requested by the landowner and/or managing land agency in accordance with applicable permit conditions.

Depth of Upland Topsoil Stripping

In deep soils (more than 12 inches of topsoil), topsoil will be stripped to a minimum depth of 12 inches, unless otherwise specified/requested by other plans, permit conditions, or the landowner. Additional space may be needed for spoil storage if more than 12 inches of topsoil are segregated. If less than 12 inches of topsoil are present, the Contractor will attempt to segregate to the depth that is present.

1.11 UPLAND TRENCHING

Trenching in uplands is typically accomplished with a backhoe excavator or a rotary wheel ditching machine. Excavated material will be side cast (stockpiled) within the approved construction ROW separate from topsoil, and stored such that the area subject to erosion is minimized. Enbridge will coordinate with landowners to minimize disruption of access caused by the trench during construction. Where deemed appropriate by Enbridge, the Contractor will leave plugs of subsoil in the ditch or will construct temporary access bridges across the trench for the landowner to move livestock or equipment. Trenches may also be sloped where started and ended to allow ramps for wildlife to escape. Spacing of plugs and ramps will be determined in the field.

1.11.1 Timing

The length of time a trench is left open will be minimized to ensure that installation of the pipe and restoration of the construction ROW occurs in a timely fashion. Therefore, unless otherwise specified by project permits or Enbridge, the Contractor will limit the amount of excavated open trench to a maximum of 3 days of anticipated welding production per spread. This timeframe may be decreased at the discretion of Enbridge based on site conditions. Site-specific activities such as horizontal directional drilling (“HDD”), guided bores, road bores, tie-in points, and valve work may be performed independent of a spread.

1.12 FOAM PILLOW INSTALLATION

Use of foam pillows for pipe protection in the trench will be approved by Enbridge in advance and installed in accordance with applicable project permits, local/state/federal regulations, and manufacturer’s recommendations.

1.13 TRENCH BREAKERS

Trench breakers will be installed as deemed necessary by Enbridge in sloped areas after the pipe has been lowered into the trench. Trench breakers protect against subsurface water flow along the pipe after the trench is backfilled. Trench breakers will be constructed with bags filled with rock-free subsoil or sand. Topsoil will not be used to construct trench breakers.

Use of foam trench breakers will be approved by Enbridge in advance and installed in accordance with applicable project permits, local/state/federal regulations, and manufacturer’s recommendations. Trench breakers will be placed from the bottom of the trench to near the top of the trench, completely surrounding the pipe and will be properly keyed into the undisturbed trench walls (refer to Figures 12 and 13). The location for trench breakers will be based on field conditions including the degree and length of slope, presence of down slope sensitive resource areas such as wetland and waterbodies, and proximity to other features such as roads and/or

railroads. The following conditions apply to the placement and installation of trench breakers unless otherwise directed by Enbridge:

- Trench breakers will be installed on slopes greater than 5 percent adjacent to streams, wetlands, or other waterbodies.

- Where the pipeline exits a wetland towards areas of lower relief, trench breakers will be installed (within the upland) where there is a potential for underground drainage along the pipe in order to prevent wetland or waterbody drainage.

- At all waterbody crossings, as necessary, to prevent diversion of water into upland portions of the pipeline trench and to keep accumulated trench water out of the waterbody.

The actual location of each trench breaker will be selected through coordination between Enbridge's EIs, Enbridge's Craft Inspectors, and the Contractor's Foreman for backfilling activities.

1.14 DRAIN TILE INLET PROTECTION AND TILE REPAIRS

Enbridge will attempt to locate existing drain tile inlets that are located near the construction work area prior to construction. Drain tile inlets will be marked using flags. The Contractor will protect located drain tile inlets with the potential to receive stormwater from construction of the Project using the appropriate ECDs until sources with the potential to discharge have been stabilized. The determination of the specific ECD will be made based on the location of an inlet with respect to the project area, drainage area from the construction work area to the inlet, topography, vegetation, soils, and accessibility to the inlet. Where drain tile inlets are located off of Enbridge's construction ROW, Enbridge may not have authorization to install ECDs at the inlet site. In these cases, sediment control measures (typically silt fence) will be installed along the edge of the construction work area that drains to the inlet structure to minimize sedimentation.

If underground drainage tile is damaged by pipeline construction, it will be repaired in a manner that assures proper tile line operation at the point of repair in accordance with the Agricultural Protection Plan.

1.15 UPLAND BACKFILLING

Backfilling follows pipe installation and consists of replacing the material excavated from the trench. In areas where topsoil has been segregated, the subsoil will be replaced first, and the topsoil will be spread uniformly over the area from which it was removed. Prior to backfilling, the trench will be dewatered in accordance with the methods discussed in Section 5.0 if water obscures the trench bottom.

1.16 CLEANUP AND ROUGH/FINAL GRADING

All waste materials, including litter generated by construction crews, will be disposed of daily by the Contractor. Initial cleanup and rough grading activities may take place simultaneously. Cleanup involves removing construction debris (including litter generated by construction crews and excess rock) and large woody debris. Rough and final grading includes restoring disturbed

areas as near as practicable to preconstruction conditions, returning the topsoil where topsoil has been stripped, preparing a seedbed and de-compacting subsoil (where applicable) for permanent seeding, installing or repairing temporary erosion control measures, repairing/replacing fences, and installing permanent erosion controls.

1.16.1 Timing

The Contractor will begin cleanup and rough grading (including installation of temporary erosion and sediment control measures) within 72 hours after backfilling the trench. The Contractor will attempt to complete this rough cleanup within one week. The Contractor will initiate final grading, topsoil replacement, seeding, and installation of permanent erosion control structures within 14 days after backfilling the trench. If seasonal or other weather conditions prevent compliance with these timeframes, temporary erosion controls will be maintained until conditions allow completion of cleanup.

1.17 PERMANENT EROSION AND SEDIMENT CONTROLS

During final grading, slopes in areas other than cropland will be stabilized with erosion control structures. With exception for actively cultivated areas, permanent berms (diversion dikes or slope breakers) will be installed on all slopes, according to the following maximum spacing requirements unless otherwise specified in permit conditions:

Slope (%)	Approximate Spacing (ft)
3-5	250
5-15	200
15-25	150
>25	<100

Permanent berms will be constructed according to the following specifications:

- Permanent berms will be constructed of compacted earth, stone, or functional equivalent as approved in advance by Enbridge.
- The outfall of berms will be directed toward appropriate energy-dissipating devices, and off the construction ROW if possible.
- Permanent berms will be inspected and repaired as deemed necessary by Enbridge to maintain function and prevent erosion.
- Erosion control blankets (curlex, jute, or equivalent) will be placed on slopes over 30 percent or that are a continuous slope to a sensitive resource area (e.g., wetland or waterway).

1.18 SOIL COMPACTION TREATMENT

Cultivated fields and compacted or rutted areas will be tilled prior to topsoil replacement with a deep tillage device or chisel plowed to loosen compacted subsoils. If subsequent construction and cleanup activities result in further compaction, additional measures will be undertaken to alleviate the soil compaction.

1.19 STONE REMOVAL

A diligent effort will be made to remove excess stones equal to or larger than 4 inches in diameter from the upper 8 inches of subsoil or as specified in permit conditions, contract documents, or landowner agreements. After the topsoil is replaced, stone removal efforts will cease when the size and density of stones on the construction ROW are similar to undisturbed areas adjacent to the construction ROW as determined by the EI. Excess rock will be piled in upland areas where landowner permission has been obtained or will be hauled off-site to an Enbridge approved disposal site.

1.20 REPAIR OF DAMAGED CONSERVATION PRACTICES

The Contractor will restore all soil conservation practices (such as terraces, grassed waterways, etc.) that are damaged by the pipeline construction to preconstruction conditions to the extent practicable.

1.21 LAND LEVELING FOLLOWING CONSTRUCTION

Following the completion of the pipeline, the construction ROW will be restored to its pre-construction conditions as practical. Should uneven settling or documented surface drainage problems occur following the completion of pipeline construction and restoration, Enbridge will take appropriate steps to remedy the issue.

2.0 STREAM AND RIVER CROSSING GENERAL REQUIREMENTS

The procedures in this section apply to streams, rivers, and other waterbodies such as jurisdictional ditches, ponds, and lakes. These procedures require that judgment be applied in the field and will be implemented under the supervision of Enbridge.

Stream crossing requirements, including construction methods, timing, erosion control, and restoration are described in this section and in the stream crossing permits issued by state and federal agencies and by tribal authorities (as applicable). If the contractor considers certain parts of these procedures to be technically impractical due to site-specific engineering constraints, they may submit an on-site modification request to Enbridge for consideration of alternative measures that would provide an equal or greater level of protection to the stream and river ecosystems. Enbridge will review the contractor's alternatives and consult with appropriate regulatory agencies and tribal resource specialists (as applicable). The contractor will receive written approval from Enbridge prior to implementing the alternatives. During wet and high runoff conditions, the EI will determine whether conditions warrant additional considerations for construction activities.

2.1 TIME WINDOW FOR CONSTRUCTION

All in-stream work activities (installation of dams, sheet piling, etc.) will be minimized to the extent practicable on an area and time duration basis. In-stream trenching will be conducted during periods permitted by the appropriate regulatory agencies and applicable permits. Unless otherwise specified in applicable permits and with exception to blasting and other rock breaking measures and directional drill, in-stream construction activities (specifically trenching, pipeline installation, backfill, and restoration of the streambed contours) for wet crossing methods will occur within the following timeframes:

- Minor Waterbodies (all waterbodies less than or equal to 10 feet wide at the water's edge at the time of crossing): 24 hours

- Intermediate Waterbodies (all waterbodies greater than 10 feet wide but less than 100 feet wide at the water's edge at the time of crossing): 48 hours

- Major Waterbodies (all waterbodies greater than 100 feet wide at the time of crossing): As specified by Enbridge or in the applicable permits.

These timeframes apply regardless of the presence or absence of flow. These timeframes also apply to dry crossing methods as a guideline and can be extended based on site-specific conditions with approval from Enbridge Environment staff, Construction Management, and the EI.

Stream crossings will be designed as close to perpendicular to the axis of the stream channel as engineering and routing constraints allow, creating the shortest crossing length.

2.2 CLEARING AND GRADING

The construction ROW width will consist of a 25-foot-wide neck down beginning 20 feet from the ordinary high water mark ("OHWM") / ordinary high water level ("OHWL") on the working side of the ROW (refer to Figures 15 through 17).

2.2.1 Beaver Dam Removal and Prevention of Dam Rebuilding

With landowner approval and in accordance with necessary permits obtained, the Contractor may trap beavers, alter or remove beaver dams in order to attempt to lower the water level prior to construction. For alterations, the Contractor will insert a 12-inch minimum diameter, 20-foot long minimum perforated steel culvert, or an equivalent device, through the dam to allow the water to continually drain. The perforations should be a minimum of 1.5-inch diameter, encompassing the entire circumference and extend for the full length of the culvert.

2.2.2 Impaired Waters

Where discharges of stormwater may occur to waters designated under Section 303(d) of the Clean Water Act as Impaired Waters, additional BMPs will be implemented as specified in the applicable project permits.

2.3 ADDITIONAL TEMPORARY WORKSPACE

ATWS includes work areas outside the boundary of the typical construction ROW. These spaces are typically used to assemble pipe segments and for temporary spoil storage. Clearing of forested and brushy areas for ATWS will be avoided as much as possible. Woody vegetation in wetlands and riparian areas will typically not be cleared for the purpose of ATWS unless approved by appropriate regulatory agencies as stipulated in permits issued for the Project. ATWS will be constructed as follows:

- ATWS will be located at least 50 feet away from the OHWM/OHWL if topographic or other physical conditions such as stream channel meanders allow, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land (refer to Figures 15 through 17).

- If safe work practices or site conditions do not allow for a 50-foot setback, ATWS should be located no closer than 20 feet from the OHWM/OHWL, subject to site-specific approval by Enbridge.

- ATWS will be limited to the minimum size needed to construct the stream crossing.

2.4 BRIDGES

Temporary equipment bridges will be used on most waterways (upon approval by the appropriate agency), including small waterways such as ditches and intermittent streams, where there is a potential for stormwater runoff or rain events to transport sediment downstream from equipment crossing the waterway. Bridges will be constructed as described below and will be removed as soon as possible during final restoration. Bridges will not typically be installed at directionally drilled waterbodies, unless there is no reasonable alternative that provides an efficient, economical way to transport heavy construction equipment around the waterbody by truck.

With exception to clearing-related equipment, fording of waterways is prohibited (i.e. civil survey, potholing, or other equipment are not permitted to ford waterways prior to bridge placement). Clearing equipment and equipment necessary for installation of equipment bridges

will be allowed a single pass across waterbodies prior to bridge installation, unless restricted by applicable permits.

2.4.1 Types of Bridges

Equipment bridges will be constructed using one of the following techniques:

- Typical Span Type Bridge (timber mats - refer to Figure 19)
- Rock Flume (refer to Figure 20)
- Railroad flat cars
- Flexi-float or other pre-fabricated portable bridges
- Other methods as approved by Enbridge and appropriate agencies

2.4.2 Bridge Design and Maintenance

Bridges will be designed as close to perpendicular to the axis of the stream channel, creating the shortest crossing length and will be built and maintained in accordance with applicable permits. Equipment bridges will be designed to withstand the maximum foreseeable flow of the stream with headers and support structures being placed above the OHWM of the feature. In the event that local jurisdictions require stricter guidelines associated with bridge placement, Enbridge will design the bridge to comply with these requirements. Bridges will not restrict flow or pool water while the bridge is in place, and will be constructed with clean materials. Bridges will be designed and maintained to prevent soil from entering the waterbody. Soil that accumulates on the bridge decking will be removed as needed, or as deemed necessary by the EI.

2.5 STREAM AND RIVER CROSSING CONSTRUCTION METHODS

The following stream and river crossing methods are typically used, subject to further restrictions by Enbridge and applicable permits and subject to modifications as approved by appropriate regulatory agencies and tribal resource specialists (as applicable) during construction.

2.5.1 Wet Trench Method

Installation

The wet trench method will be used to cross streams and rivers not permitted to be flumed, dam and pumped, or directionally drilled (refer to Figure 15). The following procedures will be used during wet trench crossings:

- Sediment control measures will be installed before grading from the 20-foot vegetative buffer left on each stream bank. Spoil containment structures will be installed back from the stream bank so that spoil does not migrate into the stream.

- Grading will be directed away from the waterbody to minimize the potential for sediment to enter the stream. Grading of stream banks will be restricted to the trench line and areas necessary for safe bridge installation.

- After grading, backhoes or draglines will be used to excavate the trench. Where possible, excavating equipment will operate from one or both banks, without entering the stream. If equipment must encroach into the stream, it will operate on clean construction mats. Streambed material will be segregated (e.g., upper one foot and the remaining trench spoil will be stored separately) and placed within a spoil containment structure in approved construction work area limits. Storage of streambed spoil within the stream will only be allowed if expressly approved in the applicable permits.

- Earthen trench plugs (hard plugs) between the stream and the upland trench will be left undisturbed during excavation of the in-stream trench to prevent diversion of the stream flow into the open trench and to prevent water that may have accumulated in the adjacent upland trench from entering the waterbody. Trench plugs will be removed immediately prior to pipe placement, and then replaced when the pipe is in place. Trench water accumulated upslope of trench plugs will be dewatered appropriately prior to trench plug removal.

- Water within the trench will be managed in accordance with Section 5.0

- Backfilling will begin after the pipe is positioned in the trench at the desired depth. Backfill material will consist of the spoil material excavated from the trench and parent streambed unless otherwise specified in state or federal permits. The in-stream trench will be backfilled so that the stream bottom is as near as practicable to its pre-construction condition, with no impediments to normal water flow.

Temporary Stabilization

The Contractor will restore the stream banks as near as practicable to pre-construction conditions unless that slope is determined to be unstable. If Enbridge determines the slope is considered unstable, the Contractor will reshape the banks to prevent slumping. Once the banks have been reshaped, ECDs will be installed within 24 hours of backfilling the crossing. Temporary slope breakers will be installed on all sloped approaches to streams in accordance with the spacing requirements previously specified.

A temporary seed mix (e.g., annual rye or annual oats) and mulch and/or erosion control blankets will be installed within a 50-foot buffer on either side of the stream, with exception to actively cultivated land. Silt fence or functional equivalent as approved in advance by Enbridge will be installed upslope of the temporary seeding area.

2.5.2 Dam and Pump Method

Installation

The dam and pump method is a dry crossing technique that is suitable for low flow streams and is generally preferred for crossing meandering channels. The dam and pump method involves damming of the stream upstream and downstream of the proposed trench before excavation

(refer to Figure 16) and pumping water around the construction area. The following procedures will be used for dam and pump crossings:

- Dams may be constructed of sandbags, inflatable dams, aqua-dams, sheet piling, and/or steel plates. The dams will prevent the stream from flowing into the construction area. The dams will be continuously monitored for a proper seal. Additional sandbags, plastic sheeting, steel plating, or similar materials will be used where necessary to minimize the amount of water seeping around the dams and into the construction work area. The dam will not be removed until after the pipeline has been installed, the trench has been backfilled, and the banks have been stabilized.

- Pumping of the stream across the ROW will commence simultaneously with dam construction to prevent interruption of downstream flow. Stream flow will be pumped across the construction area through a hose and will be discharged to an energy-dissipation device, such as plywood boards, to prevent scouring of the streambed.

- The pumps and fuel containers will be located on the upstream side of the crossing and will be placed in impermeable, sided structures which will act as containment units (refer to Section 10.0). The pumps used for this crossing method will not be placed directly in the stream or on the streambed. Pumps will have a capacity greater than the anticipated stream flow. The pumping operation will be staffed 24 hours a day and pumping will be monitored and adjusted as necessary to maintain an even flow of water across the work area and near-normal water levels upstream and downstream from the crossing.

The pump intake will be suspended to prevent sediment from being sucked from the bottom of stream and will be equipped with a screen, or equivalent device, to prevent fish uptake.

- Where possible, excavating equipment will operate from one or both banks, without entering the stream. If equipment must encroach into the stream, it will operate on clean construction mats (free of soil and plant material prior to being transported onto the construction ROW). Streambed material will be segregated as stated in the wet trench method and will be placed within a spoil containment structure in approved construction work area limits. Storage of streambed spoil within the stream will only be allowed if expressly approved in the applicable permits.

- Earthen trench plugs (hard plugs) between the stream and the upland trench will be left undisturbed during excavation of the in-stream trench to prevent diversion of the stream flow into the open trench and to prevent water that may have accumulated in the adjacent upland trench from entering the waterbody. Trench plugs will be removed immediately prior to pipe placement, and then replaced when the pipe is in place. Trench water accumulated upslope of trench plugs will be dewatered appropriately prior to trench plug removal.

- Standing water that is isolated in the construction area by the dams will be managed in accordance with Section 5.0

- Backfilling will begin after the pipe is positioned in the trench to the desired depth. Backfill material will consist of the spoil material and parent streambed excavated from the trench unless otherwise specified in state or federal permits. The in-stream trench

will be backfilled so that the stream bottom is similar to its pre-construction condition, with no impediments to normal water flow.

Temporary Stabilization

Restoration of the stream banks and the installation of temporary erosion controls will be similar to that described for the wet trench method above but will occur immediately following installation of the pipeline. Once the stream banks have been stabilized, the dams and pump will be removed.

2.5.3 Flume Method

Installation

The flume method is a dry crossing technique that is suitable for crossing relatively narrow streams that have straight channels and are relatively free of large rocks and bedrock at the point of crossing (refer to Figure 17). This method involves placement of flume pipe(s) in the stream bed to convey stream flow across the construction area without introducing sediment to the water. The procedures for using the flume method are described below.

- The flume(s) will be of sufficient diameter to transport the maximum flows anticipated to be generated from the watershed. The flume(s), typically 40 to 60 feet in length, will be installed before trenching and will be aligned so as not to impound water upstream of the flume(s) or cause downstream bank erosion. The flumes will not be removed until after the pipeline has been installed, trench has been backfilled, and the stream banks have been stabilized.

- The upstream and downstream ends of the flume(s) will be incorporated into dams made of sand bags 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 prevent backwash of water into the trench and construction work area. The dams will be continuously monitored for a proper seal. Adjustments to the dams will be made where necessary to prevent large volumes of water from seeping around the dams and into the trench and construction work area.

- Where possible, excavating equipment will operate from one or both banks, without entering the stream. If equipment must encroach into the stream, it will operate on clean construction mats. Streambed material will be segregated and placed within a spoil containment structure in approved construction work area limits. Storage of streambed spoil within the stream will only be allowed if expressly approved in the applicable permits.

- Earthen trench plugs (hard plugs) between the stream and the upland trench will be left undisturbed during excavation of the in-stream trench to prevent diversion of the stream flow into the open trench and to prevent water that may have accumulated in the adjacent upland trench from entering the waterbody. Trench plugs will be removed immediately prior to pipe placement, and then replaced when the pipe is in place. Trench water accumulated upslope of trench plugs will be dewatered appropriately prior to trench plug removal.

- If additional trench dewatering is necessary to complete the installation of the pipe, the discharge will be managed in accordance with Section 5.0.

- Backfilling will begin after the pipe is positioned in the trench to the desired depth. Backfill material will consist of the spoil material excavated from the trench and parent streambed unless otherwise specified in state or federal permits. The in-stream trench will be backfilled so that the stream bottom is similar to its pre-construction condition, with no impediments to normal water flow.

Temporary Stabilization

Restoration of the ROW and the installation of temporary erosion controls will be similar to that described for the wet trench method above but will occur immediately following installation of the pipeline. After the stream banks have been stabilized, the dams and flume will be removed from the stream bed allowing water to resume its flow in the channel.

2.5.4 Directional Drill and/or Guided Bore Method

Installation

Installing the pipe underneath a stream will involve placing a drill unit on one side of the stream (refer to Figure 18). A small-diameter pilot hole will be drilled under the stream along a prescribed profile. After the pilot hole has been completed, barrel reams will be used to enlarge the pilot hole to accommodate the desired pipeline diameter. Drilling mud will be necessary to remove cuttings and maintain the integrity of the hole. Water from an Enbridge-approved source will be used to prepare the slurry of drilling mud, and will be appropriated according to applicable permits. The pipe section will be pulled through the hole by the drilling rig and welded to the adjoining sections of pipe on each side of the river.

Drilling Mud

During drilling operations, drilling mud and slurry will be stored back from the waterbody in an earthen berm sediment control structure, in tanks, or by other methods so that it does not flow into the waterbody, adjacent wetlands or off the workspace (refer to Section 11.0 for additional details).

After the pipe is in place, excess drilling mud will be hauled off-site to an Enbridge-approved disposal location or licensed disposal facility.

Temporary Stabilization

The directional drilling/guided bore method normally does not result in the disturbance of the stream banks or riparian vegetation (with exception of extremely limited hand clearing of woody vegetation required to facilitate guide wire placement), which reduces the potential for erosion and sedimentation at the stream crossing. Consequently, temporary erosion control measures that are installed at open-cut crossings typically are not necessary for drilled/bored crossings.

2.6 PERMANENT RESTORATION

Stream/channel banks disturbed during installation of the pipelines will be stabilized with erosion control materials such as an erosion control blanket and seeded in accordance with Section 7.0. Permanent stabilization will be initiated within 24 hours after installation of the crossing using the wet trench method and prior to restoring flow using the dam and pump or flume method, unless site and permit conditions delay permanent installation. Where the banks have been disturbed, the Contractor will restore the slopes as near as practicable to pre-construction conditions unless that slope is determined by Enbridge to be unstable. Where the slope of the banks is determined to be unstable or has the potential to erode or fail, the banks will be reshaped to transition the disturbed areas into the natural stream bank with the intent to stabilize the bank and create a blended, natural appearance.

Berms or other sediment filter devices will be installed at the base of sloped approaches to streams greater than five percent and the outlet of the berm will be directed away from the stream into a well vegetated area. Temporary sediment control devices will remain in place until the area has stabilized and adequate revegetation has established.

2.6.1 Vegetative Bank Restoration

Typically, waterbody banks will be restored as near as practicable to preconstruction conditions after backfilling is complete and will be seeded with an appropriate seed mix as specified in Section 7.0 and covered with an erosion control blanket. Erosion controls, (e.g. straw bales, bio-logs, silt fences, etc.) will be installed as necessary based on site-specific conditions.

2.6.2 Supplemental Bank Stabilization

Unstable soils and/or site-specific factors such as stream velocity and flow direction may require additional restoration efforts, such as installation of rock rip-rap, to stabilize disturbed stream banks. Rock rip-rap will be used only where site-specific conditions require and where applicable permits or approvals have been acquired. Geotextile fabric and rock riprap will be placed according to site and permit conditions (refer to Figure 23). Disturbed soils upslope and on either side of the riprap will be prepared for seeding according to Section 7.0 and other stream bank protection requirements. Bioengineering techniques may also be implemented as determined by Enbridge (refer to Figures 26 through 28).

2.6.3 Bridge Removal

Equipment bridges will be removed during final cleanup or, if access is needed, after final cleanup and permanent seeding. Restoration of the bridge area will be completed upon bridge removal.

2.6.4 Swales

Swales will be restored as near as practicable to original conditions. Swales will be seeded and either mulched with straw or erosion control blankets will be installed to the perceivable top of bank for the width of the construction ROW.

3.0 WETLAND CROSSING GENERAL REQUIREMENTS

The procedures in this section apply to all wetlands that will be affected by the Project. These procedures require that judgment be applied in the field and will be implemented under the supervision of Enbridge and the EI. The intent of these procedures is to minimize construction-related disturbance and sedimentation of wetlands and to restore wetlands as nearly as possible to pre-existing conditions. Additionally, in wetlands that are being farmed at the time of construction, Enbridge will construct the pipeline using standard upland methods. Most seasonally saturated farmed wetlands are used for crop production and topsoil will be segregated in the same manner as topsoil in upland agricultural lands. Pipe stringing and fabrication may occur within the farmed wetland adjacent to the trench, or adjacent to the farmed wetland in a designated ATWS.

Wetland crossing requirements, including construction methods, timing, erosion control, and restoration, are described in this section and in the wetland crossing permits issued by state, federal and/or tribal agencies as applicable. If the contractor considers certain parts of these procedures to be technically impractical due to site-specific engineering constraints, they may submit an on-site modification request to Enbridge for approval of alternative measures. Enbridge will review the contractor's alternatives and consult with appropriate regulatory agencies. The contractor must receive approval from Enbridge prior to implementing the alternatives.

3.1 WETLAND ACCESS

The Contractor will use the construction ROW and only approved roads to access wetland areas.

3.2 CLEARING

Clearing the construction ROW in wetlands will be similar to clearing in uplands. For construction to proceed, obstructions (e.g., trees, brush, and logs) need to be removed. Typically, low ground pressure equipment will be used, limiting disturbance to the wetland. Vegetation and trees within wetlands will be cut off at ground level, leaving existing root systems intact; clearing debris will generally be removed from the wetland for disposal. Hydro-axe debris, or similar can be left in the wetland if spread evenly in the construction ROW to a depth which will allow for normal revegetation, as determined by the EI.

3.3 ADDITIONAL TEMPORARY WORKSPACE IN WETLANDS

In general, Enbridge attempts to locate ATWS outside of wetlands wherever practicable; however, ATWS may be sited in select wetlands where the wetland is adjacent to a waterbody, road, railroads, foreign utility crossings, and/or pipeline cross-over with prior approval from the applicable regulatory agencies. Clearing of forested wetlands for ATWS will be avoided as much as possible.

- Staging areas, additional spoil storage areas, and other ATWS will be located in upland areas at least 50 feet away from wetland boundaries (refer to Figures 24), where safe work practices or site conditions permit, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. If site conditions do not permit a 50-foot setback, then these areas will be located as far away from the wetland as is

practicable. Vegetation will not be cleared between these areas and the wetland in any event. No construction activities including vegetation clearing or earthwork will occur between the ATWS and the wetland.

- The size of the ATWS areas will be limited to the minimum needed to construct the wetland crossing.

3.4 GRADING IN A WETLAND

Grading activities will be confined to the area of the trench and will be minimized to the extent practicable. Grading outside the trench will only be allowed where required to ensure safety and restore the construction ROW after backfilling the trench with prior approval from Enbridge.

ECDs will be installed:

1. across the entire construction ROW upslope of the wetland boundary, where necessary, to prevent sediment flow into the wetland;

2. along the edge of the construction ROW as necessary to prevent sediment flow into off-ROW wetlands; and

3. along the edge of the construction ROW as necessary to contain spoil and sediment within the construction ROW through wetlands.

ECDs will be maintained in proper working order to prevent the flow of sediment into wetlands from spoil piles or sloped approaches that are adjacent to the wetlands. .

3.5 RIGHT-OF-WAY STABILIZATION

Tree stumps, brush riprap, imported soil, and rock fill will not be brought in to stabilize the ROW in wetlands. Where low ground pressure equipment is not used, construction equipment will operate from timber construction mats or equivalent means with prior approval from Enbridge (refer to Figure 24). To prevent the spread of noxious and invasive plant species, timber mats will be free of soil and plant material prior to being transported onto the construction ROW and/or moved from one area of the construction ROW to another area. Timber riprap (also known as corduroy road) will not be used without prior written approval from Enbridge and the appropriate regulatory agencies. Pre-existing corduroy roads in wetlands may be used but may not be improved, maintained, restored, or replaced without site-specific authorization from applicable agencies.

Subsoil from the pipeline trench within the immediate wetland may be placed on top of equipment mats for additional stabilization. Timber mats may be placed over the ditch line or on the working side to facilitate trench excavation. All timber mats, construction debris, and larger woody vegetative debris will be removed during cleanup of wetlands.

3.6 TRENCHING

Excavation of the pipeline trench in wetlands typically will be accomplished using backhoe excavators. The Contractor will take reasonable steps to ensure that the duration of open trench in wetlands, including tie-ins, is minimized to the fullest extent possible.

3.6.1 Topsoil Segregation

When constructing in wetland areas without standing water, up to one foot of topsoil (organic layer) will be stripped from the trench line and stockpiled separate from trench spoil to preserve the native seed stock. In standing water wetlands, organic soil segregation is not typically practical; however, the Contractor will attempt to segregate as much of the organic layer as possible based on site/saturation conditions. If normally unsaturated wetlands are saturated at the time of construction, topsoil segregation will be attempted according to Figure 2 and based on recommendations from the EI and appropriate regulatory agencies.

3.6.2 Trench Breakers

Where the EI determines that the pipeline trench has the potential to drain or partially drain a wetland, trench breakers will be installed as necessary to maintain the original wetland hydrology.

3.7 PIPELINE INSTALLATION

The following procedures are intended to minimize siltation and disturbance to wetlands during installation.

3.7.1 Push/Pull Method

Large wetlands with standing water can generally not be crossed with typical crossing methods. In these areas, the pipeline will be assembled in an upland area and positioned in the trench using the “push-pull" and/or "float" techniques.

Usually this fabrication requires use of ATWS adjacent to the construction ROW. A backhoe (or equivalent) supported on timber mats or equivalent low ground pressure equipment will be used to dig the trench. The prefabricated section of pipeline will then be pushed-pulled into position or floated across the wetland. When the pipeline is in position, floats, if used, will be removed and the pipeline will sink into position. The trench will then be backfilled and a backhoe or similar equipment working from construction mats or by low ground pressure equipment will be used restore the wetland.

3.7.2 Temporary Erosion and Sediment Controls

ECDs at approaches to wetlands will be installed as previously described and in accordance with Section 1.0.

3.7.3 Concrete Coating

Concrete will generally be mixed off-site, and concrete coated pipe will be transported to the construction ROW on trucks. If required, pre-fabricated concrete weights and/or saddlebag weights will also be used to provide negative buoyancy. Concrete weights will be manufactured off-site and transported to the ROW. Weights will be strung along the construction ROW, where necessary, until they are placed over the pipe within the excavated ditch. Limited mixing and coating activities may occur on the construction ROW for coating pipe joints and concrete weight repairs according to the concrete usage specifications in Section 10.0. Washing equipment used for mixing, pouring, casting, or coating will not be within 100 feet of any wetland

and will be conducted and contained in a leak-proof containment facility or impermeable liner. The EI will determine where ECDs will be installed down slope of equipment wash areas to capture sediments and minimize erosion from runoff.

3.8 BACKFILLING

Subsequent to pipe installation, backfilling of wetland trenches will take place immediately, or as approved by EI. The Contractor will restore wetlands as near as practicable to pre-construction conditions and will make a reasonable attempt to return the subsoil to its pre-construction density. During backfilling of wetland areas, subsoil material removed from the trench during construction will be replaced so that the material is not mounded above the adjacent ground surface (undisturbed trench wall). Subsoil that exceeds the elevation of the ground adjacent to the trench will be removed from the wetland and disposed of in an upland area or an Enbridge-approved disposal site. After the trench has been backfilled with subsoil, previously segregated topsoil will be spread over the trench area and mounded.

3.9 ROUGH GRADING, CLEANUP, AND TEMPORARY RESTORATION

Cleanup and rough grading activities may take place simultaneously. Cleanup typically involves removing construction debris and replacing fences removed during construction. Rough grading includes restoring original conditions within the disturbed areas (i.e., ditch line, spoil storage areas, and equipment travel lane) and installing or repairing temporary ECDs. Temporary slope breakers will be installed near the boundary between the wetland and adjacent sloped approaches, to prevent sediment flow into the wetland.

3.9.1 Timing

Cleanup and rough grading (including installation of temporary erosion control measures) will begin as soon as practical after the trench is backfilled, weather permitting.

3.9.2 Temporary Stabilization

Where necessary, disturbed wetland areas will be seeded with oats (40 lbs/acre) and/or a temporary seed mix, unless standing water is prevalent or unless permanent planting or seeding with native wetland vegetation is required by applicable permits. No fertilizer, lime, or mulch will be applied in wetlands.

4.0 HIGHWAY, ROAD AND RAIL CROSSINGS

4.1 ADDITIONAL WORKSPACE

Additional workspaces for bored road and railroad crossings and open-cut road crossings will be determined on a site-specific basis. These workspaces will be adjacent to the road or railroad and limited to the size needed to contain spoil, stage equipment, and store supplies for the crossing.

4.2 MAINTENANCE

Roadway crossings will be maintained in a condition that will prevent tracking of mud onto the roadway.

Rock tracking pads, constructed of stone as required by the applicable permits, will be installed adjacent to paved public roads to prevent or minimize the tracking of soil onto the roadway. If the roadside ditch is part of a jurisdictional waterway, a permit will be obtained prior to installing the tracking pad or culvert. If permitted in wetlands, tracking pads will be limited in size to reduce impacts. Tracking pads installed in wetlands will be constructed with clean rock placed on geotextile fabric, as approved by an EI and with approval from applicable regulatory agencies. All rock and fabric will be removed from the wetland during cleanup.

4.3 TEMPORARY EROSION AND SEDIMENT CONTROLS

Temporary ECDs (e.g., silt fence and/or double-staked straw bales) will be installed on sloped approaches to road crossings where vegetation has been disturbed (refer to Figure 25).

5.0 CONSTRUCTION DEWATERING

5.1 TRENCH DEWATERING

Prior to initiating dewatering activities, the EI will approve the water discharge plan to ensure that the BMPs are applied in such a way as to minimize the potential for scour and water containing sediment from reaching a wetland or waterbody. Furthermore, landowner approval is required in advance of placement of dewatering structures outside of the approved construction ROW. The Contractor will assess each water discharge situation to include:

1. **Water Discharge Setting** - This includes:

1. Soil Type - The soil type the discharged water would flow over. The management of discharged water traveling over sandy soil is more likely to soak into the ground as compared to clay soils.

2. Ground Surface - The topography in the area that would influence the surface flow of the discharged water.

3. Adjustable Discharge rate - The flow rate of the discharged water (which may need to vary) can be managed based on the site conditions to minimize instances of water from reaching a sensitive resource area such as a wetland or waterbody. (Example - Water discharged at 500 gallons per minute may soak into the ground while if discharged at a higher flow rate would cause water to flow via overland runoff into a sensitive resource area)

4. Discharge Outfall - The amount of hose and number/size of pumps needed to attempt to discharge water at a location which drains away from waterbodies or wetlands.

2. **Pump Intake** - Use floating suction hose or other similar measures to prevent sediment from being sucked from bottom of trench.

3. **Overwhelming Existing Drainage** - If the discharge (assumed to be clean) enters a stream, the flow added to the stream will not exceed 50 percent of the peak storm event flow (to prevent adding high water volumes to a small stream channel that causes erosion due to imposing high flow conditions on the stream.

4. **Filtering Mechanism –** All dewatering discharges will be directed through a filtering device as indicated below.

1. Well-Vegetated Upland Area – Water can be directed to a well-vegetated upland area through a geotextile filter bag. Geotextile bags need to be sized appropriately for the discharge flow and suspended sediment particle size.

2. Straw Bale Dewatering Structure – Where the dewatering discharge point cannot be located in an upland area due to site conditions and/or distance, the discharge should be directed into a straw bale dewatering structure. The size of the straw bale dewatering structure is dependent on the maximum water discharge rate (refer to

Figure 21). A straw bale dewatering structure should be used in conjunction with a geotextile filter bag to provide additional filtration near sensitive resource areas.

3. Alternative dewatering methods - Alternative methods may be approved by Enbridge on a site-specific basis.

5.1.1 Flow Measurement and Water Sampling

The volume of water discharged from the trench will be recorded as required by the applicable permits. The volume may be determined using a flow meter, or equivalent method, as approved by Enbridge or specified by applicable permit conditions.

Samples of the water discharged will be sampled if required by tribal permits and/or state-issued discharge permits.

5.1.2 Regulatory Notification and Reporting

Enbridge will notify and submit reports to appropriate tribal, state and federal agencies as required by all permits/authorizations.

5.2 HYDROSTATIC TEST DISCHARGES

Hydrostatic testing involves filling the new pipeline segments with water acquired in accordance with applicable permits (refer to Section 6.0), raising the internal pressure level, and holding that pressure for a specific period of time per federal DOT specifications. Hydrostatic testing will be done to verify that there are no flaws in the pipe or welds. Pre-built sections may be hydrostatically tested prior to installation using HDD and/or guided bore techniques. Hydrostatic testing will be conducted in accordance with applicable appropriation and discharge permits obtained by Enbridge. Hydrostatic test waters will not be transferred from one waterbody to another. Chlorinated source water will be used and treated as specified in applicable permits. After the hydrostatic test is complete, the line will be depressurized and the water discharged.

5.2.1 Refueling

The operation and refueling of hydrostatic test equipment will be in accordance with the conditions outlined in Section 10.0.

5.2.2 Siting of Test Manifolds

Hydrostatic test manifolds will be installed where necessary to ensure proper test pressures and incorporates changes due to topography. Where feasible, Enbridge will incorporate minor adjustments to the test manifold locations to avoid placement in wetlands and riparian areas. However, completely avoiding the placement of a test manifold in a wetland may not always be possible. The Contractor will install appropriate erosion control measures where the EI determines they are necessary.

5.2.3 Water Sampling

Water discharged from hydrostatic tests will be sampled as required by state-issued appropriation or discharge permits. Water volumes and flow rates will be recorded using the form provided in Appendix D.

5.2.4 Best Management Practices

Prior to hydrostatic testing the pipeline, Enbridge will prepare the pipe by removing accumulated construction debris, mill scale, dirt, and dust using a cleaning pig. The debris will be collected in a temporary receiver and will be properly disposed off-site of by the Contractor. Upon completion of the cleaning operation, the pipeline will be sealed with the test headers.

Test headers and pigs will be arranged to allow for rinse water to be installed ahead of the fill pigs. Rinse water will be treated and disposed of in accordance with applicable permit conditions.

Following testing, the test section will be depressurized and the water will be discharged to a well-vegetated, upland area with an appropriate dewatering structure such as a geotextile filter bag and/or a hay bale structure that will be lined with geotextile fabric. Direct discharges to surface waters, if allowed by permit, will be directed into an energy dissipation device such as a splash pup.

At no time will the discharge rate exceed the applicable discharge rates specified in state-issued or other discharge permits. In the event no maximum discharge rate is identified, discharges will be monitored and adjusted as necessary to avoid scouring, erosion, or sediment transport from the discharge location.

To minimize the potential for introduction and/or spread of invasive species due to hydrostatic testing activities, Enbridge will discharge water to the same source location from which it was appropriated. If water is used to test multiple test sections, it will be relayed back to the source water through the pipeline for final discharge. Test water will not be discharged to a waterbody other than the appropriation source, unless coordinated and permitted through the applicable agencies.

5.2.5 Flow Measurement

The total volume of water discharged will be determined with a flow meter (or equivalent), or as required by the applicable state permit. The total volume of water discharged will not exceed the volume specified in the applicable permit.

6.0 WATER APPROPRIATION

6.1 GENERAL

Water may be drawn from local sources, such as lakes, streams, and private or municipal wells for construction activities such as dust control, HDD/guided boring, trench dewatering, and hydrostatic testing. The Project will follow applicable permit conditions for the appropriation of water.

The intake hose will be suspended off of the stream or lake bottom and equipped with a screen, or equivalent device, to prevent fish uptake. During withdrawal, adequate waterbody flow rates and volumes will be maintained to protect aquatic life and allow for downstream uses. The volume and rate of withdrawal will be monitoring to comply with applicable permit conditions.

6.2 WATER SOURCES

Water will only be withdrawn from sources approved by Enbridge and in accordance with applicable permits. No additives to the water are permitted unless written approval is received from Enbridge and applicable permits authorize such additives.

If appropriation is scheduled to occur during possible periods of low flow, including frozen conditions, a backup source will be identified.

6.3 FLOW MEASUREMENT

At no time will the withdrawal rate for the water source exceed the rate specified in the applicable permits.

The Contractor will measure the withdrawal rate and total volumes of water appropriated with a flow meter (or equivalent) and provide the data to Enbridge, as required by the applicable permits.

6.4 WATER SAMPLING

Where required by permit conditions, Enbridge will sample the water during appropriation. The Contractor will assist Enbridge in obtaining these samples.

6.5 REGULATORY NOTIFICATION AND REPORTING

Enbridge will notify appropriate agencies of the time of appropriations if required by the state appropriations permits. Enbridge will submit reports regarding the volume and quality of the water withdrawn if required by the applicable permits.

7.0 REVEGETATION & MONITORING

This section was developed in conjunction with Natural Resources Conservation Service ("NRCS") guidelines. Project-specific permit conditions and landowner requests (with exception to wetlands) for specific seed mixes (as indicated in the Project CLL) take precedence over this section.

7.1 PROJECT SEED SPECIFICATIONS

Seed used will be purchased on a "Pure Live Seed" ("PLS") basis for seeding (both temporary and permanent) revegetation areas. Seed tags will identify:

- purity;
- germination;
- date tested;
- total weight and PLS weight;
- weed seed content; and
- seed supplier's name and business information.

Seed will be used within 12 months of testing as required by applicable state rules and regulations. The seed tags on the seed sacks will also certify that the seed is "Noxious Weed Free". Seed rates used on the Project will be based on PLS rate, not actual weight basis. Therefore, to determine the correct application rate if not indicated on the seed tag, a correction calculation will be performed based the purity and germination. For example, a seed mix that has a specified 10 pounds PLS per acre, 95 percent germination rate, and is 80 percent pure needs to be applied at the following rate:

(95% germination × 80% purity)/100 = 76% PLS
10 pounds PLS per acre/.76% PLS = 13.2 pounds per acre actual seeding rate

The species components of individual mixes are subject to availability at the time of purchase. Grass species may be substituted with alternative native or non-invasive species that are included in the NRCS guidelines and subject to approval by Enbridge.

Seed tags will be collected by the contractor and provided to Enbridge during seeding activities. The tags will be reviewed by the EI prior to installation to ensure that the seed mix complies with Enbridge's specifications and that it is being applied to the correct location. If bulk delivery of seed is made, the above information will still be made available to Enbridge. Off-loading/on-loading of seed will not be performed in a designated wetland area.

Legume seed (if used) will be treated with an inoculant specific to the species and in accordance with the manufacturer's recommended rate of inoculant appropriate for the seeding method (broadcast, drill, or hydroseeding). When hydroseeding, four times the manufacturer's recommended rate of inoculant will be used.

7.2 TEMPORARY REVEGETATION

Enbridge's temporary seed mix (refer to Appendix C) was developed based on recommendations from the NRCS. Unless specifically requested by landowners or land

managing agencies, Enbridge does not intend to establish temporary vegetation in actively cultivated land, standing water wetlands, and/or other standing water areas.

7.3 TIMING FOR TEMPORARY VEGETATION

Temporary revegetation will be established in construction work areas where 14 days or more will elapse between:

- the completion of final grading at a site and the establishment of permanent vegetation; and/or,
- where there is a high risk of erosion due to site-specific soil conditions and topography.

Enbridge may require the Contractor(s) to conduct temporary seeding sooner than 14 days at site-specific locations near sensitive resource areas and/or areas prone to wind/water erosion.

Temporary vegetation should be established at any time between **April 1 and September 1**. Attempts at temporary revegetation after this date should be assessed on a site-specific basis and with approval from Enbridge.

7.4 MULCH

Mulch (weed-free straw, wood fiber hydromulch, or a functional equivalent) will be applied to disturbed areas (except for actively cultivated land and wetlands) if requested by the landowner or land managing agency, if specified by the applicable permits or licenses, or as required by Enbridge. Mulch will specifically be required on:

- slopes greater than 5 percent; and
- dry, sandy areas that can blow or wash away (field decision).

Mulch will be free of noxious weeds as listed in applicable state laws. Certified weed-free mulch may also be required at site-specific locations. The Contractor will be responsible for identifying and acquiring sources of weed-free and certified weed-free mulch. Sources will be approved by Enbridge prior to purchase.

Mulch will be applied at a rate of 2 tons per acre to cover at least 75 percent of the ground surface unless otherwise stipulated by permit conditions. Mulch will be uniformly distributed by a mechanical mulch blower, or by hand in areas not accessible to the mulch blower. Mulch will be anchored/crimped using a mulch-anchoring tool or disc set in the straight position to minimize loss by wind and water, as site conditions allow. In areas not accessible to a mulch-anchoring tool or too steep for safe operation, the mulch may be anchored by liquid tackifiers, with advance written approval from Enbridge. The manufacturer's recommended method and rate of application will be followed.

Hydro-mulch and liquid tackifier can be used in place of straw or weed-free hay mulch with prior approval from Enbridge. All hydromulch and liquid tackifier products used will be on the applicable state DOT product list. Application rates will be at the manufacturer's recommended rate, equal to or greater than 2 tons per acre of straw mulch.

7.5 PERMANENT REVEGETATION

Permanent vegetation will be established in areas disturbed within the construction work area (permanent easement, TWS, and ATWS) except in actively cultivated areas and standing water wetlands. The seed mixes for permanent seeding include native seed varieties commonly found and/or available from local seed distributors. Enbridge's seed mixes (refer to Appendix C) were selected to augment revegetation via natural recruitment from native seed stock in the topsoil and are not intended to change the natural species composition. Rates provided are assumed for a drill application and will be adjusted as discussed in Section 7.1.

7.6 UPLAND CONSTRUCTION AREAS

In consulting with the NRCS and other agencies, Enbridge developed standard upland seed mixes for restoring disturbed areas affected by the Project (Appendix C, Tables 1-23). These mixes include species that will provide for effective erosion control and revegetation of the project area. These seed mixes will be used by Enbridge as the standard upland mixes unless an alternate seed mix is specified by a landowner or land managing agency.

7.7 PERMANENT SEEDING OF WETLAND AREAS

7.7.1 Unsaturated Wetland Areas

Non-standing water wetlands in Minnesota will be seeded with the mix provided in Appendix C, Table 17 (MN Seed Mix 3) to provide temporary cover and allowed to revegetate naturally. No unsaturated wetlands will be seeded in North Dakota. The natural revegetation process will be encouraged by the seeds and rhizomes in the topsoil spread back over the ROW after pipe installation. No fertilizer, lime, or mulch will be applied in wetlands.

7.7.2 Saturated/Standing Water Wetlands

Enbridge does not propose to seed saturated or standing water wetland areas. It is widely accepted that the reestablishment of vegetation within standing water wetlands occurs best through natural process without supplemental seeding.

7.7.3 Forested Wetland Restoration

Enbridge proposes to allow natural reforestation of the TWS area within forested wetlands via stump sprouting, root sprouting, and natural recruitment. Specific forested wetland restoration provisions will be followed as indicated in applicable permits issued for the Project.

7.8 PERMANENT SEEDING OF WATERBODY BANKS

Enbridge will reestablish stream bank vegetation in North Dakota using ND Seed Mix 2 (Table 2, Appendix C), and in Minnesota using MN Seed Mix 2 (Table 16 Appendix C) unless an alternate seed mix is requested by applicable agencies. Additional vegetation requirements may also be contained within project-specific permits. Where a waterbody is located within a wetland, the Contractor will re-seed the banks with the applicable wetland seed mix.

7.9 SPECIALIZED SEED MIXES

Enbridge developed specialized seed mixes for restoring these areas:

1. Native prairie in North Dakota and Minnesota;
2. Openings in forested areas in Minnesota;
3. Mixed native prairie/tamed hayland areas and road ditches in North Dakota, and Minnesota;
4. Tame pasture and Conservation Reserve Program ("CRP") lands;
5. North Dakota State School land; and
6. Protected waterbody banks and wetland fringes in Minnesota.

Enbridge will provide other specialized seed mixes upon landowner request on a site-specific basis for:

- Residential Areas: This seed mix will be used to reestablish residential lawns or other types of "turf-type" land cover.
- Wildlife Areas: This seed mix will be used to provide a desirable food source for wildlife, specifically deer.

7.10 CONSERVATION RESERVE PROGRAM PROPERTIES

Enbridge's Land Agents will contact landowners where the construction ROW crosses land enrolled in CRP. Enbridge will work with the respective landowners to identify the parcel-specific CRP seed mixes. CRP lands will be seeded at the direction of the landowner per the site-specific landowner CRP requirements for that parcel and no non-CRP approved seed mix will be planted on CRP lands. CRP parcels will also be seeded with Enbridge's temporary cover seed mix. Seed for CRP seeding will meet the same criteria as other seed described in Section 7.1

7.11 SEED BED PREPARATION AND SEEDING PROCEDURES

After final grading, deep tillage will be performed in actively cultivated areas and in non-agricultural areas (as directed by Enbridge) to relieve soil compaction and promote root penetration. Deep tillage will not be conducted in non-farmed wetlands. The soil will then be tilled with a disc, field cultivator, or chisel plow (or equivalent) to prepare a seedbed, breaking up large clods and firm the soil surface.

Tillage and equipment operations related to seeding and mulching will be performed parallel to ground contours as much as practicable. Fertilizer and other soil amendments will be incorporated into the soil during seedbed preparation as specified by Enbridge in the project-specific CLL requirements and permits. No soil amendments will be applied in wetlands unless directed by the appropriate agencies.

7.12 SEEDING METHODS

Seed will be applied uniformly at specified rates across the prepared construction ROW by drilling, broadcasting, hydroseeding, or air seeding. The EI will suspend seeding activities if conditions are such that equipment will cause rutting of the surface in the designated seeding areas. Enbridge will continue to monitor ROW conditions to resume seeding activities as site conditions improve and according to the general seeding timing restrictions listed in Section 7.15.

7.12.1 Drill Seeding

Seeding equipment will be capable of uniformly distributing the seed and sowing it at the required depth. Drills will be equipped with a feeding mechanism that will provide a uniform flow of seed at the desired application rate. Double-disc furrow openers equipped with depth bands and packer wheels to firm the soil over the seed will be used where practicable.

7.12.2 Broadcast Seeding

Broadcast seeding rate will be double the drill-seeding rate. Seed will be uniformly distributed by a mechanical or hand operated seeder. Following seeding, a cultipacker, harrow, or hand rake will be used to cover the seeds and firm the seedbed as is appropriate for the area.

7.12.3 Hydroseeding

Hydroseeding rate will be double the drill seeding rate, or the same as broadcast seeding rate. Seed will be applied alone or in a seed, fertilizer, and/or hydromulch slurry. If seeding is applied alone, the amount of hydromulch material will be adjusted to the seed slurry to show where seeding has taken place, providing a means to identify uniform cover of the construction ROW. Hydroseeders will provide continuous agitation and be capable of supplying a continuous, non-fluctuating flow of slurry. Enbridge will pre-approve all hydromulch products, which must be on the applicable state DOT product list.

7.13 COMPANION CROPS

A companion crop is an annual that can be planted with the perennial species where soil erosion is a severe hazard. A companion crop may be used for all seed mixes.

Seeding rates for companion crops are lower than normal seeding rates for those crops to reduce competition with the seeded perennial species.

Table 7.13-1
Companion Crops

Seed	Planting Rate
Barley	10 lbs/acre
Oats	10 lbs/acre
Spring wheat	15 lbs/acre
Flax	7 lbs/acre

7.14 SOIL AMENDMENTS

Enbridge will consult with NRCS representatives and review county soil survey information to assess where soil amendments, specifically the application of fertilizer or lime are needed to promote successful revegetation. No fertilizer or lime will be added with native seed mixes. When using non-native species on dry, dry-mesic and mesic sites for permanent seeding a minimum of 150 pounds of 20-10-10, and 2 tons of 80-85 lime or equivalent will be applied, unless otherwise specified or restricted by the landowner, NRCS, or land-managing agency. Soil amendments may be applied to agricultural, pasture, and/or residential lands if requested by landowners and/or land managing agencies. Enbridge will apply phosphate free fertilizers to areas within 100 feet of a waterway if soil amendments are required.

7.15 SEEDING PERIODS

Recommended seeding dates in Table 7.15-1 are based on climatic records, research, and experience; and they also represent optimum periods for the germination of grass and legumes. The dates below provide adequate development of adventurous roots prior to stressful periods.

Table 7.15-1
Recommended Seeding Dates

Species Type and Season of Planting	Recommended Dates
Cool Season Species Spring Late Summer Late fall dormant seeding	Prior to May 20 August 10 to September 1 Typically, November 1 and later
Warm Season Species Spring	May 10 to June 25
Warm/Cool Season Mix Spring	May 1 to June 14

Enbridge will delay seeding during frozen ground conditions until the applicable spring seeding period or will complete dormant seeding where conditions allow (i.e., no snow cover). Enbridge will install temporary erosion controls during frozen conditions.

7.16 TIMING OF FINAL SEEDING

Upon final grading of the construction ROW, and upon the restoration of wetland and waterways, seeding and restoration/stabilization will occur within 48 hours if weather and soils conditionals allow. Other methods of stabilization will be used if temporary seeding is not appropriate due to seasonal conditions (e.g., mulch, erosion control matting).

7.17 EROSION AND SEDIMENT CONTROL

Erosion control blankets, such as sewn straw mats, jute mats, coconut erosion control blankets, or biodegradable synthetic erosion control blankets, as approved by Enbridge, will be used on slopes over 30 percent, on stream banks and ditch banks and as directed by Enbridge.

7.18 DORMANT SEEDING

Dormant seeding is a method used after soil temperatures have cooled to 55 degrees Fahrenheit or cooler to prevent seed germination. Dormant seeding is only practicable if the soil is not frozen and snow is not present. Procedures for applying soil amendments, seedbed preparation, seeding, and mulching are the same as outlined for permanent revegetation in this section.

Where dormant seeding is conducted, one or more of the following temporary erosion and sediment controls will be put in place over the freshly seeded area unless the local soil conservation authority, landowner, or land managing agency specifies otherwise. The temporary measures will be in place within 48 hours of seeding, and are as follows:

- noxious weed-free straw mulch, at not more than 2 tons/acre, anchored;
- hydromulch, at 2 tons/acre, anchored; and/or
- erosion control blanket.

Additional erosion control measures will be applied as requested by the EI.

7.19 MANAGEMENT AND MONITORING

Enbridge will monitor and address all areas where stabilization techniques have been implemented in accordance with conditions identified in the applicable project permits and/or licenses.

8.0 WINTER CONSTRUCTION

Frozen conditions can preclude effective topsoil segregation. When soil is frozen to a depth greater than the depth of topsoil, the soil will come off in thick slabs that contain both topsoil and subsoil, and mixing can result. If top soiling will proceed under these conditions, it should be done at the excavation only. A ripper (deep tillage device or scarifier) should be used to break up the frozen topsoil over the trench line only. Care should be taken to only rip to the actual depth of topsoil or to a maximum depth of 12 inches, whichever is less. Topsoil in the spoil storage area should be graded smooth to minimize mixing during backfilling. Sufficient time is needed to allow the newly graded topsoil to freeze in place prior to trenching.

Summer construction of large diameter pipelines in saturated/standing water wetlands with unconsolidated soils can be difficult and potentially result in greater wetland disturbance including wider trench widths and extensive rutting/surface disturbance. Constructing across these types of wetlands in the winter can result in fewer impacts. Heavy construction equipment use and travel along the construction ROW, which may not be possible in summer conditions due to saturated, unstable soil conditions, can be accomplished in the winter by establishing temporary winter frost/ice roads. These frost/ice roads protect underlying vegetation and upper layers of wetland surfaces from disturbance potentially created during summer construction.

The area of open excavation will be minimized during winter construction to reduce amount of frozen backfill and facilitate restoration to pre-construction contours. If winter conditions preclude final grading and cleanup, the Contractor will stabilize the area and temporary erosion control measures will remain in place until permanent erosion control measures are installed. Depending on site and weather conditions, Enbridge may require the Contractor to install dormant seeding, mulching, and/or installation of erosion control blanket on stream banks or other sensitive locations.

9.0 WASTE MANAGEMENT

The Contractor will properly handle, store, and dispose of all solid and hazardous materials and wastes that are used or generated by the Contractor as a result of the Project. The Contractor will determine if the materials and wastes associated with the Project classify as hazardous materials and/or wastes in accordance with applicable federal and/or state criteria. Upon request by Enbridge, the Contractor will provide documentation to Enbridge to substantiate findings of the regulatory status of materials and/or wastes used and/or generated as a result of the Project.

The Contractor will collect all waste materials, including oil or other waste liquids generated as a result of equipment maintenance, daily in suitable or approved containers (i.e., labeled and meeting any relevant regulatory requirements). On a routine basis, the Contractor will remove the containers of waste from the site and properly dispose of them. Throughout the duration of the Project, the Contractor will cleanup areas to the satisfaction of Enbridge. The Contractor is responsible for proper off-site disposal of all wastes generated during the Project. No wastes are to be left on Enbridge property, along the ROW, or buried in an excavation or otherwise disposed of on Enbridge property or ROW.

9.1 HAZARDOUS WASTES

If a Contractor generates a hazardous waste from materials they have brought on-site (e.g., paint clean-up solvents, waste paints), then the Contractor is responsible for proper waste collection, storage and disposal in accordance with all applicable regulations. The Contractor remains responsible for the proper handling, storage and disposal of the hazardous waste. Any release of the hazardous waste as a result of the improper handling, storage or disposal by the Contractor in this instance is the responsibility of the Contractor to rectify to the satisfaction of Enbridge and all applicable regulatory agencies.

9.2 ABRASIVE BLAST DEBRIS

The Contractor will contain and collect spent abrasive blast materials and place it into appropriate containers. The Contractor is responsible for covering the containers with appropriate means of rainwater and stormwater control to prevent said waters from entering or exiting the container. The Contractor is responsible for disposal of the spent abrasive in accordance with applicable federal, state and local regulatory requirements. The Contractor is responsible for determining if the spent abrasive is classified as a “hazardous” or “special” waste as defined by applicable federal and state regulations. If the spent abrasive is determined to be hazardous waste as a direct result of constituents of an Enbridge facility or equipment, Enbridge will coordinate proper disposal with the Contractor as previously discussed.

10.0 SPILL PREVENTION, CONTAINMENT, AND CONTROL MEASURES

This section describes planning, prevention and control measures to minimize impacts resulting from spills of fuels, petroleum products, or other regulated substances as a result of construction. These measures will be implemented by the Contractor, unless otherwise indicated by Enbridge.

10.1 PLANNING AND PREVENTION

Enbridge requires its Contractors to implement proper planning and preventative measures to minimize the likelihood of spills, and to quickly and successfully clean up a spill should one occur. This section sets forth minimum standards for handling and storing regulated substances and cleaning up spills. Potential sources of construction-related spills include machinery and equipment failure, fuel handling, transfer accidents and storage tank leaks. The Contractor will be responsible for implementing, at a minimum, the following planning and prevention measures.

10.2 ROLES AND RESPONSIBILITIES

10.2.1 Spill Coordinator

A Spill Coordinator will be designated by the Contractor, subject to approval by Enbridge. For all construction related spills, the Spill Coordinator will:

- report all spills to the Enbridge Representative immediately;
- report spills to appropriate federal, state and local agencies as soon as possible (subject to EI verification);
- mobilize on-site personnel, equipment, and materials for containment and/or cleanup commensurate with the extent of the spill;
- assist the Emergency Response Contractor (refer to a list of potential contractors provided in Appendix E) and monitor containment procedures to ensure that the actions are consistent with the requirements of this section;
- in consultation with Enbridge and appropriate agencies, determine when it is necessary to evacuate spill sites to safeguard human health;
- in consultation with Enbridge, coordinate with appropriate agencies the need to contact additional parties or agencies; and
- complete a Spill Report Form (refer to Appendix F) within 24-hours of the occurrence of a spill, regardless of the size of the spill.

10.2.2 Environmental Inspector

The EI will monitor the Contractor's compliance with the provisions of this section to ensure that appropriate agency notifications are made, spill resources are allocated, and clean-up is accomplished in accordance with applicable agency requirements

10.2.3 Authorized Personnel

Authorized Personnel are representatives of the Contractor who are designated to handle fuel, lubricants or other regulated substances. Authorized Personnel will be familiar with the requirements of this section and the consequences of non-compliance.

10.2.4 Construction Superintendent

The Contractor's Construction Superintendent or representative will notify the EI immediately of any spill of a petroleum product or hazardous liquid, regardless of volume.

10.2.5 Construction Personnel

Construction Personnel are representatives of the Contractor involved with the installation of the pipeline. Construction Personnel will notify the crew foreman or Spill Coordinator immediately of any spill of a petroleum product or hazardous liquid, regardless of volume.

10.3 TRAINING

The Contractor will train all employees handling fuels and other regulated substances to follow spill prevention procedures. The Contractor will train all employees who handle fuels and other regulated substances to prevent spills and to quickly and effectively contain and clean up spills that may occur in accordance with applicable regulations. .

10.4 EQUIPMENT

- Each construction crew will have adequate absorbent materials and containment booms on hand, to enable the rapid cleanup of any spill which may occur.

- The Contractor will maintain spill kits containing a sufficient quantity of absorbent and barrier materials to adequately contain and recover foreseeable spills. These kits may include, but are not limited to absorbent pads, straw bales, absorbent clay, sawdust, floor-drying agents, spill containment barriers, plastic sheeting, skimmer pumps, and holding tanks. This equipment will be located near fuel storage areas and other locations as necessary to be readily available to control foreseeable spills.

- Suitable plastic lining materials will be available for placement below and on top of temporarily-stored contaminated soils and materials.

- All fueling vehicles, and where necessary, service vehicles, will carry materials adequate to control foreseeable spills. Such material may include but not be limited to absorbent pads, commercial absorbent material, plastic bags with ties, and shovels.

- The Spill Coordinator will inform the Authorized Personnel, Construction Personnel, and the EIs of the locations of spill control equipment and materials, and have them readily accessible during construction activity. Spill kits should be clearly labeled for quick and easy identification in the field.

- All fuel nozzles will be equipped with functional automatic shut-offs.

- Fuel trucks transporting fuel to on-site construction equipment will travel only on approved access roads.

10.5 SUPERVISION AND INSPECTION

The Contractor will perform a pre-construction inspection and test of all equipment to ensure that it is in good repair. During construction, the Contractor will regularly inspect hoses, pipes, valves, and tanks to ensure equipment is free of leaks. Any equipment that found to be is leaking or in need of repair will be immediately removed from service by Contractor and repaired, prior to resuming work.

10.6 STORAGE AND HANDLING OF FUELS/HAZARDOUS LIQUIDS

10.6.1 Fuel Storage - General

The Contractor will follow proper fuel storage practices, including, but not limited to the following:

- Fuel storage will be at Contractor yards only or as approved by Enbridge.

- Proper signage at and adjacent to fuel storage areas to include “Fuel Storage Area – No smoking within 50 feet.”

- Tools and materials to stop the flow of leaking will be kept on-site. Such equipment may include, but not be limited to, plugs of various sizes, 3M tank patches, a hammer, assorted sizes of metal screws with rubber washers, a screwdriver, and plastic tape.

- Fuels, lubricants, waste oil, and any other regulated substances will be stored in aboveground tanks only.

- Storage tanks and containers will conform to all applicable industry codes (e.g., National Fire Protection Association [NFPA], Unified Facilities Criteria [UFC]).

- A suitable secondary containment structure will be utilized at each fuel storage site. These structures will be lined with suitable plastic sheeting; provide a minimum containment volume equal to 150 percent of the volume of the largest storage vessel.

- Secondary containment areas will not have drains. Precipitation may be drawn off as necessary. If visual inspection indicates that no spillage has occurred in the secondary containment structure, accumulated water may be drawn off and discharged in accordance with Section 5.0. If spillage has occurred in the structure, accumulated waste will be drawn off and pumped into drum storage for disposal.

10.6.2 Refueling

Contractor will make all efforts to dispense fuel by Authorized Personnel during daylight hours. Fuel dispensing operations will be attended by Authorized Personnel at all times. Personnel will be stationed at both ends of the hose during fueling unless both ends are visible and are readily accessible by one person.

10.6.3 Refueling, Maintenance, and Fuel Storage Near Wetlands and Waterbodies

Enbridge requires that the storage of petroleum products, refueling, maintenance, and lubricating operations take place in upland areas that are more than 100 feet from wetlands, streams, and waterbodies (including drainage ditches), and water supply wells. In addition, the Contractor will store hazardous materials, chemicals, fuel and lubricating oils, and perform concrete coating activities outside these areas.

In certain instances, refueling or fuel storage may be unavoidable due to site-specific conditions or unique construction requirements (e.g., continuously operating pumps or equipment on barges). These locations will be approved in advance by the EI. Site-specific precautions, in addition to those practices described above, will be taken when refueling or maintenance activities are required within 100 feet of streams, wetlands or other waterbodies. These precautions include, but are not limited to:

- adequate amounts of absorbent materials and containment booms will be kept on hand by each construction crew to enable the rapid cleanup of any spill which may occur;
- if fuel will be stored within wetlands or near streams for refueling of continuously operating pumps, secondary containment will be used;
- secondary containment structures will be lined with suitable plastic sheeting, provide a containment volume of at least 150 percent of the storage vessel, and allow for at least one foot of freeboard; and
- provide adequate lighting for these locations and activities.

10.6.4 Overnight parking

Overnight parking of equipment (including but not limited to light plants, generators, pumps, and machinery) is not allowed within 100 feet of a wetland or waterbody unless special containment provisions have been implemented and approved by the EI in advance.

10.6.5 Concrete Washout Handling

Concrete wash water, grindings and slurry, will not be discharged to wetlands, waterbodies, and storm sewer systems or allowed to drain onto adjacent properties. Wash water disposal will be limited to a defined area of the site or to an area designated for cement washout. The area(s) will be sufficient to contain the wash water and residual cement. Contractors hired to provide concrete products will provide equipment capable of reclaiming wash water during wash out.

10.7 INITIAL SPILL MANAGEMENT

10.7.1 Immediate Response

Immediately upon learning of any fuel, oil, hazardous material or other regulated substance spill, or upon learning of conditions that will lead to an imminent spill, the person discovering the situation will:

- initiate actions to contain the fluid that has spilled or is about to spill, and initiate action to eliminate the source of the spill to the maximum extent that is safely possible; and
- notify the crew foreman and/or the Spill Coordinator and provide them with the following information:
    - location and cause of the spill;
    - the type of material that has spilled; and
    - whether the spill has reached or is likely to reach any surface water.

Upon learning of a spill or a potential spill the Spill Coordinator will:

- assess the situation and determine the need for further action;
- direct subsequent activities and/or further assign responsibilities to other personnel; and
- notify the EI.

10.7.2 Mobilization

The Spill Coordinator will mobilize on-site personnel, equipment, and materials for containment and/or cleanup commensurate with the extent of the spill. If the Spill Coordinator feels that a spill is beyond the scope of on-site equipment and personnel, the Spill Coordinator will immediately notify the Construction Superintendent that an Emergency Response Contractor is needed to contain and/or clean up the spill. Appendix E contains a list of potential Emergency Response Contractors. The Spill Coordinator will assist the Emergency Response Contractor and monitor containment procedures to ensure that the actions are consistent with the requirements of this Section.

In the event of a suspected Enbridge pipeline spill (or from an adjacent pipeline), Enbridge's Emergency Pipeline Control Center will be notified at 1-800-858-5253 (24-hours/day), as well as the Enbridge EI. Actions requiring emergency response will be coordinated by Enbridge.

10.8 SPILL NOTIFICATION RESPONSIBILITIES

10.8.1 Notification Volumes

The Contractor's Construction Superintendent or representative will notify the Enbridge Representative and the EI immediately of any spill of a petroleum product or hazardous liquid, regardless of volume.

10.8.2 Spill Report Form

The Spill Coordinator will complete a Spill Report Form (Appendix F) for each release of a regulated substance, regardless of volume. The Spill Report Form will be submitted to the EI within 24 hours of the occurrence of a spill. Follow-up written reports, associated laboratory analyses, and other documentation may also be required separately on a site-specific basis as directed by the EI. Documentation is the responsibility of the Contractor.

10.8.3 Agency Notification

The Contractor will report spills to appropriate federal, state and local agencies as soon as possible. A listing of federal, state, and local agencies including reporting thresholds and timeframes is provided in Appendix G.

The Contractor, in coordination with Enbridge and the appropriate federal, state and local agencies will ensure that additional parties or agencies are properly notified. Additionally, the Contractor is responsible for ensuring that all cleanup activities required by a jurisdictional agency are satisfactorily met and provide documentation to Enbridge demonstrating this compliance.

10.9 SPILL CONTAINMENT AND CLEANUP

In the event of a spill, the Contractor will abide by all applicable federal, state and local regulations with respect to cleaning up the spill. All clean-up and other construction related spill activities will be completed by, and costs assumed by the Contractor. Specific cleanup measures for both upland and wetland/waterbody spills are described below.

10.9.1 Spill Control - Upland Areas

- If a spill should occur during refueling operations, STOP the operation until the spill can be controlled and the situation corrected.
- The source of the spill will be identified and contained immediately.
- For large spills on land, the spill will be contained and pumped immediately into tank trucks. The Contractor or, if necessary, an Emergency Response Contractor, will excavate contaminated soil.
- The spilled material and the contaminated soil will be treated and/or disposed of in accordance with all applicable federal, state, and local agency requirements.

- Smaller spills on land will be cleaned up with absorbent materials. Contaminated soil or other materials associated with these releases will also be collected and disposed of in accordance with applicable regulations.

- Flowing spills will be contained and/or absorbed before reaching surface waters or wetlands.

- Absorbent material(s) will be placed over spills to minimize spreading and to reduce its penetration into the soil.

- The Spill Coordinator, in consultation with the EI and appropriate agencies, determine when spill sites will be evacuated as necessary to safeguard human health. Evacuation parameters will include consideration for the potential of fire, explosion, and hazardous gases.

10.10 SPILL CONTROL - WETLANDS AND WATERBODIES

In addition to the above measures, the following conditions apply if a spill occurs near or into a wetland or waterbody, regardless of size:

- If a spill occurs during refueling operations, **STOP** the operation until the spill can be controlled and the situation corrected.

- The Contractor will use absorbent booms and pads to contain and recover released materials in standing water.

- If necessary, for large spills in waterbodies, The Contractor will secure an Emergency Response Contractor to further contain and clean up the spill.

- The Contractor will excavate contaminated soils in wetlands and temporarily place them on plastic sheeting in a bermed area, a minimum of 100 feet away from the wetland. Contaminated soils will be covered with plastic sheeting while being stored temporarily and properly disposed of as soon as possible, in accordance with Section 10.11.

10.11 STORAGE AND DISPOSAL OF CONTAMINATED MATERIALS

- Appendix E lists potential treatment and disposal facilities for contaminated materials, petroleum products, and other construction-related wastes. The Contractor should recycle those wastes, such as motor oil, where there is an established recycling program available. Wastes such as grease or oily rags shall be disposed of in accordance with state requirements.

- The Contractor will store and dispose of all contaminated soils, absorbent materials, and other wastes in accordance with all applicable state and federal regulations.

- Only licensed carriers may be used to transport contaminated material from the site to a disposal facility.

- If it is necessary to temporarily store excavated soils on site, these materials will be placed on, and covered by, plastic sheeting, and the storage area bermed to prevent and contain runoff.

11.0 DRILLING FLUID RESPONSE, CONTAINMENT, AND NOTIFICATION PROCEDURES

Construction of a pipeline may include the use of trenchless methods known as the HDD and guided/road bore methods. Throughout this section, both methods are referred to collectively as "drilling". While the HDD method always includes the use of drilling fluid, the guided or road bore method might use drilling fluid or only use water to power and lubricate the bore. The HDD drilling fluids/mud consists primarily of water mixed with inert bentonite clay. Under certain conditions an additive may need to be mixed with the drilling fluids/mud for viscosity or lubricating reasons. Only non-hazardous additives will be used and a Safety Data Sheet for the drilling fluid will be maintained on-site.

This section elaborates on measures to be implemented by the Contractor if an inadvertent release of drilling fluid occurs despite prevention efforts. Prior to the commencement of drilling operations, the Contractor will inform construction personnel involved as to the responsible party(ies) for release containment and response. The Contractor will ensure that the appropriate response personnel and containment equipment are on site for each drill/bore.

11.1 ON-SITE OBSERVATION DURING CONSTRUCTION

During construction of a drilled crossing, Contractor personnel will monitor the pipeline route throughout the process, as follows:

The Contractor will inform construction observers on what to watch for and will make them aware of the importance of timely detection and response actions to any release of drilling fluid.

- Construction observers will have appropriate, operational communication equipment (e.g., radio and cell phones) available at all times during installation of the directionally drilled crossing, with the ability to communicate directly with the HDD operator.

- The HDD operator will monitor the annular drilling fluid pressures during pilot hole operations.

- If the HDD operator identifies a sustained loss in fluid pressure or loss of circulation:

    - The operator will immediately notify the construction observers of the assumed position of the drill tool; and

    - The Contractor will visually monitor the appropriate portion of the drill path where the drill tool is located to determine if an inadvertent return occurred. The Contractor may perform this monitoring by walking or by using a boat, as appropriate.

- Construction observers, EI(s), or the Enbridge HDD craft inspector have the authority to order installation of containment structures, if needed, and to require additional response measures if deemed appropriate.

11.2 CONTAINMENT, RESPONSE, AND CLEAN-UP EQUIPMENT

Containment, response and clean-up equipment will be available at both sides of an HDD crossing location and one side of a guided or road bore prior to the commencement to assure a timely response in the event of an inadvertent release of drilling fluid. Containment and response equipment includes but is not limited to:

A. straw bales and staking
B. pre-filled sandbags
C. turbidity curtain (not necessary for guided or road bores that do not involve a waterbody)
D. silt fence
E. plastic sheeting and/or geotextile fabric
F. shovels, brooms, buckets, and other appropriate hand tools
G. pumps and sufficient hose
H. fluid storage tanks (may not be necessary for guided or road bores)
I. vacuum truck on 24-hour call
J. one small boat (for larger rivers and open water wetlands)
K. light plant/generator (only necessary where operations are conducted outside of daylight hours)

11.3 RESPONSE

In the event an inadvertent drilling fluid release is observed, the EI and the Contractor will assess to determine the amount of fluid being released and potential for the release to reach sensitive resource areas (e.g., wetlands and waterbodies). Response measures will vary based on location of inadvertent release as discussed below.

11.3.1 Upland Locations

Response measures include the following:

- The EI will evaluate the release to determine if containment structures are warranted and if they will effectively contain the release.

- If the amount of the surface release is not great enough to allow the practical physical collection from the affected area, it will be diluted with clean water and/or the fluid will be allowed to dry and dissipate naturally.

- Earthen or sandbag berms, silt fence, and/or hay bales will be installed to contain small releases and prevent migration of drilling fluid.

- The Contractor will remove excess fluid at a rate sufficient to prevent an uncontrolled release.

- If the amount of the surface release exceeds that which can be completely contained with hand-placed barriers, small collection sumps (less than 5 cubic yards) may be used (with approval from Enbridge) to remove released drilling fluid by the use of portable pumps and hoses.

- The EI will inform the Contractor to initiate immediate suspension of drilling operations if the fluid release cannot be effectively contained.

11.3.2 Wetland and Waterbody Locations

This section also applies to areas immediately adjacent to wetlands and waterbodies, such as stream banks or steep slopes, where drilling fluid releases could quickly reach surface waters.

- In the event of a drilling fluid release in wetlands, waterbodies, or adjacent areas:

    1. The EI will evaluate the release, and the Contractor will implement appropriate containment measures.

    2. The EI and the Contractor will evaluate the recovery measures to determine the most effective collection method.

    3. Enbridge Engineering and the Contractor will review and consider adjusting drill pressures, pump volume rates, and drill profile, based on BMPs, to minimize the extent of the release.

    4. Enbridge will suspend drilling operations if containment measures do not effectively control the release.

- If the amount of the surface release exceeds that which can be contained with hand-placed barriers, small collection sumps (less than 5 cubic yards) may be utilized to collect released drilling fluid for removal by the use of portable pumps and hoses.

- If the amount of the surface release is not great enough to allow the practical physical collection from the affected area without causing additional impacts, with approval from both Enbridge Environmental and Construction Management, the drilling fluid may be diluted with clean water and/or the fluid will be allowed to dry and dissipate naturally.

- Excess fluid will be held within the containment area and removed using pumps or other appropriate measures at a rate sufficient to maintain secure containment.

- Recovered fluid will be stored in a temporary holding tank or other suitable structure out of the floodplain and/or wetland for reuse or eventual disposal in an approved disposal facility

- Enbridge will consult with the appropriate regulatory agencies to evaluate the circumstances of the release, discuss additional containment or cleanup requirements, and determine whether and under what conditions the HDD may proceed.

11.4 NOTIFICATION AND RESUMPTION OF SUSPENDED HDD OPERATIONS

The Contractor will immediately notify the EI of all drilling fluid releases. If the EI determines the release affects wetland or waterbody areas, he or she will immediately notify Enbridge Environment and Construction Management and the appropriate regulatory agencies.

If notifications are necessary during non-business hours they will be done according to prior arrangements made between Enbridge and the regulatory agencies. Follow-up notifications will be made as necessary and practicable.

The conditions under which drilling/boring operations can resume will be discussed with appropriate regulatory agencies and/or field representatives. If containment measures are functioning, and the circumstances and potential impacts of the release are understood, drilling/boring operations will resume.

11.5 CLEAN-UP

The following measures are to be considered as appropriate:

- Drilling fluid will be cleaned up by hand using hand shovels, buckets and soft-bristled brooms as possible without causing extensive ancillary damage to existing vegetation. Clean water washes may also be employed if deemed beneficial and feasible.

- Containment structures will be pumped out and the ground surface scraped to bare topsoil without causing undue loss of topsoil or ancillary damage to existing and adjacent vegetation.

- Material will be collected in containers for temporary storage prior to removal from the site.

- The EI will regularly evaluate the potential for secondary impact from the clean-up process and clean-up activities terminated if physical damage to the site is deemed to exceed the benefits of removal activities. This decision will be made in consultation with the appropriate regulatory agencies and/or Enbridge.

11.6 RESTORATION AND POST-CONSTRUCTION MONITORING

Following cleanup activities, restoration and revegetation of affected areas will be completed in accordance with all applicable local, state, and federal permits in addition to Enbridge's EPP. Enbridge will monitor the release site as appropriate to assure adequate restoration.

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Figures

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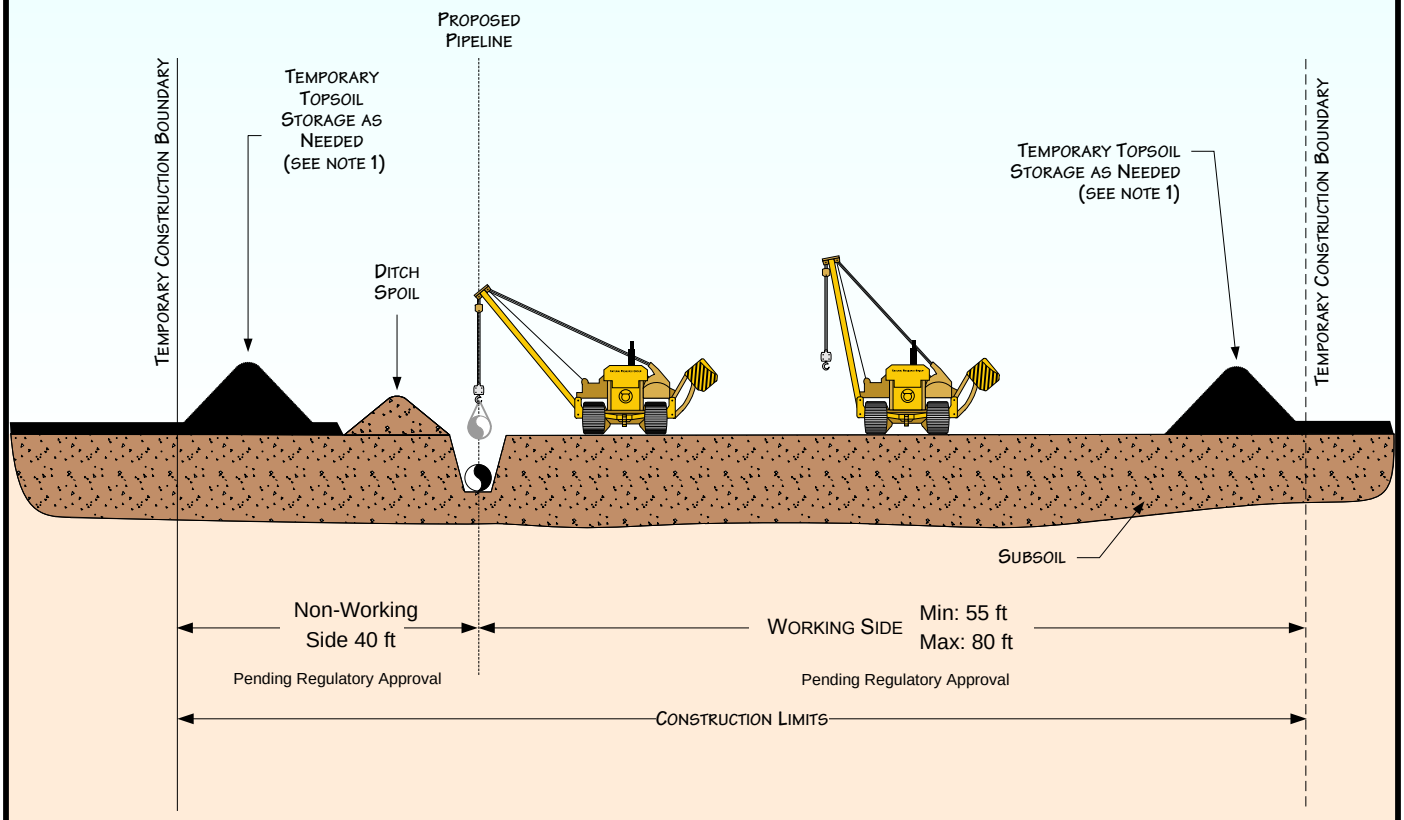


PROFILE

NOTES:

1. STOCKPILE TOPSOIL SEPARATELY FROM DITCH SPOIL AS SHOWN OR IN OTHER CONFIGURATIONS APPROVED BY THE COMPANY.

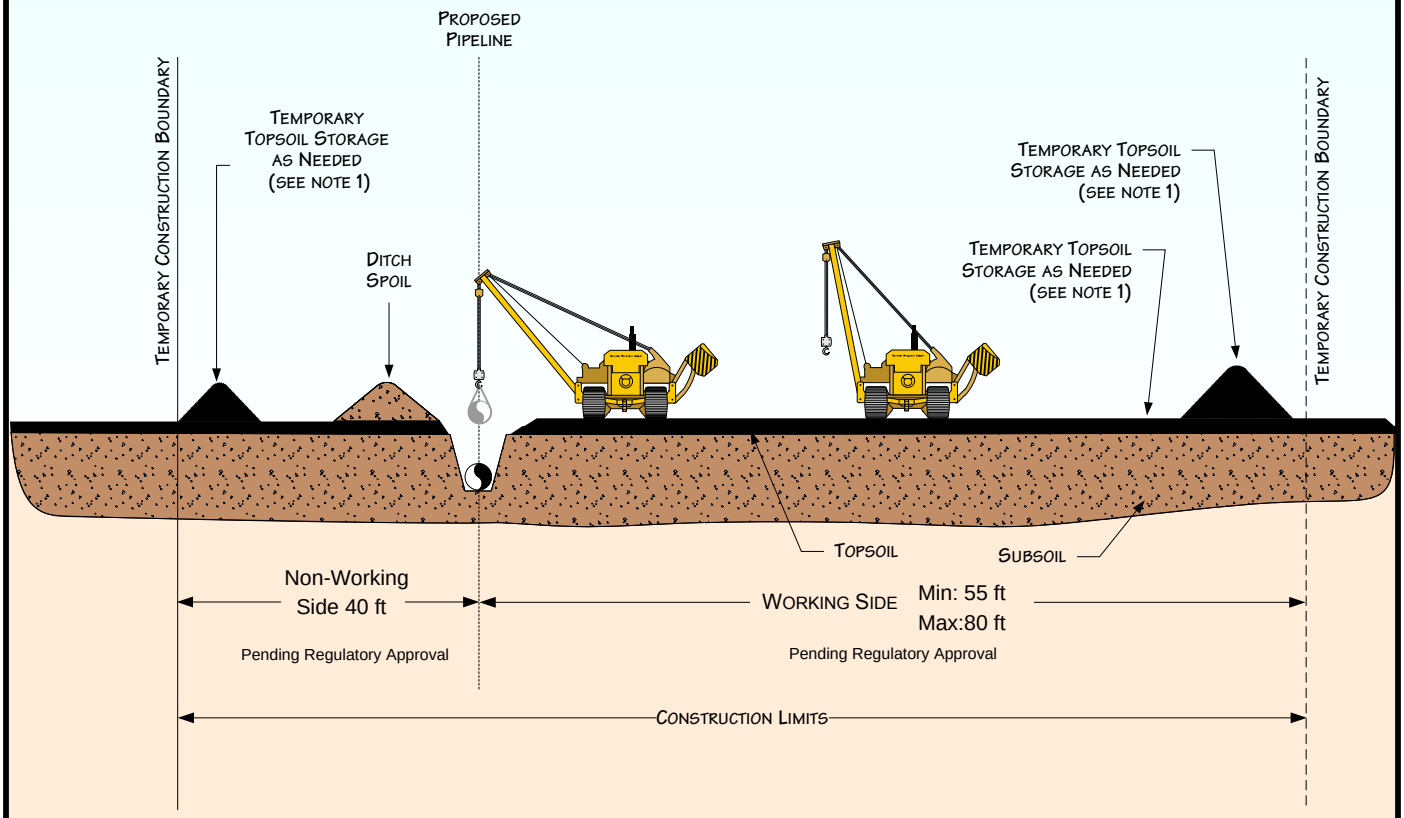
ENBRIDGE

Figure 1

Environmental Protection Plan

Typical Topsoil Segregation - Full Right-of-Way

DATE:	7/9/2001
REVISED:	3/11/2011
SCALE:	NTS
DRAWN BY:	JPBOENTJE
K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_1-3_TYPICAL_TOPSOIL_SEGREGATION.VSD	



PROFILE

NOTES:

1. STOCKPILE TOPSOIL SEPARATELY FROM DITCH SPOIL AS SHOWN OR IN OTHER CONFIGURATIONS APPROVED BY THE COMPANY.

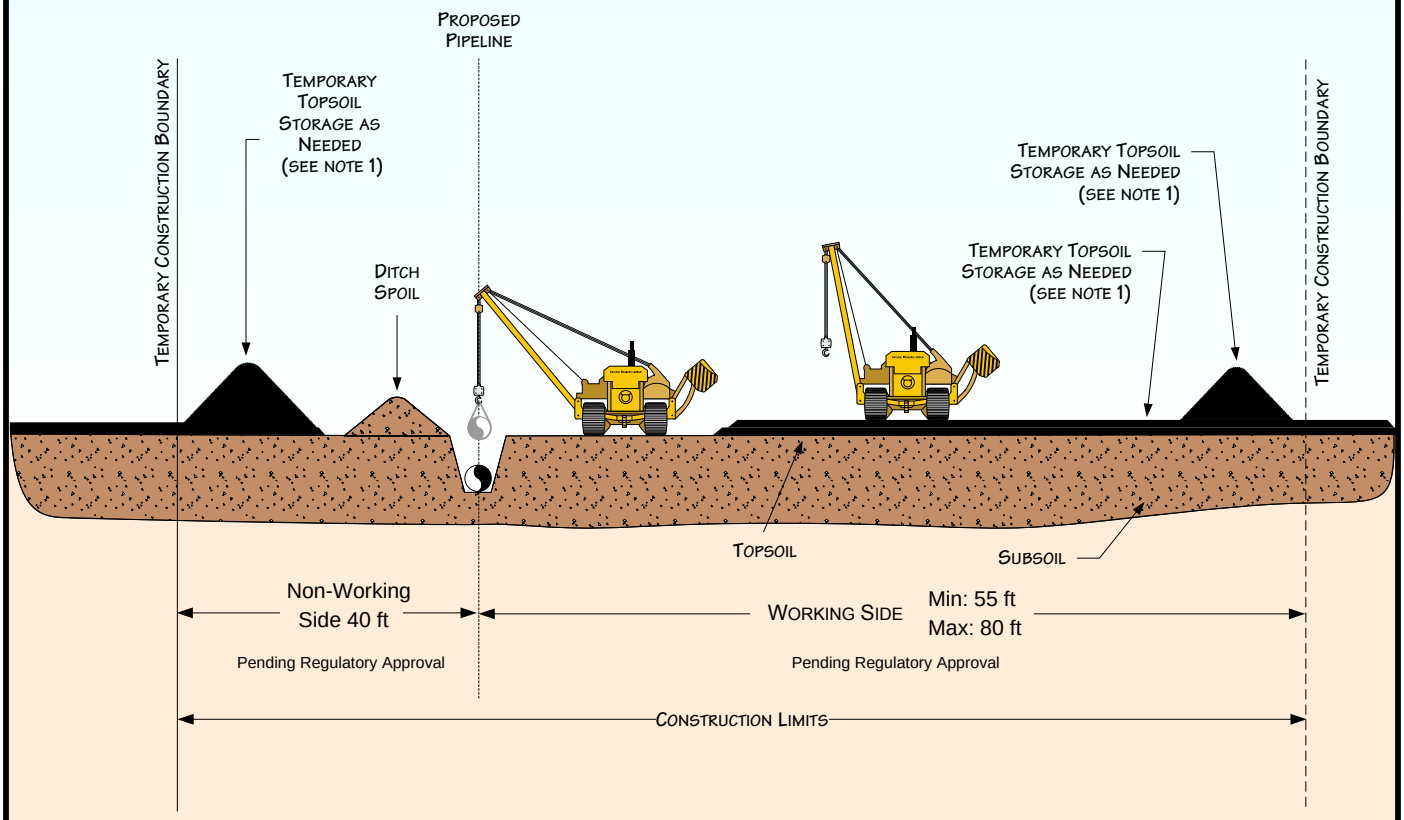
ENBRIDGE

Figure 2

Environmental Protection Plan

Typical Topsoil Segregation – Trench Line Only

DATE:	7/9/2001
REVISED:	3/11/2011
SCALE:	NTS
DRAWN BY:	JPBOENTJE
K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_1-3_TYPICAL_TOPSOIL_SEGREGATION.VSD	



PROFILE

NOTES:

1. STOCKPILE TOPSOIL SEPARATELY FROM DITCH SPOIL AS SHOWN OR IN OTHER CONFIGURATIONS APPROVED BY THE COMPANY.

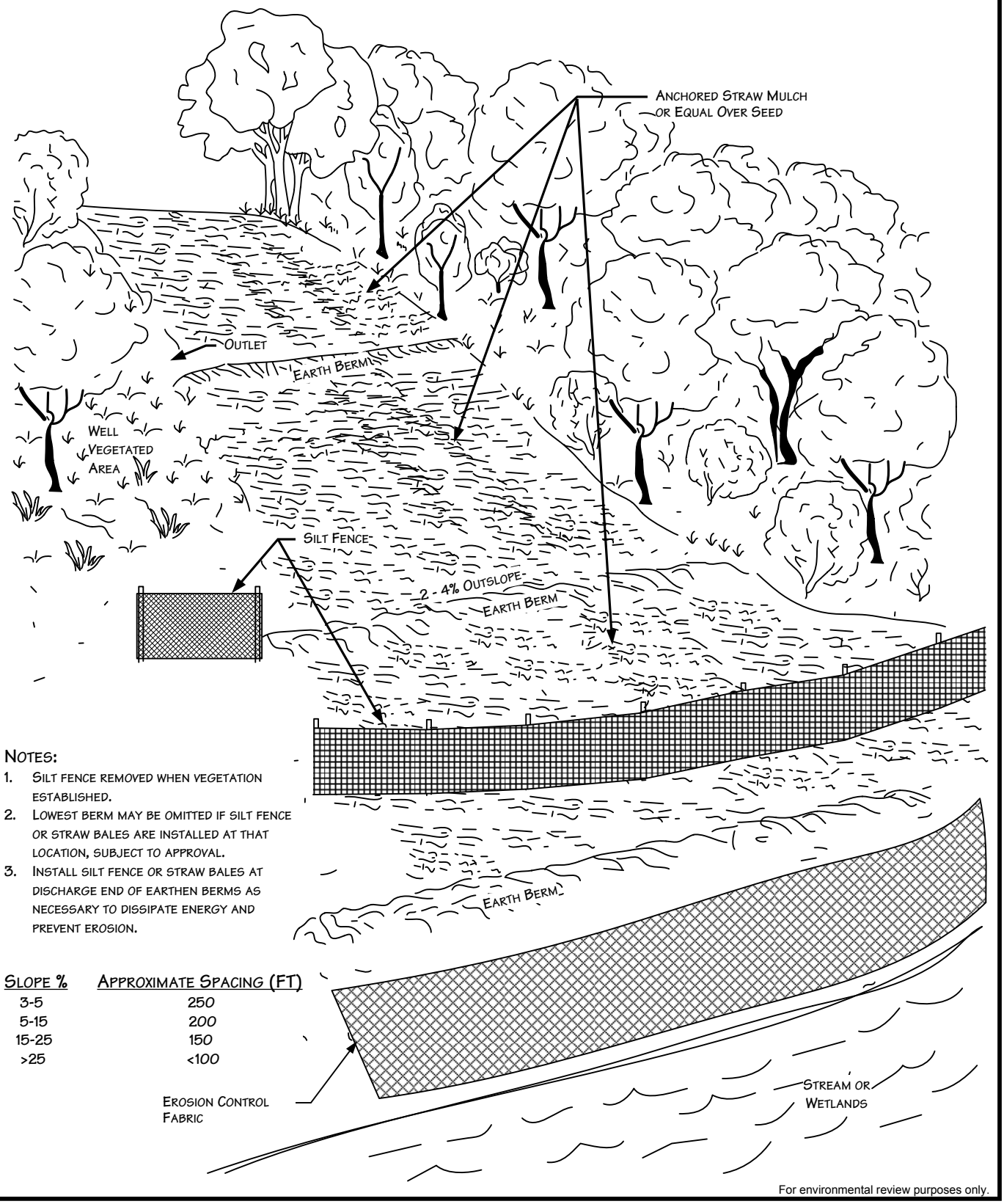
ENBRIDGE

Figure 3

Environmental Protection Plan

Typical Topsoil Segregation –
Modified Ditch Plus Spoil Side

DATE:	7/9/2001
REVISED:	3/11/2011
SCALE:	NTS
DRAWN BY:	JPBOENTJE
K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_1-3_TYPICAL_TOPSOIL_SEGREGATION.VSD	



Notes:

1. Silt fence removed when vegetation established.
2. Lowest berm may be omitted if silt fence or straw bales are installed at that location, subject to approval.
3. Install silt fence or straw bales at discharge end of earthen berms as necessary to dissipate energy and prevent erosion.

Slope %	Approximate Spacing (ft)
3-5	250
5-15	200
15-25	150
>25	<100

For environmental review purposes only.

ENBRIDGE

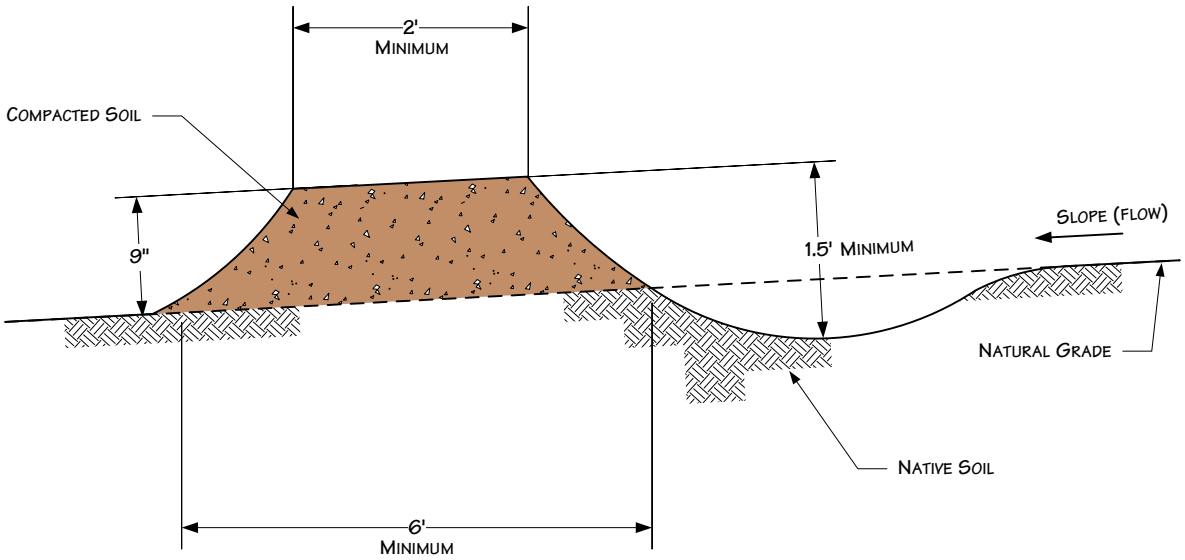
Figure 4

Environmental Protection Plan

Typical Temporary or Permanent Berms
Perspective View

DATE:	11/14/2000
REVISED:	3/11/2011
SCALE:	NTS
DRAWN BY:	KMKENDALL

K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_4_BERMS_PERSPECTIVE_VIEW.VSD



NOTES

1. BERMS SHALL BE CONSTRUCTED WITH 2 TO 4 PERCENT OUTSLOPE.
2. BERMS SHALL BE OUTLETED TO WELL VEGETATED STABLE AREAS, SILT FENCES, STRAW BALES OR ROCK APRONS.
3. BERMS SHALL BE SPACED AS DESCRIBED IN CONSTRUCTION SPECIFICATIONS.
4. ADDITIONAL INFORMATION INCLUDED ON OTHER DRAWINGS.

For environmental review purposes only.

ENBRIDGE

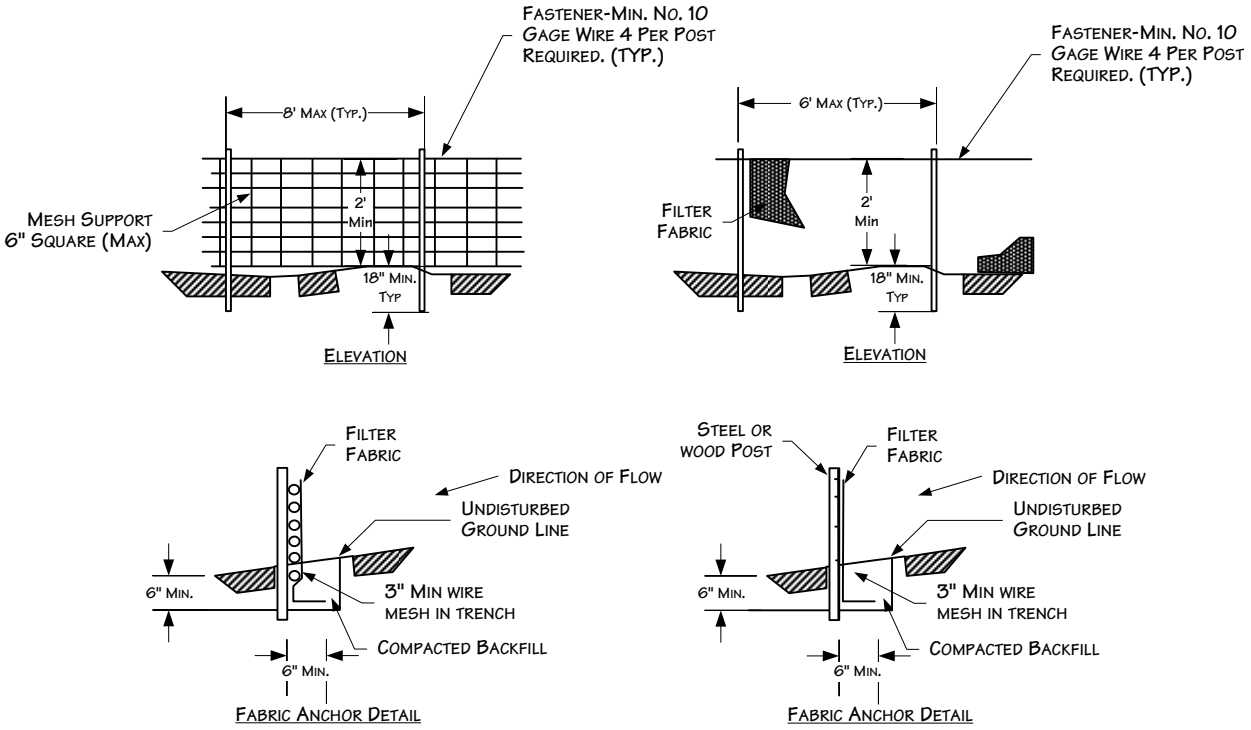
Figure 5

Environmental Protection Plan

Typical Temporary or Permanent Berms
Elevation View

DATE:	5/25/2001
REVISED:	3/11/2011
SCALE:	NTS
DRAWN BY:	KMKENDALL

K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_5_BERMS_ELEVATION_VIEW.VSD



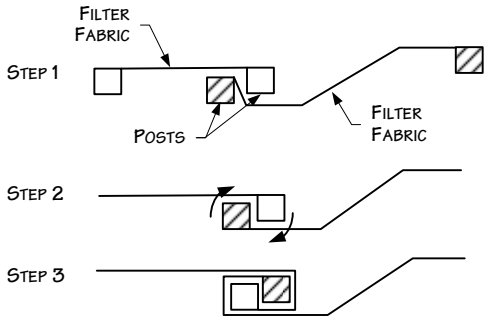
Silt Fence with wire support Plan

Silt Fence Plan

NTS

Notes:

1. Wires of mesh support shall be min. gage no. 12.
2. Filter fabric shall meet the requirements of the specification with equivalent opening size of at least 30 for nonwoven and 50 for woven. (Sieve No.)
3. The posts used to support the silt fence should be hardwood material with a minimum cross sectional area of 4 inches square and 4 feet long. Metal posts should be used in areas that pond water.



Attaching two silt fences

Notes:

1. Place the end post of the second fence inside the end post of the first fence.
2. Rotate both posts at least 180 degrees in a clockwise direction to create a tight seal with the fabric material.
3. Drive both posts a minimum of 18 inches in the ground and bury the flap.

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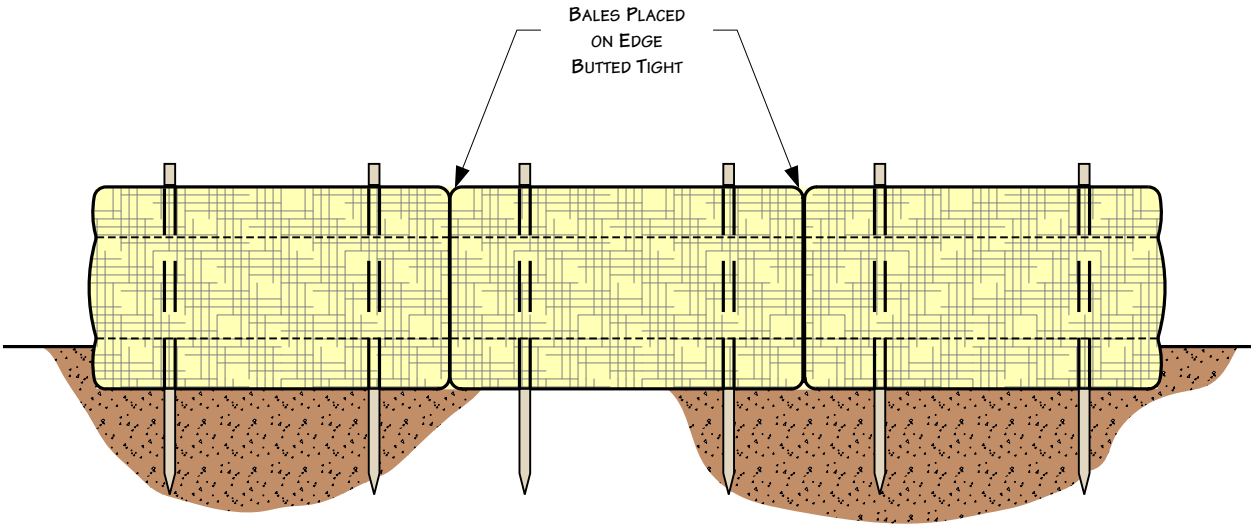
Figure 6

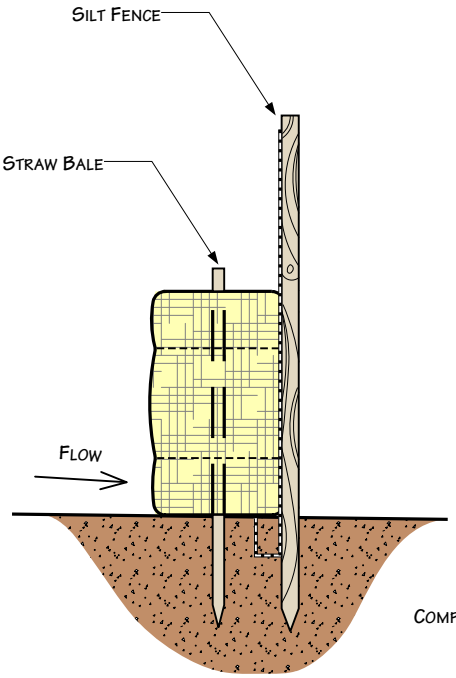
Environmental Protection Plan

Typical Silt Fence Installation

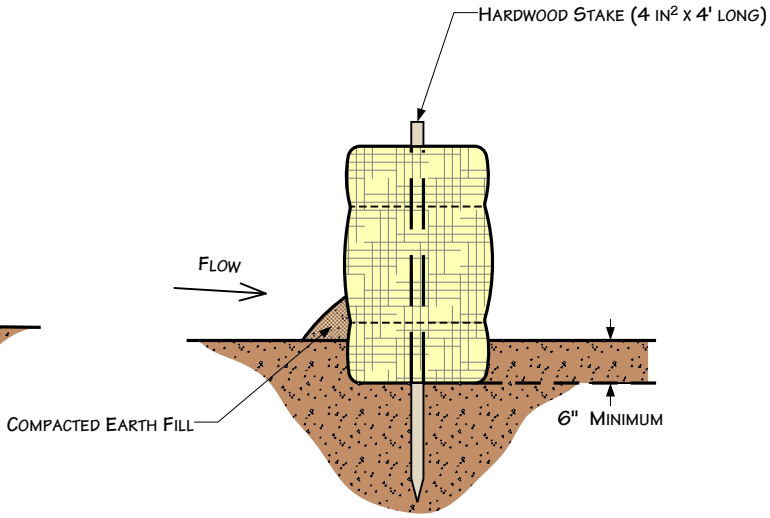
DATE:	5/25/2001
REVISED:	3/23/2011
SCALE:	NTS
DRAWN BY:	KMKENDALL

K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_6_SILT_FENCE_INSTALL.VSD





Straw Bales & Silt Fence



Straw Bales Only

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Figure 7
Environmental Protection Plan
Typical Straw Bale Installation

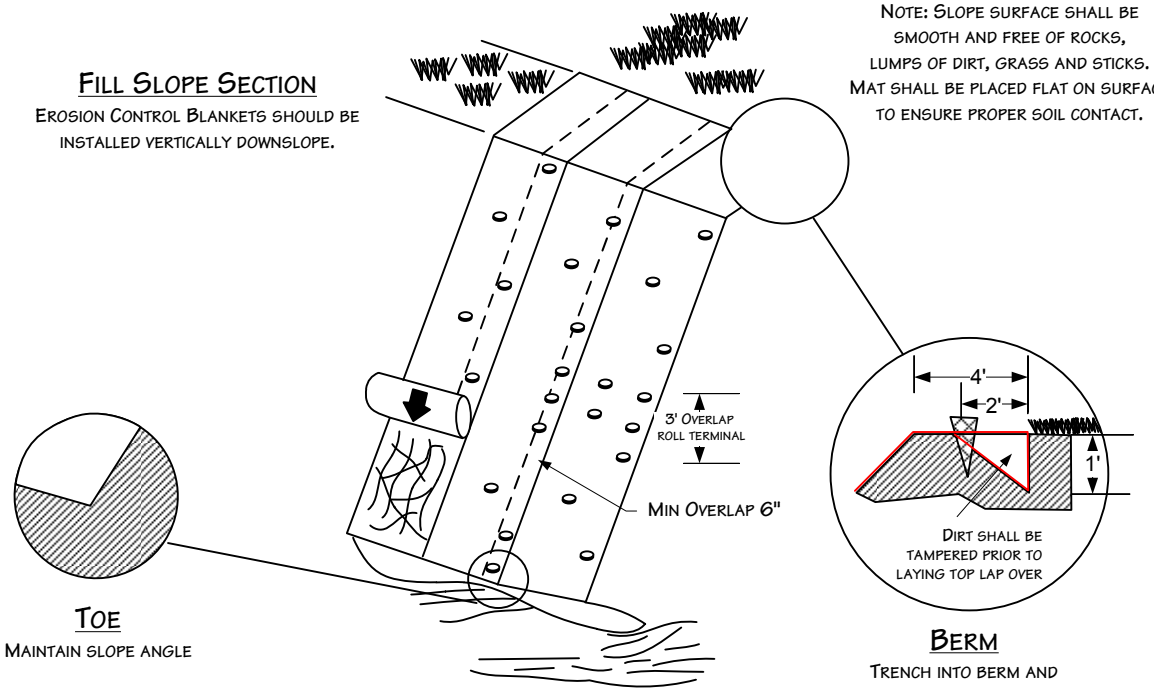
DATE:	5/25/01
REVISED:	3/11/11
SCALE:	Not to Scale
DRAWN BY:	KMKENDALL

K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_7_STRAW_BALE_INSTALL.VSD

Fill Slope Section

Erosion Control Blankets should be installed vertically downslope.

Note: Slope surface shall be smooth and free of rocks, lumps of dirt, grass and sticks. Mat shall be placed flat on surface to ensure proper soil contact.



Toe

Maintain slope angle

Berm

Trench into berm and progress downslope

Stream Channel

Erosion Control Blankets should be installed Horizontally with Stream Flow.

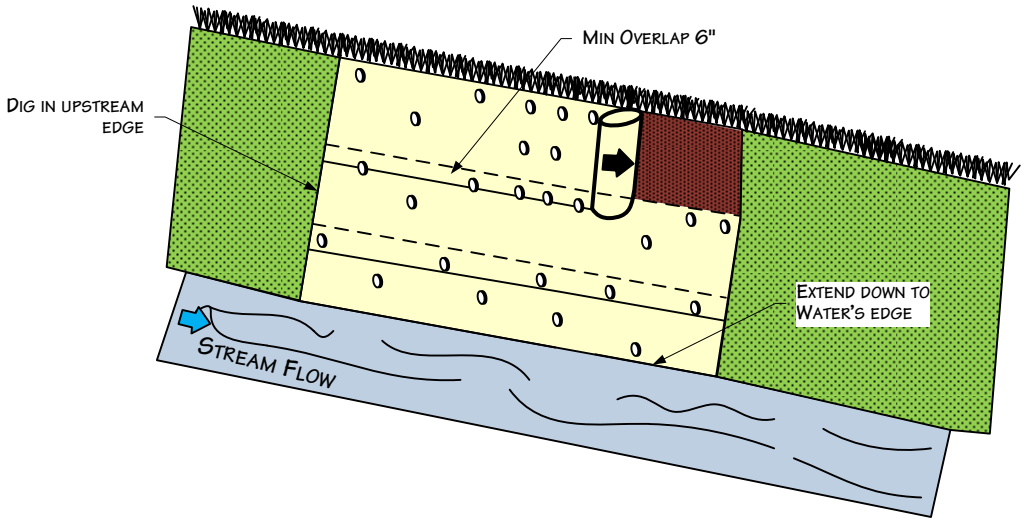


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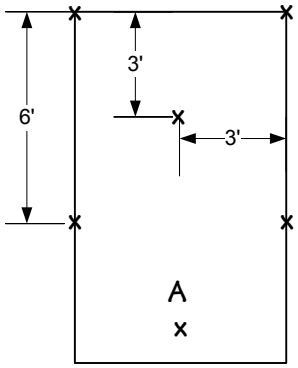
Figure 8

Environmental Protection Plan

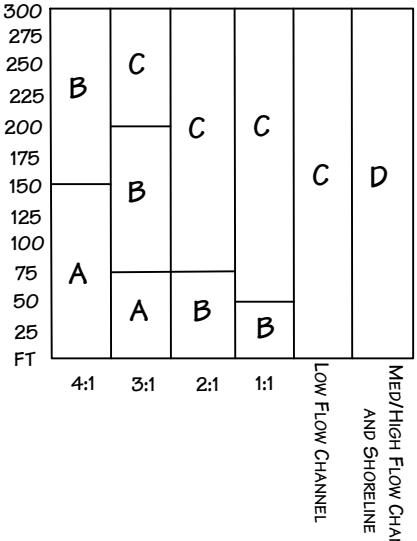
Typical Erosion Control Blanket Installation

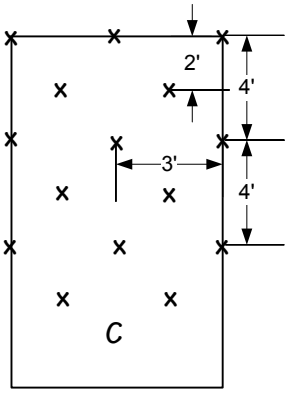
DATE:	5/25/2001
REVISED:	3/23/2011
SCALE:	NTS
DRAWN BY:	KMKENDALL

K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_8_EROSION_CONTROL_BLANKET_INSTALL.VSD

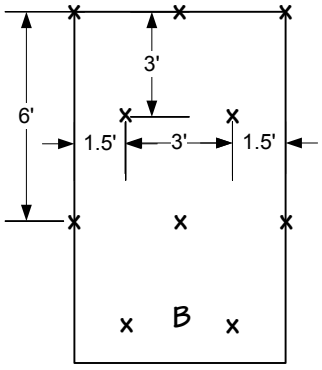


1 Staple Per Sq. Yd



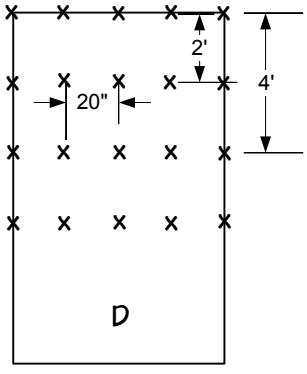


2 Staples Per Sq. Yd



1 ½ Staples Per Sq. Yd

For optimum results, these recommended staple pattern guides must be followed. Suggested anchoring methods vary according to the manufacturer. This chart shows how to slope lengths and how gradients affect sampling patterns.



3 1/2 Staples Per Sq. Yd

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Figure 9

Environmental Protection Plan

Typical Staple Pattern for Erosion Control Fabric

DATE:	5/25/2001
REVISED:	3/24/2011
SCALE:	NTS
DRAWN BY:	KMKENDALL

K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_9_STAPLE_PATTERN_EROSION_CONTROL_FABRIC.VSD

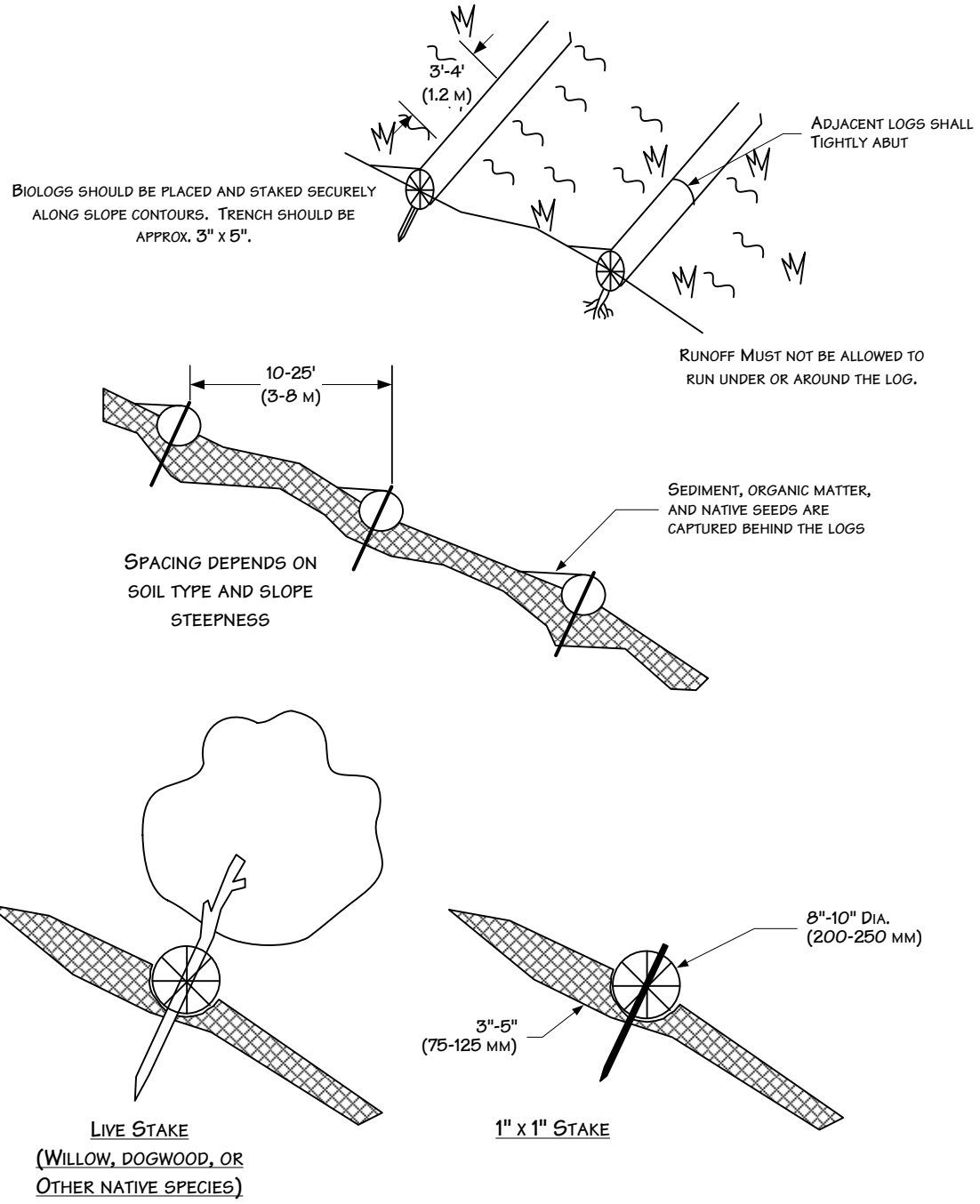

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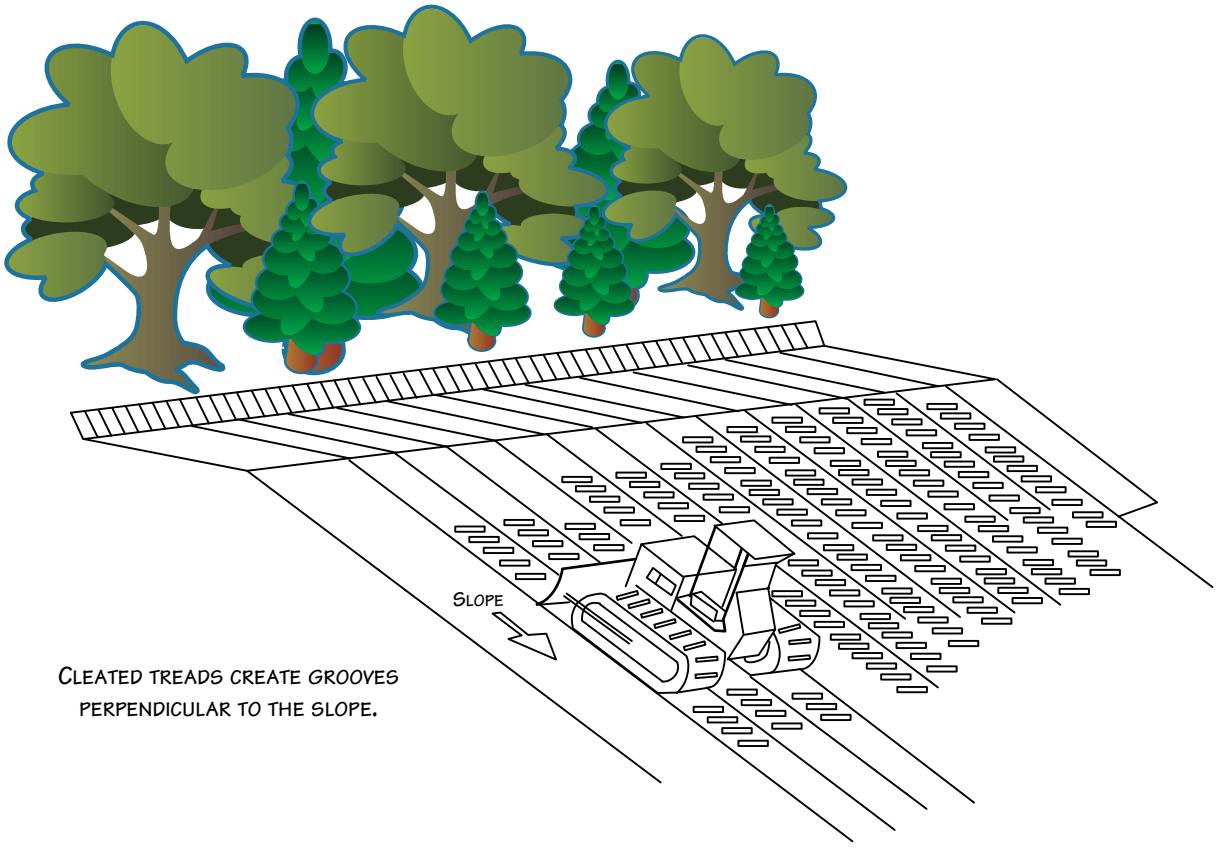
Figure 10
Environmental Protection Plan
Typical Biolog Installation

DATE:	5/25/2001
REVISED:	3/24/2011
SCALE:	NTS
DRAWN BY:	KMKENDALL

K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_10_BIOLOG INSTALL.VSD



CLEATED TREADS CREATE GROOVES PERPENDICULAR TO THE SLOPE.

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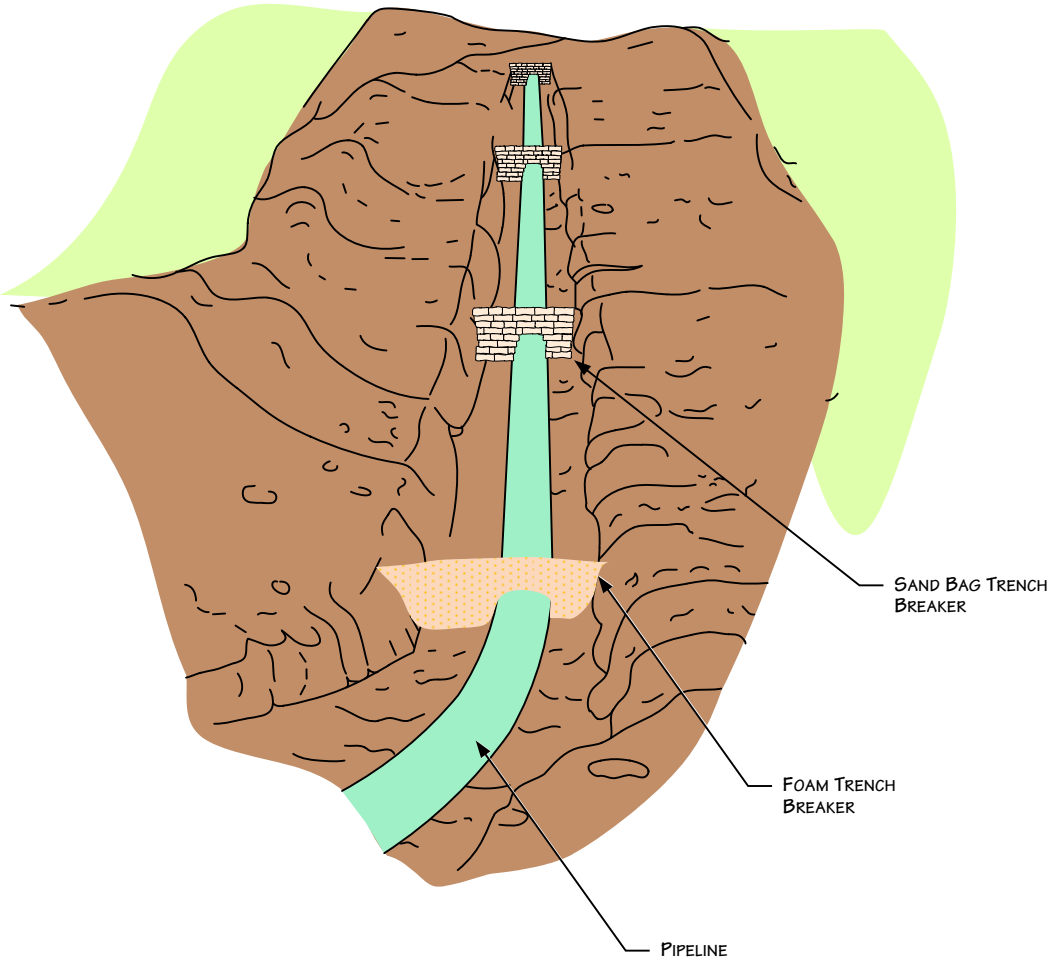
Figure 11
Environmental Protection Plan
Typical Cat Tracking

DATE:	5/25/2001
REVISED:	3/24/2011
SCALE:	NTS
DRAWN BY:	KMKENDALL

K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_11_CAT_TRACKING.VSD



Notes

1. Bags will not be filled with topsoil.
2. Additional information included on other drawings.

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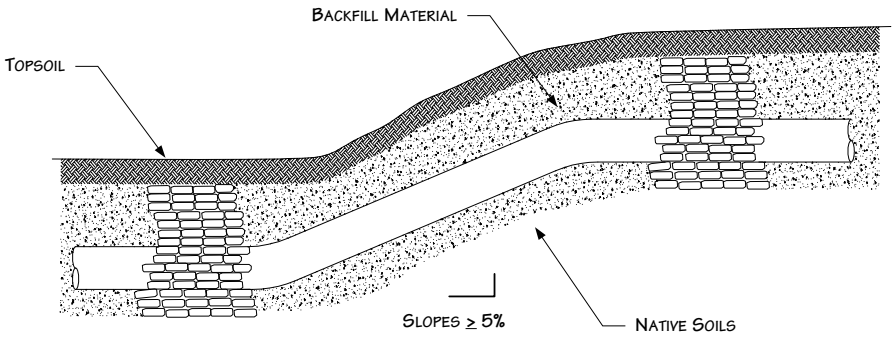
ENBRIDGE

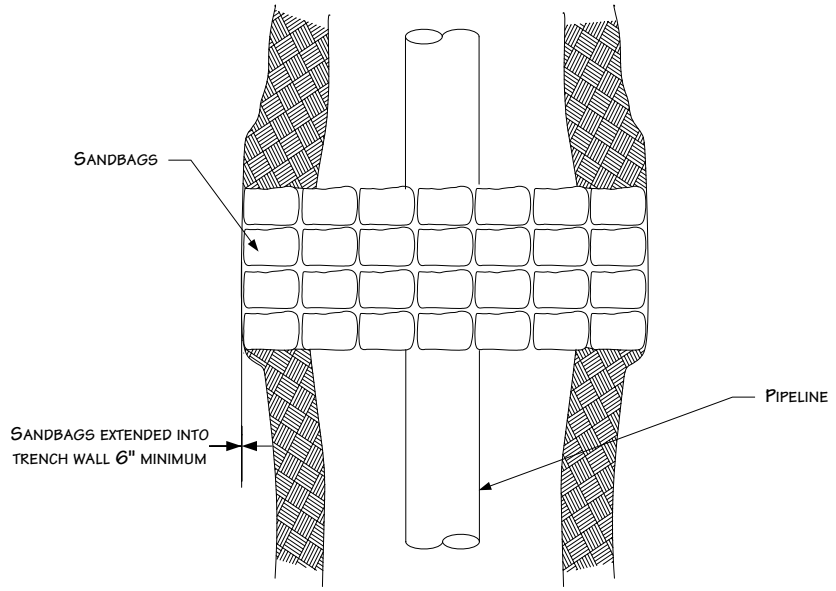
Figure 12
Environmental Protection Plan
Typical Trench Breakers - Perspective View

DATE:	5/25/2001
REVISED:	3/11/11
SCALE:	NTS
DRAWN BY:	KMKENDALL

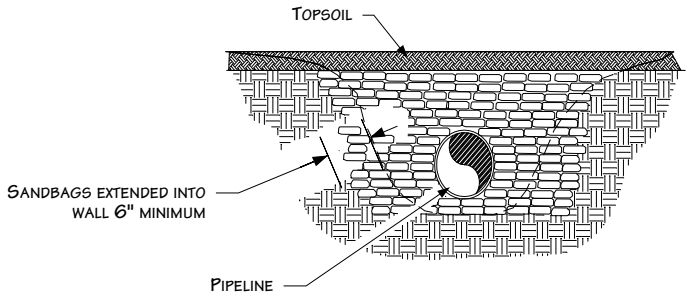
K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_12_TRENCH_BREAKER_PERSPECTIVE_VIEW.VSD



PROFILE VIEW
(NOT TO SCALE)



PLAN VIEW
(NOT TO SCALE)



FACE VIEW
(NOT TO SCALE)

NOTES

1. BAGS WILL NOT BE FILLED WITH TOPSOIL
2. ADDITIONAL INFORMATION INCLUDED ON OTHER DRAWINGS

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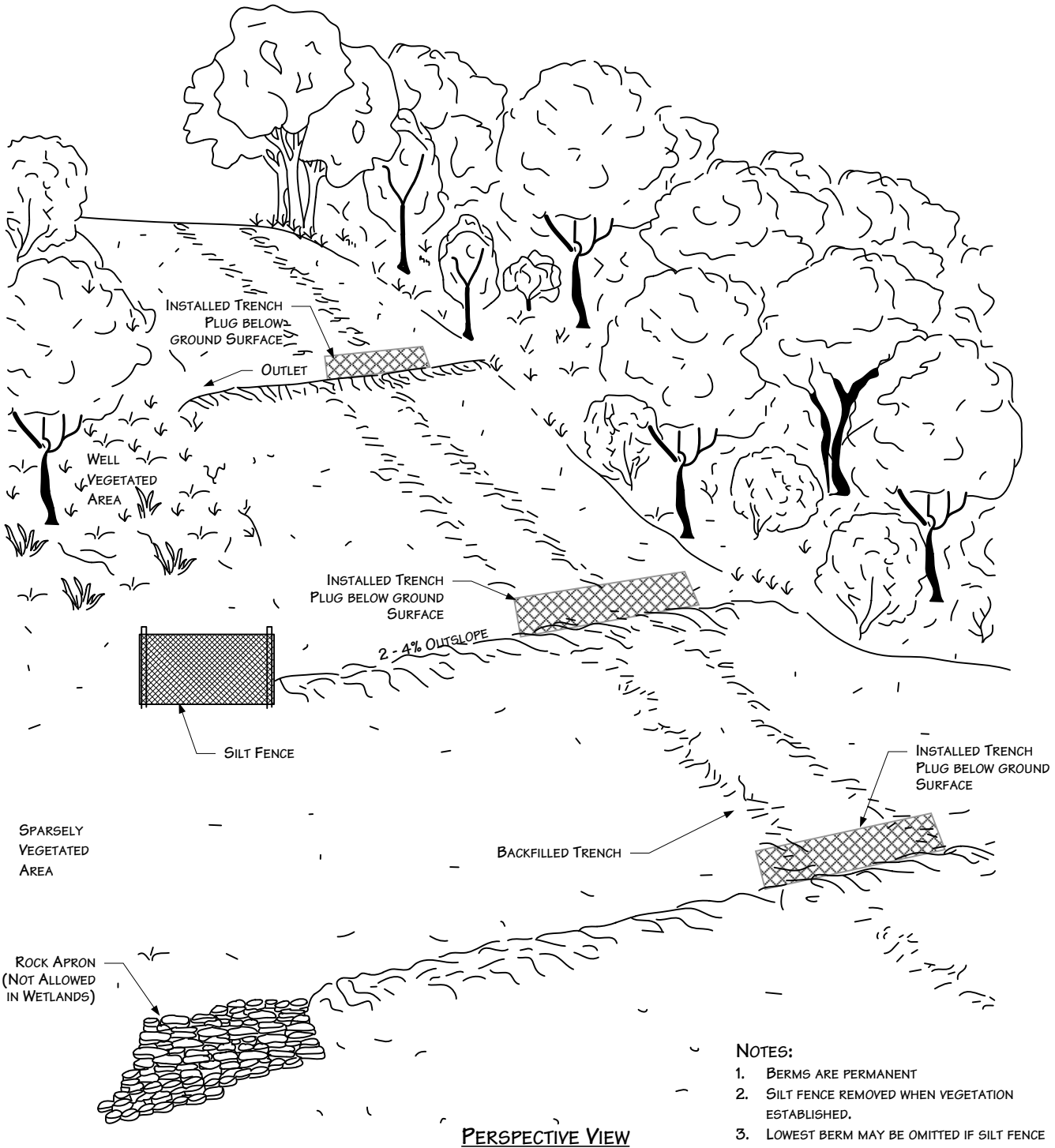
ENBRIDGE

Figure 13
Environmental Protection Plan
Typical Trench Breakers – Plan & Profile View

DATE:	11/15/2000
REVISED:	3/11/11
SCALE:	NTS
DRAWN BY:	KMKENDALL

K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_13_TRENCH_BREAKER_PLAN_PROFILE_VIEW.VSD



Perspective View
(not to scale)

Slope %	Approximate Spacing (FT)
3-5	250
5-15	200
15-25	150
>25	<100

Notes:

1. Berms are permanent
2. Silt fence removed when vegetation established.
3. Lowest berm may be omitted if silt fence or straw bales are installed at that location, subject to approval.
4. Install silt fence or straw bales at discharge end of earthen berms as necessary to dissipate energy and prevent erosion.

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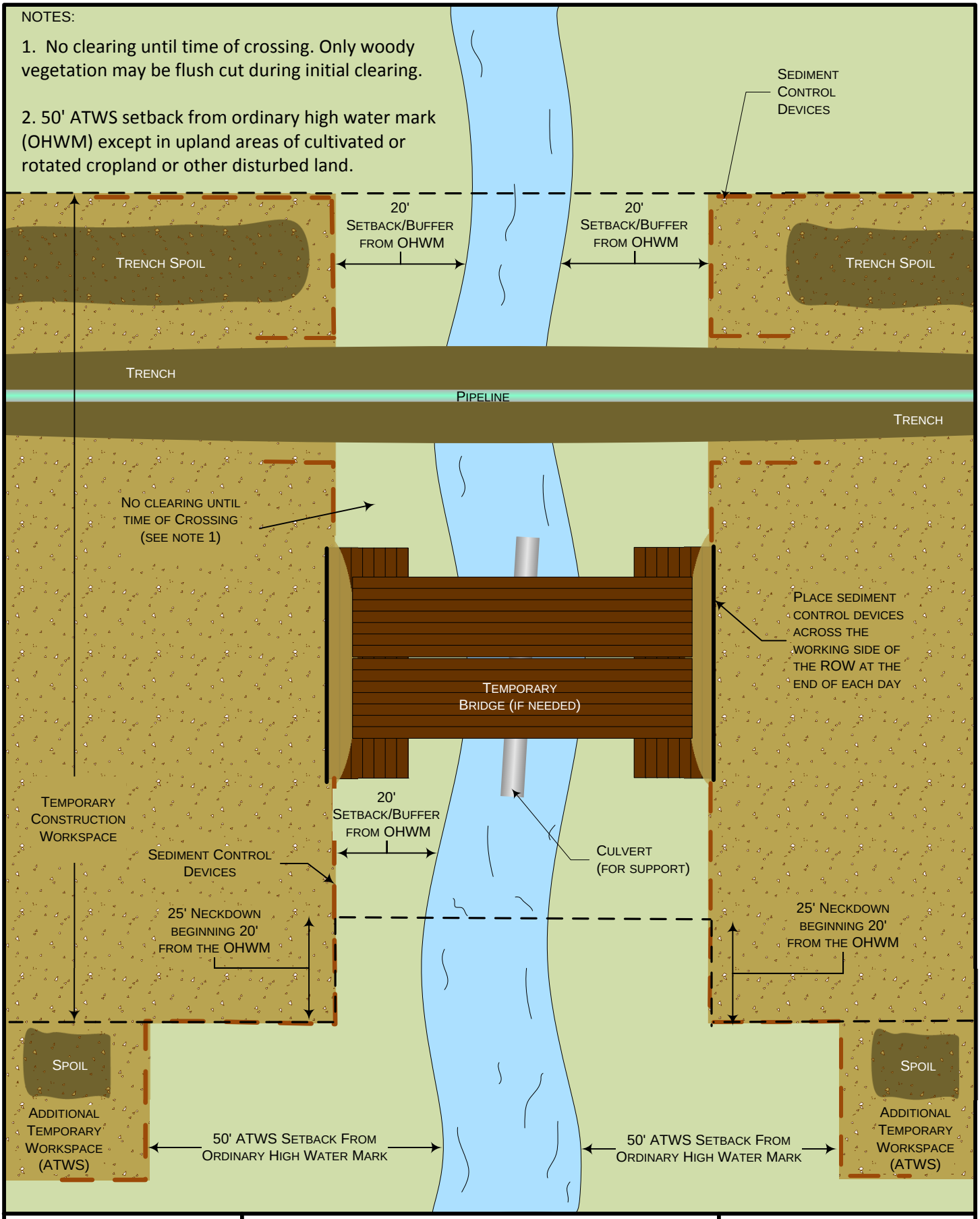
Figure 14

Environmental Protection Plan

Permanent Slope Breakers - Perspective View

DATE:	5/25/2001
REVISED:	3/11/11
SCALE:	NTS
DRAWN BY:	KMKENDALL

K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_14_SLOPE_BREAKERS_PERSPECTIVE_VIEW.VSD

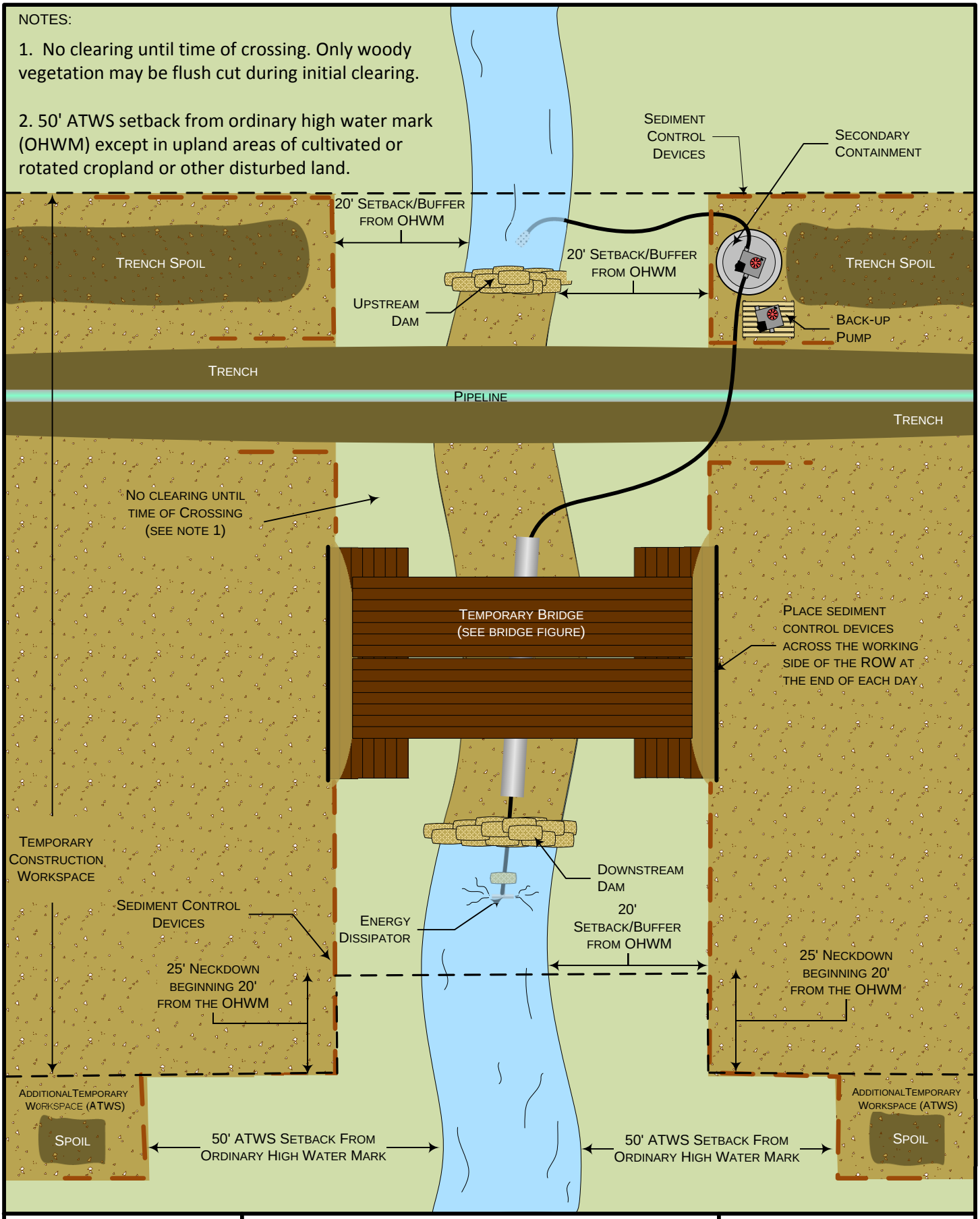


ENBRIDGE

Figure 15
Typical Waterbody Crossing
Open-Cut Wet Trench Method

Environmental Protection Plan

Drawn by: merjent 9/17/2015



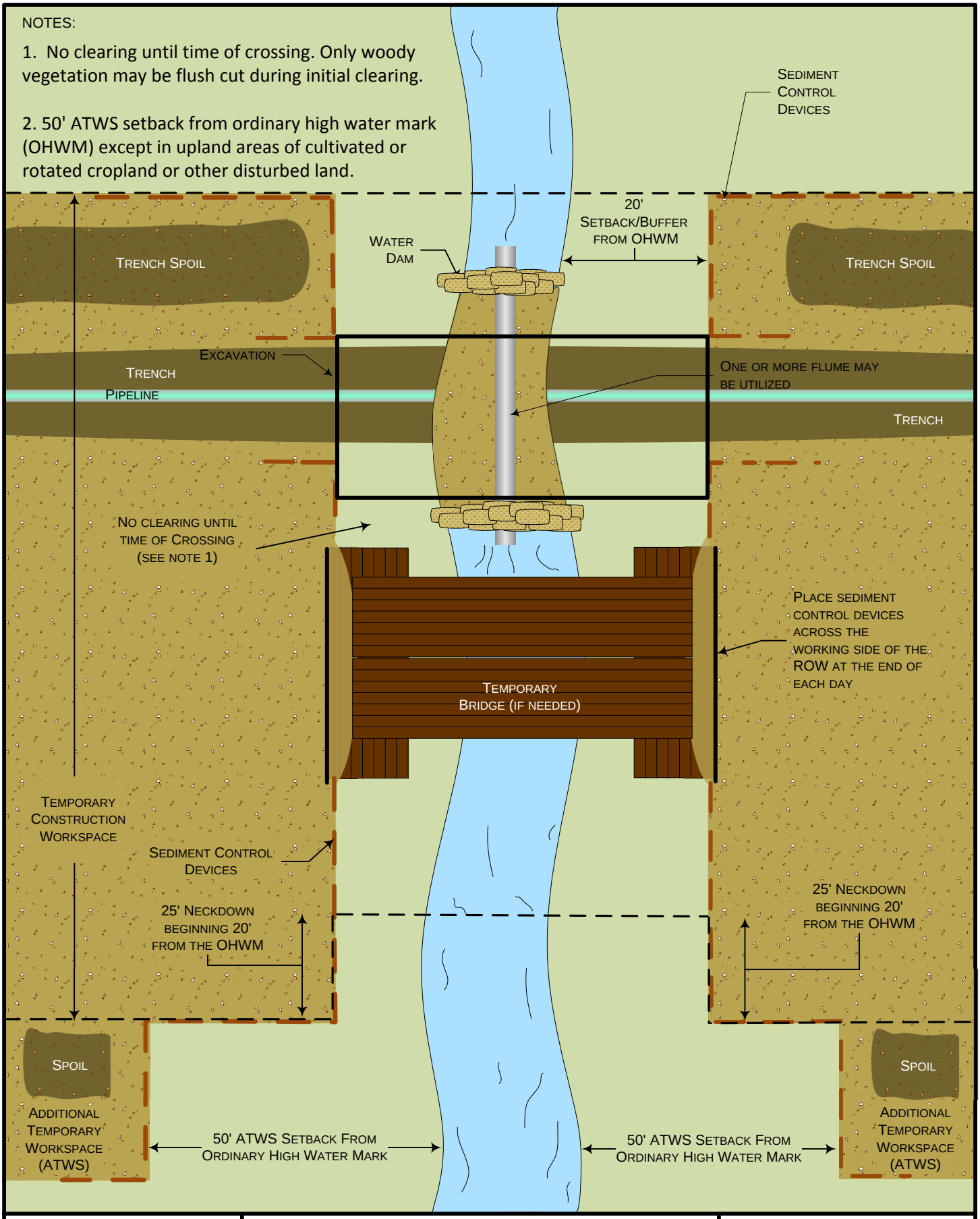
ENBRIDGE

Figure 16
Typical Waterbody Crossing
Dam and Pump Method

Environmental Protection Plan

Drawn by: Merjent

9/14/2015

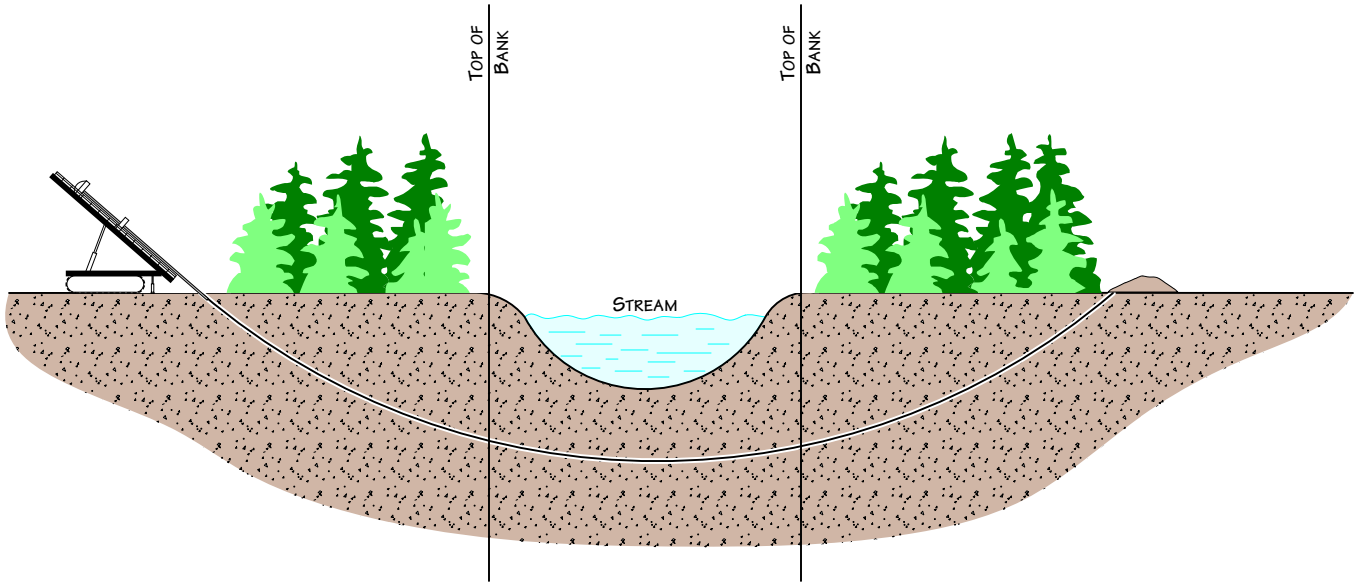


ENBRIDGE

Figure 17
Typical Waterbody Crossing
Flume Method

Environmental Protection Plan

Drawn by: Merjent 9/14/2015



For environmental review purposes only.

ENBRIDGE

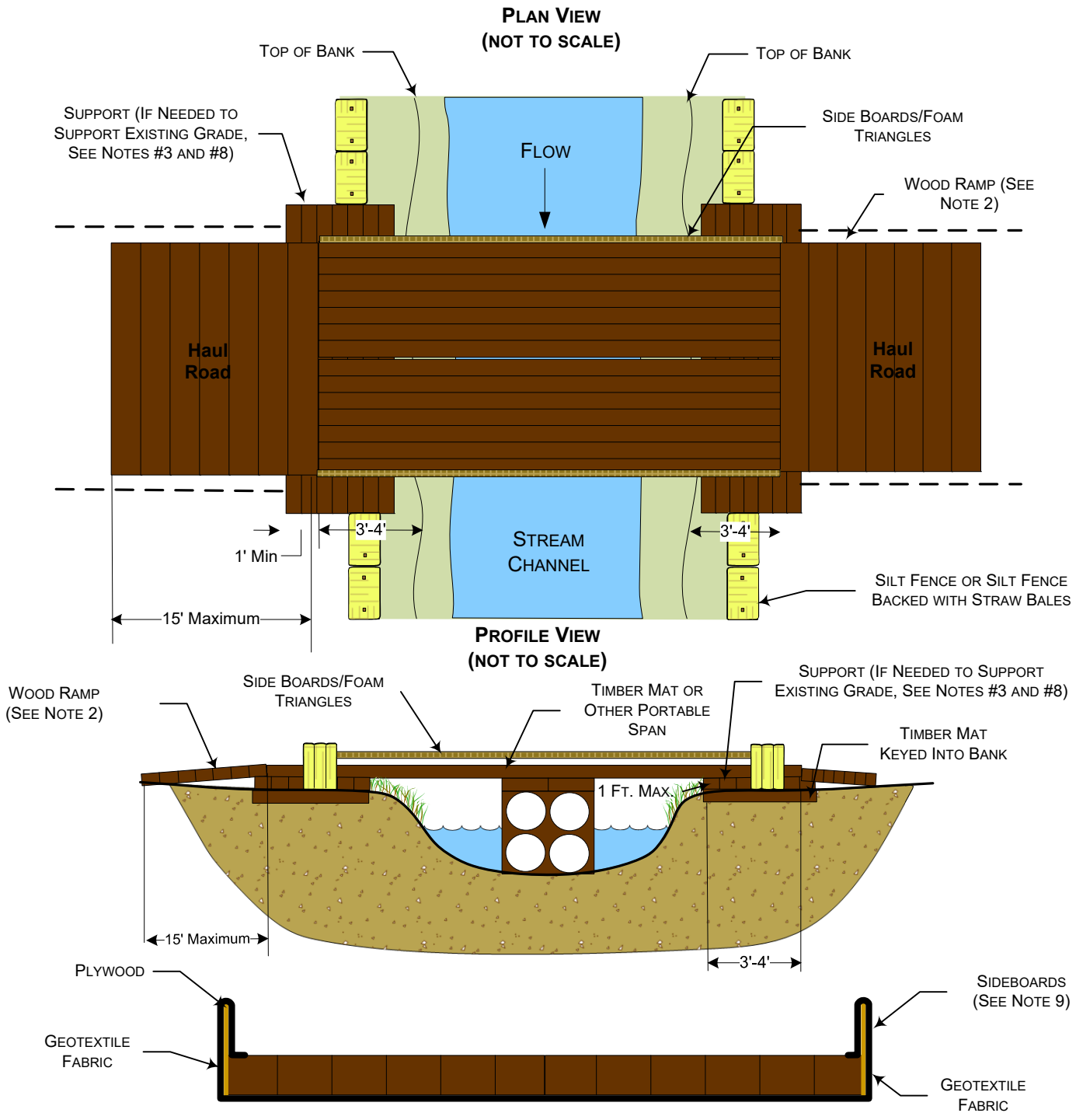
Figure 18

Environmental Protection Plan

Typical Waterbody Crossing
Directional Drill Method

DATE:	7/14/2000
REVISED:	3/11/11
SCALE:	NTS
DRAWN BY:	KMKENDALL

K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_18_WATERBODY_DIRECTIONAL_DRILL.VSD



NOTES:

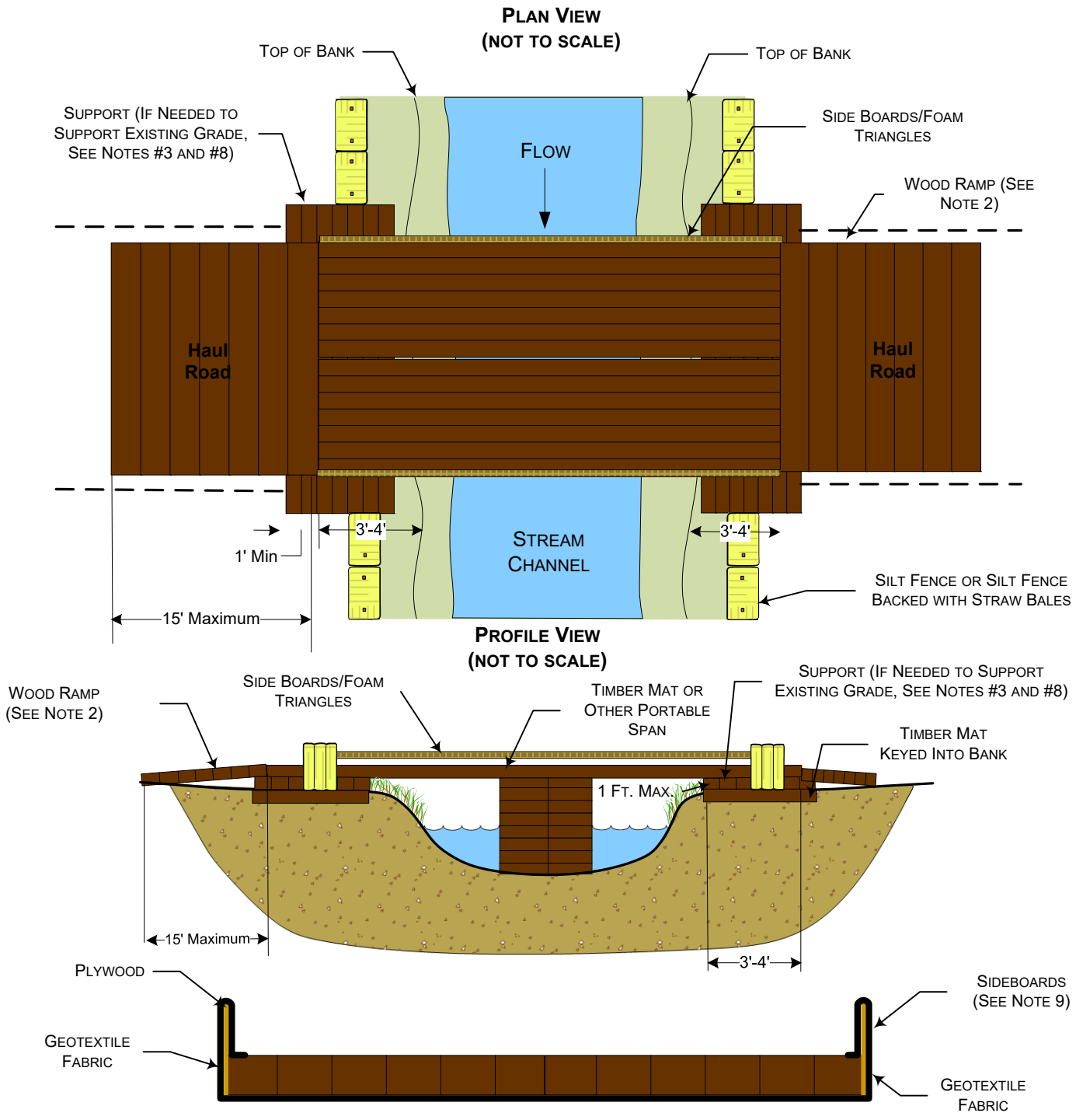
1. INSPECT BRIDGE OPENING PERIODICALLY AND FOLLOWING RAINFALLS OF OVER ½". REMOVE ANY DEBRIS RESTRICTING FLOW AND DEPOSIT IT AT AN UPLAND SITE OUTSIDE OF FLOODPLAIN.
2. IF PHYSICAL CIRCUMSTANCES PROHIBIT WOOD OR METAL RAMPS, EARTHEN RAMPS MAY BE USED AS APPROVED.
3. INSPECT BRIDGE ELEVATION SO BRIDGE REMAINS SUPPORTED ABOVE OHWM.
4. THE CULVERT SUPPORT MUST BE ANCHORED TO THE STREAM BOTTOM AND MAY NOT BE SUPPORTED WITH FILL.
5. EARTHEN RAMP CANNOT BE TALLER THAN 1' AND CANNOT EXTEND FOR MORE THAN 15' ON EITHER SIDE OF THE CROSSING.
6. THE BRIDGE MUST SPAN ABOVE OHWM TO OHWM.
7. ADDITIONAL SUPPORT MUST BE ADDED ON TOP OF BANK AND UNDER SPAN IF THE SPAN IS 12' WIDE OR GREATER, OR IF INITIAL SUPPORT STARTS TO SETTLE.
8. EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE INSPECTED AND MAINTAINED IN ACCORDANCE WITH THE COMPANY'S ENVIRONMENTAL PROTECTION PLAN.
9. SIDEBOARDS WILL BE INSTALLED ON TEMPORARY BRIDGES TO MINIMIZE THE POTENTIAL FOR SEDIMENT TRANSPORT. SIDEBOARDS MAY BE CONSTRUCTED OUT OF PLYWOOD, OR EQUIVALENT, AND AFFIXED TO THE OUTER SIDES OF THE BRIDGE. GEO-TEXTILE FABRIC, OR EQUIVALENT, MUST ALSO BE ADEQUATELY SECURED TO THE UNDERSIDE OF THE BRIDGE TO PREVENT MATERIAL FROM FALLING THROUGH THE BRIDGE DECK. THE GEO-TEXTILE FABRIC OR AN EQUIVALENT SHOULD BE SECURED TO THE BOTTOM OF THE BRIDGE AND WRAPPED AROUND THE SIDEBOARDS IN A CONTINUOUS FASHION.

ENBRIDGE

Figure 19A
Environmental Protection Plan
Typical Span Type Bridge
With or Without Instream Support (Flume Support)

Environmental Protection Plan

Drawn by: merjent



NOTES:

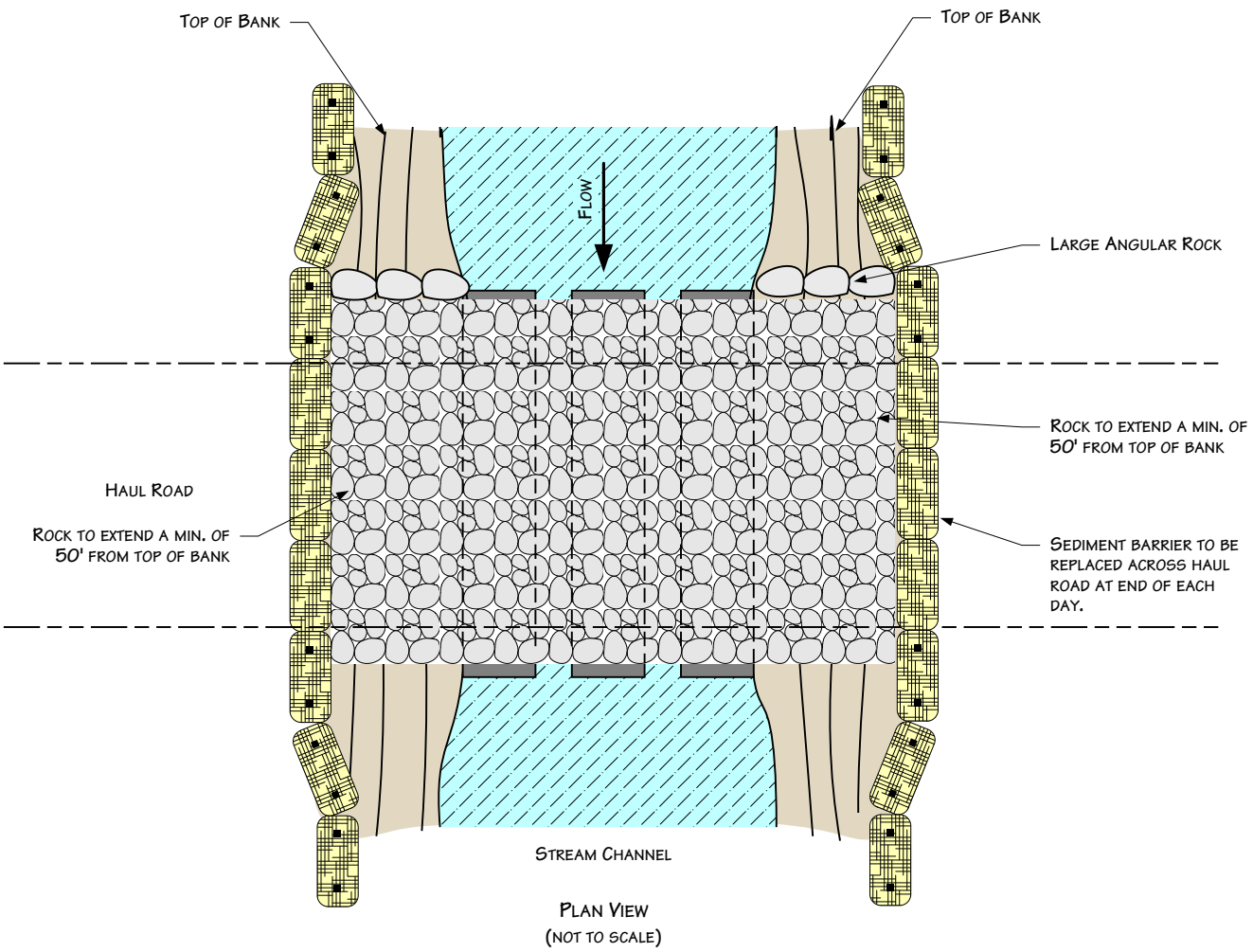
1. INSPECT BRIDGE OPENING PERIODICALLY AND FOLLOWING RAINFALLS OF OVER ½". REMOVE ANY DEBRIS RESTRICTING FLOW AND DEPOSIT IT AT AN UPLAND SITE OUTSIDE OF FLOODPLAIN.
2. IF PHYSICAL CIRCUMSTANCES PROHIBIT WOOD OR METAL RAMPS, EARTHEN RAMPS MAY BE USED AS APPROVED.
3. INSPECT BRIDGE ELEVATION SO BRIDGE REMAINS SUPPORTED ABOVE OHWM.
4. THE CULVERT SUPPORT MUST BE ANCHORED TO THE STREAM BOTTOM AND MAY NOT BE SUPPORTED WITH FILL.
5. EARTHEN RAMP CANNOT BE TALLER THAN 1' AND CANNOT EXTEND FOR MORE THAN 15' ON EITHER SIDE OF THE CROSSING.
6. THE BRIDGE MUST SPAN ABOVE OHWM TO OHWM.
7. ADDITIONAL SUPPORT MUST BE ADDED ON TOP OF BANK AND UNDER SPAN IF THE SPAN IS 12' WIDE OR GREATER, OR IF INITIAL SUPPORT STARTS TO SETTLE.
8. EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE INSPECTED AND MAINTAINED IN ACCORDANCE WITH THE COMPANY'S ENVIRONMENTAL PROTECTION PLAN.
9. SIDEBOARDS WILL BE INSTALLED ON TEMPORARY BRIDGES TO MINIMIZE THE POTENTIAL FOR SEDIMENT TRANSPORT. SIDEBOARDS MAY BE CONSTRUCTED OUT OF PLYWOOD, OR EQUIVALENT, AND AFFIXED TO THE OUTER SIDES OF THE BRIDGE. GEO-TEXTILE FABRIC, OR EQUIVALENT, MUST ALSO BE ADEQUATELY SECURED TO THE UNDERSIDE OF THE BRIDGE TO PREVENT MATERIAL FROM FALLING THROUGH THE BRIDGE DECK. THE GEO-TEXTILE FABRIC OR AN EQUIVALENT SHOULD BE SECURED TO THE BOTTOM OF THE BRIDGE AND WRAPPED AROUND THE SIDEBOARDS IN A CONTINUOUS FASHION.

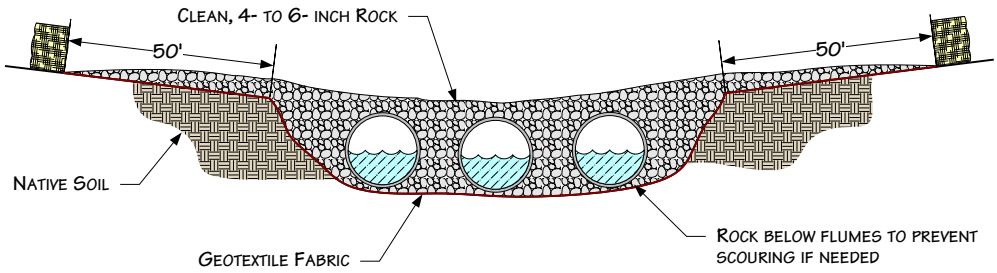
ENBRIDGE

Figure 19B
Environmental Protection Plan
Typical Span Type Bridge
With or Without Instream Support (Timber Matted Support)

Environmental Protection Plan

Drawn by: merjent





NOTES:

1. STEEL FLUME PIPE(S) SIZED TO ALLOW FOR STREAM FLOW AND EQUIPMENT LOAD.
2. STRAW BALES SHALL BE PLACED ACROSS BRIDGE ENTRANCE EVERY NIGHT.
3. ADDITIONAL INFORMATION INCLUDED ON OTHER DRAWINGS.

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ENBRIDGE

Figure 20

Environmental Protection Plan

Typical Rock Flume Bridge

DATE:	5/25/2001
REVISED:	3/15/11
SCALE:	NTS
DRAWN BY:	KMKENDALL

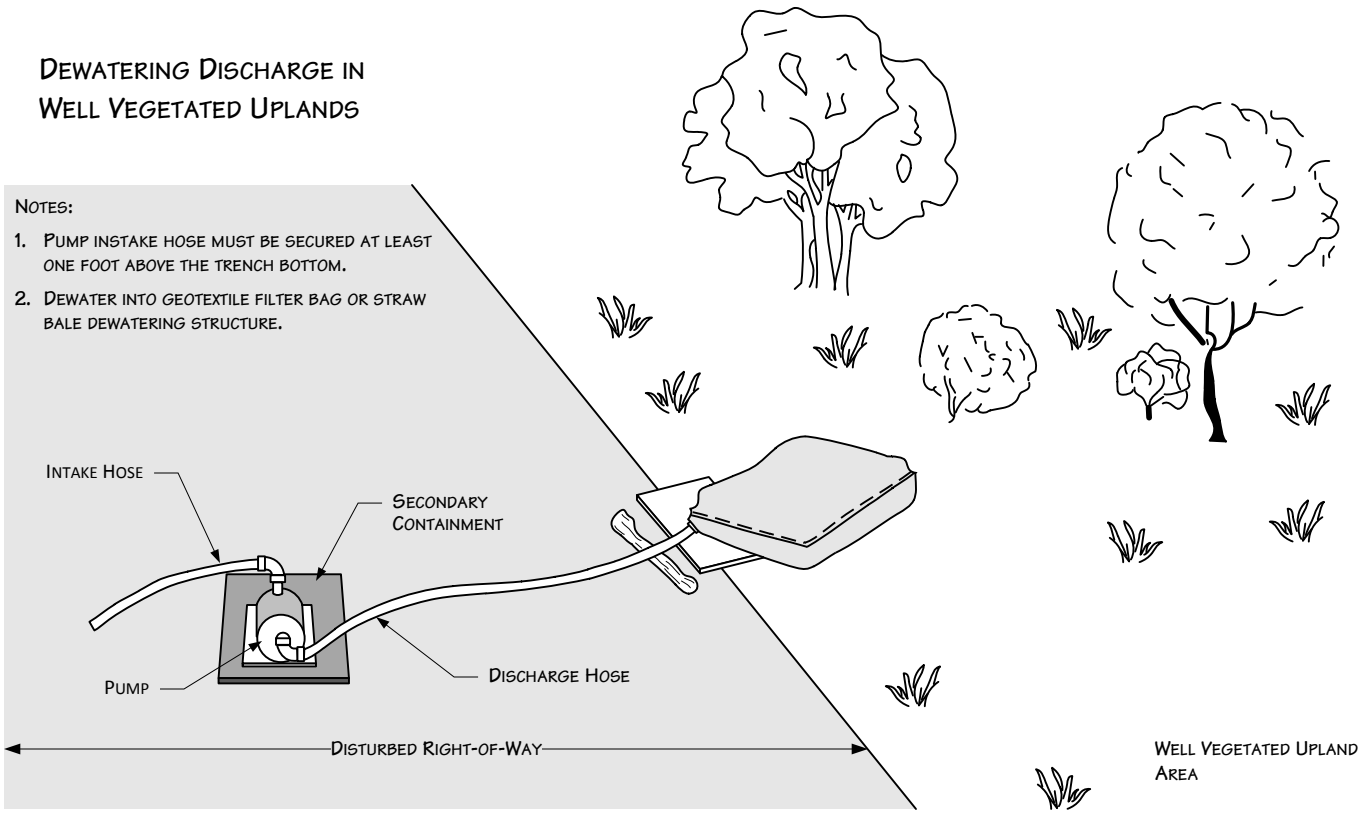
NATURAL RESOURCE GROUP

K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_20_ROCK_FLUME_BRIDGE.VSD

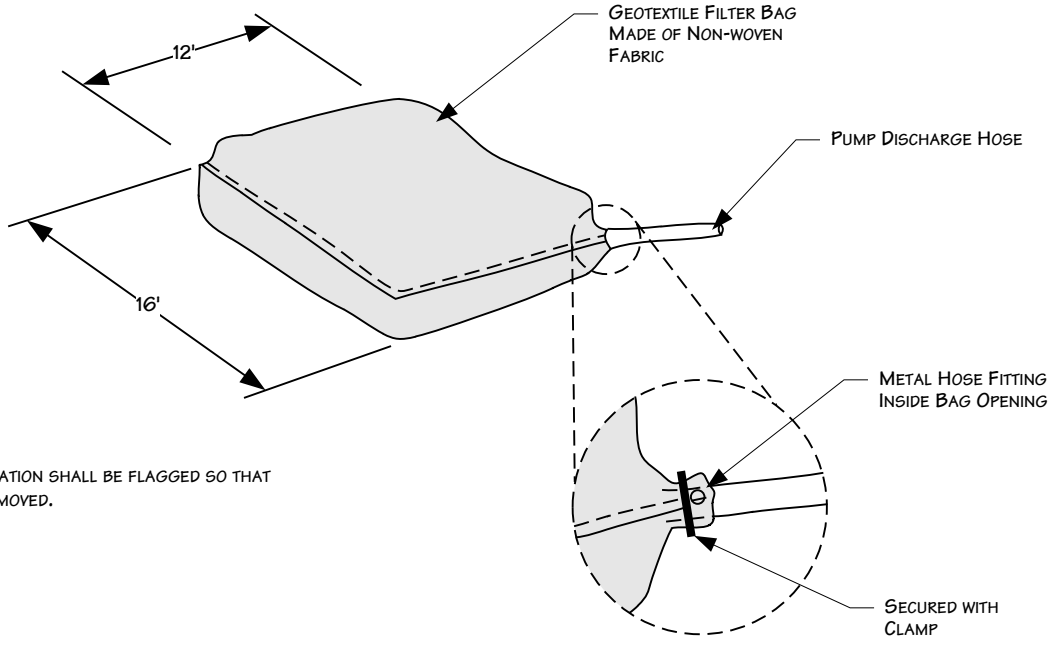
Dewatering Discharge in Well Vegetated Uplands

Notes:

1. Pump instake hose must be secured at least one foot above the trench bottom.
2. Dewater into geotextile filter bag or straw bale dewatering structure.



Geotextile Filter Bag



Note:

1. Filter bag location shall be flagged so that bag can be removed.

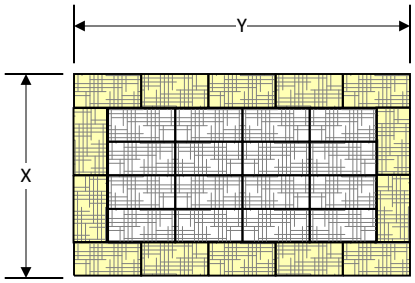
For environmental review purposes only.

ENBRIDGE

Figure 21
Environmental Protection Plan
Typical Dewatering Measures

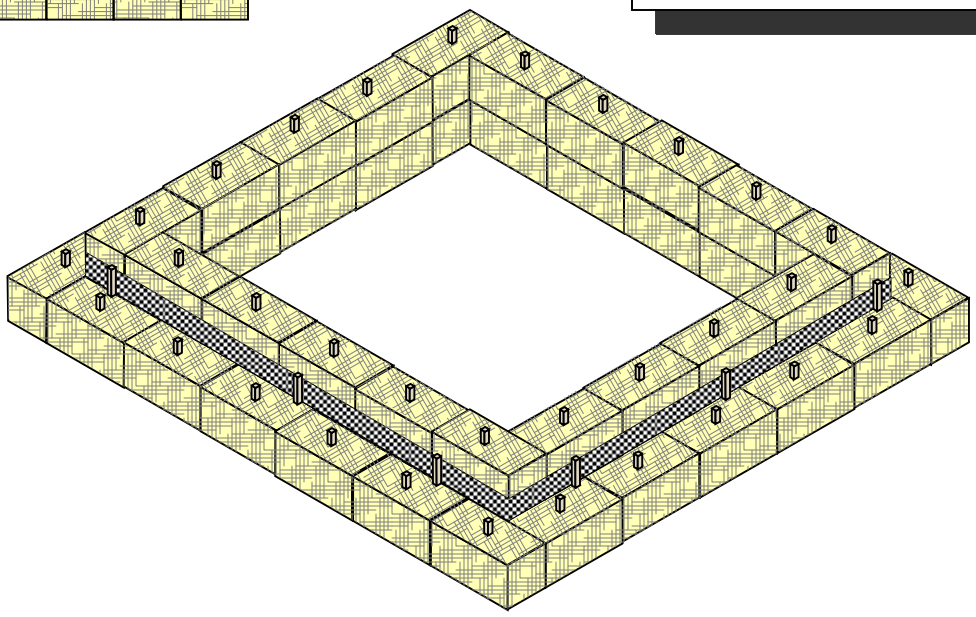
DATE:	5/25/2001
REVISED:	3/15/11
SCALE:	NTS
DRAWN BY:	KMKENDALL

K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_21_DEWATERING_MEASURES.VSD

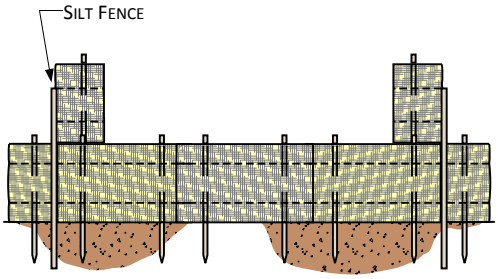


NOTES

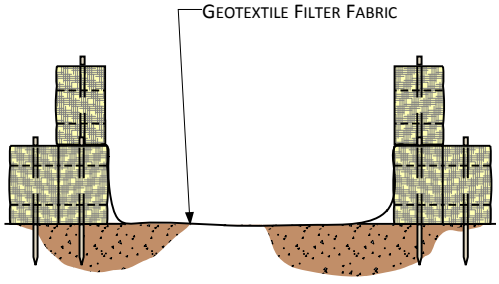
1. ARRANGE THE STRAW BALES TO THE X AND Y DIMENSIONS AS SPECIFICIED BELOW.
2. IF BOTTOM OF STRUCTURE IS NOT LINED WITH STRAW BALES (OPTION 1), LINE ENTIRE STRUCTURE WITH GEOTEXTILE FILTER FABRIC.



PERSPECTIVE VIEW



OPTION 1



OPTION 2

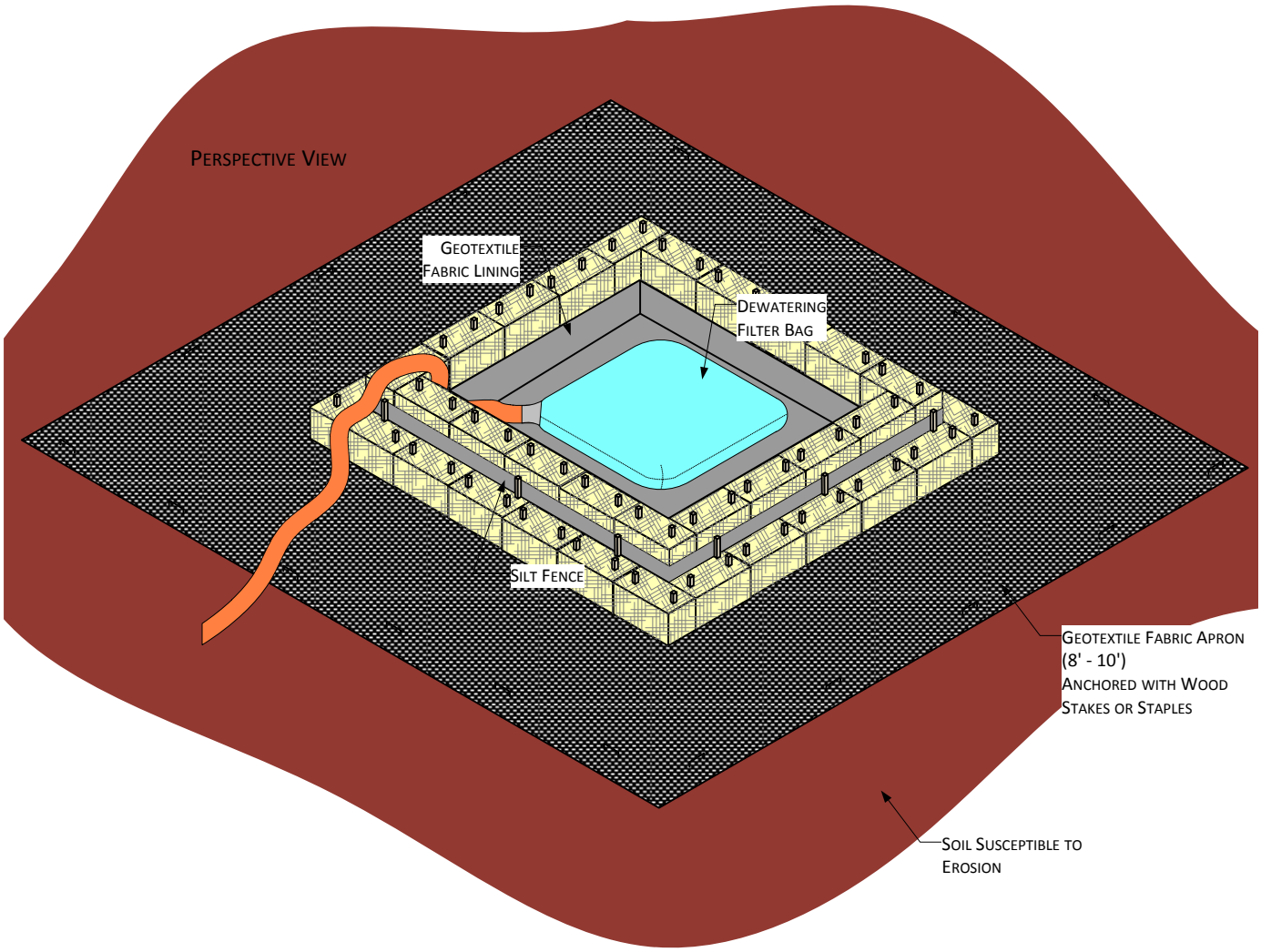
TYPICAL MINIMUM SUMP DIMENSIONS (FEET)		MAXIMUM PUMPING RATE
X	Y	GALLONS PER MINUTE
10	20	300
15	20	350
20	20	400
20	25	450
25	25	500
25	30	550
30	30	660

ENBRIDGE

Figure 22A
Environmental Protection Plan
Straw Bale Dewatering Structure

NATURAL RESOURCE GROUP

K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_22_STRAW_BALE_DEWATERING_STRUCTURE_C.VSD	SCALE: NTS	DATE: 3/11/2003	REVISED: 3/25/2011	DRAWN BY: KJANDERSON



Construct Dewatering Structure to accommodate anticipated pumping rates. See example below.

Example Pumping rate = 200 g.p.m.
Storage volume (c.f.) = 16 x 200 g.p.m. = 3200 c.f.
Height of straw bale structure = 3 feet (2 bales stacked) (based on height of bales, not silt fence)
Inside dimensions of structure = 33 x 33 feet square

Notes:

1. Silt fence ends must be wrapped to join two sections.
2. Install silt fence 2 inches above top of straw bales, and anchor a minimum of 8 inches straight down.
3. Silt fence post staking must be 4 feet or less.
4. Dewatering intake hose supported at least 1 foot from bottom of trench being dewatered.
5. Erosion and sedimentation control measures shall be inspected and maintained in accordance with the company's upland erosion control, revegetation, and maintenance plan.

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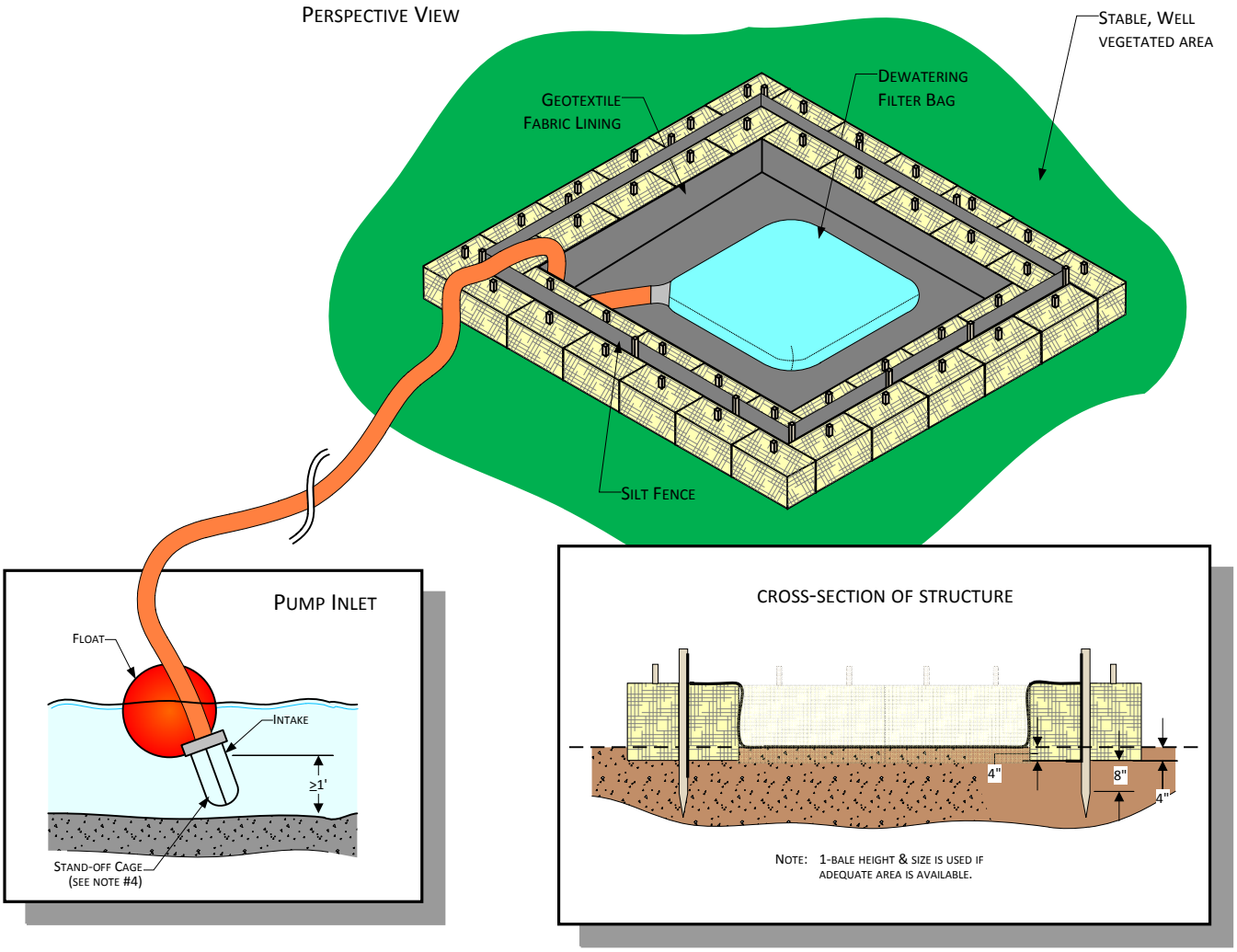
Figure 22B
Environmental Protection Plan
Straw Bale Dewatering Structure

NATURAL RESOURCE GROUP

K:_CLIENT_PROJECTS\D-FEEL\2011-019\FIG_22_STRAW_BALE_DEWATERING_STRUCTURE_C.VSD	SCALE: NTS	DATE: 3/11/2003	REVISED: 3/25/2011	DRAWN BY: KJANDERSON



CONSTRUCT DEWATERING STRUCTURE TO ACCOMMODATE ANTICIPATED PUMPING RATES. SEE EXAMPLE BELOW.

EXAMPLE PUMPING RATE = 200 G.P.M.
STORAGE VOLUME (C.F.) = 16 X 200 G.P.M. = 3200 C.F.
HEIGHT OF STRAW BALE STRUCTURE = 1.5 FEET (1 BALE) (BASED ON HEIGHT OF BALES, NOT SILT FENCE)
INSIDE DIMENSIONS OF STRUCTURE = 46 X 46 FEET SQUARE

NOTES:

1. SILT FENCE ENDS MUST BE WRAPPED TO JOIN TWO SECTIONS.
2. INSTALL SILT FENCE 2 INCHES ABOVE TOP OF STRAW BALE, AND ANCHOR A MINIMUM OF 8 INCHES STRAIGHT DOWN.
3. SILT FENCE POST STAKING MUST BE 4 FEET OR LESS.
4. DEWATERING INTAKE HOSE SUPPORTED AT LEAST 1 FOOT FROM BOTTOM OF TRENCH BEING DEWATERED.
5. USE A FILTER BAG AT THE DISCHARGE HOSE END.
6. EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE INSPECTED AND MAINTAINED IN ACCORDANCE WITH THE COMPANY'S UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN.

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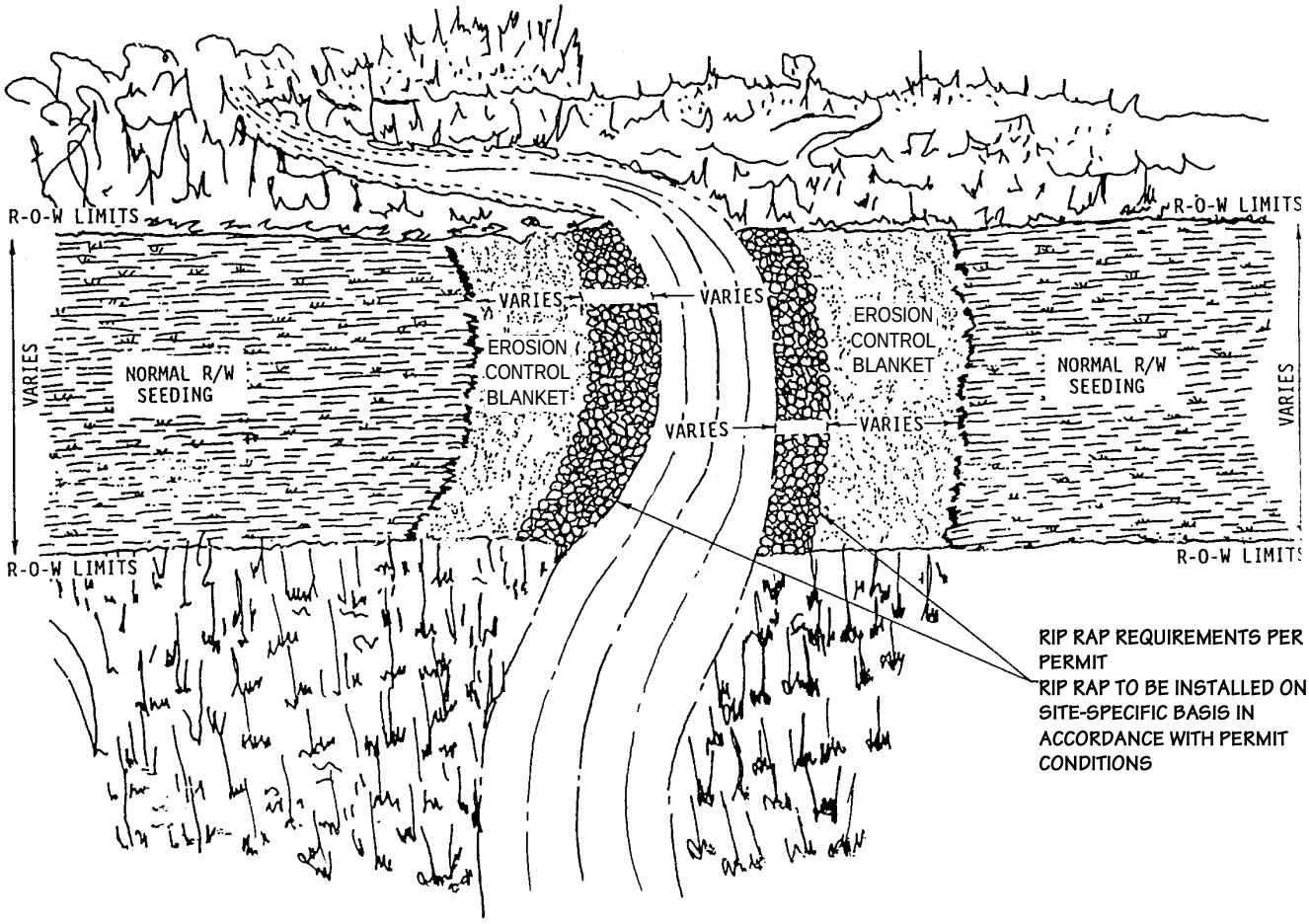
Figure 22C
Environmental Protection Plan
Straw Bale Dewatering Structure

NATURAL RESOURCE GROUP

NOTE: PLACE JUTE BLANKET A MINIMUM OF ONE (1) FOOT UNDER RIP RAP. EXTEND JUTE BLANKET FROM MEAN HIGH WATER LEVEL TO SEVERAL FEET BEHIND HIGH BANK.



For environmental review purposes only.

ENBRIDGE

Figure 23

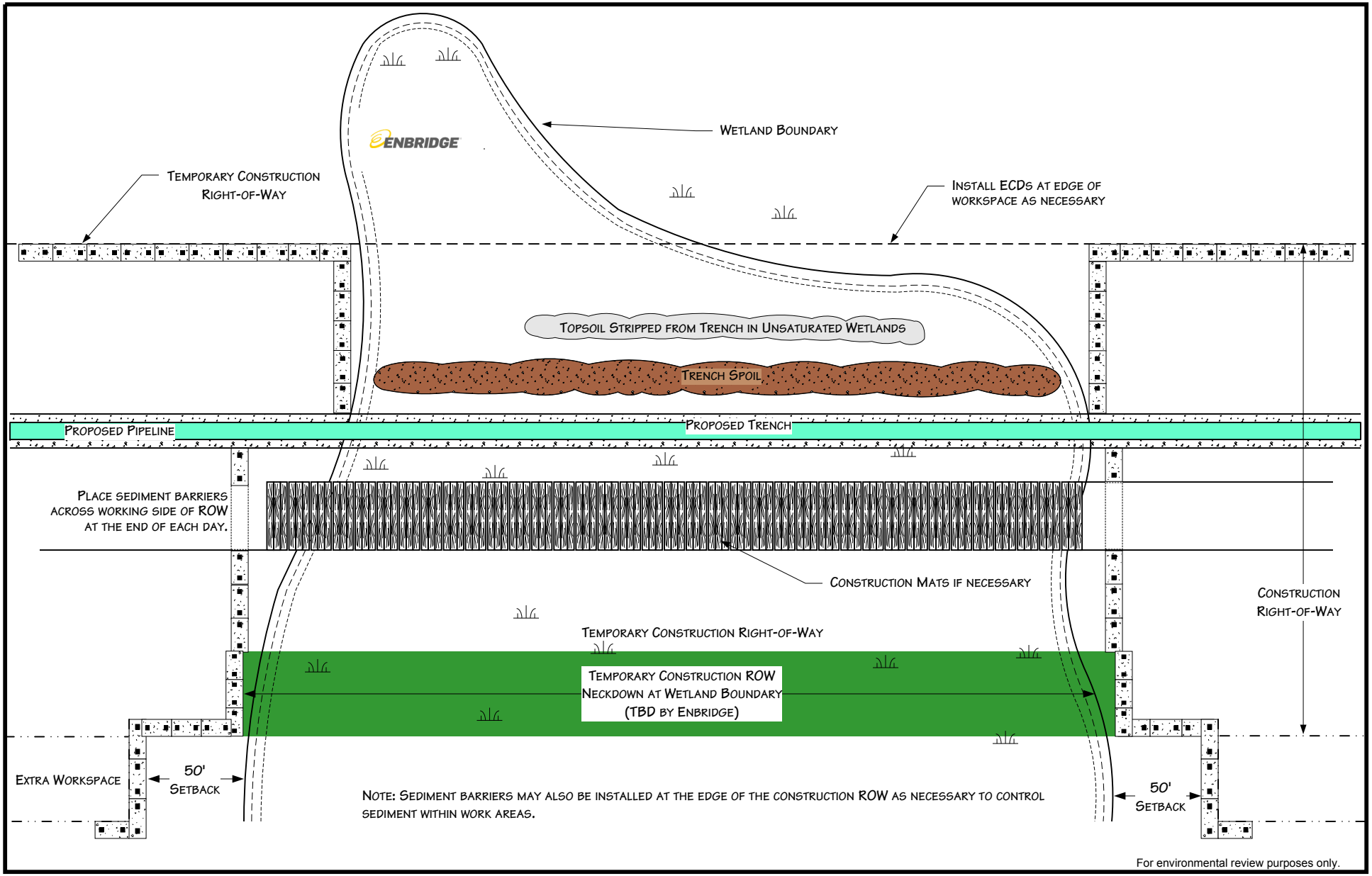
Environmental Protection Plan

Typical Final Stream Bank Stabilization
Rip Rap & Erosion Control

DATE:	7/19/2000
REVISED:	3/14/11
SCALE:	NTS
DRAWN BY:	KMKENDALL

NATURAL RESOURCE GROUP

K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_23_STREAM_BANK_STABILIZATION.VSD



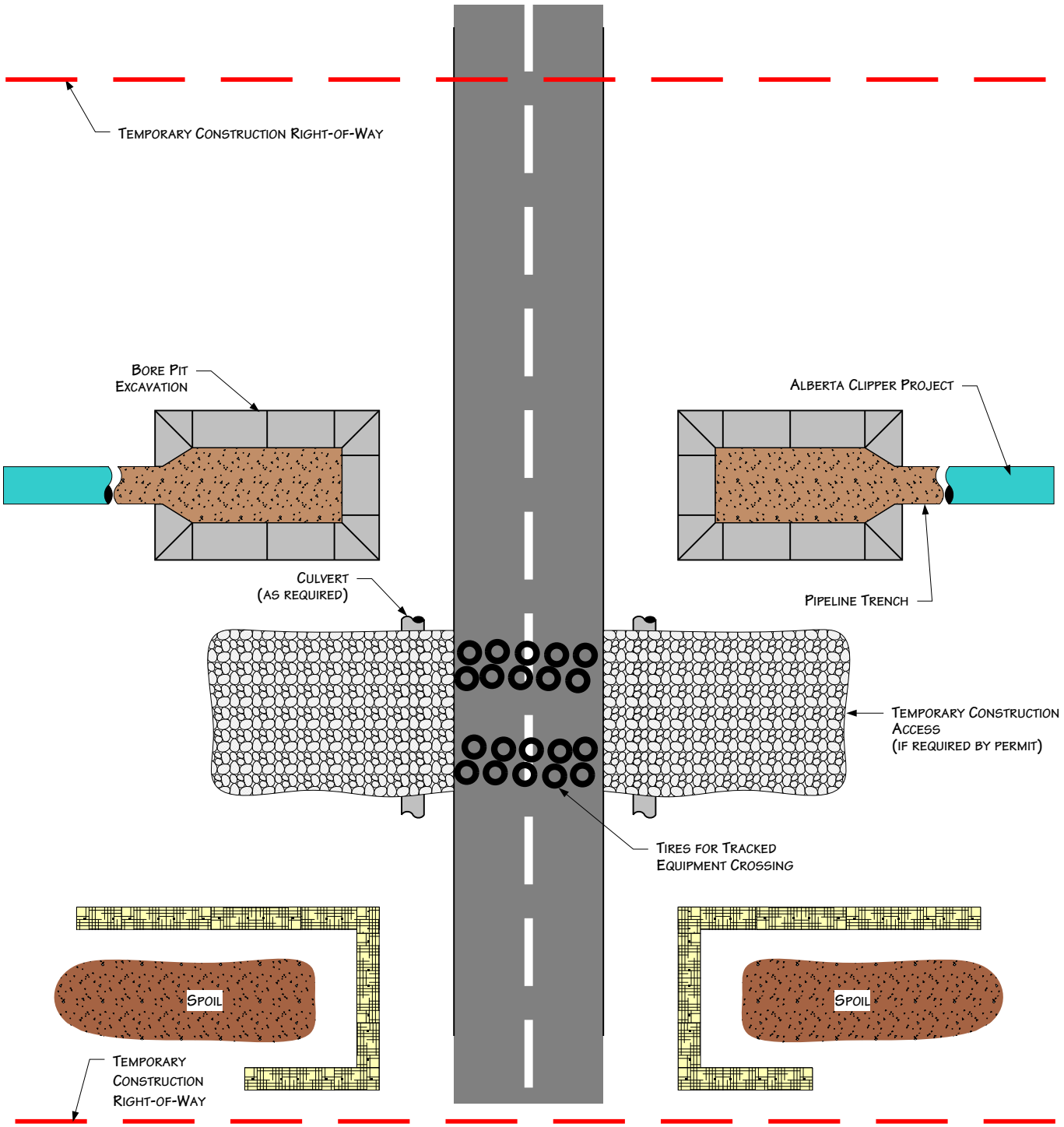
For environmental review purposes only.

ENBRIDGE

Figure 24
Environmental Protection Plan
Typical Wetland Crossing Method

DATE:	5/25/2001
REVISED:	3/14/11
SCALE:	NTS
DRAWN BY:	KMKENDALL

K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_24_WETLAND_CROSSING_METHOD.VSD



Plan View

Notes

1. Procedures shown in this drawing apply to improved roads.
2. Roads must be cleaned after equipment crosses and dirt placed in spoil containment areas.
3. Temporary access materials must be removed upon project completion.
4. Additional information included on other drawings or permits.
5. Construction areas located outside road ROW.

For environmental review purposes only.

ENBRIDGE

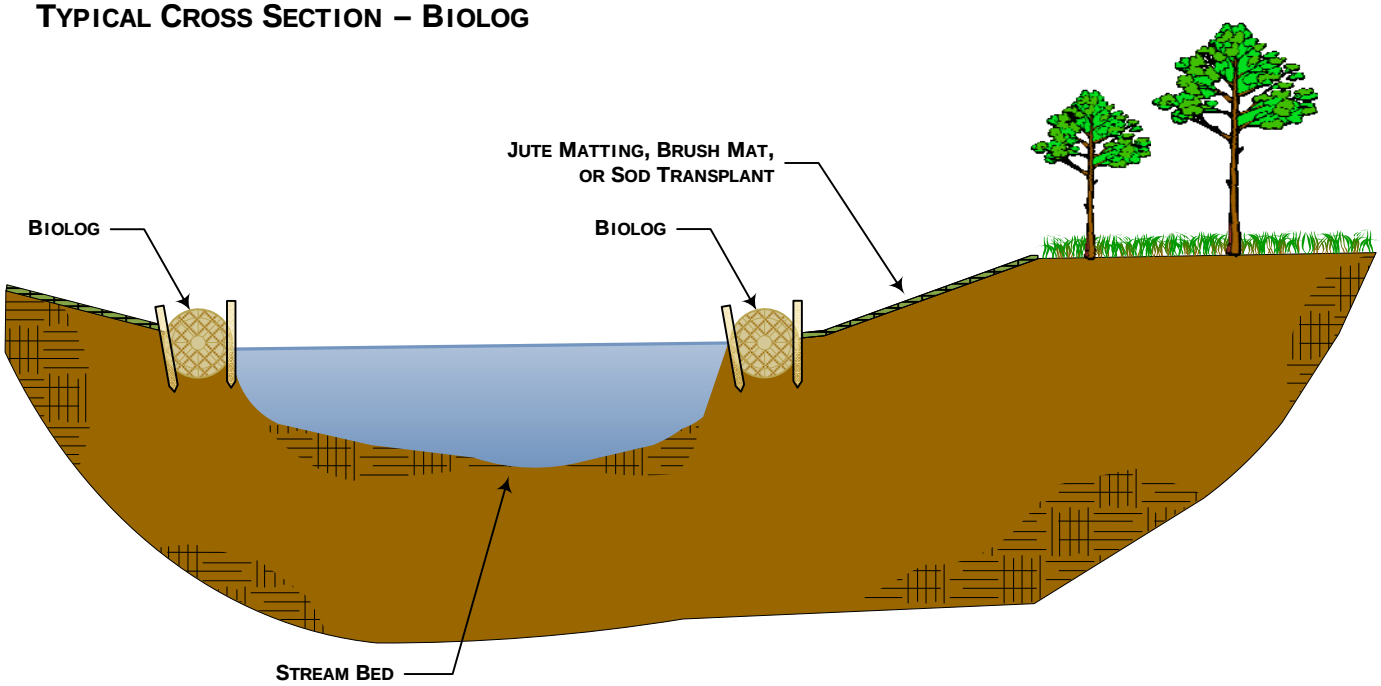
Figure 25
Environmental Protection Plan
Typical Improved Road Crossing
Directional Bore Method

DATE: 7/13/1999
REVISED: 3/14/11
SCALE: NTS
DRAWN BY: KMKENDALL

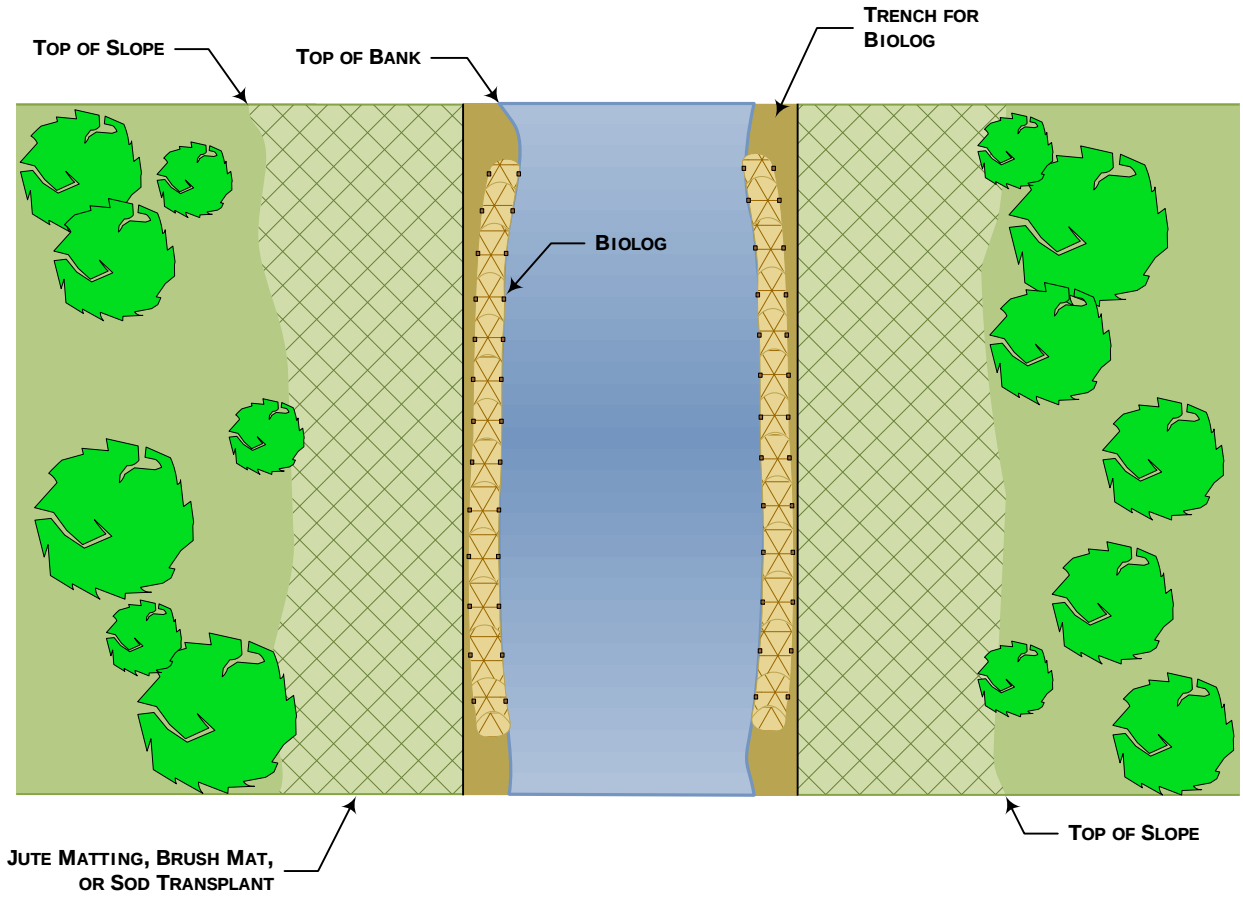
NATURAL RESOURCE GROUP

K:_CLIENT_PROJECTS\D-F\EEL\2011-019\FIG_25_IMPROVED_ROAD_BORE_CROSSING.VSD

Typical Cross Section – Biolog



Typical Plan View – Biolog

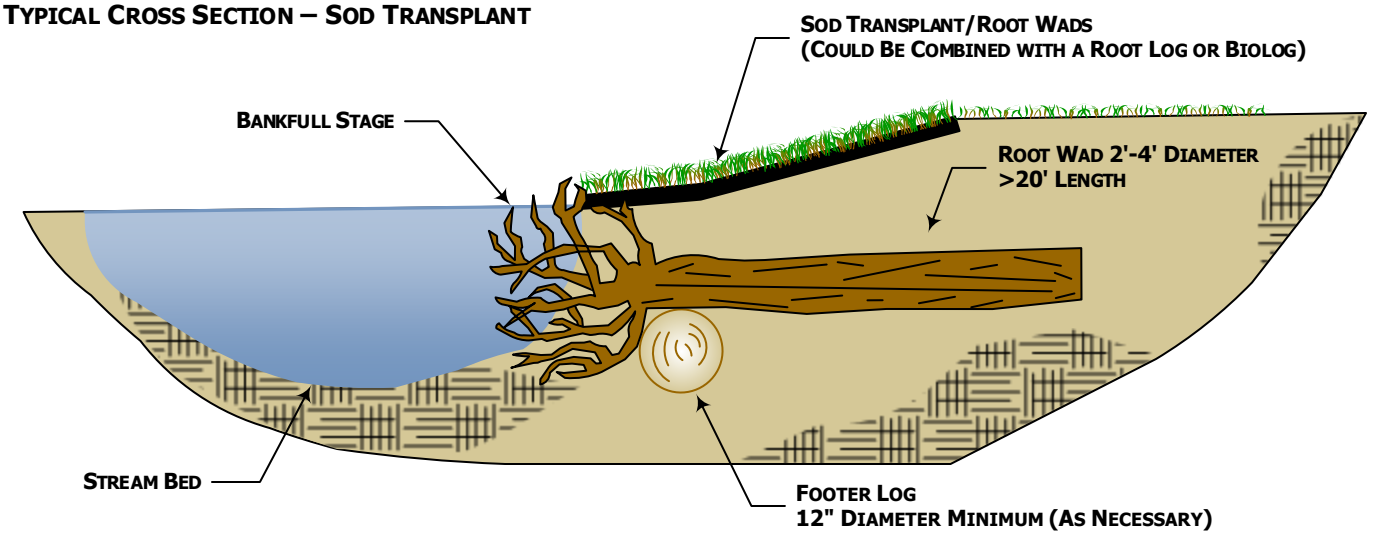


ENBRIDGE

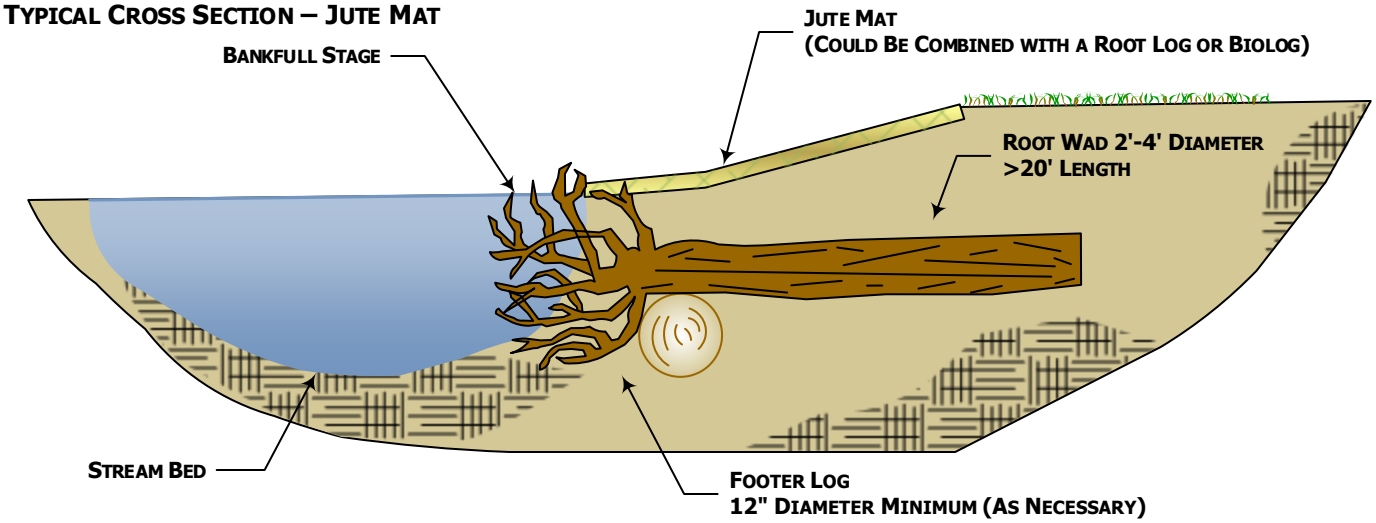
Figure 26
Typical Stream Bank Stabilization
Biolog

04/17/2013

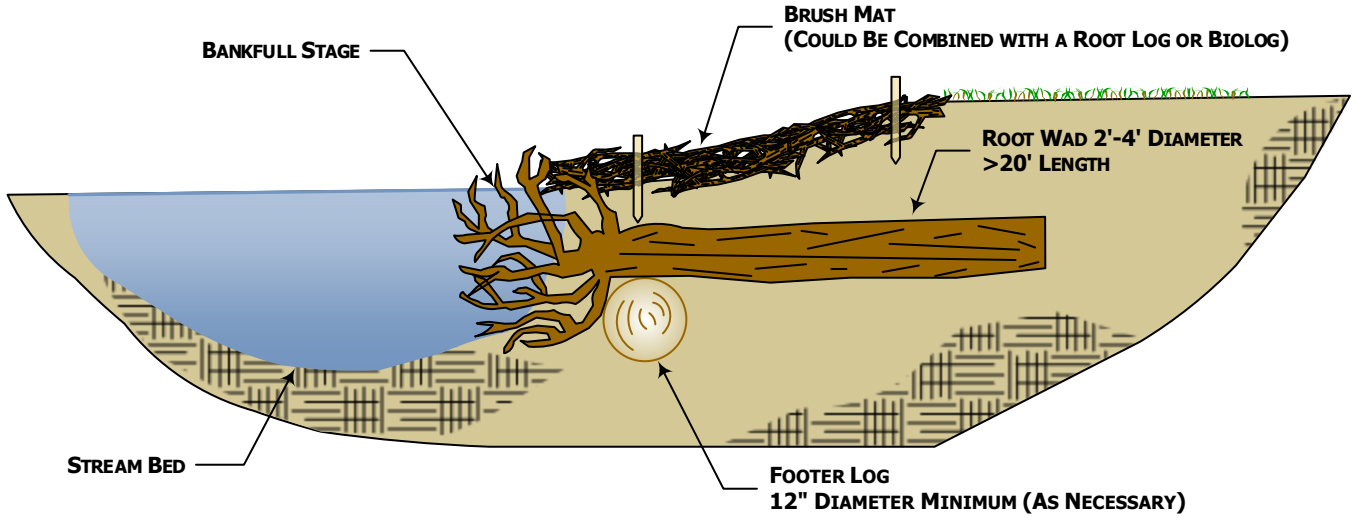
Typical Cross Section – Sod Transplant



Typical Cross Section – Jute Mat



Typical Cross Section – Brush Mat

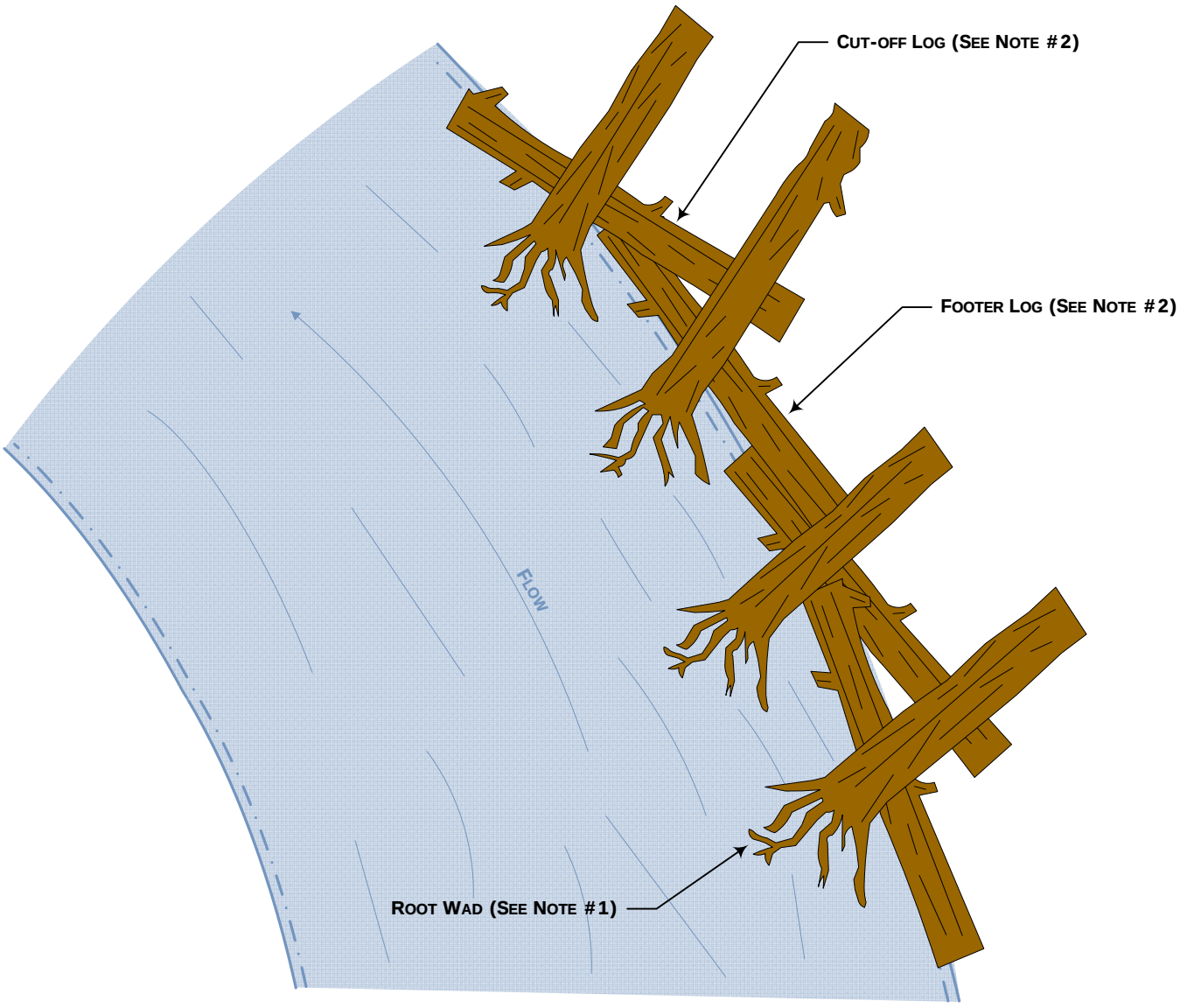


ENBRIDGE

Figure 27
Typical Root Wad

8/25/2015

TYPICAL PLAN VIEW – NATURAL MATERIAL REVETMENT



Notes:

#1 – Root wad logs to be used on steep banks or based on agency recommendations.
#2 - Root wad logs to be anchored appropriately based on site-specific conditions or agency recommendations.

ENBRIDGE

Figure 28
Typical Natural Material Revetment

04/17/2013

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Appendix A
Noxious and Invasive Weed Species

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NOXIOUS AND INVASIVE SPECIES REGULATIONS

Region	*Regulatory Category*	*Agency*[1]	*Reference*
Federal	Federal Noxious Weeds (aquatic and terrestrial plants)	USDA-APHIS	https://plants.usda.gov/java/noxious?rptType=Federal
	Federal Plant Pest Protection Act	USDA-APHIS	https://www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs/pests-and-diseases
	Interstate Regulations: Pest movement restriction	USDA-APHIS	https://www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs
North Dakota	State Aquatic Nuisance Species	NDGFD	https://gf.nd.gov/ans/species
	State Noxious Weeds	NDDA	https://www.nd.gov/ndda/plant-industries/noxious-weeds
	County/City Noxious Weeds	Defining County/City	https://www.nd.gov/ndda/sites/default/files/resource/2018%20Feb%20-%20City%20County%20Noxious%20Weeds%20List.pdf
Minnesota	State Prohibited, Regulated, Unregulated Nonnative, and Unlisted Nonnative Invasive Species (wild animals and aquatic plants)	MDNR	https://www.dnr.state.mn.us/invasives/laws.html
	State Prohibited, Restricted, and Specially Regulated Noxious Weeds (terrestrial plants)	MDA	http://www.mda.state.mn.us/plants/pestmanagement/weedcontrol/noxiouslist.aspx
	State Plant Pest Act (insects and terrestrial plants)	MDA	http://www.mda.state.mn.us/plants/pestmanagement/invasivesunit/pestindex.aspx
	State ballast water regulations (aquatic organisms)	MPCA	https://www.pca.state.mn.us/water/vessel-discharge
Wisconsin	State Regulated - Aquatic	WDNR	https://dnr.wi.gov/topic/Invasives/species.asp?filterBy=Aquatic&filterVal=Y
	State Regulated - Terrestrial	WDNR	https://dnr.wi.gov/topic/Invasives/species.asp?filterBy=Terrestrial&filterVal=Y
	State Regulated - Wetland	WDNR	https://dnr.wi.gov/topic/Invasives/species.asp?filterBy=Wetland&filterVal=Y

[1] APHIS: Animal Plant Health Inspection Service
MDA: Minnesota Department of Agriculture
MDNR: Minnesota Department of Natural Resources
MPCA: Minnesota Pollution Control Agency
NDDA: North Dakota Department of Agriculture
NDGFD: North Dakota Game and Fish Department
USDA: United States Department of Agriculture
WDNR: Wisconsin Department of Natural Resources

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Appendix B
Equipment Cleaning Log

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Equipment Cleaning Log

Form Completed By: _____

Date: _____ Time: _____

Location of Equipment (tract & milepost): _____

Equipment Type: _____

Equipment ID (e.g., company, unique ID number): _____

Cleaning Method: (check all that apply)

- □ Scrape Down
- □ Steam Wash Blow Down (compressed air)
- □ Power/Pressure Wash (water)
- □ Other (Describe): _____

Comments: _____

_____

_____

_____

_____

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Appendix C
Seed Mixes

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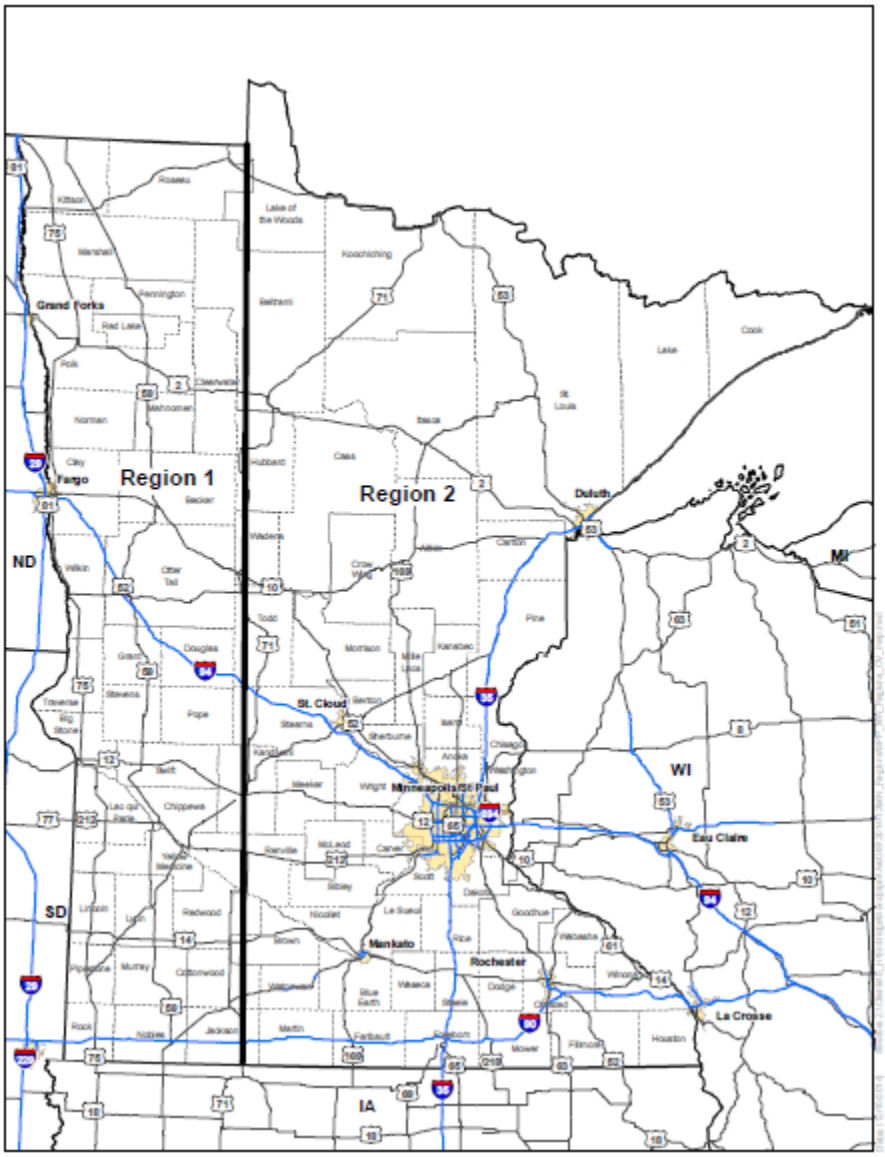
MINNESOTA SEED MIXES

Based on average annual precipitation and temperatures and soil types, Enbridge divided seeding in Minnesota into two regions. These regions have different seed mixes for specific areas.

- Region 1 is between the North Dakota state line and approximately Highway 71; and
- Region 2 is between Highway 71 and the Wisconsin state line.



MINNESOTA STATEWIDE SEED MIXES

Table 15
MN Seed Mix 1 – Minnesota Default CRP Seed Mix

Use: Minnesota state-wide on tracts enrolled in the CRP
Seeding Rate: 12.0 pounds/acre PLS drilled or 24.0 PLS pounds/acre broadcast without the companion crop
Double the rate of the companion crop when broadcast seeding
Notes: *No species substitutions allowed*

Species: Preferred Variety (if available)	Pounds/Acre PLS	Percent of Mix
Big Bluestem: Bison, Bonilla	4.0	33.3
Western Wheatgrass: Rodan	0.5	4.2
Slender Wheatgrass; Revenue	0.9	7.5
Sideoats Grama: Bad River	1.6	13.3
Switchgrass:Dacotah, Forestburg, Sunburst, Nebraska	0.2	1.7
Indiangrass: Tomahawk, Holte	0.5	4.2
Rough Dropseed: Common	0.3	2.5
Yarrow: Common	0.1	0.8
Purple Prairie Clover: Common	2.0	16.7
Ox-eye Sunflower: Common	1.0	8.3
Prairie Cinquefoil: Common	0.1	0.8
Black-eyed Susan Common	0.8	6.7
Total	**12.0**	**100.0[1]**
Companion Crop		
Oats (or see Table 4 in Seed Standards and Specifications)	10.0	100.0
Total Seed	**22.0**	**100.0[1]**

[1] May not equal 100 percent due to rounding

Table 16
MN Seed Mix 2 – Minnesota Protected and Other Waters Seed Mix

Use: Minnesota state-wide on the outer fringe of Public Water Inventory ("PWI") waterbodies and wetlands and all other waterbody banks
Seeding Rate: 8.255 pounds/acre PLS drilled or 16.510 pounds/acre PLS broadcast without the companion crop
Double the rate of the companion crop when broadcast seeding
Notes: *Enbridge Environment must approve s*ubstitutions *in advance*

Species: Preferred Varieties (if available)	Pounds/Acre PLS	Percent of Mix
American slough grass: Common	1.500	18.2
Blue-joint grass: Common	0.100	1.2
Reed manna grass: Common	0.200	2.4
Fowl manna grass: Common	0.100	1.2
Fowl bluegrass: Common	1.800	21.8
Rice cut-grass: Common	0.250	3.0
Annual ryegrass: Common	0.900	10.9
Tussock sedge: Common	0.100	1.2
Fox sedge: Common	0.300	3.6
Green bulrush: Common	0.100	1.2
Wool grass: Common	0.005	0.1
River bulrush: Common	0.250	3.0
Soft-stem bulrush: Common	0.100	1.2
March milkweed: Common	0.100	1.2
Flat-topped aster: Common	0.300	3.6
Joe-pye weed: Common	0.300	3.6
Boneset: Common	0.250	3.0
Sneezeweed: Common	0.250	3.0
Spotted touch-me-not: Common	0.100	1.2
Great blue lobelia: Common	0.100	1.2
Monkey flower: Common	0.100	1.2
Mountain mint: Common	0.100	1.2
Giant goldenrod: Common	0.250	3.0
Blue vervain: Common	0.350	4.2
Ironweed: Common	0.350	4.2
Total	**8.255**	**100.0[1]**
Companion Crop		
Slender wheatgrass: Adanac, Pryor, Revenue, Primar, First Strike	3.000	100.0
Total Seed	**11.255**	**100.0[1]**

[1] May not equal 100 percent due to rounding

Table 17
MN Seed Mix 3 – Minnesota Unsaturated Wetlands Seed Mix

Use: Minnesota state-wide in unsaturated wetland areas
Seeding Rate: 17.0 pounds/acre PLS drilled or 34.0 pounds/acre PLS broadcast
Notes: *No species substitutions allowed*

Species: Preferred Variety (if available)	Pounds/Acre PLS	Percent of Mix
American slough grass: Common	6.0	35.3
Annual ryegrass: Common	8.0	47.1
Flow bluegrass: Common	3.0	17.6
Total Seed	**17.0**	**100.0[1]**

[1] May not equal 100 percent due to rounding

MINNESOTA REGION 1 SEED MIXES

Table 18
MN Seed Mix 4 – Native Prairie Seed Mix

Use: Minnesota Region 1 on private and public land where native or degraded prairie are currently managed as range or hay land
Seeding Rate: 13.0 pounds/acre PLS drilled or 26.0 pounds/acre PLS broadcast without the companion crop
Double the rate of the companion crop when broadcast seeding
Notes: *Enbridge Environment must approve s*ubstitutions *in advance*

Species: Preferred Varieties (if available)	Pounds/Acre PLS	Percent of Mix
Big bluestem: Sunnyview, Bison, Bonilla, Bounty	1.25	9.6
Side-oats grama: Killdeer, Pierre, Butte	1.00	7.7
Fringed bromegrass: Common	1.40	10.8
Canadian wild rye: Mandan	2.00	15.4
Slender wheatgrass: Adanac, Pryor, Revenue, Primar, First Strike	2.50	19.2
Virginia wild rye: Common	2.00	15.4
Switchgrass: Dacotah, Forestburg, Sunburst, Summer	0.75	5.8
Fowl bluegrass: Common	0.60	4.6
Indian grass: Tomahawk	1.00	7.7
Black-eyed Susan: Common	0.10	0.8
Wild bergamont: Common	0.05	0.4
Hoary vervain: Common	0.05	0.4
Partridge pea: Common	0.30	2.3
Total	**13.00**	**100.0[1]**
Companion Crop		
Oats (or see Table 4 in Seed Standards and Specifications)	10.00	100.0
Total Seed	**23.00**	**100.0[1]**

[1] May not equal 100 percent due to rounding

Table 19
MN Seed Mix 5 – Mixed Hay Land (Converted Prairie) and Open-Cut Road Ditches Seed Mix

Use: Minnesota Region 1 on private mixed hay land and for re-establishing road bank/ditch vegetation
Seeding Rate: 15.0 pounds/acre PLS drilled or 30.0 pounds/acre PLS broadcast without the companion crop
Double the rate of the companion crop when broadcast seeding
Notes: *Enbridge Environment must approve s*ubstitutions *in advance*

Species: Preferred Varieties (if available)	Pounds/Acre PLS	Percent of Mix
Meadow bromegrass: Fleet, Paddock, Regar, Montana, MacBeth, Cache	3.75	25.0
Intermediate wheatgrass: Reliant, Clarke, Slate, Chief, Oahe, Haymaker, Beefmaker, Manifest	3.75	25.0
Crested wheatgrass: Nordan, RoadCrest, Summit	3.75	25.0
Tetraploid ryegrass: Common	1.50	10.0
Alfalfa: Any with Zone 2 hardiness	2.25	15.0
Total	**15.00**	**100.0[1]**
Companion Crop		
Oats (or see Table 4 in Seed Standards and Specifications)	10.00	100.0
Total Seed	**25.00**	**100.0[1]**

[1] May not equal 100 percent due to rounding

Table 20
MN Seed Mix 6 – Tame Pasture Reclamation Seed Mix

Use: Minnesota Region 1 on private land tame (improved) pasture planting
Seeding Rate: 20.0 pounds/acre PLS drilled or 40.0 pounds/acre PLS broadcast without the companion crop
Double the rate of the companion crop when broadcast seeding
Notes: *Enbridge Environment must approve s*ubstitutions *in advance*

Species: Preferred Varieties (if available)	Pounds/Acre PLS	Percent of Mix
Alfalfa: Any with Zone 2 hardiness	6.0	30.0
Red clover: Arlington, Astred, Cinnamon , Concord or Marathon	4.0	20.0
Timothy: Climax or Claire	2.0	10.0
Orchard grass: Orion, Hawkeye, Duke, Condor, Albert	3.0	15.0
Smooth bromegrass: Alpha, Badger, Bounty , York	5.0	25.0
Total	**20.0**	**100.0[1]**
Companion Crop		
Oats (or see Table 4 in Seed Standards and Specifications)	10.0	100.0
Total Seed	**30.0**	**100.0[1]**

[1] May not equal 100 percent due to rounding

MINNESOTA REGION 2 SEED MIXES

Table 21
MN Seed Mix 7 – Native Prairie Seed Mix

Use: Minnesota Region 2 on private and public land where native or degraded prairie are currently managed as range or hay land
Seeding Rate: 8.20 pounds/acre PLS drilled or 16.40 pounds/acre PLS broadcast without the companion crop
Double the rate of the companion crop when broadcast seeding
Notes: *Enbridge Environment must approve s*ubstitutions *in advance*

Species: Preferred Varieties (if available)	Pounds/Acre PLS	Percent of Mix
Fringed brome grass: Common	2.00	24.4
Bluejoint grass: Common	0.15	1.8
Poverty grass: Common	0.50	6.1
Canadian (Nodding) wild rye: Manda	1.25	15.2
Slender wheatgrass: Adanac, Pryor, Revenue, Primar, First Strike	2.00	24.4
Fowl Bluegrass: Common	0.85	10.4
False melic grass: Common	0.25	3.0
Stiff golden rod: Common	0.15	1.8
Smooth wild rose: Common	0.15	1.8
Black-eyed susan: Common	0.25	3.0
Smooth aster: Common	0.15	1.8
American vetch: Common	0.50	6.1
Total	**8.20**	**100.0[1]**
Companion Crop		
Oats (or see Table 4 in Seed Standards and Specifications)	10.00	100.0
Total Seed	**18.20**	**100.0[1]**

[1] May not equal 100 percent due to rounding

Table 22
MN Seed Mix 8 – Mixed Hay Land and Open-Cut Road Ditches Seed Mix

Use: Minnesota Region 2 on private mixed hay land and for re-establishing road bank/ditch vegetation
Seeding Rate: 45.00 pounds/acre PLS drilled or 90.00 pounds/acre PLS broadcast without the companion crop
Double the rate of the companion crop when broadcast seeding
Notes: *Enbridge Environment must approve s*ubstitutions *in advance*

Species: Preferred Varieties (if available)	Pounds/Acre PLS	Percent of Mix
Fowl Bluegrass: Common	6.00	13.3
Smooth Bromegrass: Alpha, Badger, Bounty , York	7.75	17.2
Slender Wheatgrass: Adanac, Pryor, Revenue, Primar, First Strike	2.00	4.4
Perennial Rye: Citadel, Mongita, Madera, Pagent, Achiever, SR-4000, Vivid, Linn Perennial Ryegrass, Windstar, and Festulolium hybrid	13.50	30.0
Switchgrass: Kanlow, Blackwell, Shelter, Carthage	1.50	3.3
Timothy: Climax or Claire	1.75	3.9
Alfalfa: Any with Zone 2 hardiness	12.50	27.8
Total	**45.00**	**100.0[1]**
Companion Crop		
Oats (or see Table 4 in Seed Standards and Specifications)	10.00	100.0
Total Seed	**55.00**	**100.0[1]**

[1] May not equal 100 percent due to rounding

Table 23
MN Seed Mix 9 – Tame Pasture Reclamation Seed Mix

Use: Minnesota Region 2 on private land tame (improved) pasture planting
Seeding Rate: 20.0 pounds/acre PLS drilled or 40.0 pounds/acre PLS broadcast without the companion crop
Double the rate of the companion crop when broadcast seeding
Notes: *Enbridge Environment must approve s*ubstitutions *in advance*

Species: Preferred Varieties (if available)	Pounds/Acre PLS	Percent of Mix
Alfalfa: Any with Zone 2 hardiness	6.0	30.0
Red clover: Arlington, Astred, Cinnamon , Concord or Marathon	4.0	20.0
Timothy: Climax or Claire	2.0	10.0
Orchard grass: Orion, Hawkeye, Duke, Condor, Albert	3.0	15.0
Smooth bromegrass: Alpha, Badger, Bounty , York	5.0	25.0
Total	**20.0**	**100.0[1]**
Companion Crop		
Oats (or see Table 4 in Seed Standards and Specifications)	10.0	100.0
Total Seed	**30.0**	**100.0[1]**

[1] May not equal 100 percent due to rounding

Appendix D
Enbridge Environment Hydrotest Discharge Authorization and Documentation

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Enbridge Environment Hydrotest Discharge Authorization & Documentation - *Instructions*

The purpose of this form is to document and insure that appropriate planning occurs prior to hydrostatic test discharge activities as well as the proper recording of necessary information during the actual discharge event. If the discharge permit specifies the need for a Certified Operator, he/she is responsible for the final section of the form. Otherwise, an Environmental Inspector will be responsible for completion of this form.

Part 1: Basic Discharge Information: All information must be completed. Coordination with Enbridge Engineering is necessary to obtain the exact test section length and volume of water to be discharged. The estimated duration of the discharge must be calculated using the maximum permitted rate (or the anticipated rate, if lower than the permitted rate) and the total volume of water to be discharged. This is critical information and will ensure that any required sampling is conducted at the appropriate frequency specified in the permit.

Part 2: Pre-Discharge Planning Checklist: A pre-discharge planning meeting must be held with the Certified Operator (if required), Contractor, Craft Inspection, Environmental Inspection, and Construction Management staff to review items included in the checklist and any other pertinent information deemed necessary. A full copy of the permit and discharge plan must be provided to all participants. Upon completion of this meeting, all participants must sign the form to indicate that they understand all steps of the discharge process. ***Note: In order to proceed with discharge activities, the Enbridge Construction Manager and Environment Staff assigned to the project, or their designees, must review the information and provide their authorization by signing and dating the form.***

Part 3: Discharge Monitoring: A copy of the permit, discharge plan, and parts one and two of the form must be on-site at all times during the discharge event. In addition to the items specified on the form, the following photographs are required:

- Receiving water before, during, and after the discharge (minimum 3 photos/day)
- Discharge structure/device before and during the discharge (minimum 3 photos/day)

As noted, upon completion of the discharge event, the Certified Operator or Environmental Inspector, Craft Inspector, Contractor Foreman, and Enbridge Construction Manager must sign and date the form. ***The completed form, along with the supplemental photographs, and a copy of the chain of custody for any samples submitted for laboratory analysis must be submitted to the Enbridge Environment Project Manager/Lead within 12 hours of ending the discharge. Any permit violations will be reported to the applicable agencies by the Enbridge Environment Project Manager/Lead within the timeframes specified in the discharge permit.***

Enbridge Environment Hydrotest Discharge Authorization & Documentation

Part 1: Basic Discharge Information

Date: _____

Project Name: _____ Spread: _____ Tract #: _____

Test Section Identification: _____

Pipe Diameter (inches): _____ Test Section Length (feet): _____ Volume to be discharged (gallons): _____

Permitted Discharge Rate (gpm): _____ Est. Duration of Discharge (hours): _____

Receiving Waterbody Name/Nearest Surface Waterbody: _____

Certified Operator Name and Number (if applicable): _____

Part 2: Pre-Discharge Planning Checklist ***Note: All items must be complete prior to initiating discharge activities***

- ☐ Notification to agency(ies) provided (if applicable - attach copy of notification documentation)
- ☐ Flow meter installed and functional in accordance with manufacturers recommendations
- ☐ Sample collection port/tap installed or other positive means of direct sampline of discharge water (only necessary if sampling is required)
- ☐ Review of discharge permit and site-specific plan complete (attach a copy of the permit and approved site specific plan)
- ☐ Discharge structure/BMPs installed according to approved plan
- ☐ Complete the table below, including quantity of samples required in accordance with the permit based on anticipated discharge duration. Add other parameters as specified in the permit:

Parameter	Analytical Method Number	Container type	Container Volume	Preservation	Maximum Holding Times	Permit Limit	Sample Type	Frequency of Analysis Specified in Permit	Number of Samples Required
pH	NA	Polyethylene / Glass	NA	None required	Analyze immediately		Field measurement		
Dissolved Oxygen	NA	Glass bottle and top	NA	None required	Analyze immediately		Field measurement		
TSS	106.2	Polyethylene	500 ml	Cool to 4° C	7 days				
Oil & Grease	1664	Amber Glass	1 liter	Cool to 4° C, HCL or H_2SO_4 to pH <2	28 days				

- ☐ Indicate responsible party for emergency/upset/spill notifications in accordance with the permit:_____
- ☐ Indicate responsible party for to begin flow diversion when change in coloration observed:

All staff involved in hydrostatic test discharge activities must review the above information and print and sign their name below indicating their participation in a pre-job planning meeting and that they understand the discharge plan, permit, and procedures and are prepared to properly implement them. Attach additional sheets as necessary.

Name (print and sign):

Certified Operator or Environmental Inspector Signature: ____

Enbridge Environment and Construction Management staff reviewed the pre-planning information provided and approve the initiation of discharge activities.

Enbridge Environment Staff Signature and Date: ____

Enbridge Construction Manager Signature and Date: ____

Part 3: Discharge Monitoring - attach additional sheets as necessary ***Note: Flow rate must be recorded hourly, sample frequency must be in accordance with the permit specifications***

Date	Time	Recorded/Sampled By	Flow Rate (gpm)	pH	Dissolved Oxygen (mg/l)	TSS Sample Collected?	Oil & Grease Sample Collected?	Other (indicate)

Flow meter manufacturer and model:

Flow meter date of last calibration :

pH/Dissolved Oxygen instrument manufacturer and model:

pH/Dissolved Oxygen instrument date of last calibration:

Date and Time discharge start: Date and Time discharge complete: _____

Equipment, Discharge, and Receiving Water Inspection Notes (minimum 3 enteries per day):

Outfall Observations & Photo Documentation Notes (note presence or absence of any unusual characteristics such as unnatural turbidity, color, oil film, floating solids, foams, settleable solids, suspended solids, or deposits - minimum 3 enteries per day) :

Certified Operator or Environmental Inspector Signature: _____

Enbridge Craft Inspector Signature: _____

Contractor Foreman Signature: _____

Enbridge Construction Manager Signature: _____

Appendix E
Emergency Response Contractors/Disposal and Treatment Facilities

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Emergency Response Contractors

The Contractor will dispose of all wastes according to applicable federal, state, and local requirements. A listing of potential Emergency Spill Response Contractors and is provided below, and waste disposal facilities by state are provided in the pages that follow. This list was developed from state-wide databases. This list represents firms operating at the time the database was produced. The Contractor is responsible for verifying if a contractor or facility is currently operating under appropriate permits or licenses. The Contractor is responsible for ensuring wastes are disposed of properly.

Spill Response Contractors		
Company	**City/State**	**Phone Number**
North Dakota		
Clean Harbors Environmental	Williston, ND	(701) 774-2201 (800) 645-8265
Garner Environmental Services	Williston, ND	(701) 577-1200 (855) 774-1200
Absorbent & Safety Solutions	Watford City, ND	(701) 838-4558
Minnesota Limited	Berthold, ND	(701) 453-3700
Bobs Oilfield Service Inc	Belfield, ND	(701) 575-4666
Keitu Engineers & Consultants, Inc.	Mandan, ND	(701) 667-1800
Minnesota		
Bay West Environmental	St. Paul, MN	(800) 279-0456 (651) 291-0456
West Central Environmental Consultants Inc.	Morris, MN	(800) 422-8356 (888) 923-2778
Minnesota Limited	Bemidji, MN	(218) 755-9595
OSI Environmental	Bemidji, MN	(800) 585-8838
OSI Environmental	Eveleth, MN	(800) 777-8542
Bay West Environmental	Duluth, MN	(800) 279-0456 (218) 740-0110
Wisconsin - *The Contractor should consult with the WDNR Northern Regional Spill Coordinator (John Sager: phone (715) 365-8959) for assistance when selecting a spill response contractor.*		

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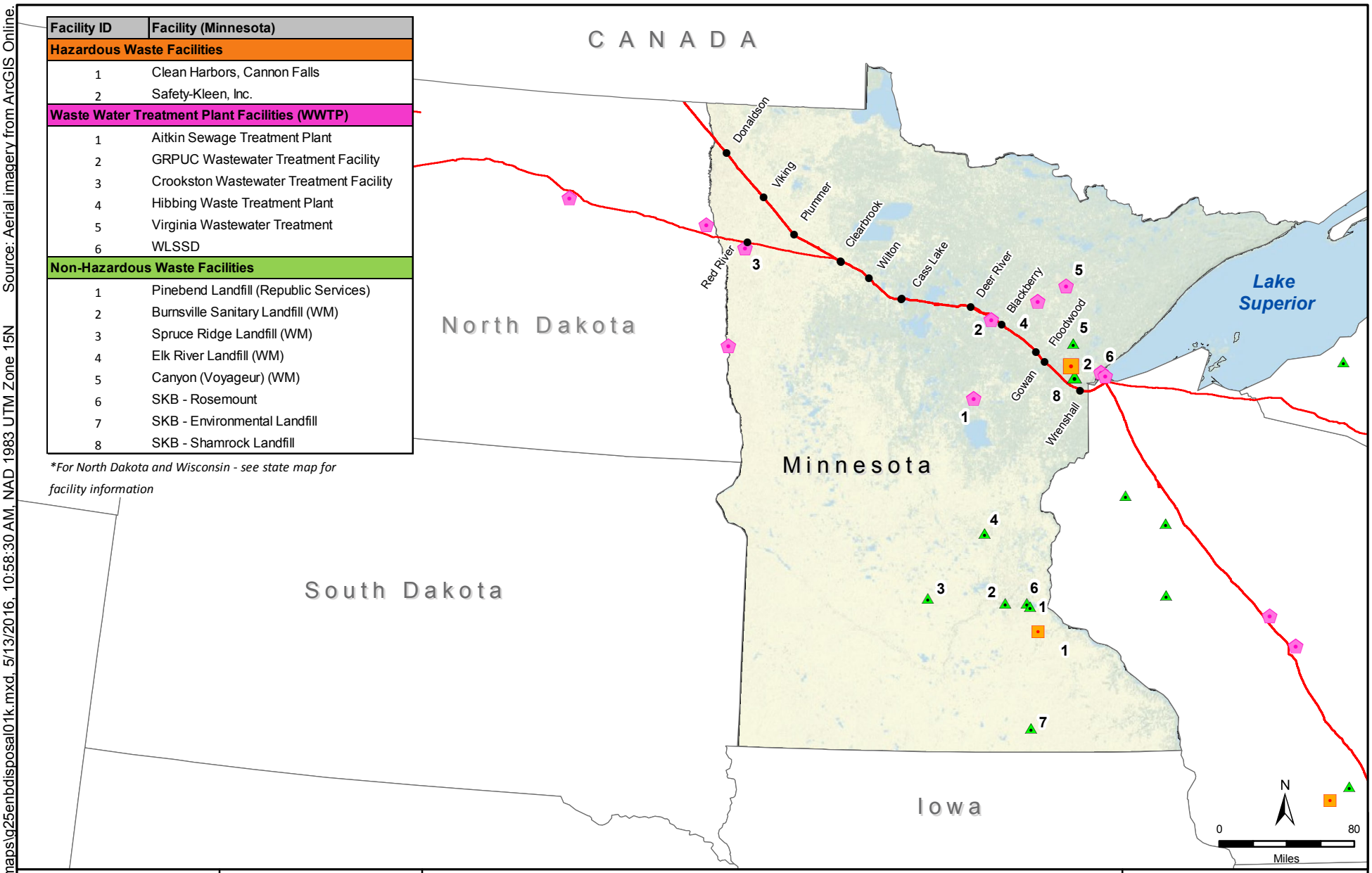
Facility ID	Facility (Minnesota)
Hazardous Waste Facilities	
1	Clean Harbors, Cannon Falls
2	Safety-Kleen, Inc.
Waste Water Treatment Plant Facilities (WWTP)	
1	Aitkin Sewage Treatment Plant
2	GRPUC Wastewater Treatment Facility
3	Crookston Wastewater Treatment Facility
4	Hibbing Waste Treatment Plant
5	Virginia Wastewater Treatment
6	WLSSD
Non-Hazardous Waste Facilities	
1	Pinebend Landfill (Republic Services)
2	Burnsville Sanitary Landfill (WM)
3	Spruce Ridge Landfill (WM)
4	Elk River Landfill (WM)
5	Canyon (Voyageur) (WM)
6	SKB - Rosemount
7	SKB - Environmental Landfill
8	SKB - Shamrock Landfill

**For North Dakota and Wisconsin - see state map for facility information*



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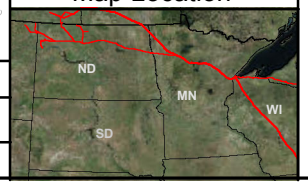
ENBRIDGE

Drawn: LBG 5/13/2016
Approved: LBG 5/13/2016
Project #: Disposal

Map Location



Legend

- Hazardous Waste Facility
- Waste Water Treatment Plant (WWTP)
- Non-Hazardous Waste Facility
- Enbridge Pipeline

WASTE FACILITIES - MINNESOTA

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Waste Facilities – Minnesota

Facility ID	Facility (Minnesota)	Waste Type	Address	City	State	Zip	County	Contact Phone
Hazardous Waste Facilities								
1	Clean Harbors, Cannon Falls	Solid & Liquid - Haz	211 Holiday Avenue	Cannon Falls	MN	55009	Goodhue	(507) 263-0252
2	Safety-Kleen, Inc.	Solid & Liquid - Haz	1302 18th Street	Cloquet	MN	55720	Goodhue	(218) 879-2164
Waste Water Treatment Plant Facilities (WWTP)								
1	Aitkin Sewage Treatment Plant	Liquid -WWTP	120 1st Street Northwest	Aitkin	MN	56431	Aitkin	(218) 927-3406
2	GRPUC Wastewater Treatment Facility	Liquid -WWTP	1105 SE 23rd Avenue	Grand Rapids	MN	55744	Itasca	(218) 326-7024
3	Crookston Wastewater Treatment Facility	Liquid -WWTP	County Road 233	Crookston	MN	56716	Polk	(218) 281-5711
4	Hibbing Waste Treatment Plant	Liquid -WWTP	11669 Town Line Road	Hibbing	MN	55746	St. Louis	(218) 362-5999
5	Virginia Wastewater Treatment	Liquid -WWTP	1204 Southern Drive	Virginia	MN	55792	St. Louis	(218) 748-7519
6	WLSSD	Liquid -WWTP	2626 Courtland Street	Duluth	MN	55806	St. Louis	(218) 722-3336
Non-Hazardous Waste Facilities								
1	Pinebend Landfill (Republic Services)	Solid - NonHaz	2495 East 117th Street	Inver Grove Heights	MN	55077	Dakota	(651) 450-2155
2	Burnsville Sanitary Landfill (WM)	Solid - NonHaz	2650 West Cliff Road	Burnsville	MN	55337	Dakota	(952) 890-3248
3	Spruce Ridge Landfill (WM)	Solid - NonHaz	12755 137th Street	Glencoe	MN	55336	McLeod	(320) 864-5503
4	Elk River Landfill (WM)	Solid - NonHaz	22460 Highway 169	Elk River	MN	55330	Sherburne	(763) 441-2464
5	Canyon (Voyageur) (WM)	Solid - NonHaz	6830 Highway 53	Canyon	MN	55717	St. Louis	(218) 345-6302
6	SKB - Rosemount	Solid - NonHaz	13425 Courthouse Blvd	Rosemount	MN	55060	Dakota	(651) 438-1500
7	SKB - Environmental Landfill	Solid - NonHaz	52563 243rd Street	Austin	MN	55912	Mower	(507) 433-8131
8	SKB - Shamrock Landfill	Solid - NonHaz	761 MN Highway 45	Cloquet	MN	55720	Carlton	(218) 878-0112

Appendix F
Spill Report Form

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Spill Report Form

(The Contractor Spill Coordinator must complete this for any spill, regardless of size, and submit the form to the Enbridge Representative within 24 hours of the occurrence)

Date of Spill:_____ Date of Spill Discovery:_____

Time of Spill:_____ Time of Spill Discovery:_____

Name and Title of Discoverer:_____

Type of material spilled and manufacturer's name:_____

Legal Description of spill location to the quarter section:_____

Directions from nearest community:_____

Estimated volume of spill:_____

Weather conditions:_____

Topography and surface conditions of spill site:_____

Spill medium (pavement, sandy soil, water, etc.):_____

Proximity of spill to surface waters: _____

Did the spill reach a waterbody? _____Yes _____No

If so, was a sheen present? _____Yes _____No

Describe the causes and circumstances resulting in the spill:_____

_____

_____

_____

Describe the extent of observed contamination, both horizontal and vertical (i.e., spill-stained soil in a 5-foot radius to a depth of 1 inch): _____

_____

_____

Describe immediate spill control and/or cleanup methods used and implementation schedule: _____

_____

_____

_____

Current status of cleanup actions:_____

Name and Company for the following:

Construction Superintendent:_____

Spill Coordinator:_____

Enbridge Representative:_____

Person Who Reported the Spill:_____

Environmental Inspector:_____

Form completed by:_____Date:_____

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Appendix G
Spill Reporting-Agency Contacts

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Spill Reporting Contacts						
Agency	**Water**	**Soil**	**Notification Period**	**24-Hour Reporting Hotline**	**Regulation/Code**	**Comments**
Federal Contacts						
National Response Center	Any quantity of discharged oil that violates state water quality standards, causes a film or sheen on water's surface or leaves sludge or emulsion beneath the surface	Release of a hazardous substance in an amount equal to or greater than its reportable quantity under CERCLA	Immediately	1-800-424-8802	40 CFR 302 – Designation, Reportable Quantities, and Notification	
Environmental Protection Agency Region V (MN / WI)	Any quantity of discharged oil that violates state water quality standards, causes a film or sheen on water's surface or leaves sludge or emulsion beneath the surface		Immediately	1-312-353-2000	40 CFR 117 – Determination of Reportable Quantities for Hazardous Substances Clean Water Act § 311 – Oil and Hazardous Substance Liability	

Spill Reporting Contacts						
Agency	**Water**	**Soil**	**Notification Period**	**24-Hour Reporting Hotline**	**Regulation/Code**	**Comments**
Environmental Protection Agency Region VIII (ND)	Any quantity of discharged oil that violates state water quality standards, causes a film or sheen on water's surface or leaves sludge or emulsion beneath the surface		Immediately	1-303-312-6312	40 CFR 117 – Determination of Reportable Quantities for Hazardous Substances Clean Water Act § 311 – Oil and Hazardous Substance Liability	
State Contacts						
Minnesota Pollution Control Agency	Visible Sheen or Emulsion	No minimum quantity for crude oil. Any spill >5 gallons of refined petroleum product. Spills of any quantity of all other chemicals or materials should be reported.	Immediately upon discovery.	Minnesota State Duty Officer 1-800-422-0798 (In State) or (651) 649-5451	Minnesota Statute 115.061	Follow up report established after initial response.

Spill Reporting Contacts						
Agency	**Water**	**Soil**	**Notification Period**	**24-Hour Reporting Hotline**	**Regulation/Code**	**Comments**
North Dakota Department of Health	Visible Sheen or Emulsion	No minimum requirement. All spills that impact or threaten groundwater or surface water or may potentially have adverse effects on human health or the environment are reportable.	Immediately upon discovery.	North Dakota Department of Health 1-701-328-5210 North Dakota Hazardous Materials Emergency Assistance and Spill Reporting 1-800-472-2121 (In State) 1-701-328-5210 (Out of State)	North Dakota Administrative Code NDAC 33-16-02.1-1	Follow up report established after initial response.

Spill Reporting Contacts						
Agency	**Water**	**Soil**	**Notification Period**	**24-Hour Reporting Hotline**	**Regulation/Code**	**Comments**
Wisconsin Department of Natural Resources	Visible Sheen or Emulsion	All spills are reportable unless they meet the following criteria: 1) spill is contained on an impervious surface; 2) <5 gallons of petroleum products on a pervious surface; 3) <1 gallon of gasoline on a pervious surface.	Immediately of any discharge not exempted by the statute.	24-hour WI DNR reporting number 1-800-943-0003	Chapter 292.11 of the Wisconsin Statutes, Chapter NR 706 Wisconsin Administrative Code	Follow up report established after initial response.
County Contacts – Minnesota						
Kittson County Emergency Management	As Needed			Scot Olson (218) 843-2113	Kittson County 2015 Hazard Management Plan	
Marshall County Emergency Services	As Needed			Josh Johnston (218) 745-5841	Marshall County, MN Hazard Mitigation Plan 2016 Update	
Pennington County Emergency Management	As Needed			Erik Beitel (218) 683-7087		
Wadena County Emergency Management	As Needed			Tyler Wheeler (218) 631-7795		

Spill Reporting Contacts						
Agency	**Water**	**Soil**	**Notification Period**	**24-Hour Reporting Hotline**	**Regulation/Code**	**Comments**
Polk County Emergency Management	As Needed			Jody Beauchane, Director (218) 470-8263	Polk County, MN Hazard Mitigation Plan (July 2015)	
Red Lake County Emergency Management	As Needed			Mitch Bernstein (218) 253-2996		
Clearwater County Emergency Management	As Needed		8:00 AM – 4:30 PM Monday – Friday	(218) 694-6226		
Hubbard County Emergency Management	As Needed			Brian Halbasch (218) 732-2588		
Cass County Emergency Management	As Needed			Chad Emery (218) 547-7437	Cass County Hazard Mitigation Plan	
Crow Wing County Emergency Management	As Needed			John Bowen, Director (218) 829-4749		
Aitkin County Emergency Management	As Needed			Dispatch (non-emergency) (218) 927-7400		
Carlton County Emergency Management	As Needed			Steve VanKekerix, Director (218) 384-9539		

Spill Reporting Contacts						
Agency	**Water**	**Soil**	**Notification Period**	**24-Hour Reporting Hotline**	**Regulation/Code**	**Comments**
St Louis County Emergency Management	As Needed			Sheriff's Office Emergency Management Division (218) 336-4340		
County Contacts – North Dakota						
Pembina County Emergency Management	As Needed			Andrew Kirking (701) 265-4849		
County Contacts – Wisconsin						
Douglas County Emergency Management	As Needed		8:00 AM – 4:30 PM Monday – Friday	Keith Kesler, Director (715) 395-1636		

Minnesota

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MINNESOTA SPILL NOTICATION REQUIREMENTS

The Minnesota Department of Public Safety, Division of Emergency Management (DEM) operates a 24-hour State Duty Officer service establishing a one call system for all state reporting requirements. The Duty Officers record all pertinent information and then make the appropriate notifications to the county and state agencies. The 24-Hour spills and leaks hotline can be reached via one of the following telephone numbers:

1-800-422-0798 (In State)

1-651-649-5451 (Out of State)

The Minnesota Pollution Control Agency (MPCA) requires immediate notification upon discovery of any spill of any quantity of crude oil. This includes historical contamination found during environmental investigations.

Every person who has "any substance or material under its control" is required to report. This includes:

- Property owners who discover contamination – Individuals, partnerships, companies, corporations;
- Governmental subdivisions, including officers of these entities;
- Owners of substances being stored or transported by another company; and
- Contractors that are in physical control of a discharged substance.

In addition to MPCA notification, local regulations may require additional notifications.

Additionally, reporting of releases of non-petroleum materials greater than the Reportable Quantity (RQ) is required if the material exceeds the quantity listed in **Table 3** (located at the beginning of this document).

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Minnesota Reporting of Petroleum Releases Guidance Documents

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Reporting leaks and spills

Minn. Stat. §115.061, which has been in effect since 1969, describes the duty of people to notify the Minnesota Pollution Control Agency (MPCA) when spills and leaks occur:

115.061 — Duty to Notify and Avoid Water Pollution

a) Except as provided in paragraph (b), it is the duty of every person to notify the agency immediately of the discharge, accidental or otherwise, of any substance or material under its control which, if not recovered, may cause pollution of waters of the state, and the responsible person shall recover as rapidly and thoroughly as possible such substance or material and take immediately such other action as may be reasonably possible to minimize or abate pollution of waters of the state caused thereby.

b) Notification is not required under paragraph (a) for a discharge of five gallons or less of petroleum, as defined in section 115C.02, subdivision 10. This paragraph does not affect the other requirements of paragraph (a).

The law provides penalties of up to $10,000 per day for violations.

The Minnesota Department of Public Safety, Bureau of Criminal Apprehension, operates a 24 hour service, establishing a one call system for all state reporting requirements.

Reportable spills should be directed to the Minnesota Duty Officer by calling 651-649-5451 or 800-422-0798. The duty officer will record all pertinent information and then make the appropriate notifications to the state agencies.

Spills that must be reported

Report spills that may cause pollution, such as spills of toxic, flammable, corrosive and dangerous industrial chemicals. Also report spills of environmentally damaging materials, including milk, coal, animal parts, batteries, etc.

Reportable quantities

Minnesota has a reporting threshold of greater than five-gallons for petroleum spills. Spills of any quantity of all other chemicals or materials should be reported. If in doubt, report.

Anyone who spills is required to report

EVERY person who has “any substance or material under its control” must report spills and leaks. This includes:

- property owners who discover contamination;
- individuals, partnerships, companies and corporations;
- governmental subdivisions, including officers of these entities;
- owners of substances being stored or transported by another company; and
- contractors who are in physical control of a discharged substance.

Sometimes a fire department, police agency or other local or state agency that responds to a spill or leak chooses to report the incident to the MPCA. In some circumstances, the entity may be required to report the

spill. However, in no case does a report from someone else stand in lieu of your responsibility to report to the MPCA by calling the Minnesota Duty Officer if a substance is under your control.

Be aware that there may be other reporting requirements imposed by local ordinances, state or federal law, or permits. Understanding all reporting requirements is the responsibility of those who handle substances which can pollute.

It is the responsibility of the spiller to ensure an effective cleanup and proper management of all wastes generated. With the exception of used oil, waste generated from petroleum spills that have been reported and cleaned up immediately are exempt from Minnesota's Hazardous Waste Rules. Waste from used oil spills must be sent to a facility for energy recovery.

For more information

For more information on spill prevention, cleanup or disposal, call the MPCA at 651-296-6300 or 800-657-3864 and ask for a member of the Emergency Management Unit or go to https://www.pca.state.mn.us/waste/emergency-response.

More information is also on the U.S. Environmental Protection Agency website at https://www.epa.gov/oilspill/.

Crude oil and unrefined petroleum wastes

Crude oil and related unrefined petroleum wastes present risks to human health and the environment if improperly managed. This fact sheet will discuss the hazardous waste requirements for these wastes administered by the Minnesota Pollution Control Agency (MPCA) and the Metropolitan Counties of Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington (Metro Counties).

What are crude oil and unrefined petroleum wastes?

Crude oil wastes include:

- Spilled crude oil or unrefined petroleum from pipelines, trains, trucks, tanks, and other sources.
- Absorbents, cleanup materials, soil, and water contaminated with crude oil or unrefined petroleum.

Crude oil and unrefined petroleum wastes almost always contain enough benzene and related organic compounds to make them a characteristic hazardous waste. They may also contain hazardous concentrations of heavy metals, including arsenic, cadmium, chromium, lead, mercury, and selenium.

Assume untested crude oil, unrefined petroleum, and any related wastes that will be disposed or burned are hazardous wastes until you evaluate them and document that they are non-hazardous. See MPCA fact sheet #w-hw1-01, Evaluate Waste, at https://www.pca.state.mn.us/sites/default/files/w-hw1-01.pdf.

What are *not* crude oil or unrefined petroleum wastes?

Other wastes may be confused with crude oil and unrefined petroleum wastes, including:

- Manufactured or refined petroleum-based and other-based fuels, such as fuel oil, gasoline, and diesel. Manage these fuel-related wastes as discussed in MPCA fact sheet #w-hw4-19, Fuel-related Wastes, at https://www.pca.state.mn.us/sites/default/files/w-hw4-19.pdf.
- Used oils and related wastes, including lubricating, hydraulic, and cutting oils. Manage these used oil wastes as discussed in MPCA fact sheet #w-hw4-30, Used Oil and Related Wastes, at https://www.pca.state.mn.us/sites/default/files/w-hw4-30.pdf.
- Recovered crude oil or unrefined petroleum that will be managed by refining along with normal process streams at a petroleum refining facility. This material is considered a commodity instead of a regulated waste.

What must I do if crude oil or unrefined petroleum is spilled?

Immediately report all spills of crude oil or unrefined petroleum to the Minnesota Duty Officer. See More information on the page 3. If needed, call 911 to summon emergency responders first.

> Note: The five-gallon exemption in Minnesota's spill reporting law applies only to refined petroleum fuel products, not crude oil or unrefined petroleum-contaminated wastes. All spills of crude oil or unrefined petroleum, regardless of volume, must be reported.

Next, take all reasonable steps to contain the spill and begin to recover as much of the spilled material as possible. Follow any directions given to you by MPCA Emergency Management Unit (EMU) staff.

Finally, document your spill response actions. Submit a written report of transport-related spills to the U.S. Department of Transportation (DOT) within 30 days.

How must crude oil and unrefined petroleum wastes be managed?

- Manage untested wastes and wastes that are not eligible for any of the other options below as fully regulated hazardous wastes. See MPCA fact sheet #w-hw1-06, Treat or Dispose of Hazardous Waste, at https://www.pca.state.mn.us/sites/default/files/w-hw1-06.pdf.
- In certain situations, MPCA EMU staff may allow specific management of crude oil or unrefined petroleum wastes that is different than explained in this fact sheet. If the EMU staff issue a specific allowance, this authorization supersedes the requirements discussed here. EMU authorizations are incident-specific and cannot be used for a different spill.
- Liquids and solids that meet the criteria below may be managed equivalent to off-specification used oil and burned for energy recovery in utility or industrial furnaces and boilers. Crude oil and unrefined petroleum wastes that will be burned for energy recovery equivalent to used oil must contain:
  - 10 parts per million (ppm) or less of arsenic.
  - 0.2 ppm or less of mercury.

  For guidance on management requirements for off-specification used oil, see MPCA fact sheet #w-hw4-30, Used Oil and Related Wastes, at https://www.pca.state.mn.us/sites/default/files/w-hw4-30.pdf.
- Contaminated soil shown to leach less arsenic, cadmium, chromium, lead, mercury, and selenium than the hazardous waste toxicity characteristic levels in MPCA fact sheet #w-hw2-04, Characteristic Hazardous Wastes, at https://www.pca.state.mn.us/sites/default/files/w-hw2-04.pdf, may be transported without a hazardous waste manifest in Minnesota and:
  - Landfilled if soils have been dewatered and the receiving landfill's permit and Industrial Solid Waste Management Plan allow its acceptance. The landfill must be notified prior to shipment and must agree to accept the soil. The landfill may require additional testing before accepting the waste, and may apply specific conditions or limitations to the disposal.
  - Land applied if soil application has been approved by the MPCA's Petroleum Remediation Program (PRP). For information on the PRP approval process, see MPCA fact sheet #c-prp3-03, Land Treatment of Petroleum Contaminated Soil, at https://www.pca.state.mn.us/sites/default/files/c-prp3-03.pdf.
- Contaminated water shown to contain less arsenic, cadmium, chromium, lead, mercury, and selenium than the hazardous waste toxicity characteristic levels in MPCA fact sheet #w-hw2-04, Characteristic Hazardous Wastes, at https://www.pca.state.mn.us/sites/default/files/w-hw2-04.pdf, may be transported without a hazardous waste manifest in Minnesota and:
  - Discharged to a publicly owned treatment works (POTW). The POTW must be notified prior to shipment and must agree to accept the water. The POTW may require additional testing before accepting the waste, and may apply specific conditions or limitations to the discharge.
  - Land applied if water application has been issued a National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) Permit for Contaminated Groundwater by the MPCA. For the application process for this permit, see MPCA form #wq-wwprm7-29, Industrial Groundwater Pump-Out Application, at https://www.pca.state.mn.us/sites/default/files/wq-wwprm7-29.doc.

More information

Guidance in this fact sheet was compiled from Minnesota Statutes, Chapter 115, and Minnesota Rules, Chapters 7037 and 7045, and incorporates regulatory interpretation decisions made by the MPCA on April 13, 2016. To review Minnesota laws, visit the Office of the Revisor of Statutes at https://www.revisor.mn.gov/pubs.

For information about waste minimization, contact the Minnesota Technical Assistance Program (MnTAP). The MPCA's Small Business Environmental Assistance Program can offer free, confidential compliance assistance. Immediately report all hazardous waste spills to the Minnesota Duty Officer.

Metro County Hazardous Waste Offices

Anoka 763-422-7093
..... https://www.anokacounty.us/
Carver 952-361-1800
..... http://www.co.carver.mn.us/
Dakota 952-891-7557
..... https://www.co.dakota.mn.us/
Hennepin 612-348-3777
..... http://www.hennepin.us/
Ramsey 651-266-1199
..... https://www.ramseycounty.us/
Scott 952-496-8475
..... http://www.scottcountymn.gov/
Washington 651-430-6655
..... https://www.co.washington.mn.us/

Minnesota Pollution Control Agency

Toll free (all offices) 1-800-657-3864
All offices 651-296-6300
..... https://www.pca.state.mn.us/

Minnesota Duty Officer

Toll free 1-800-422-0798
Metro 651-649-5451

Small Business Environmental Assistance Program

Toll free 1-800-657-3938
Metro 651-282-6143
..... https://www.pca.state.mn.us/sbeap/

Minnesota Technical Assistance Program

Toll free 1-800-247-0015
Metro 612-624-1300
..... http://www.mntap.umn.edu

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Minnesota Pollution Control Agency District Contacts

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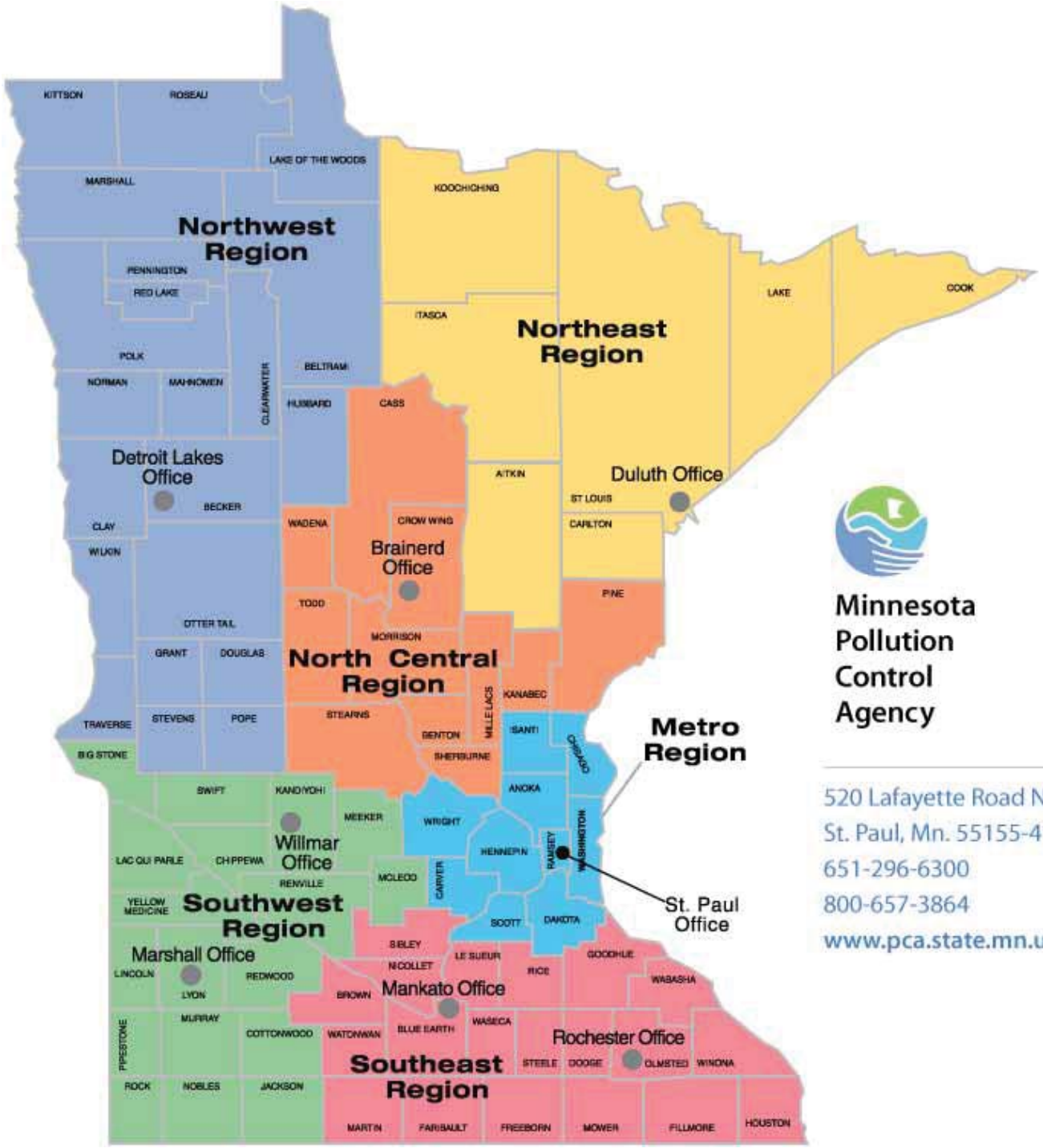

Minnesota Pollution Control Agency

520 Lafayette Road North
St. Paul, Mn. 55155-4194
651-296-6300
800-657-3864
www.pca.state.mn.us

Minnesota PCA District office contacts

Brainerd:
7678 College Road
Suite 105
Baxter, MN 56425
218-828-2492
800-657-3864
Fax: 218-828-2594

Detroit Lakes:
714 Lake Ave.
Suite 220
Detroit Lakes, MN 56501
218-847-1519
800-657-3864
Fax: 218-846-0719

Duluth:
525 Lake Ave. S.
Suite 400
Duluth, MN 55802
218-723-4660
800-657-3864
Fax: 218-723-4727

Mankato:
12 Civic Center Plaza
Suite 2165
Mankato, MN 56001
507-389-5977
800-657-3864
Fax: 507-389-5422

Marshall:
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Suite 200
Marshall, MN 56258
507 537-7146
800-657-3864
Fax: 507 537-6001

Rochester:
18 Wood Lake Drive SE
Rochester, MN 55904
507-285-7343
800-657-3864
Fax: 507-280-5513

St. Paul:
520 Lafayette Road N
St. Paul, MN 55155-4194
651-296-6300
800-657-3864,
TTY: use your preferred telecommunications relay service.

Willmar:
1601 Highway 12 East
Suite 1
Willmar, MN 56201-6002
320-214-3786
800-657-3864
Fax: 320-214-3787

Fond du Lac Line 4 Project

Application for Pipeline Routing Permit and Partial Exemption

Minnesota Public Utilities Commission

Appendix C

Safety Data Sheets

ENBRIDGE

Safety Data Sheet

Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil—Heavy	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1267
	Synonyms	Premium Conventional Heavy (PCH), Conventional Heavy (CHV)
	Chemical Category	Crude oils—extremely flammable
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION

Skin Irritation	Category 2
Eye Irritation	Category 2
Germ Cell Mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 2
Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
Specific Target Organ Toxicity (Repeated Exposure)	Category 1
Aspiration Toxicity	Category 1
Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms

Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.
- May cause drowsiness or dizziness.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
Petroleum distillate (naphtha)	8002-05-9	60-100	
Natural Gas Condensates (petroleum)	64741-47-5	60-100	
Asphalt	8052-42-4	50-90	
Butane	106-97-8	0-10	
Pentane	109-66-0	0-7	
Octane	111-65-9	0-5	
Nonane	111-84-2	0-5	
Heptane	142-82-5	0-5	
2-Methylbutane	78-78-4	0-5	
Isobutane	75-28-5	0-5	
Hexane	110-54-3	0-5	
Decane	124-18-5	0-5	
Benzene	71-43-2	0-2	
Xylene	1330-20-7	0-1	
Toluene	108-88-3	0-1	
Ethylbenzene	100-41-4	0-1	
1,2,4-Trimethylbenzene	95-63-6	0-1	
Hydrogen Sulfide	7783-06-4	0-1	

**Values do not reflect absolute minimums and maximums; those values may vary from time to time.*

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES

Inhalation	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.

	Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/ attention.
	Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed—can enter lungs and cause damage.
MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED	**Refer to Section 11 - Toxicological Information**	
INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY	**Note to the Physician**	• Aspiration hazard. Symptoms may be delayed. • Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for development of cardiac arrhythmias. • Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA	**Suitable Extinguishing Media**	• SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
	Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.
FIREFIGHTING PROCEDURES		• FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out. • Stay upwind. • Ventilate closed spaces before entering. • Fire fighters should wear complete protective clothing including self-contained breathing apparatus. • FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions. • FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions. • Move containers from fire area if you can do it without risk. • LARGE FIRES: Use water spray or fog; do not use straight streams. • LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn. • LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (CO_2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced firefighters.
- Carbon dioxide can displace oxygen.
- Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions	• Evacuate personnel to safe areas. • Remove all sources of ignition. • Deny entry to unauthorized and unprotected personnel. • Use personal protective equipment. • Avoid contact with skin, eyes and clothing. • Stop leak if you can do it without risk. • Keep people away from and upwind of spill/leak. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Ventilate enclosed areas. • Do not walk through spilled material.
Protective Equipment	• Wear appropriate breathing apparatus (if applicable) and protective clothing.
Emergency Procedures	• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk. • Report spills to local or federal authorities as appropriate or required.

ENVIRONMENTAL PRECAUTIONS

- Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.

METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Methods for Containment

- Stop leak if you can do it without risk.
- Contain and recover liquid when possible.
- A vapor suppressing foam may be used to reduce vapors.
- Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming.
- Use water spray to reduce vapors or divert vapor cloud drift.
- A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.

Methods for Cleaning Up

- Clean up spill immediately.
- LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.
- SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal.
- Use appropriate Personal Protective Equipment (PPE).
- Use clean non-sparking tools to collect absorbed material.
- Vacuum spilled material.
- Try to work upwind of spill.
- All equipment used when handling the product must be grounded.
- Recover and return free product to proper containers
- Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids.
- Do not place spilled materials back in the original container.
- Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING

Handling

- All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces.
- The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes).
- The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.
- Take precautionary measures against static discharges.

	Handling	• Do not cut drill, grind or weld on empty containers since they may contain explosive residues. • Stay upwind and vent open hatches before uploading. • Avoid contact with skin, eyes and clothing. • Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. • Wear personal protective equipment. • Remove and wash contaminated clothing before re-use. • Do not eat, drink or smoke when using this product. • Do not take internally. • Wash thoroughly after handling. • Empty containers pose a potential fire and explosion hazard.
CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES	**Storage**	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
	Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
Petroleum distillate (naphtha)	–	–	TWA 350 mg/m^3 IDLH 1100 ppm Ceiling 1800 mg/m^3
Asphalt	TLV 0.5 mg/m^3		Ceiling 5 mg/m^3
Butane	STEL 1000 ppm	–	TWA 800 ppm TWA 1900 mg/m^3

Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm
Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
Nonane	TLV 200 ppm TLV 1050 mg/m^3	–	TWA 200 ppm TWA 1050 mg/m^3
Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
2-Methylbutane	TWA 600 ppm	–	–
Isobutane	TWA 1000 ppm	–	–
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
Decane	–	–	–
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm
Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm
Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm

1,2,4-Trimethylbenzene	TWA 25 ppm	–	TWA 25 ppm TWA 125 mg/m^3
Hydrogen sulfide	TLV 1 ppm TLV 1.4 mg/m^3 STEL 5 ppm STEL 7 mg/m^3	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m^3 IDLH 100 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES

Eye and Face	• Wear face shield and eye protection.
Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid	**Odor**	Petroleum like odor
Substance Type	Mixture	**Odor Threshold**	No data available
Appearance	Brown		

PROPERTIES

pH	No data available	**Vapor pressure**	No data available
Melting Point/ Freezing Point	No data available	**Vapor density**	2.5 to 5.0 Air=1
Boiling Point/ Boiling Range	34 to 260°C 93.2 to 500°F	**Relative density**	No data available
Flash Point	-40 to 260 °C -40 to 500 °F	**Water Solubility**	Negligible
Evaporation Rate	No data available	**Partition coefficient: n-octanol/water**	No data available
Flammability (solid, gas)	No data available	**Autoignition temperature**	No data available
Upper Flammability Limit	No data available	**Decomposition temperature**	No data available

Lower Flammability Limit	No data available	**Specific Gravity**	0.65-0.98
Viscosity	No data available		

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides, chlorine
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE

Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
Eye Contact	• Causes serious eye irritation.
Skin Contact	• Causes skin irritation.
Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
Asphalt	>5000 mg/kg (Rat)	–	>94.4 mg/m^3 (Rat)
Butane	–	–	658 mg/L (Rat) 4 h
Pentane	>2000 mg/kg (Rat)	–	364 g/cu (Rat) 4 h
Octane	–	–	= 118 g/m^3 (Rat) 4 h = 25260 ppm (Rat) 4 h
Nonane	–	–	= 3200 ppm (Rat) 4 h
Heptane	–	= 3000 mg/kg (Rabbit)	= 103 g/m^3 (Rat) 4 h
2-Methylbutane	–	–	= 150,000 mg/m^3 (Rat) 2 h

Isobutane	–	–	= 658,000 mg/m^3 (Rat) 4 h
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h
Decane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	–
Benzene	1800 mg/kg (Rat)	–	13050 - 14380 ppm (Rat) 4 h
Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	–
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
1,2,4-Trimethylbenzene	5 g/kg (Rat)	–	18000 mg/m^3 (Rat) 4h
Hydrogen sulfide	–	–	= 444 ppm (Rat)

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene

- Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.

Hydrogen Sulfide Gas (H_2S)

- Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning have been reported. Complete and rapid recovery is the general rule. However, if the exposure was sufficiently intense and sustained causing cerebral hypoxia (lack of oxygen to the brain), neurologic effects such as amnesia, intention tremors or brain damage are possible.

Hexane

- This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.

Xylenes

- Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.

Toluene	**Carcinogenicity:** Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC. **Target Organs:** Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances. **Reproductive Toxicity:** Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.
Ethylbenzene	**Carcinogenicity:** Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC. **Target Organs:** In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA
Petroleum distillate (naphtha)	A2	–	Group 3		–
Asphalt	A4	–	Group 2B	Reasonably Anticipated	–
Hexane	–	X	–	–	–
Benzene	A1	X	Group 1	Known	X
Xylenes	A4	–	Group 3	Evidence	
Toluene	A4	–	Group 3	Evidence	–
Ethylbenzene	A3	–	Group 2B	Evidence	X

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY	• Suspected of damaging fertility or the unborn child.
STOT—SINGLE EXPOSURE	• May cause drowsiness and dizziness.
STOT—REPEATED EXPOSURE	• Causes damage to organs through prolonged or repeated exposure.
ASPIRATION HAZARD	May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Petroleum distillate (naphtha)	–	LC50: 258 mg/L Salmo gairdneri 96 h static	EC50 48 h: < 0.26 mg/L Static (Daphnia magna) EC50 24 h: = 36 mg/L (Daphnia magna)	–
Natural gas condensates (petroleum)	–	LC50 96 h: = 119 mg/L static (Alburnus alburnus) LC50 96 h: = 82 mg/L static (Cyprinodon variegatus)	EC50 24 h: = 170 mg/L (Daphnia magna)	–
Butane	–	–	–	–
Pentane	–	LC50 96 h: = 11.59 mg/L (Pimephales promelas) LC50 96 h: = 9.87 mg/L (Oncorhynchus mykiss) LC50 96 h: = 9.99 mg/L (Lepomis macrochirus)	EC50 48h: 135 mmol/cu	LC50 24h: 165 mmol/cu Artemia salina (Brine Shrimp)
Octane	–	–	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
Heptane	–	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	–
2-Methylbutane			EC50 48 h: = 2.3 mg/L (Daphnia magna)	
Hexane	–	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	–
Decane	EC50 24 h: = 0.043 mg/L (Chlorella vulgaris)	–	EC50 48 h: = 0.029 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	–
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	-
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)
1,2,4-Trimethylbenzene	–	LC50 96 h: 7.72 mg/L (Pimephales promelas)	EC50 48h: 30 mmol/cu (Daphnia magna)	LC50 24h: 100 mmol/cu Artemia salina (Brine Shrimp)
Hydrogen sulfide	–	LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	–

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
Asphalt	6.006
Butane	2.89
Pentane	3.39
Octane	5.18
Heptane	4.66
2-Methylbutane	2.72
Isobutane	2.76
Hexane	3.90
Decane	5.1
Benzene	1.83
Xylene	2.77-3.15
Toluene	2.65
Ethylbenzene	3.118

1,2,4-Trimethylbenzene	3.78
Hydrogen Sulfide	0.45

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
Petroleum distillate (naphtha)	High
Butane	Low
Pentane	High
Octane	Immobile
Nonane	Immobile
Heptane	Moderate
2-Methylbutane	Low
Isobutane	Very High
Hexane	High
Decane	Immobile
Benzene	High
Xylene	Very High to Moderate
Toluene	High to Moderate
Ethylbenzene	Low
1,2,4-Trimethylbenzene	Low

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste

- This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.
- This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).
- This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).
- It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.

Packaging Waste	• Container contents should be completely used and containers should be emptied prior to discard. • Container could be considered a RCRA hazardous waste and must be disposed of with care and in full compliance with federal, state and local regulations. • Larger empty containers, such as drums, should be returned to the distributor or to a drum re-conditioner. • To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1267	Petroleum Crude Oil	3	I	Emergency response guide number: 128
TDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IMO/IMDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IATA/ICAO	UN1267	Petroleum Crude Oil	3	I	ERG Code 3L

SPECIAL RECAUTIONS FOR USER

• None

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	Not Listed
Pentane	109-66-0	Not Listed
Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	Not Listed

Isobutane	75-28-5	Not Listed
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
Decane	124-18-5	Not Listed
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	Not Listed
Pentane	109-66-0	Not Listed
Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	Not Listed
Isobutane	75-28-5	Not Listed
Hexane	110-54-3	Not Listed
Decane	124-18-5	Not Listed
Benzene	71-43-2	10 lb RQ
Xylene	1330-20-7	100 lb RQ
Toluene	108-88-3	1000 lb RQ
Ethylbenzene	100-41-4	1000 lb RQ
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	100 lb RQ

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR FRESHWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR SALTWATER LIFE

COMPONENT	CAS #	AMOUNT
HydrogenSulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	Not Listed
Pentane	109-66-0	Not Listed
Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	Not Listed
Isobutane	75-28-5	Not Listed
Hexane	110-54-3	Not Listed
Decane	124-18-5	Not Listed
Benzene	71-43-2	X
Xylene	1330-20-7	X
Toluene	108-88-3	X
Ethylbenzene	100-41-4	X
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	X

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)—PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	Not Listed
Pentane	109-66-0	Not Listed
Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	Not Listed
Isobutane	75-28-5	Not Listed
Hexane	110-54-3	Not Listed
Decane	124-18-5	Not Listed
Benzene	71-43-2	X
Xylene	1330-20-7	Not Listed
Toluene	108-88-3	X
Ethylbenzene	100-41-4	X
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	Not Listed

X= The component is listed

CANADA-WHMIS—CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
Petroleum distillate (naphtha)	8002-05-9	B2
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	A, B1
Pentane	109-66-0	B2

Octane	111-65-9	B2, D2B
Nonane	111-84-2	B2, D2B
Heptane	142-82-5	B2, D2B
2-Methylbutane	78-78-4	B2
Isobutane	75-28-5	A, B1 (listed under Methyl-2 propane)
Hexane	110-54-3	B2, D2A, D2B
Decane	124-18-5	B3, D2B
Benzene	71-43-2	B2, D2A, D2B
Xylene	1330-20-7	B2, D2A, D2B
Toluene	108-88-3	B2, D2A, D2B
Ethylbenzene	100-41-4	B2, D2A, D2B
1,2,4-Trimethylbenzene	95-63-6	B3
Hydrogen Sulfide	7783-06-4	A, B1, D1A, D2B

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	X
Pentane	109-66-0	X

Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	X
Isobutane	75-28-5	X
Hexane	110-54-3	Not Listed
Decane	124-18-5	Not Listed
Benzene	71-43-2	X
Xylene	1330-20-7	X
Toluene	108-88-3	X
Ethylbenzene	100-41-4	X
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	X

X= The component is listed

Section 16: Other Information

NFPA

Health Hazard: 2	**Flammability:** 4	**Instability:** 0	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 2	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 5/4/15

REVISION DATE 5/4/15

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

ENBRIDGE

Safety Data Sheet

Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil—Sour	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1267
	Synonyms	Medium Sour Blend (MSB), Central Alberta Pipeline (CAL 1), Pembina Light Sour (PLS 1), Gibsons Light Sour (GLS 1), Pembina Low Sour (PLO 1), Gibson Sour (MGS 2), Kinder Morgan High Sour (KHE 2), Pembina High Sour (PHO 2), Peace Pipe Sour (SPR 2), Rangeland Sour (RSO 2), Gibsons High Sour (GHE 2), Hardisty Light (MBL 3), Manitoba Medium (MM 4), Wespur Midale (MSM 4), Tundra Light Sour (MLS), Moose Jaw Tops (MJT), Midale (M), Light Sour Blend (LSB)
	Chemical Category	Crude oils—extremely flammable
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION

Skin Irritation	Category 2
Eye Irritation	Category 2
Germ Cell Mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 2
Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
Specific Target Organ Toxicity (Repeated Exposure)	Category 1
Aspiration Toxicity	Category 1
Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms

Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.
- May cause drowsiness or dizziness.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
2-Methylbutane (In Liquid form)	78-78-4	0-4	
Benzene	71-43-2	0-5	
Butane	106-97-8	0-5	
Cyclohexane	110-82-7	0-5	
Ethylbenzene	100-41-4	0-2	
Heptane	142-82-5	0-10	
Hexane	110-54-3	0-8	
Hydrogen Sulfide	7783-06-4	0-5	
Isobutane	75-28-5	0-5	
Methylcyclohexane	108-87-2	0-3	
Methylcyclopentane	96-37-7	0-3	
Naphthalene	91-20-3	0-1	
Natural gas condensates (petroleum)	64741-47-5	0-25	
Octane	111-65-9	0-10	
Pentane	109-66-0	0-3	
Petroleum	8002-05-9	0-100	
Sulfur	7704-34-9	0.5-2	
Toluene	108-88-3	0-5	
Xylene	1330-20-7	0-3	

**Values do not reflect absolute minimums and maximums; those values may vary from time to time.*

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES	**Inhalation**	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
	Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
	Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
	Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed—can enter lungs and cause damage.
MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED	**Refer to Section 11 - Toxicological Information**	
INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY	**Note to the Physician**	• Aspiration hazard. Symptoms may be delayed. • Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for development of cardiac arrhythmias. • Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA	**Suitable Extinguishing Media**	• SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
	Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.
FIREFIGHTING PROCEDURES	• FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out. • Stay upwind. • Ventilate closed spaces before entering. • Fire fighters should wear complete protective clothing including self-contained breathing apparatus. • FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions. • FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions. • Move containers from fire area if you can do it without risk.	

- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (CO_2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced firefighters.
- Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions	• Evacuate personnel to safe areas. • Remove all sources of ignition. • Deny entry to unauthorized and unprotected personnel. • Use personal protective equipment. • Avoid contact with skin, eyes and clothing. • Stop leak if you can do it without risk. • Keep people away from and upwind of spill/leak. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Ventilate enclosed areas. • Do not walk through spilled material.
Protective Equipment	• Wear appropriate breathing apparatus (if applicable) and protective clothing.

	Emergency Procedures	• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk. • Report spills to local or federal authorities as appropriate or required.
ENVIRONMENTAL PRECAUTIONS	• Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.	
METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP	**Methods for Containment**	• Stop leak if you can do it without risk. • Contain and recover liquid when possible. • A vapor suppressing foam may be used to reduce vapors. • Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming. • Use water spray to reduce vapors or divert vapor cloud drift. • A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.
	Methods for Cleaning Up	• Clean up spill immediately. • LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST. • SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal. • Use appropriate Personal Protective Equipment (PPE). • Use clean non-sparking tools to collect absorbed material. • Vacuum spilled material. • Try to work upwind of spill. • All equipment used when handling the product must be grounded. • Recover and return free product to proper containers • Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. • Do not place spilled materials back in the original container. • Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING	**Handling**	• All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces. • The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). • The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits. • Take precautionary measures against static discharges.

	Handling	• Do not cut drill, grind or weld on empty containers since they may contain explosive residues. • Stay upwind and vent open hatches before uploading. • Avoid contact with skin, eyes and clothing. • Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. • Wear personal protective equipment. • Remove and wash contaminated clothing before re-use. • Do not eat, drink or smoke when using this product. • Do not take internally. • Wash thoroughly after handling. • Empty containers pose a potential fire and explosion hazard.
CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES	**Storage**	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
	Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
2-Methylbutane (In Liquid form)	TWA 600 ppm	–	–
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Butane	STEL 1000 ppm	–	TWA 800 ppm TWA 1900 mg/m^3

Cyclohexane	TLV 100 ppm TLV 334 mg/m^3	PEL 300 ppm PEL 1050 mg/m^3	TWA 300 ppm TWA 1050 mg/m^3 IDLH 1300 ppm
Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm
Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
Hydrogen sulfide	TLV 1 ppm TLV 1.4 mg/m^3 STEL 5 ppm STEL 7 mg/m^3	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m^3 IDLH 100 ppm
Isobutane	TWA 1000 ppm	–	–
Methylcyclohexane	TLV 400 ppm TLV 1610 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 400 ppm TWA 1600 mg/m^3 IDLH 1200 ppm
Naphthalene	TLV 10 ppm STEL 15 ppm	PEL 10 ppm PEL 50 mg/m^3	TWA 10 ppm TWA 50 mg/m^3 STEL 15 ppm STEL 75 mg/m^3
Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm
Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm

Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES

Eye and Face	• Wear face shield and eye protection.
Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid	**Odor**	Petroleum like odor
Substance Type	Mixture	**Odor Threshold**	No data available
Appearance	Yellow/green to Brown/black liquid		

PROPERTIES

pH	No data available	**Vapor Pressure**	No data available
Melting Point/ Freezing Point	No data available	**Vapor Density**	>1 Air=1
Boiling Point/ Boiling Range	-20 to 550°C -4 to 1022°F	**Relative Density**	No data available
Flash Point	-40 to 100 °C -40 to 212 °F	**Water Solubility**	Negligible
Evaporation Rate	No data available	**Partition Coefficient: n-octanol/water**	No data available
Flammability (solid, gas)	No data available	**Autoignition Temperature**	No data available
Upper Flammability Limit	No data available	**Decomposition Temperature**	No data available

Lower Flammability Limit	No data available	**Specific Gravity**	0.84 to 0.88
Viscosity	No data available		

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides, chlorine
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE

Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
Eye Contact	• Causes serious eye irritation.
Skin Contact	• Causes skin irritation.
Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
2-Methylbutane (In Liquid form)	–	–	= 150,000 mg/m^3 (Rat) 2 h
Benzene	1800 mg/kg (Rat)	–	13050 - 14380 ppm (Rat) 4 h
Butane	–	–	658 mg/L (Rat) 4 h
Cyclohexane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 13.9 mg/L (Rat) 4 h
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
Heptane	–	= 3000 mg/kg (Rabbit)	= 103 g/m^3 (Rat) 4 h
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h

Hydrogen sulfide	–	–	= 444 ppm (Rat)
Isobutane	–	–	= 658,000 mg/m^3 (Rat) 4 h
Methylcyclohexane	> 3200 mg/kg (Rat)	–	–
Naphthalene	490 mg/kg (Rat)	0.05 ml (Rabbit) 24 h	–
Natural gas condensates (petroleum)	–	–	= 600 mg/m^3 (Rat)
Octane	–	–	= 118 g/m^3 (Rat) 4 h = 25260 ppm (Rat) 4 h
Pentane	>2000 mg/kg (Rat)	–	364 g/cu (Rat) 4 h
Petroleum	>4300 mg/kg (Rat)	500 mg (Rabbit) 24 h	–
Sulfur	–	–	1660 mg/m^3 (Mammal)
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	–
Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene	• Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.
Hydrogen Sulfide Gas (H_2S)	• Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning have been reported. Complete and rapid recovery is the general rule. However, if the exposure was sufficiently intense and sustained causing cerebral hypoxia (lack of oxygen to the brain), neurologic effects such as amnesia, intention tremors or brain damage are possible.
Hexane	• This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.

Xylenes	• Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.
Toluene	**Carcinogenicity:** Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC. **Target Organs:** Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances. **Reproductive Toxicity:** Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.
Ethylbenzene	**Carcinogenicity:** Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC. **Target Organs:** In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.
Naphthalene	Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The US National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcinogen by IARC and NTP.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA
Benzene	A1	X	Group 1	Known	X
Ethylbenzene	A3	–	Group 2B	Evidence	X
Hexane	–	X	–	–	–
Naphthalene	A4	X	2B	Evidence	
Petroleum	–		Group 3	Evidence	
Toluene	A4	–	Group 3	Evidence	–
Xylenes	A4	–	Group 3	Evidence	–

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY

- Suspected of damaging fertility or the unborn child.

STOT—SINGLE EXPOSURE

- May cause drowsiness and dizziness.

STOT—REPEATED EXPOSURE

- Causes damage to organs through prolonged or repeated exposure.

ASPIRATION HAZARD

May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
2-Methylbutane (In Liquid form)			EC50 48 h: = 2.3 mg/L (Daphnia magna)	
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow-through (Pimephales promelas) LC50 96 h: 23.03 - 42.07 mg/L static (Pimephales promelas) LC50 96 h: 24.99 - 44.69 mg/L static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L static (Poecilia reticulata)	EC50 24 h: > 400 mg/L (Daphnia magna	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min (Microorganisms)
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)
Heptane	–	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	–
Hexane	–	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	–
Hydrogen sulfide	–	LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	–
Methylcyclohexane	–	LC50 96hr: 72.0 mg/l (Golden Shiner)	–	–
Naphthalene	EC50 24 h: = 33000 ug/L (Chlorella vulgaris)	LC50 96 h: = 1.4 mg/L (Oncorhynchus gorbuscha)	EC50 48 h: 1600 ug/L (Daphnia magna)	–
Natural gas condensates (petroleum)	–	LC50 96 h: = 119 mg/L static (Alburnus alburnus) LC50 96 h: = 82 mg/L static (Cyprinodon variegatus)	EC50 24 h: = 170 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Octane	–	–	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
Pentane	–	–	EC50 48h: 135 mmol/cu	LC50 24h: 165 mmol/cu Artemia salina (Brine Shrimp)
Sulfur	–	LC50 96h: <14000 ug/l (Lepomis macrochirus)	EC50 48 h: = >5000000 ug/L (Daphnia magna)	–
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	-

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
2-Methylbutane (In Liquid form)	2.72
Benzene	1.83
Butane	2.89
Cyclohexane	3.44
Ethylbenzene	3.118
Heptane	3.90
Hexane	3.90
Hydrogen Sulfide	0.45
Isobutane	2.76
Methylcyclohexane	3.61
Methylcyclopentane	3.37
Naphthalene	3.30
Octane	5.18
Pentane	3.39
Toluene	2.65
Xylene	2.77-3.15

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
2-Methylbutane (In Liquid form)	Low
Benzene	High
Butane	Low
Cyclohexane	Moderate
Ethylbenzene	Low
Heptane	Moderate
Hexane	High
Isobutane	Very High
Methylcyclopentane	Low
Naphthalene	High to None
Octane	Immobile
Pentane	High

Toluene	High to Moderate
Xylene	Very High to Moderate

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste	• This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility. • This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP). • This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s). • It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.
Packaging Waste	• Container contents should be completely used and containers should be emptied prior to discard. • Container could be considered a RCRA hazardous waste and must be disposed of with care and in full compliance with federal, state and local regulations. • Larger empty containers, such as drums, should be returned to the distributor or to a drum re-conditioner. • To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1267	Petroleum Crude Oil	3	I	Emergency response guide number: 128

TDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IMO/IMDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IATA/ICAO	UN1267	Petroleum Crude Oil	3	I	ERG Code 3L

SPECIAL RECAUTIONS FOR USER

- None

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb final RQ; 454 kg final RQ
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
Heptane	142-82-5	Not Listed
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	100 lb final RQ; 45.4 kg final RQ
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	10 lb RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb RQ
Ethylbenzene	100-41-4	1000 lb RQ
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	100 lb RQ
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	100 lb RQ
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	1000 lb RQ
Xylene	1330-20-7	100 lb RQ

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR FRESHWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR SALTWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	X
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	X
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Sulfur	7704-34-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)—PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	Not Listed
Isobutane	75-28-5	Not Listed

Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	X
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Sulfur	7704-34-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	Not Listed

X= The component is listed

CANADA-WHMIS—CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
2-Methylbutane (In Liquid form)	78-78-4	B2
Benzene	71-43-2	B2, D2A, D2B
Butane	106-97-8	A, B1
Cyclohexane	110-82-7	B2, D2B
Ethylbenzene	100-41-4	B2, D2A, D2B
Heptane	142-82-5	B2, D2B
Hexane	110-54-3	B2, D2A, D2B
Hydrogen Sulfide	7783-06-4	A, B1, D1A, D2B
Isobutane	75-28-5	A, B1 (listed under Methyl-2 propane)
Methylcyclohexane	108-87-2	B2
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	B4, D2A
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	B2, D2B
Pentane	109-66-0	B2
Petroleum	8002-05-9	B2
Sulfur	7704-34-9	B4

Toluene	108-88-3	B2, D2A, D2B
Xylene	1330-20-7	B2, D2A, D2B

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L
Naphthalene	91-20-3	1.1 µg/L (listed under Polycyclic aromatic hydrocarbons (PAHs))

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L
Naphthalene	91-20-3	1.4 µg/L (listed under Polycyclic aromatic hydrocarbons (PAHs))

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
2-Methylbutane (In Liquid form)	78-78-4	X
Benzene	71-43-2	X
Butane	106-97-8	X
Cyclohexane	110-82-7	X
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Isobutane	75-28-5	X
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	X
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	X
Petroleum	8002-05-9	Not Listed

Sulfur	7704-34-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

Section 16: Other Information

NFPA

Health Hazard: 3	**Flammability:** 4	**Instability:** 0	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 3	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 5/7/15

REVISION DATE 06/19/2018

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

ENBRIDGE

Safety Data Sheet

Section 1: Identification

PRODUCT IDENTIFIER	High Sweet Clearbrook	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1267
	Synonyms	Bakken Crude Oil; High Sweet Clearbrook (UHC); Hydrocarbons of Petroleum; North Dakota Sweet (NSW)
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420- 5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION	Skin Corrosion/Irritation	Category 2
	Eye Irritation	Category 2
	Germ Cell Mutagenicity	Category 1B
	Carcinogenicity	Category 1A
	Reproductive Toxicity	Category 2
	Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
	Specific Target Organ Toxicity (Repeated Exposure)	Category 1
	Aspiration Toxicity	Category 1
	Flammable liquids	Category 1
LABEL ELEMENTS	**Signal Word**	Danger
	Hazard Pictograms	

	Hazard Statements	• Causes skin irritation. • Causes serious eye irritation. • May cause genetic defects. • May cause cancer. • Suspected of damaging fertility or the unborn child. • May cause respiratory irritation. • Causes damage to organs through prolonged or repeated exposure. • May be fatal if swallowed and enters airways. • Extremely flammable liquid and vapor.
PRECAUTIONARY STATEMENTS	**Prevention**	• Wash face, hands and any exposed skin thoroughly after handling. • Wear protective gloves/protective clothing/eye protection/face protection. • Obtain special instructions before use. • Do not handle until all safety precautions have been read and understood. • Use personal protective equipment as required. • Do not breathe dust/fume/gas/mist/vapors/spray. • Use only outdoors or in a well-ventilated area. • Do not eat, drink or smoke when using this product. • Keep away from heat/sparks/open flames/hot surfaces. • No smoking. • Keep container tightly closed. • Ground/bond container and receiving equipment. • Use explosion-proof electrical/ventilating/lighting/equipment. • Use only non-sparking tools. • Take precautionary measures against static discharge. • In case of inadequate ventilation wear respiratory protection.
	Response	• IF exposed or concerned: Get medical advice/attention. • IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing. • Call a POISON CENTER or doctor/physician if you feel unwell. • Get medical advice/attention if you feel unwell. • IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. • IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. • In case of fire: Use CO2, dry chemical, or foam for extinction. • IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. • Do NOT induce vomiting.
	Storage/Disposal	• Store locked up. • Store in a well-ventilated place. Keep container tightly closed. • Keep cool. • Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.
OTHER INFORMATION		• Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous. • Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
Petroleum Hydrocarbons	68919-39-1	100	
Trans-1, 2-dimethylcyclopentane	28729-52-4	1.8	
2-Methylhexane	591-76-4	1.0	
2-Methylpentane	107-83-5	1.8	
3-Methylhexane	589-34-4	1.6	
3-Methylpentane	96-14-0	1.3	
2-Methylheptane	592-27-8	1.4	
Benzene	71-43-2	0.4	
Cyclohexane	110-82-7	1.0	
i-Pentane	109-66-0	1.8	
MethylCyclohexane	108-87-2	2.3	
Methylcyclopentane	96-37-7	2.2	
n-Butane	106-97-8	1.9	
n-Heptane	142-82-5	3.4	
n-Hexane	110-54-3	3.4	
n-Pentane	109-66-0	3.4	
n-Octane	111-65-9	3.0	
n-Nonane	111-84-2	2.2	
n-Decane	124-18-5	2.0	
n-Undecane	1120-21-4	1.7	
n-Dodecane	112-40-3	1.5	
n-Tridecane	629-50-5	1.3	
Toluene	108-88-3	0.9	
Hydrogen sulfide	7783-06-4	<0.00001	
Ethylbenzene	100-41-4	0.6	
Xylenes	1330-20-7	0-5	

**Values do not reflect absolute minimums and maximums; those values may vary from time to time.*

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES	**Inhalation**	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
	Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
	Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
	Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed - can enter lungs and cause damage.
MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED	**Refer to Section 11 - Toxicological Information**	
INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY	**Note to the Physician**	• Aspiration hazard. Symptoms may be delayed. • Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for development of cardiac arrhythmias. • Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA	**Suitable Extinguishing Media**	• SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
	Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.
FIREFIGHTING PROCEDURES	• FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out. • Stay upwind. • Ventilate closed spaces before entering. • Fire fighters should wear complete protective clothing including self-contained breathing apparatus. • FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.	

- FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions.
- Move containers from fire area if you can do it without risk.
- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (CO2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced firefighters.
- Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions

- Evacuate personnel to safe areas.
- Remove all sources of ignition.
- Deny entry to unauthorized and unprotected personnel.
- Use personal protective equipment.
- Avoid contact with skin, eyes and clothing.
- Stop leak if you can do it without risk.
- Keep people away from and upwind of spill/leak.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

- Ventilate enclosed areas.
- Do not walk through spilled material.

Protective Equipment

- Wear appropriate breathing apparatus (if applicable) and protective clothing.

Emergency Procedures

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk.
- Report spills to local or federal authorities as appropriate or required.

ENVIRONMENTAL PRECAUTIONS

- Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.

METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Methods for Containment

- Stop leak if you can do it without risk.
- Contain and recover liquid when possible.
- A vapor suppressing foam may be used to reduce vapors.
- Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming.
- Use water spray to reduce vapors or divert vapor cloud drift.
- A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.

Methods for Cleaning Up

- Clean up spill immediately.
- LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.
- SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal.
- Use appropriate Personal Protective Equipment (PPE).
- Use clean non-sparking tools to collect absorbed material.
- Vacuum spilled material.
- Try to work upwind of spill.
- All equipment used when handling the product must be grounded.
- Recover and return free product to proper containers
- Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids.
- Do not place spilled materials back in the original container.
- Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING

Handling

- All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces.
- The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes).

- The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.
- Take precautionary measures against static discharges.

Handling

- Do not cut drill, grind or weld on empty containers since they may contain explosive residues.
- Stay upwind and vent open hatches before uploading.
- Avoid contact with skin, eyes and clothing.
- Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.
- Wear personal protective equipment.
- Remove and wash contaminated clothing before re-use.
- Do not eat, drink or smoke when using this product.
- Do not take internally.
- Wash thoroughly after handling.
- Empty containers pose a potential fire and explosion hazard.

CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Storage

- Ventilate enclosed areas.
- Store in a well-ventilated place.
- Keep container tightly closed.
- Store locked up.
- Avoid shock, impact, friction, and rough handling. Do not use sparking tools.
- Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources.
- Keep away from sources of ignition.
- No Smoking.
- Do not enter confined spaces such as tanks or pits without following proper entry procedures.
- Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area.
- Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments.
- Keep away from open flames, hot surfaces and sources of ignition.
- Keep product and empty container away from heat and sources of ignition.
- Storage containers should be grounded and bonded.
- Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.
- Store away from incompatible materials.

Incompatible Products

- Strong oxidizers such as nitrates, chlorates, peroxides.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
2-Methylpentane	-	-	TWA 100 ppm TWA 350 mg/m^3 Ceiling 510 ppm Ceiling 1800 mg/m^3

3-Methylpentane	-	-	TWA 100 ppm TWO 350 mg/m^3 Ceiling 510 ppm Ceiling 1800 mg/m^3
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Cyclohexane	TLV 100 ppm TLV 334 mg/m^3	PEL 300 ppm PEL 1050 mg/m^3	TWA 300 ppm TWA 1050 mg/m^3 IDLH 1300 ppm
i-Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm
MethylCyclohexane	TLV 400 ppm TLV 1610 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 400 ppm TWA 1600 mg/m^3 IDLH 1200 ppm
n-Butane	TLV 1000 ppm	-	TWA 800 ppm TWA 1900 mg/m^3
n-Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
n-Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
n-Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm
n-Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
n-Nonane	TLV 200 ppm TLV 1050 mg/m^3	-	TWA 200 ppm TWA 1050 mg/m^3

Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm
Hydrogen sulfide	TLV 1 ppm TLV 1.4 mg/m^3 STEL 5 ppm STEL 7 mg/m^3	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m^3 IDLH 100 ppm
Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm
Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES

Eye and Face	• Wear face shield and eye protection.
Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid	**Odor**	Rotten egg, petroleum-like odor
Substance Type	Mixture	**Odor Threshold**	No data available
Appearance	Clear to brown liquid		

PROPERTIES				
	pH	No data available	**Vapor pressure**	72.3 to 101.35 kPa @ 37.8°C (100.4°F)
	Melting Point/ Freezing Point	No data available	**Vapor density**	1.0 to 3.9 Air=1
	Boiling Point/ Boiling Range	82.6 to 1330 °F 28.1 to 721.1 °C	**Relative density**	41.2 to 42.6
	Flash Point	-38 to -36 °F -38.8 to -37.7 °C	**Water Solubility**	Negligible
	Evaporation Rate	(Ethyl Ether =1) >1	**Partition coefficient: n-octanol/water**	No data available
	Flammability (solid, gas)	No data available	**Autoignition temperature**	No data available
	Upper Flammability Limit	No data available	**Decomposition temperature**	No data available
	Lower Flammability Limit	No data available	**Specific Gravity**	0.82
	Viscosity	5.43 mm^2/s		

Section 10: Stability and Reactivity

REACTIVITY	No data available
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE		
	Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
	Eye Contact	• Causes serious eye irritation.
	Skin Contact	• Causes skin irritation.

Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
Benzene	1800 mg/kg (Rat)	-	13050 - 14380 ppm (Rat) 4 h
Cyclohexane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 13.9 mg/L (Rat) 4 h
i-Pentane	>2000 mg/kg (Rat)	-	364 g/cu (Rat) 4 h
MethylCyclohexane	> 3200 mg/kg (Rat)	-	-
n-Butane	-	-	658 mg/L (Rat) 4 h
n-Heptane	-	= 3000 mg/kg (Rabbit)	= 103 g/m^3 (Rat) 4 h
n-Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h
n-Pentane	>2000 mg/kg (Rat)	-	364 g/cu (Rat) 4 h
n-Octane	-	-	= 118 g/m^3 (Rat) 4 h = 25260 ppm (Rat) 4 h
n-Nonane	-	-	= 3200 ppm (Rat) 4 h
n-Decane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rat)	-
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	-
Hydrogen sulfide	-	-	= 444 ppm (Rat)
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene

- Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in man. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.

Hydrogen Sulfide Gas (H_2S)	• Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning have been reported. Complete and rapid recovery is the general rule. However, if the exposure was sufficiently intense and sustained causing cerebral hypoxia (lack of oxygen to the brain), neurologic effects such as amnesia, intention tremors or brain damage are possible.
Hexane	• This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.
Xylenes	• Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	IARC	NTP	OSHA
Benzene	A1	Group 1	Known	X
Toluene	A4	Group 3	Evidence	-
Ethylbenzene	A3	Group 2B	Evidence	X
Xylenes	A4	Group 3	Evidence	-

REPRODUCTIVE TOXICITY

• Suspected of damaging fertility or the unborn child.

STOT - SINGLE EXPOSURE

• No information available.

STOT - REPEATED EXPOSURE

• Causes damage to organs through prolonged or repeated exposure.

ASPIRATION HAZARD

May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	-
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow-through (Pimephales promelas) LC50 96 h: 23.03 - 42.07 mg/L static (Pimephales promelas) LC50 96 h: 24.99 - 44.69 mg/L static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L static (Poecilia reticulata)	EC50 24 h: > 400 mg/L (Daphnia magna	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min (Microorganisms)
Pentane	-	-	EC50 48h: 135 mmol/cu	LC50 24h: 165 mmol/cu Artemia salina (Brine Shrimp)
MethylCyclohexane	-	LC50 96hr: 72.0 mg/l (Golden Shiner)	-	-
n-Heptane	-	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	-
n-Hexane	-	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	-
n-Octane	-	-	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
n-Undecane	-	-	-	-
n-Dodecane	-	-	-	-
n-Tridecane	-	-	-	-

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)
Hydrogen sulfide		LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus) LC50 96 h: = 19 mg/L (Lepomis macrochirus) LC50 96 h: 7.711 - 9.591 mg/L static (Lepomis macrochirus) LC50 96 h: 23.53 - 29.97 mg/L static (Pimephales promelas) LC50 96 h: = 780 mg/L semi-static (Cyprinus carpio) LC50 96 h: > 780 mg/L (Cyprinus carpio) LC50 96 h: 30.26 - 40.75 mg/L static (Poecilia reticulata)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	-

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
Benzene	1.83
Cyclohexane	3.44
Butane	2.89
Octane	5.18
Heptane	4.66
Decane	5.1
Xylene, mixed isomers	2.77 - 3.15
Toluene	2.65
Ethylbenzene	3.118

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
2-Methylpentane	Low
3-Methylpentane	Slight
Benzene	High

Cyclohexane	Moderate
Pentane	High
MethylCyclohexane	Low
Butane	Low
Heptane	Moderate
Hexane	High
Octane	Immobile
Nonane	Immobile
Decane	Immobile
Undecane	Immobile
Dodecane	Immobile
Tridecane	Immobile
Toluene	High to Moderate
Ethylbenzene	Low
Xylenes	Very high to Moderate

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste

- This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.
- This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).
- This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).
- It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.

Packaging Waste	• Container contents should be completely used and containers should be emptied prior to discard. • Container could be considered a RCRA hazardous waste and must be disposed of with care and in full compliance with federal, state and local regulations. • Larger empty containers, such as drums, should be returned to the distributor or to a drum re-conditioner. • To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1267	Petroleum crude oil	3	I	Emergency response guide number: 128
TDG	UN1267	Petroleum crude oil	3	I	-
IMO/IMDG	UN1267	Petroleum crude oil	3	I	EmS No. F-E, S-E
IATA/ICA	UN1267	Petroleum crude oil	3	I	-

SPECIAL RECAUTIONS FOR USER

• None

Section 15: Regulatory Information

U.S. - CERCLA/ SARA - HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ

U.S. - CWA (CLEAN WATER ACT) - REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	100 lb RQ
Ethylbenzene	100-41-4	1000 lb RQ
Toluene	108-88-3	1000 lb RQ
Xylene	1330-20-7	100 lb RQ
Benzene	71-43-2	10 lb RQ

U.S. - CWA (CLEAN WATER ACT) - RECOMMENDED WATER QUALITY CRITERIA - CCC FOR FRESHWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S. - CWA (CLEAN WATER ACT) - RECOMMENDED WATER QUALITY CRITERIA - CCC FOR SALTWATER LIFE

COMPONENT	CAS #	AMOUNT
HydrogenSulfide	7783-06-4	2.0 µg/L CCC

U.S. - CWA (CLEAN WATER ACT) - HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
Hydrogen Sulfide	7783-06-4	X
MethylCyclohexane	108-87-2	Not Listed
3- Methylhexane	589-34-4	Not Listed
Hexane, 2-methyl-	591-76-4	Not Listed
Dimethylcyclopentane	28729-52-4	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Pentane	109-66-0	Not Listed
Decane	124-18-5	Not Listed
Octane	111-65-9	Not Listed
Dodecane	112-40-3	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X
Benzene	71-43-2	X

Butane	106-97-8	Not Listed
Hexane	110-54-3	Not Listed
2-Methylpentane	107-83-5	Not Listed
3-Methylpentane	96-14-0	Not Listed
Tridecane	629-50-5	Not Listed
Undecane	1120-21-4	Not Listed
2-Methylheptane	592-27-8	Not Listed

X= The component is listed

U.S. - CWA (CLEAN WATER ACT) - HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
Hydrogen Sulfide	7783-06-4	Not Listed
MethylCyclohexane	108-87-2	Not Listed
3- Methylhexane	589-34-4	Not Listed
Hexane, 2-methyl-	591-76-4	Not Listed
Dimethylcyclopentane	28729-52-4	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Pentane	109-66-0	Not Listed
Pentane	109-66-0	Not Listed
Decane	124-18-5	Not Listed
Octane	111-65-9	Not Listed
Dodecane	112-40-3	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Hexane	110-54-3	Not Listed
2-Methylpentane	107-83-5	Not Listed
3-Methylpentane	96-14-0	Not Listed

Tridecane	629-50-5	Not Listed
Undecane	1120-21-4	Not Listed
2-Methylheptane	592-27-8	Not Listed

X= The component is listed

US-STATE-RIGHT-TO-KNOW

CHEMICAL	NEW JERSEY	MASSACHUSETTS	PENNSYLVANIA	ILLINOIS	RHODE ISLAND
Nonane	X	X	X	-	X
Decane	X	-	X	-	X
Hexane	X	X	X	X	X
MethylCyclohexane	X	X	X	-	X
Octane	X	X	X	-	X
n-Heptane	X	X	X	-	X
Butane	X	X	X	-	X
Ethylbenzene	X	X	X	X	X
Toluene	X	X	X	X	X
Cyclohexane	X	X	X	-	X
Xylene, mixed isomers	X	X	X	X	X
Benzene	X	X	X	X	X

CANADA-WHMIS-CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
2-Methylhexane	591-76-4	B2
2-Methylpentane	107-83-5	B2
3-Methylhexane	589-34-4	B2
3-Methylpentane	96-14-0	B2
Benzene	71-43-2	B2, D2A, D2B
MethylCyclohexane	108-87-2	B2
Methylcyclopentane	96-37-7	-
n-Butane	106-97-8	A, B1
n-Heptane	142-82-5	B2, D2B
n-Hexane	110-54-3	B2, D2A, D2B

n-Pentane	109-66-0	B2
n-Octane	111-65-9	B2, D2B
n-Decane	124-18-5	B3, D2B
n-Undecane	1120-21-4	B3, D2B
n-Dodecane	112-40-3	B3
n-Tridecane	629-50-5	B3
Toluene	108-88-3	B2, D2A, D2B
Hydrogen sulfide	7783-06-4	A, B1, D1A, D2B
Ethylbenzene	100-41-4	B2, D2A, D2B
Xylenes	1330-20-7	B2, D2A, D2B

X= The component is listed

CANADA - COUNCIL OF MINISTERS OF THE ENVIRONMENT - WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L

CANADA - COUNCIL OF MINISTERS OF THE ENVIRONMENT - WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L

CANADA - ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
Hydrogen sulfide	7783-06-4	X
MethylCyclohexane	108-87-2	Not Listed
3-Methylhexane	589-34-4	Not Listed
Hexane, 2-methyl-	591-76-4	Not Listed
Dimethylcyclopentane	28729-52-4	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Pentane	109-66-0	X
Decane	124-18-5	Not Listed
Octane	111-65-9	Not Listed

Dodecane	112-40-3	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X
Benzene	71-43-2	X
Butane	106-97-8	X
Hexane	110-54-3	Not Listed
2-Methylpentane	107-83-5	Not Listed
3-Methylpentane	96-14-0	Not Listed
Tridecane	629-50-5	Not Listed
Undecane	1120-21-4	Not Listed
2-Methylheptane	592-27-8	Not Listed
Petroleum Hydrocarbons	68919-39-1	Not Listed

X= The component is listed

Section 16: Other Information

NFPA

Health Hazard: 2	**Flammability:** 3	**Instability:** 1	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 2	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 3/2/15

REVISION DATE 06/18/2018

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDS's may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

Fond du Lac Line 4 Project

Application for Pipeline Routing Permit and Partial Exemption

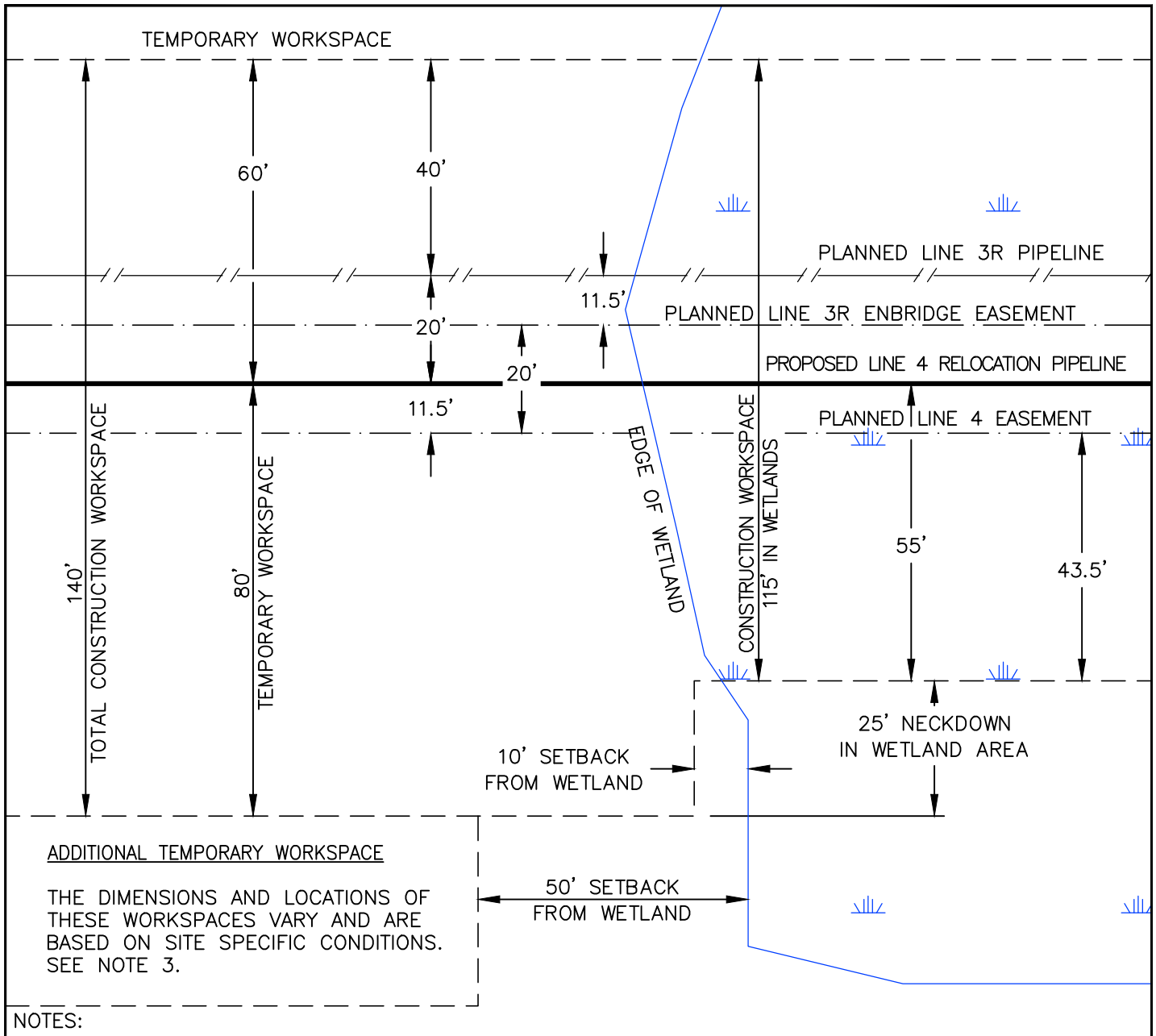
Minnesota Public Utilities Commission

Appendix D

Typical Right-of-Way Configuration Drawings

REVISED: March 15, 2019

REVISED: March 15, 2019



NOTES:

1. A PIPELINE RIGHT-OF-WAY LIMIT WILL BE TYPICALLY 11.5-FOOT PARALLEL AND ADJACENT TO THE PROPOSED LINE 4 RELOCATION PIPELINE.

2. IN WETLAND AREAS, CONSTRUCTION WILL TYPICALLY UTILIZE A 115-FOOT-WIDE CONSTRUCTION WORKSPACE TO INSTALL THE PROPOSED LINE 4 RELOCATION PIPELINE AND WILL TYPICALLY HAVE A 20-FOOT OFFSET FROM THE EXISTING ENBRIDGE PIPELINE.

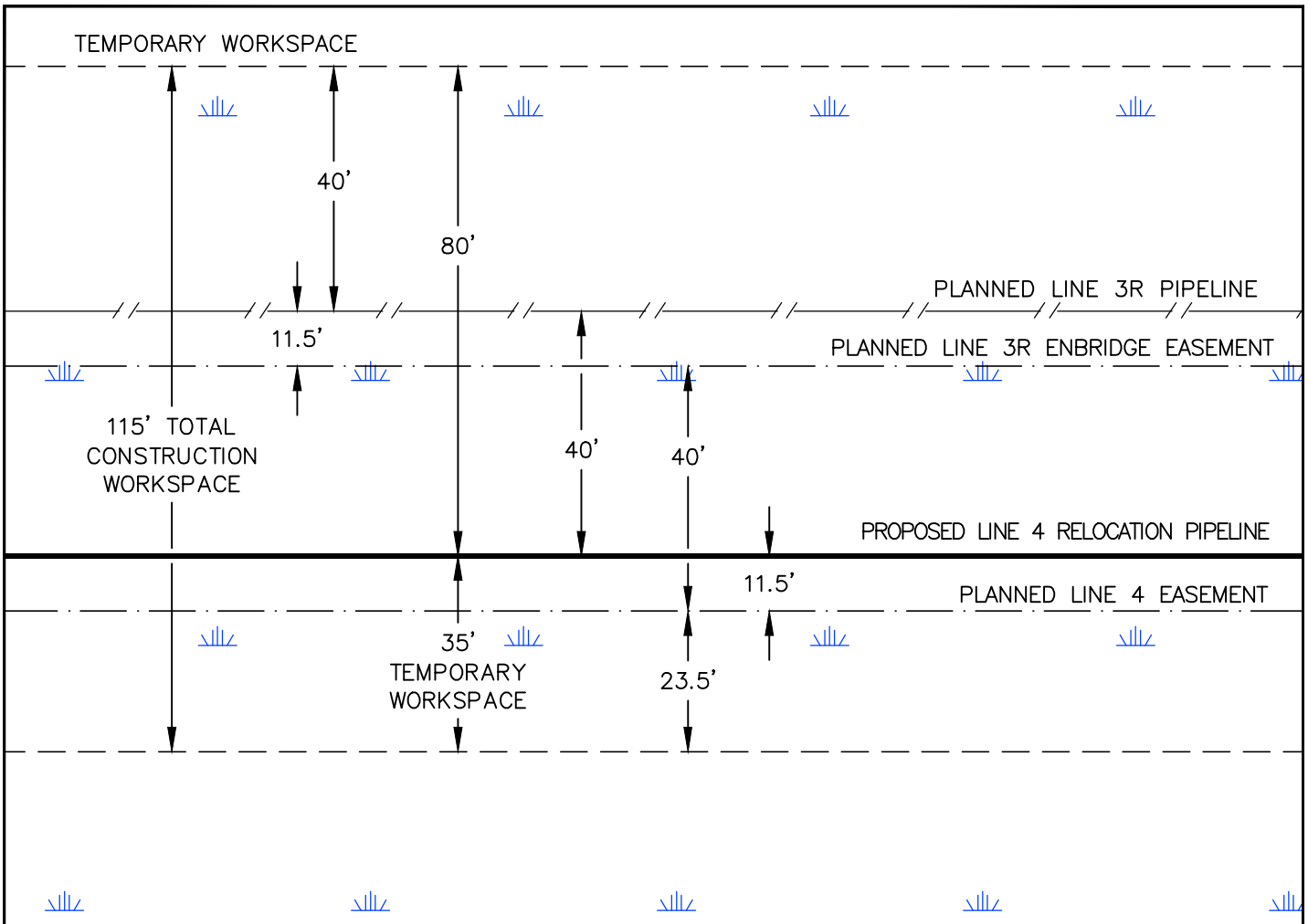
3. ADDITIONAL TEMPORARY WORKSPACE REQUIREMENTS WILL VARY PENDING; CONSTRUCTION TECHNIQUE, TYPE OF CROSSING, TOPOGRAPHY AND ANY SPECIAL PERMIT CONDITIONS OR ENVIRONMENTAL FEATURES. THESE ADDITIONAL TEMPORARY WORKSPACES ARE GENERALLY USED AT ROAD, RAILROAD, WATERBODY, WETLAND, UNEVEN GRADIENTS, AND UTILITY CROSSINGS.

REVISED 03/15/2019

ENBRIDGE

DWN. BY: JW	DATE 10/26/18	TYPICAL WORKSPACE PROPOSED LINE 4 RELOCATION PIPELINE CO-LOCATED WITH EXISTING ENBRIDGE PIPELINE	
CHK. ND	10/26/18		
PROJ. MGR. VB	10/26/18	SCALE NO SCALE	DWG. NO.

REVISED: March 15, 2019



ADDITIONAL TEMPORARY WORKSPACE

THE DIMENSIONS AND LOCATIONS OF THESE WORKSPACES VARY AND ARE BASED ON SITE SPECIFIC CONDITIONS. SEE NOTE 3.

EDGE OF WETLAND

NOTES:

1. A PIPELINE RIGHT-OF-WAY LIMIT WILL BE TYPICALLY 11.5-FOOT PARALLEL AND ADJACENT TO THE PROPOSED LINE 4 RELOCATION PIPELINE.

2. IN SATURATED WETLAND AREAS, CONSTRUCTION WILL TYPICALLY UTILIZE A 115-FOOT-WIDE CONSTRUCTION WORKSPACE TO INSTALL THE PROPOSED LINE 4 RELOCATION PIPELINE AND WILL TYPICALLY HAVE A 40-FOOT OFFSET FROM THE EXISTING ENBRIDGE PIPELINE.

3. ADDITIONAL TEMPORARY WORKSPACE REQUIREMENTS WILL VARY PENDING; CONSTRUCTION TECHNIQUE, TYPE OF CROSSING, TOPOGRAPHY AND ANY SPECIAL PERMIT CONDITIONS OR ENVIRONMENTAL FEATURES. THESE ADDITIONAL TEMPORARY WORKSPACES ARE GENERALLY USED AT ROAD, RAILROAD, WATERBODY, WETLAND, UNEVEN GRADIENTS, AND UTILITY CROSSINGS.

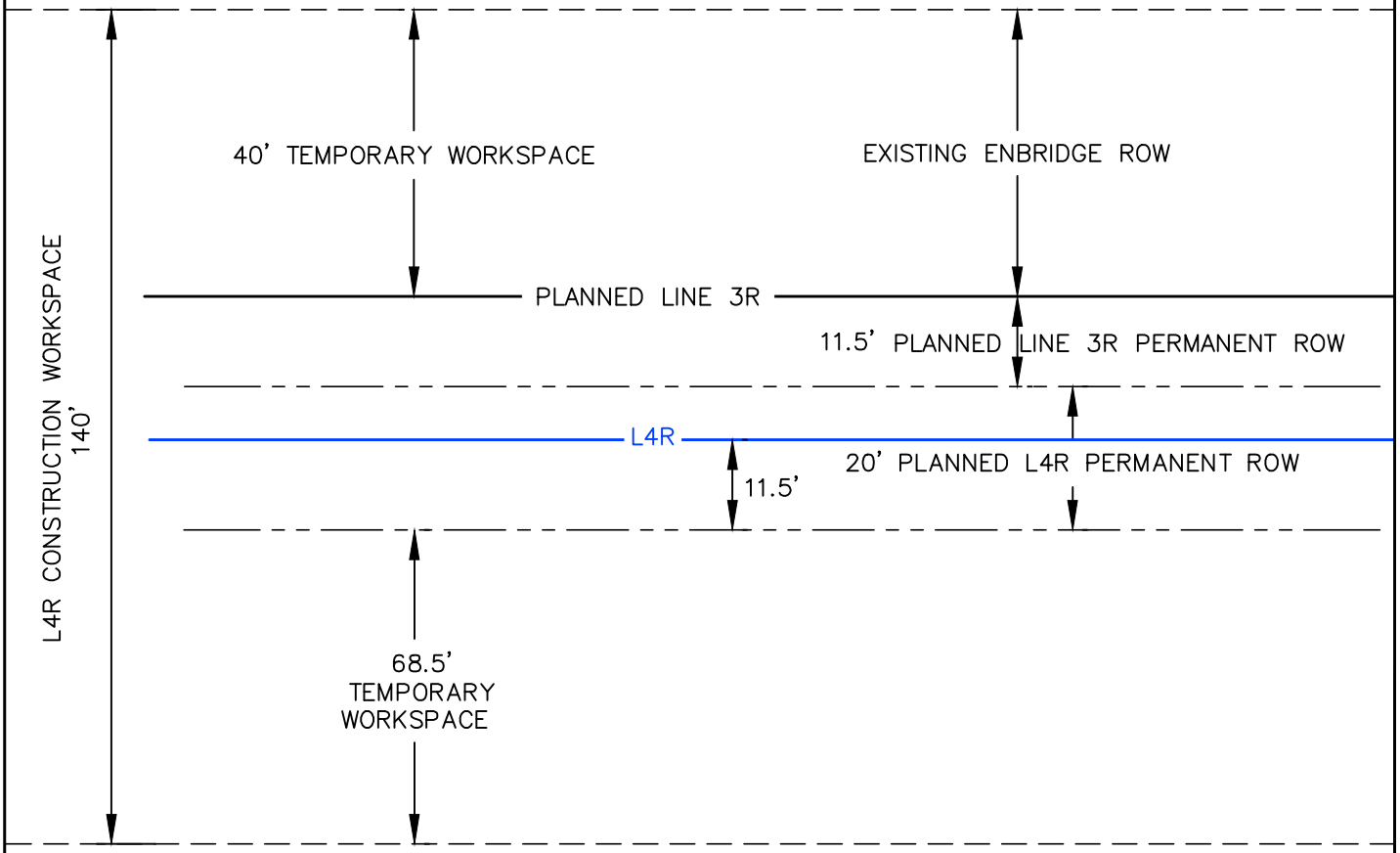
REVISED 03/15/2019

ENBRIDGE

DWN. BY: JW	DATE 10/26/18	TYPICAL WORKSPACE - SATURATED WETLANDS PROPOSED LINE 4 RELOCATION PIPELINE CO-LOCATED WITH EXISTING ENBRIDGE PIPELINE
CHK. ND	10/26/18	
PROJ. MGR. VB	10/26/18	
		SCALE: NO SCALE / DWG. NO.

REVISED: March 15, 2019

LINE 4 RELOCATION (Uplands–Co–located with Enbridge Line 3R)



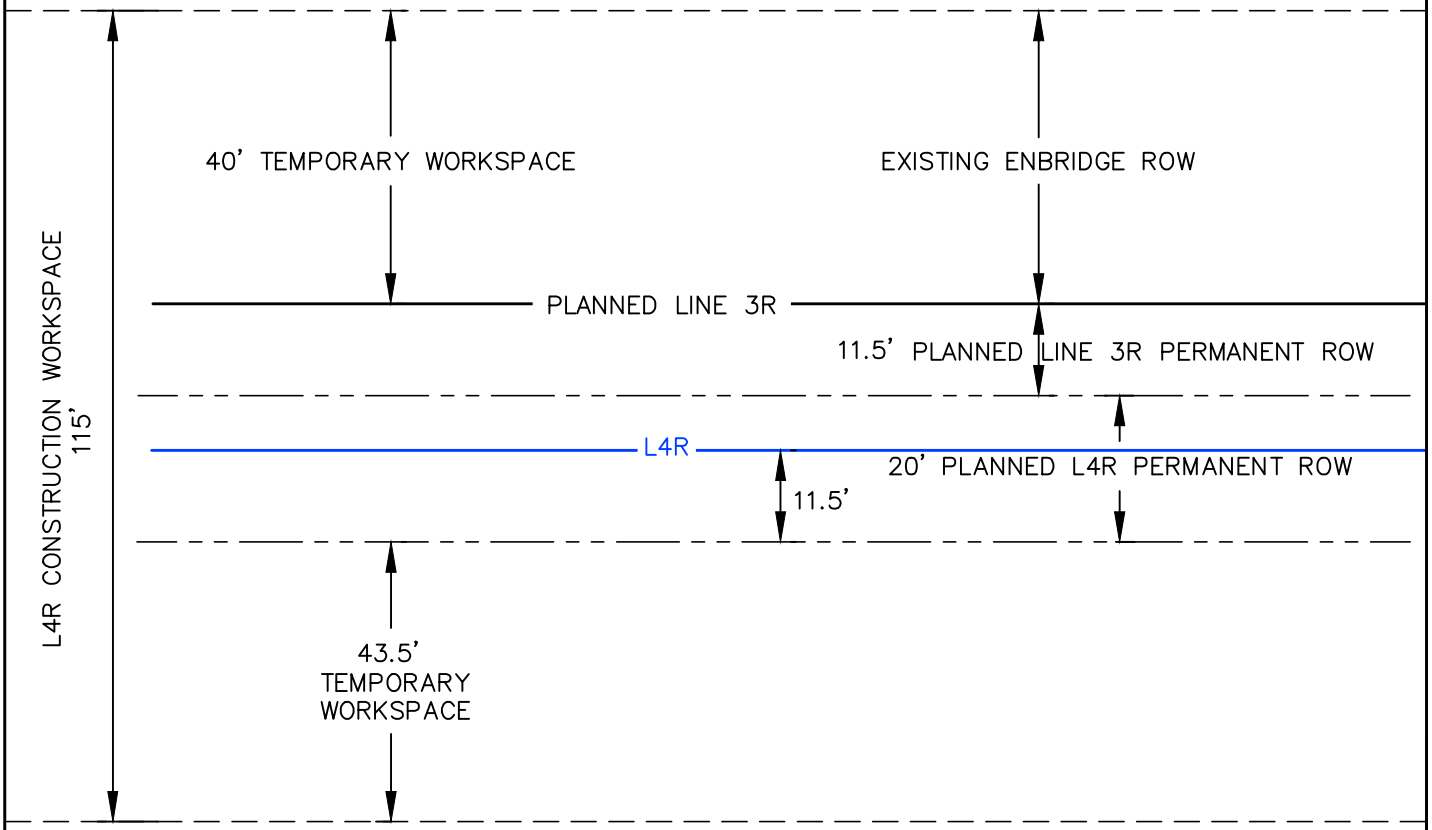
REVISED
03/14/19

ENBRIDGE

DWN. BY: JW	DATE 10/26/18	TYPICAL WORKSPACE PROPOSED LINE 4 RELOCATION PIPELINE CO-LOCATED WITH EXISTING ENBRIDGE PIPELINE UPLANDS
CHK. ND	10/26/18	
PROJ. MGR. VB	10/26/18	
		SCALE NO SCALE / DWG. NO.

REVISED: March 15, 2019

LINE 4 RELOCATION (Wetlands–Co–located with Enbridge Line 3R)



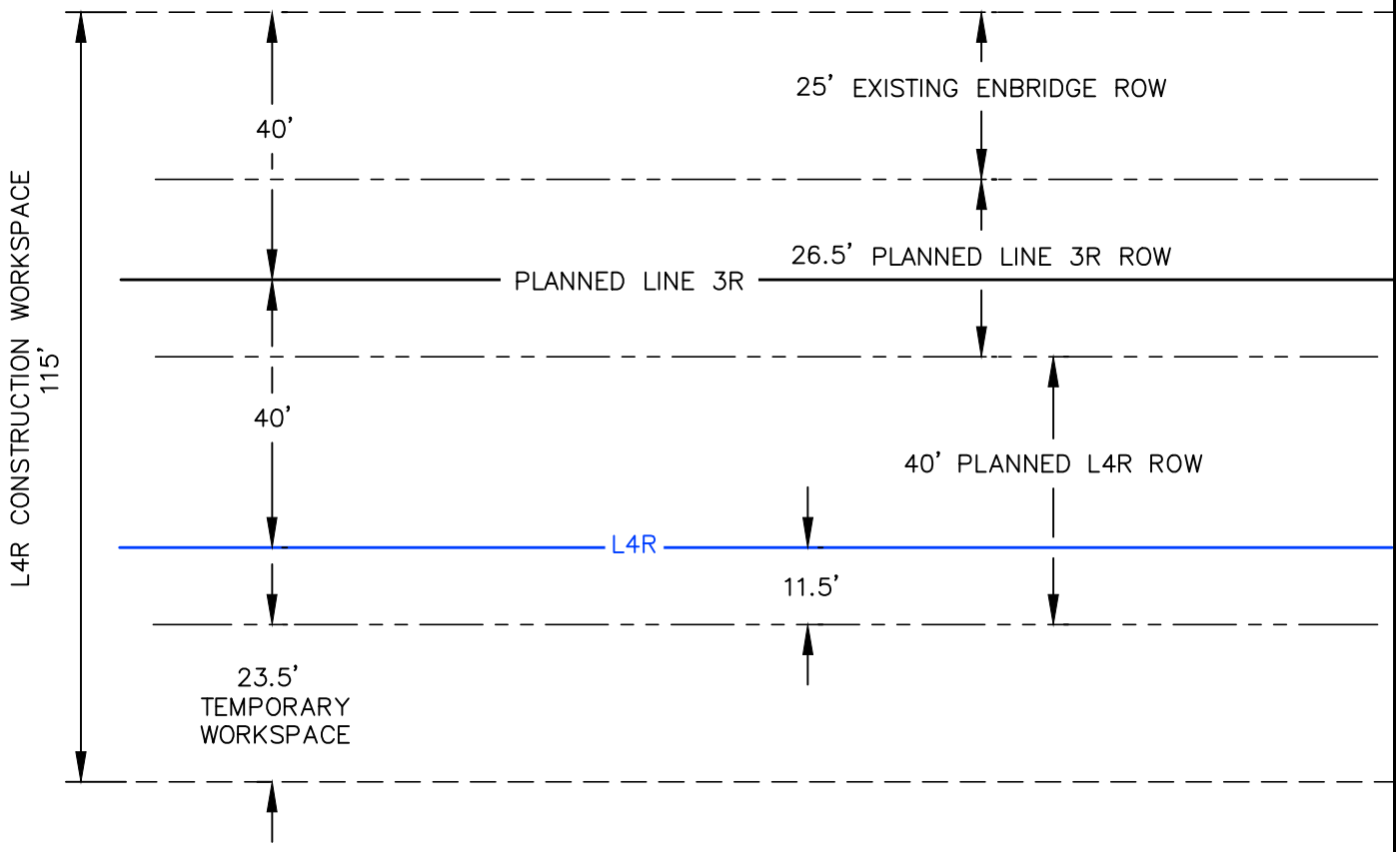
REVISED
03/14/19

ENBRIDGE

DWN. BY: JW	DATE 10/26/18	TYPICAL WORKSPACE PROPOSED LINE 4 RELOCATION PIPELINE CO-LOCATED WITH EXISTING ENBRIDGE PIPELINE WETLANDS
CHK. ND	10/26/18	
PROJ. MGR. VB	10/26/18	SCALE: NO SCALE; DWG. NO.

REVISED: March 15, 2019

LINE 4 RELOCATION (Saturated Wetlands–Co–located with Enbridge Line 3R)



REVISED
03/14/19

ENBRIDGE

DWN. BY: JW	DATE 10/26/18	TYPICAL WORKSPACE PROPOSED LINE 4 RELOCATION PIPELINE CO-LOCATED WITH EXISTING ENBRIDGE PIPELINE SATURATED WETLANDS
CHK. ND	10/26/18	
PROJ. MGR. VB	10/26/18	
		SCALE NO SCALE / DWG. NO.

Fond du Lac Line 4 Project

Application for Pipeline Routing Permit and Partial Exemption

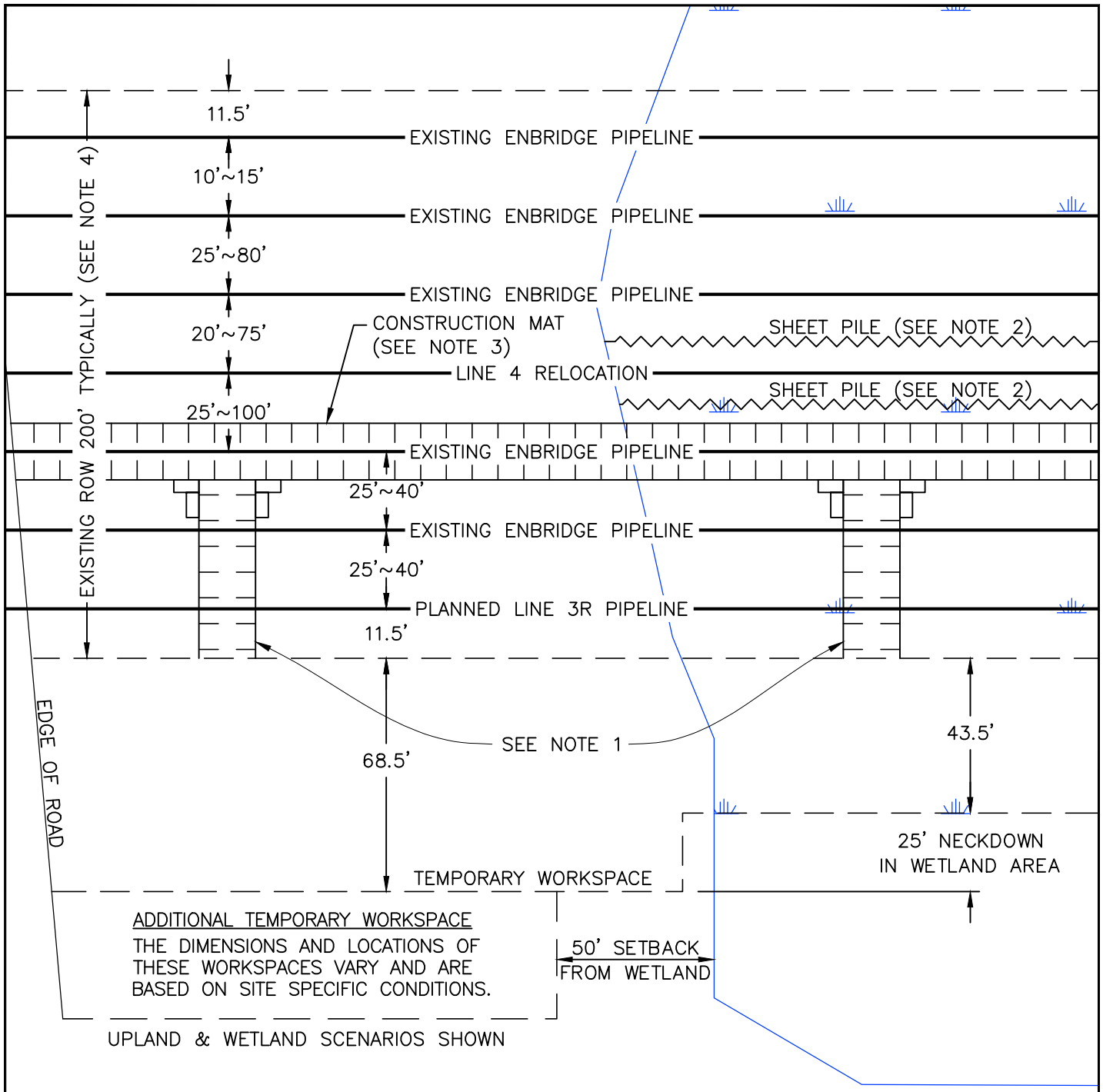
Minnesota Public Utilities Commission

Appendix E

Same Trench Line Lowering

REVISED: March 15, 2019

REVISED: March 15, 2019



NOTES:

1. ACCESS LOCATIONS VARY DEPENDING ON TERRAIN, ENVIRONMENTAL FEATURES, AND SITE SPECIFIC CONDITIONS.
2. SHEET PILE AS NECESSARY FOR THE PROTECTION OF ACTIVE LINES, PIPE REMOVAL, AND INSTALLATION.
3. SITE SPECIFIC REMOVAL/INSTALLATION PLANS MAY BE REQUIRED IN AREAS WITH SATURATED SOILS.
4. EXISTING ROW WIDTH WILL VARY DUE TO NUMBER OF EXISTING PARALLEL PIPELINES.

REVISED 03/15/19

ENBRIDGE

DWN. BY: JW	DATE 10/26/18	TYPICAL WORKSPACE LINE 4 RELOCATION PIPELINE SAME DITCH INSTALLATION
CHK. ND	10/26/18	
PROJ. MGR. VB	10/26/18	
SCALE NO SCALE		DWG. NO.

Fond du Lac Line 4 Project

Application for Pipeline Routing Permit and Partial Exemption

Minnesota Public Utilities Commission

Appendix F

Unanticipated Discoveries Plan

TABLE OF CONTENTS

APPENDICES

ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
CFR	Code of Federal Regulations
EI	Environmental Inspector
Enbridge	Enbridge Energy, Limited Partnership
MIAC	Minnesota Indian Affairs Council
Minn. Stat.	Minnesota Statute
NPS	National Park Service
NRHP	National Register of Historic Places
OSA	Office of the State Archaeologist
Project	Fond du Lac Line 4 Project
RFA	Responsible Federal Agency
SHPO	State Historic Preservation Office
TCP	Traditional Cultural Property
TCR	Traditional Cultural Resources
THPO	Tribal Historic Preservation Office
UDP	Unanticipated Discoveries Plan
USACE	United States Army Corps of Engineers

DEFINITIONS

"Consulting Tribe," means a Tribe included in the National Historic Preservation Act Section 106 consultation for this Project.

"Enbridge Environmental Department", means a member of the Enbridge Environmental Compliance Management Team responsible for ensuring compliance with environmental permit conditions and company commitments during construction.

"Enbridge Lead Environmental Inspector", means the individual responsible for implementing the various environmental requirements within the given construction area.

"Traditional Cultural Properties" ("TCPs"), means a subtype of historic properties recognized as eligible for listing on the Minnesota State and/or NRHP, as further defined in National Register Bulletin #38, "Guidelines for Evaluating and Documenting Traditional Cultural Properties" and other federal guidance.

"Traditional Cultural Landscapes," means a subtype of historic properties recognized as eligible for listing on the Minnesota State and/or NRHP, as further defined by National Park Service Preservation Brief 36, "Protecting Cultural Landscapes: Planning, Treatment and Management of Historic Landscapes" and other federal guidance.

"Traditional Cultural Resources Survey" ("TCR") Survey, which will be conducted in accordance with existing state and federal guidance and requirements, is intended to comply with the Enbridge's federal, state, and contracted obligations to conduct a survey of tribal historic properties and other cultural resources that may be affected by the Project, and must include: field surveys to identify Tribal Sites along the entire length of any approved route that identify (preserving confidentiality of sites) (sic); literature review; the results of Tribal consultation; and other matters.

"Cultural Resources," is an umbrella term to refer to all historic properties of importance to tribes (including but not limited to both TCPs and Traditional Cultural Landscapes) and any other cultural resources of importance to tribes.

"Third Party Cultural Resource Monitor," means a monitor the Permittee hires to address concerns related to observed or suspected Archeological and Cultural Resources or human remains.

"Tribe," means a federally recognized Indian tribe.

1.0 INTRODUCTION

Enbridge Energy, Limited Partnership ("Enbridge") is proposing to construct the Fond du Lac Line 4 Project, a project that would relocate approximately 10 miles of Line 4 pipeline within the Fond du Lac Reservation in St. Louis and Carlton Counties, Minnesota ("the Project").

This Unanticipated Discoveries Plan ("UDP") sets forth the guidelines to be used in the event archaeological resources (includes both prehistoric and historical resources) or human skeletal remains are discovered during construction activities. These measures were developed by Enbridge in accordance with applicable state and federal guidelines. Early and frequent communications are essential in meeting both the spirit and law of those guidelines; therefore, Appendix A shows the most current list of relevant contacts in the event of an unanticipated discovery during construction.

2.0 UNANTICIPATED DISCOVERY CONDITIONS

Pipeline construction excavations have the potential to uncover previously unknown archaeological sites and human skeletal remains, as well as many other cultural and natural elements such as modern refuse and faunal remains. While extensive environmental surveys can effectively eliminate most discoveries during construction, Enbridge is aware that project planning should anticipate even the remote possibility of a discovery.

Third Party Cultural Resource Monitors required by Fond du Lac for work on the Reservation ("Monitor") and the Enbridge Lead Environmental Inspector ("Lead EI") will have the primary responsibility of initially distinguishing discoveries of significant archaeological and cultural resource sites or human skeletal remains from those that are neither. The unanticipated discovery of significant archaeological and cultural resource sites and human skeletal remains would require ceasing construction activities at the find location followed by a coordinated consultation effort among Enbridge, permitting agencies, landowners, and the Fond du Lac tribe. In the event that a suspected discovery is determined not to involve a significant archaeological or cultural resource site or human skeletal remains, construction would resume and there would be no need of the consultation process as outlined above; however, documentation of the event must be made and can include notes, photographs, and drawings as appropriate.

When possible archaeological and cultural materials or suspected human skeletal remains are identified during ground disturbing activities within the construction corridor, the Monitor and the Lead EI will be notified immediately of the discovery.

1. Immediately following notification of the discovery, the Lead EI shall:

   (a) Establish and delineate a 25-foot buffer around the edge of the discovery (using flagging and/or fencing), advise the on-site construction manager to halt all ground-disturbing activities within the buffered area until otherwise notified by Enbridge Environment, and implement measures to protect the discovery from looting and vandalism, including a 24-hour watch, if necessary; and

   (b) Contact a qualified Professional Archaeologist (possible archaeological materials) meeting the Professional Qualification Standards of the Secretary of Interior as stated in Title 48 Federal Regulation 44716 ("48 FR 44716") and/or Physical Anthropologist (suspected human skeletal remains) with a graduate degree in said

discipline and a recognized body of work in the professional community, to conduct an assessment of the discovery. The Professional Archaeologist should meet the qualification standards outlined in 36 Code of Federal Regulations ("CFR") Part 61 in order to conduct the assessment. The Physical Anthropologist must be acknowledged as competent to positively identify human skeletal remains during the initial event of their discovery. As indicated below, this individual will work closely with the OSA who has the statutory responsibility to authenticate human burials in Minnesota.

2. When contacted by the Lead EI, the Professional Archaeologist shall gather additional information from the discovery area and assess the potential significance and condition and integrity of the discovery according to the guidelines established by the National Park Service ("NPS") in Bulletin 15 and its amendments:

   (a) The Professional Archaeologist will determine whether-or-not the discovery is an archaeological site or cultural resource over 45 years of age. If the discovery is an archaeological site or cultural resource greater than 45 years of age, the Professional Archaeologist will record as much information as possible to secure a Smithsonian Trinomial Number from the appropriate state agency. The Lead EI would then notify Enbridge Environment to initiate the process outlined in Section 3.0 below.

   (b) If the discovery is not an archaeological site or cultural resource greater than 45 years of age, the Professional Archaeologist will document the discovery for the record and Enbridge's lead EI will advise the on-site construction manager to restart ground-disturbing activities.

3. When contacted by the Lead EI, the Physical Anthropologist shall investigate the site to make an assessment of the likely nature of the remains:

   (a) If the remains are likely human, then the Lead EI would notify the Enbridge Environmental Department ("Enbridge Environment") to initiate the process outlined in Section 4.0 below as they have access to multiple forms of communication to quickly follow the procedures outlined in this plan.

   (b) If the discovery does not represent human skeletal remains, the Physical Anthropologist will document the discovery for the record and Enbridge's Lead EI will advise the on-site construction manager to restart ground-disturbing activities.

3.0 DISCOVERY OF HISTORIC PROPERTIES

Upon the discovery of an archaeological site or cultural resource greater than 45 years of age, the Professional Archaeologist will advise Enbridge Environment of the proper agency notification procedure and recommend a plan of action for the discovery area.

(a) If the discovery area is under the jurisdiction of a federal permit and/or approval, or otherwise subject to federally mandated conditions, Enbridge Environment will advise the Responsible Federal Agency ("RFA") of the resource and provide information regarding its significance and condition and integrity (see Section 3.1 below).

(b) If the discovery is on state land, Enbridge Environment will first advise the land-managing agency of the resource and provide information regarding its significance, condition and integrity and, if directed by the land-managing agency, advise the appropriate State Archaeologist or Tribal Archaeologist (see Section 3.2 below).

(c) If the discovery is on private land, its disposition will still be subject to the authority of the appropriate state routing agency. Enbridge Environment will advise the state routing agency of the resource and provide information regarding its significance, condition and integrity (see Section 3.3 below).

3.1 FEDERAL AGENCY JURISDICTION

(a) Enbridge Environment will notify the RFA of the resource and provide information regarding its significance and condition and integrity.

(b) Within 24 hours of notification, the RFA shall provide notice of the discovery to other parties who may wish to participate in consultation, including but not limited to the appropriate Fond du Lac tribal official (Tribal Historic Preservation Office ["THPO"]), state routing authority, state agencies (such as the MPUC), land-managing agencies, or private landowner(s), as applicable. After 24 hours, consultation for eligibility and effect with continue in order for avoidance and mitigation options to be developed.

(c) The RFA shall have 5 calendar days following notification to determine the discovery's eligibility for listing on the National Register of Historic Places ("NRHP") in consultation with the appropriate THPO and other consulting parties. The RFA may extend the review period by an additional 7 calendar days by providing written notice to consulting parties prior to the expiration of the 5-day calendar period. The RFA shall provide Enbridge Environment with avoidance or mitigation treatment options by the end of the 5-day period.

(d) For properties determined eligible for listing on the NRHP pursuant to (c) above, Enbridge Environment shall notify the RFA and other consulting parties of Enbridge's proposed treatment measures to resolve adverse effects to the discovered resource. The consulting parties shall comment on the proposed treatment measures within 48 hours. The RFA shall ensure that the recommendations of the consulting parties are considered prior to granting approval of Enbridge-proposed treatment measures. Once approval has been granted by the RFA, Enbridge Environment shall carry out the approved treatment measures and, after doing so, Enbridge may resume construction.

(e) In the event of any disagreements between the consulting parties regarding the NRHP eligibility of the newly discovered property or the treatment measures proposed to mitigate adverse effects to the property, the RFA shall seek and take into account the recommendations of the Advisory Council on Historic Preservation ("ACHP"). Within 48 hours of receipt of a request, ACHP shall provide the RFA with recommendations on how to resolve the dispute.

(f) If, after consultation, the RFA determines that the discovery does not represent an NRHP-eligible resource, the RFA will direct Enbridge Environment to resume ground-disturbing activities at the discovery location at its discretion.

3.2 STATE LANDS

(a) Enbridge Environment will notify the land-managing agency of the resource and provide information regarding its significance and integrity. If directed by the land-managing agency to do so, Enbridge Environment will advise the appropriate State Archaeologist and/or Tribal Archaeologist. The State/Tribal Archaeologist has the discretion to notify Native American tribal officials, state routing authority, and other state agencies as appropriate.

(b) The land-managing agency will have 5 calendar days following notification to consult with the appropriate state archaeologist and other consulting parties, as necessary, about the assessment of the discovery to determine its eligibility, avoidance, and/or mitigation measures. NPS criteria of eligibility for listing on the NRHP may be considered as a guideline to determine the significance of the find and SHPO may be consulted during the assessment, but the state agency is not obliged to apply NPS standards in making its decision. The land-managing agency may assume the resource is eligible for listing on the NRHP while consultation occurs and may require avoidance, impact minimization, or mitigation. The land-managing agency shall provide Enbridge Environment with avoidance or mitigation treatment options by the end of the 5-day period.

(c) For properties determined eligible for listing on the NRHP, Enbridge Environment shall notify the land-managing agency and other consulting parties of the treatment measures it proposes for resolving adverse effects to the resource. The consulting parties shall provide their views on the proposed treatment measures to Enbridge Environment, the land-managing agency and other consulting parties within 48 hours. The land-managing agency shall ensure that the recommendations of the consulting parties are considered prior to granting approval of Enbridge's proposed treatment measures. Once approval has been granted by the land-managing agency, Enbridge Environment shall carry out the approved treatment measures and, after doing so, Enbridge may resume construction.

(d) If, after consultation, the land-managing agency determines that the discovery does not represent an NRHP-eligible or otherwise important resource, the land-managing agency will direct Enbridge Environment to resume ground-disturbing activities, at its discretion, at the discovery location.

3.3 PRIVATE LANDS SUBJECT TO STATE ROUTING AUTHORITY JURISDICTION

(a) Enbridge Environmental Department will notify the state routing authority of the resource and provide information regarding its significance and integrity.

(b) Within 24 hours of notification, the state routing authority shall provide notice of the resource to other parties, including, but not limited to, the appropriate THPO, the appropriate State Archaeologist, Native American tribal officials, state agencies, and private landowner(s), as applicable to comply with the permit and to notify the parties that the resource requires determinations of eligibility and effect in order to develop avoidance and/or mitigations options.

(c) The state routing authority will have 5 calendar days following notification to consult with the appropriate SHPO and other consulting parties, as necessary, about assessing the

discovery. Criteria for eligibility for listing on the NRHP may be considered as a guideline to determine the significance of the find and THPO may be consulted during the assessment, but the state routing authority is not obliged to apply the standards in making its decision. The state routing authority may assume the resource is eligible for listing on the NRHP while consultation occurs and may require avoidance, impact minimization, or mitigation. Construction may not resume until the appropriate THPO or other consulting parties have developed avoidance or mitigation strategies and notified Enbridge Environment. The state routing authority shall provide Enbridge Environment with avoidance or mitigation treatment options by the end of the 5-day period.

(d) For properties eligible for listing on the NRHP, Enbridge Environment shall notify the state routing authority and other consulting parties of the treatment measures it proposes to resolve impacts to the resource. The consulting parties shall provide their views on the proposed treatment measures within 48 hours. The state routing authority shall ensure that the recommendations of the consulting parties are considered prior to granting approval of Enbridge's proposed treatment measures. Once approval has been granted by the state routing authority, Enbridge Environment shall carry out the approved treatment measures and, after doing so, Enbridge may resume construction.

(e) If, after consultation, the state routing authority determines that the discovery does not represent an NRHP-eligible or otherwise important resource, the state routing authority will direct Enbridge Environment to resume ground-disturbing activities, at its discretion, at the discovery location.

4.0 DISCOVERY OF HUMAN SKELETAL REMAINS

1. When unmarked human burial or skeletal remains are encountered during construction activities, Enbridge will comply with Minnesota's "Private Cemeteries Act" (Minnesota Statute ["Minn. Stat."] §307.08).

2. In the event a human burial or skeletal remains are encountered during ground-disturbing construction activity, all construction shall immediately cease in the vicinity, and Enbridge Environment will implement the State-mandated notification procedure in Minnesota by notifying the local law enforcement agency (county sheriff). As required by Minn. Stat. §307.08 Enbridge Environment will also notify the Office of the State Archaeologist ("OSA") and Tribal Archaeologist of the find.

3. Enbridge Environment also shall promptly notify the RFA, land-managing agency, or state routing authority of the find and consult regarding the appropriate measures to handle the discovery.

After permission to resume construction has been issued by the RFA, land-managing agency, or state routing authority, Enbridge's Lead EI will advise the on-site construction manager to restart ground-disturbing activities.

5.0 TRAINING OF CONSTRUCTION PERSONNEL

Prior to construction, Enbridge will train workers about the need to avoid archaeological, historic and cultural properties, how to identify archaeological, historic, and cultural properties, and procedures to follow if undocumented archaeological, historic and cultural properties, including human burials and gravesites, are found during construction.

Appendix A

Contacts List

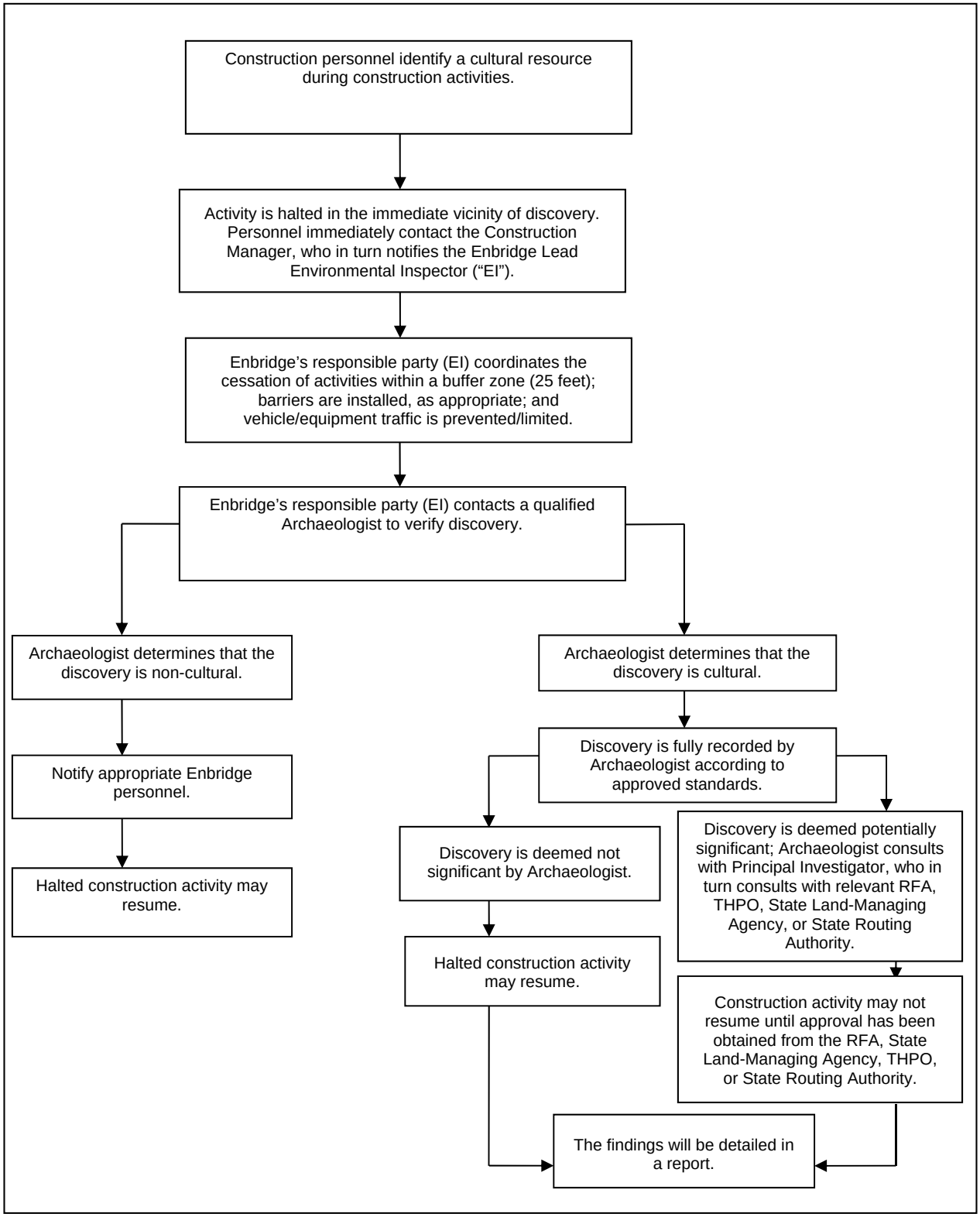
Contact List		
State/County/Agency	**Contact**	**Address/Telephone**
FEDERAL		
U.S. Army Corps of Engineers	Brad Johnson, St. Paul District Archaeologist	Contact info U.S. Army Corps of Engineers Centre 180 5th Street East St. Paul, MN 55101-1638 Telephone: (651) 290-5201 E-mail: brad.a.johnson@usace.army.mil
U.S. Army Corps of Engineers	Nancy Komulainen-Dillenburg, St. Paul District Archaeologist	Contact info U.S. Army Corps of Engineers Centre 180 5th Street East St. Paul, MN 55101-1638 Telephone: (651) 290-5201 E-mail: Nancy.S.Komulainen-Dillenburg@usace.army.mil
Bureau of Indian Affairs	Richard Berg, Midwest Regional Office Archaeologist	Contact info 5600 American Blvd W, Ste 500 Bloomington, MN 55437 Telephone: (612) 713-4400, ext. 1145 E-mail: richard.berg@bia.gov
Fond du Lac Band of Lake Superior Chippewa Reservation Business Committee ("RBC")	Kevin DuPuis, Chairman	1720 Big Lake Road, Cloquet, MN 55720 Telephone: (218) 879-4593 Fax: (218) 879-4146 E-mail: kevindupuis@fdlrez.com
Fond du Lac Band of Lake Superior Chippewa Tribal Historic Preservation Officer ("THPO")	Jill Hoppe, THPO	1720 Big Lake Road, Cloquet, MN 55720 Telephone: (218) 878-7124 E-mail: JillHoppe@fdlrez.com
Minnesota Indian Affairs Council	Melissa Cerda, Cultural Resource Director	161 St. Anthony Ave, Suite 919 St. Paul, MN 55103 Telephone: (651) 276-2797 E-mail: melissa.cerda@state.mn.us
MINNESOTA		
Enbridge	TBD, Lead Environmental Inspectors	Cellphone: TBD E-mail: TBD
Minnesota State Historic Preservation Office	Amy Spong, Deputy SHPO	Minnesota State Historic Preservation Office Minnesota Historical Society 345 Kellogg Boulevard West St. Paul, MN 55102-1903 Telephone: (651) 259-3466 E-mail: amy.spong@mnhs.org
Office of the State Archaeologist	Amanda Gronhovd, Minnesota State Archaeologist	Office of the State Archaeologist Fort Snelling History Center 200 Tower Avenue St. Paul, MN 55111 Telephone: (612) 725-2411 E-mail: Amanda.Gronhovd@state.mn.us
Minnesota Geological Survey	Harvey Thorleifson, Director	Minnesota Geological Survey 2642 University Ave. St. Paul, MN 55114-1057 Telephone: (612) 627-4780, ext. 224
Minnesota Department of Natural Resources	TBD	500 Lafayette Rd., St. Paul, MN 55155 Telephone: E-mail:
Minnesota Public Utilities Commission	TBD	121 7th Place E, Suite 350 Saint Paul, MN 55101 Telephone: E-mail:

Contact List		
State/County/Agency	**Contact**	**Address/Telephone**
St. Louis	Ross Litman, County Sheriff	100 N 5th Avenue W Room 103 Duluth, MN 55802 Telephone: (218) 726-2340
Carlton	Kelly Lake, County Sheriff	317 Walnut Avenue Carlton, MN 55718 Telephone: (218) 384-3236

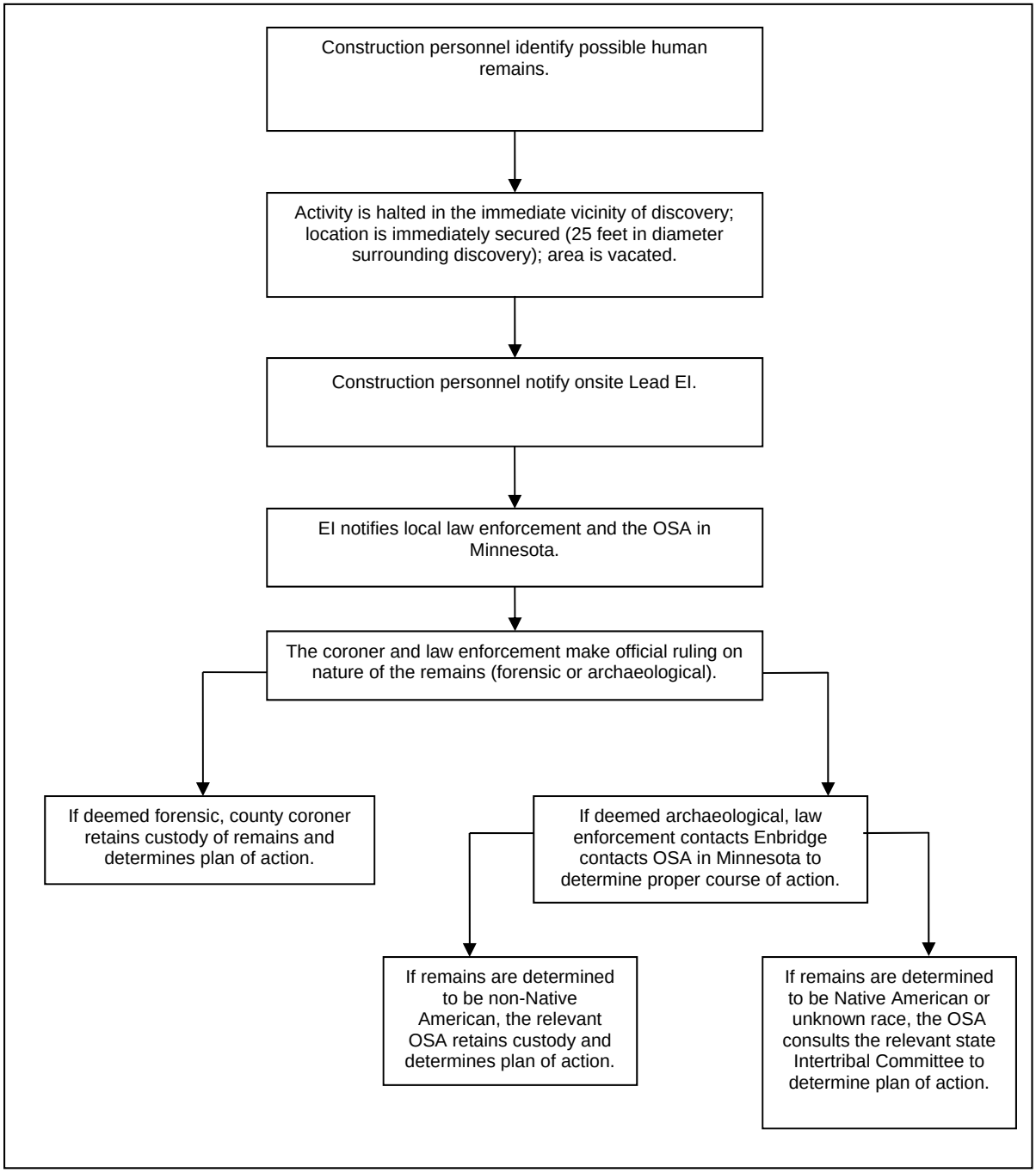
Appendix B

Unanticipated Discovery Flow Charts

Discovery of Historic Properties Flow Chart



Unanticipated Discovery of Human Remains Flow Chart



Fond du Lac Line 4 Project

Application for Pipeline Routing Permit and Partial Exemption

Minnesota Public Utilities Commission

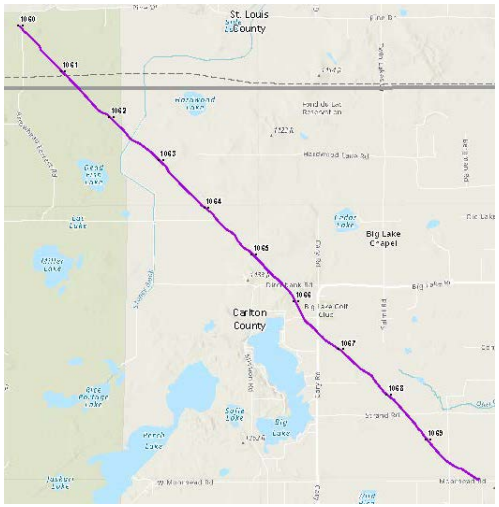
Appendix G.1

Potential Construction Impacts by Land Use and County

REVISED: March 15, 2019

Appendix G: Land Cover and Wetland Detailed Construction and Operations Impacts

Appendix G.1: Land Cover – Construction Impacts (page 1 of 2)



Legend	
	Represents planned Line 3 Replacement operationally maintained pipeline ROW that is planned to be disturbed by the Line 3 Replacement Project and planned to be used as temporary workspace for the Fond du Lac Line 4 Project.
	Represents planned new Line 4 operationally maintained pipeline ROW that is planned to be disturbed by the Line 3 Replacement Project.
	Represents Line 4 temporary workspace planned to be cleared for the Line 3 Replacement Project.
	Represents planned new area of disturbance that is planned to be used as temporary workspace during the construction for the Fond du Lac Line 4 Project.
	Represents the Existing Enbridge Mainline Corridor.

Figure G.1-1: Line 4 Upland Construction Workspace

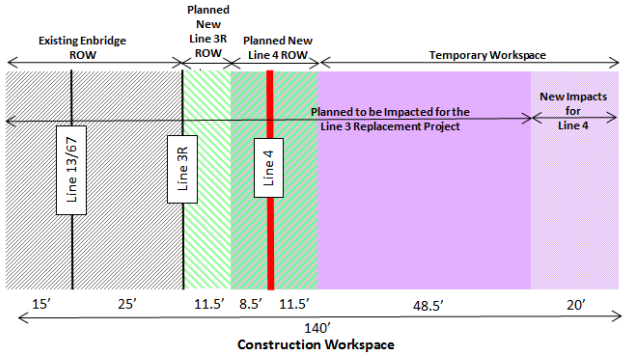


Figure G.1-2: Line 4 Wetland Construction Workspace

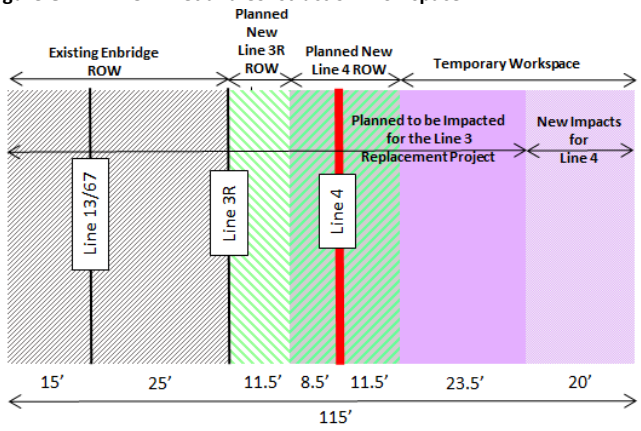
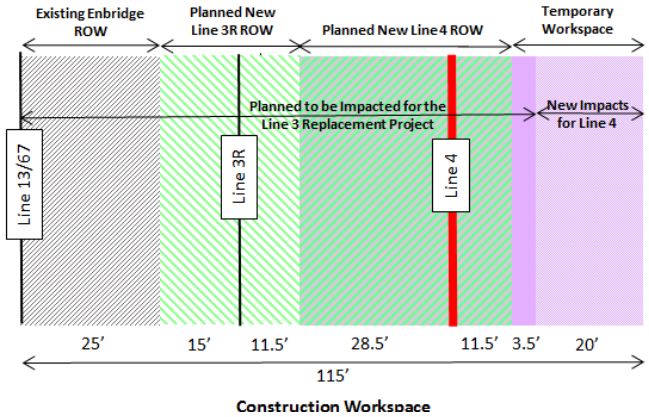


Figure G.1-3: Line 4 Saturated Wetland Construction Workspace



Appendix G: Land Cover and Wetland Detailed Construction and Operations Impacts

Appendix G.1: Land Cover – Construction Impacts (page 2 of 2)

TABLE G.1-1
Fond du Lac Line 4 Project - Total Construction Impacts by Land Cover Type (acres)

	Area of Planned Disturbance			Area of New Disturbance	
Land Cover Type	Temporary Line 4	Line 4 New ROW	Temporary Line 4	Temporary Line 4	Grand Total
Developed Land	2.4	0.5	0.6	1.4	4.9
Forest Land	22.6	10.6	13.0	10.7	56.9
Open Land	14.0	3.5	3.2	1.2	21.9
Wetland/Open Water	38.5	22.1	9.4	14.4	84.4
Total	77.5	36.7	26.2	27.7	168.1

TABLE G.1-2
Fond du Lac Line 4 Project - Construction Impacts by Land Cover Type (acres) – St. Louis County

	Area of Planned Disturbance			Area of New Disturbance	
Land Cover Type	Temporary Line 4	Line 4 New ROW	Temporary Line 4	Temporary Line 4	Grand Total
Developed Land	0.6	0.1	0.2	0.4	1.3
Forest Land	5.1	2.1	1.4	1.3	9.9
Open Land	0.4	0.1	0.1	0.3	0.9
Wetland/Open Water	4.1	2.9	0.9	1.4	9.3
Total	10.2	5.1	2.6	3.3	21.2

TABLE G.1-3
Fond du Lac Line 4 Project - Construction Impacts by Land Cover Type (acres) – Carlton County

	Area of Planned Disturbance			Area of New Disturbance	
Land Cover Type	Temporary Line 4	Line 4 New ROW	Temporary Line 4	Temporary Line 4	Grand Total
Developed Land	1.8	0.5	0.4	1.0	3.7
Forest Land	17.5	8.6	11.6	9.3	47
Open Land	13.5	3.4	3.2	1.0	21.1
Wetland/Open Water	34.4	19.4	8.5	12.9	75.2
Total	67.3	31.9	23.7	24.2	147.0

TABLE G.1-4
Fond du Lac Line 4 Project – Access Road by Land Cover Type (acres)

Land Cover Type	St. Louis County	Carlton County	Total
Developed Land	0.2	0.6	0.9
Forest Land	3.6	0.0	3.5
Open Land	0.4	0.0	0.4
Wetland/Open Water	0.2	0.3	0.5
Total	4.4	0.9	5.3

Note: Table totals may not be consistent due to rounding.

Fond du Lac Line 4 Project

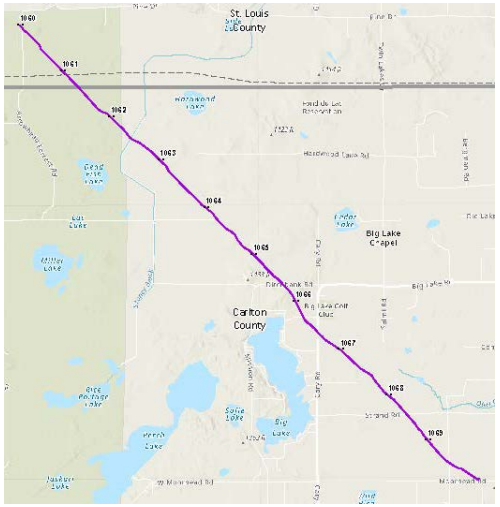
Application for Pipeline Routing Permit and Partial Exemption

Minnesota Public Utilities Commission

Appendix G.2

Potential Operation Impacts by Land Use and County

REVISED: March 15, 2019



Appendix G: Land Cover and Wetland Detailed Construction and Operations Impacts

Appendix G.2: Land Cover – Operations Impacts (page 1 of 2)

Legend	
	Represents planned Line 3 Replacement operationally maintained pipeline ROW that is planned to be disturbed by the Line 3 Replacement Project and planned to be used as temporary workspace for the Fond du Lac Line 4 Project.
	Represents planned new Line 4 operationally maintained pipeline ROW that is planned to be disturbed by the Line 3 Replacement Project.
	Represents the Existing Enbridge Mainline Corridor.

Figure G.2-1: Line 4 Operations Workspace – Upland/Wetlands

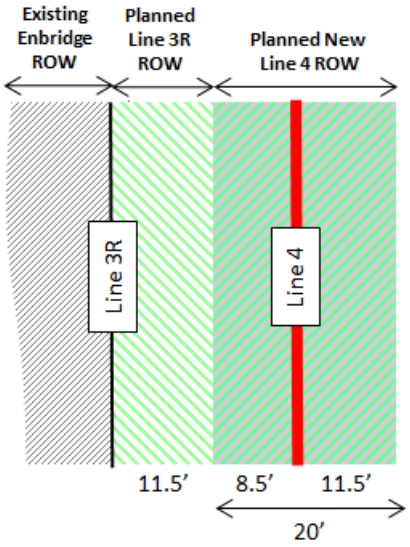
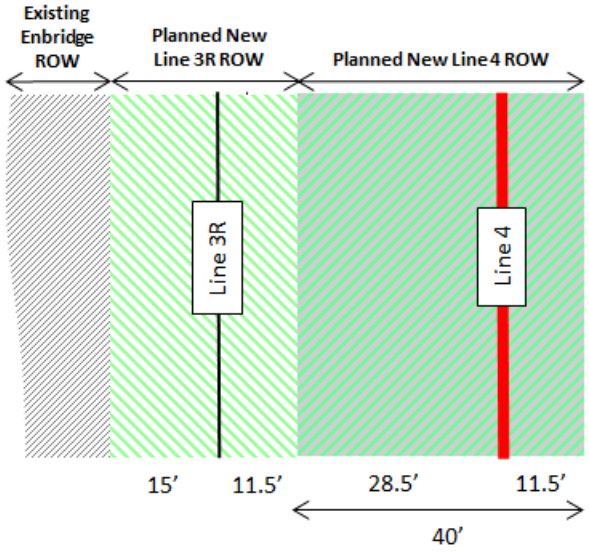


Figure G.2-2: Line 4 Operations Workspace – Saturated Wetlands



Appendix G: Land Cover and Wetland Detailed Construction and Operations Impacts

Appendix G.2: Land Cover – Operations Impacts (page 2 of 2)

TABLE G.2-1
Fond du Lac Line 4 Project - Total Operations Impacts by Land Cover Type (acres)

Land Cover Type	Area of Planned Disturbance Line 4 New ROW
Developed Land	0.5
Forest Land	10.6
Open Land	3.5
Wetland/Open Water	22.1
Total	36.7

TABLE G.2-2
Fond du Lac Line 4 Project - Operations Impacts by Land Cover Type (acres) – St. Louis County

Land Cover Type	Area of Planned Disturbance Line 4 New ROW
Developed Land	0.1
Forest Land	2.1
Open Land	0.1
Wetland/Open Water	2.9
Total	5.1

TABLE G.2-3
Fond du Lac Line 4 Project - Operations Impacts by Land Cover Type (acres) - Carlton County

Land Cover Type	Area of Planned Disturbance Line 4 New ROW
Developed Land	0.4
Forest Land	8.5
Open Land	3.4
Wetland/Open Water	19.2
Total	31.6

Note: Table totals may not be consistent due to rounding.

Fond du Lac Line 4 Project

Application for Pipeline Routing Permit and Partial Exemption

Minnesota Public Utilities Commission

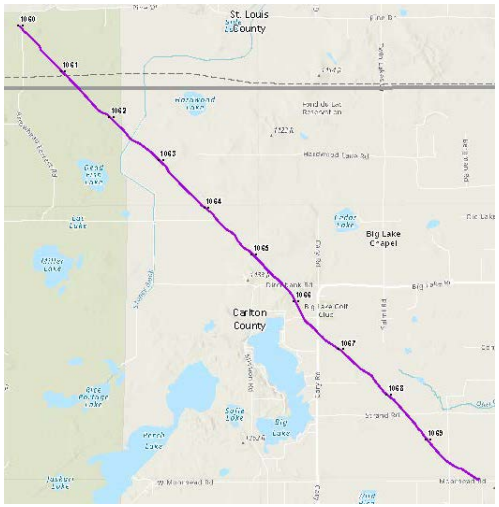
Appendix G.3

Potential Construction Impacts by Wetland Type and County

REVISED: March 15, 2019

Appendix G: Land Cover and Wetland Detailed Construction and Operations Impacts

Appendix G.3: Wetlands – Construction Impacts (page 1 of 2)



Legend	
	Represents planned Line 3 Replacement operationally maintained pipeline ROW that is planned to be disturbed by the Line 3 Replacement Project and planned to be used as temporary workspace for the Fond du Lac Line 4 Project.
	Represents planned new Line 4 operationally maintained pipeline ROW that is planned to be disturbed by the Line 3 Replacement Project.
	Represents Line 4 temporary workspace planned to be cleared for the Line 3 Replacement Project.
	Represents planned new area of disturbance that is planned to be used as temporary workspace during the construction for the Fond du Lac Line 4 Project.
	Represents the Existing Enbridge Mainline Corridor.

Figure G.3-1: Line 4 Wetland Construction Workspace

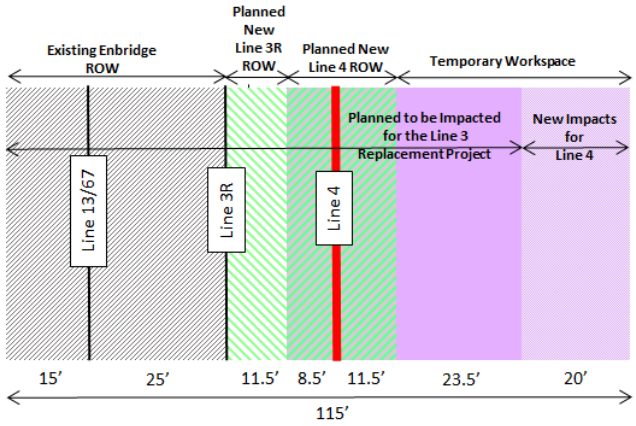
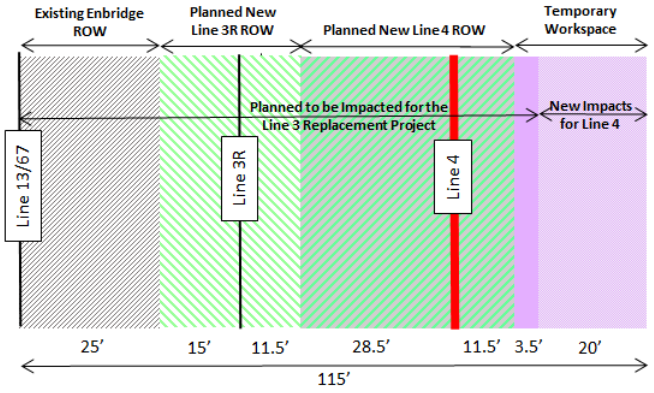


Figure G.3-2: Line 4 Saturated Wetland Construction Workspace



Appendix G: Land Cover and Wetland Detailed Construction and Operations Impacts

Appendix G.3: Wetlands – Construction Impacts (page 2 of 2)

TABLE G.3-1
Fond du Lac Line 4 Project - Total Construction Impacts by Wetland Type (acres)

	Area of Planned Disturbance			Area of New Disturbance	
Wetland Type	Temporary Line 4	Line 4 New ROW	Temporary Line 4	Temporary Line 4	Grand Total
PEM	29.2	10.1	1.7	3.9	44.9
PFO	4.1	7.6	4.9	8.1	24.7
PSS	10.3	6.1	3.5	3.6	23.5
PUB	1.2	0.7	0.1	0.4	2.4
Total	44.8	24.5	10.2	16.0	95.5

TABLE G.3-2
Fond du Lac Line 4 Project - Construction Impacts by Wetland Type (acres) – St. Louis County

	Area of Planned Disturbance			Area of New Disturbance	
Wetland Type	Temporary Line 4	Line 4 New ROW	Temporary Line 4	Temporary Line 4	Grand Total
PEM	3.2	1.8	0.1	0.7	5.7
PFO	0.9	0.9	0.6	0.7	3.1
PSS	2.6	1.5	0.8	0.7	5.7
PUB	0.0	0.0	0.0	0.0	0.0
Total	6.6	4.1	1.6	2.2	14.5

TABLE G.3-3
Fond du Lac Line 4 Project - Construction Impacts by Land Cover Type (acres) – Carlton County

	Area of Planned Disturbance			Area of New Disturbance	
Wetland Type	Temporary Line 4	Line 4 New ROW	Temporary Line 4	Temporary Line 4	Grand Total
PEM	26.1	8.4	1.6	3.2	39.3
PFO	3.2	6.8	4.3	7.3	21.6
PSS	7.7	4.5	2.7	2.8	17.7
PUB	1.2	0.7	0.1	0.4	2.4
Total	38.1	20.4	8.7	13.8	80.9

TABLE G.3-4
Fond du Lac Line 4 Project – Access Road by Wetland Type (acres)

Wetland Type	St. Louis County	Carlton County	Total
PEM	0.3	0.2	0.4
PFO	0.0	0.0	0.0
PSS	0.1	0.1	0.2
PUB	0.0	0.0	0.0
Total	0.4	0.3	0.6

Note: Table totals may not be consistent due to rounding.

Fond du Lac Line 4 Project

Application for Pipeline Routing Permit and Partial Exemption

Minnesota Public Utilities Commission

Appendix G.4

Potential Operation Impacts by Wetland Type and County

REVISED: March 15, 2019

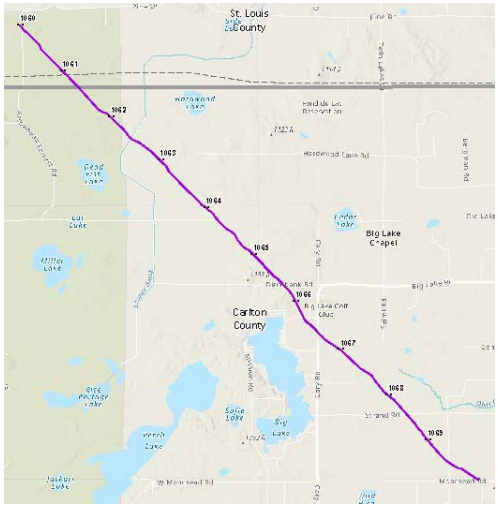


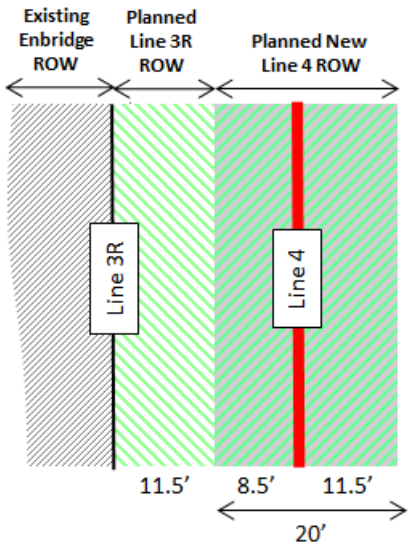
Figure G.4-1: Line 4 Operations Workspace – Upland/Wetlands

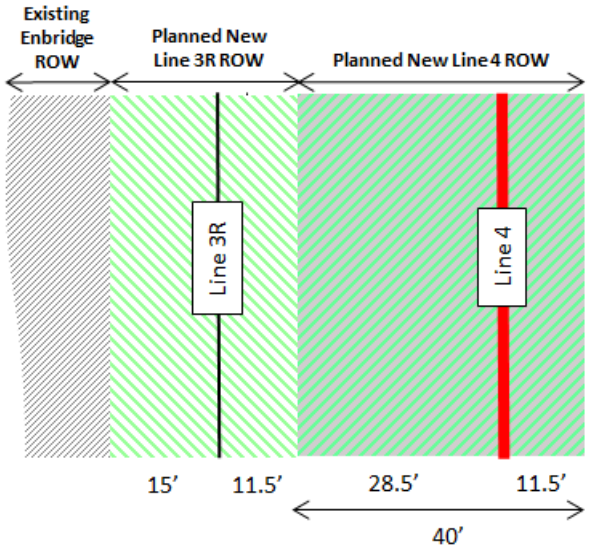
Appendix G: Land Cover and Wetland Detailed Construction and Operations Impacts

Appendix G.4: Wetlands – Operations Impacts (page 1 of 2)

Legend	
	Represents planned Line 3 Replacement operationally maintained pipeline ROW that is planned to be disturbed by the Line 3 Replacement Project and planned to be used as temporary workspace for the Fond du Lac Line 4 Project.
	Represents planned new Line 4 operationally maintained pipeline ROW that is planned to be disturbed by the Line 3 Replacement Project.
	Represents the Existing Enbridge Mainline Corridor.

Figure G.4-2: Line 4 Operations Workspace – Saturated Wetlands





Appendix G: Land Cover and Wetland Detailed Construction and Operations Impacts

Appendix G.4: Wetlands – Operations Impacts (page 2 of 2)

TABLE G.4-1 Fond du Lac Line 4 Project - Total Operations Impacts by Wetland Type (acres) (Type Conversion)	
	Area of Planned Disturbance
Wetland Type	Line 4 New ROW
PEM	0.0
PFO	7.6
PSS	6.1
PUB	0.0
Total	13.7

TABLE G.4-2 Fond du Lac Line 4 Project -Operations Impacts by Wetland Type (acres) – St. Louis County (Type Conversion)	
	Area of Planned Disturbance
Wetland Type	Line 4 New ROW
PEM	0.0
PFO	0.9
PSS	1.5
PUB	0.0
Total	2.4

TABLE G.4-3 Fond du Lac Line 4 Project - Operations Impacts by Wetland Type (acres) – Carlton County (Type Conversion)	
	Area of Planned Disturbance
Wetland Type	Line 4 New ROW
PEM	0.0
PFO	6.8
PSS	4.5
PUB	0.0
Total	11.3

TABLE G.4-4 Fond du Lac Line 4 Project – Operations Impacts by Wetland Type (acres) (Permanent Fill Associated with Valve Sites)			
Wetland Type	St. Louis County	Carlton County	Total
PEM	0.00	0.00	0.00
PFO	0.00	0.00	0.00
PSS	0.00	0.03	0.03
PUB	0.00	0.00	0.00
Total	0.00	0.03	0.03

Note: Table totals may not be consistent due to rounding.

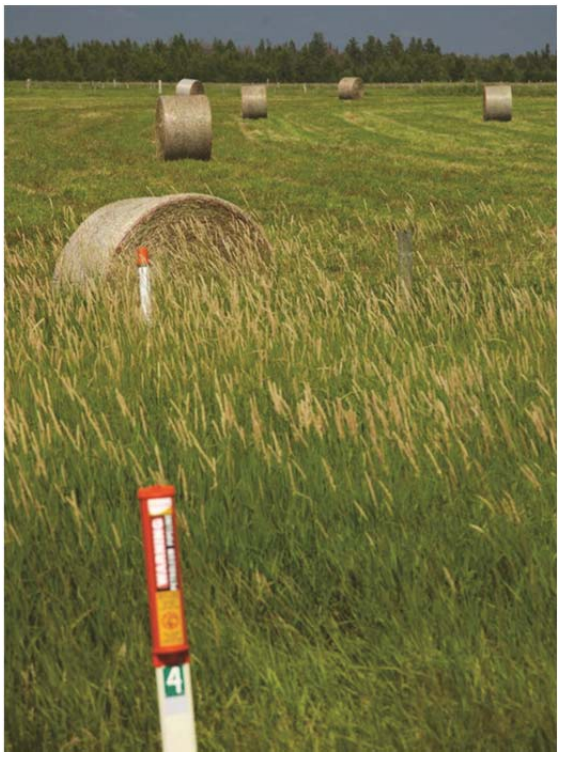
Fond du Lac Line 4 Project

Application for Pipeline Routing Permit and Partial Exemption

Minnesota Public Utilities Commission

Appendix H

Contaminated Sites Management Plan



Contaminated Sites Management Plan

Enbridge Energy, Limited Partnership • Fond du Lac Line 4 Project

TABLE OF CONTENTS

List of Tables

List of Figures

APPENDICES

1.0 INTRODUCTION

This Contaminated Sites Management Plan ("CSMP") has been prepared by Enbridge Energy, Limited Partnership ("Enbridge") for the Fond du Lac Line 4 Project ("Project") that will take place within the Fond du Lac Reservation in Minnesota. The proposed Project Preferred Route is shown on Figure 1. The purpose of the CSMP is to present guidance to Contractors for managing contaminated soil, water, debris or other materials which may be encountered during Project work based on the applicability described below. This CSMP does not address potential contractor safety requirements that may apply when managing contaminated materials.

2.0 APPLICABILITY

This CSMP applies to contaminated material that may be encountered along the Project Preferred Route as a result of activities or events that occurred prior to the Project commencing (i.e., historical). Contamination may be caused by petroleum products, agricultural chemicals, asbestos, or other industrial byproducts that are present as a result of historical activities or events whether known or unknown.

2.1 CONTAMINATED MATERIAL

For the purpose of this CSMP, "contaminated material" has one or more of the following characteristics:

- Petroleum odors in soil or water
- Petroleum staining in soil or on vegetation
- Petroleum free product or sheen (e.g., rainbow or bluish colors) on water, soil, or debris surfaces
- Evidence of improper waste disposal such as industrial garbage, scrap materials, used containers, or other by-product type wastes
- Evidence of man-made earthen features (hills, depressions, waste piles, etc.)
- Evidence of dumping or other waste disposal
- Vegetation that is stressed or dead
- Soil that is discolored compared to adjacent or nearby soils
- Evidence of present or past chemical storage or use, including tanks, drums or containers
- Buildings or structures that suggest current or past industrial activity
- Evidence of land use associated with potential contamination (landfills, waste treatment plants, agricultural pesticide storage facilities, storage ponds, septic fields, drains, culverts, etc.)

2.1.1 Known

Enbridge will conduct a review of data and information to identify sites with the potential to encounter contaminated material within 1,200 feet of the Project Preferred Route. If any sites with historical documentation of contaminated material are identified, they will be listed in Table 1, and locations will be shown on Figure 2.

2.1.2 Unknown

It is possible that contaminated material may be encountered unexpectedly at locations along the Preferred Route where no historical information was available. Such locations will be considered previously unknown sites this CSMP will apply to such sites.

2.2 OTHER MATERIAL

Material such as debris (e.g., common household waste, construction debris, old appliances, etc.) with no apparent signs of contamination may be encountered during the Project. The material will not be considered contaminated and will not be managed as part of this CSMP.

In addition, natural organic (i.e., biogenic) sheens where the Project route crosses wetlands, ditches, or other water-saturated surfaces may be encountered. A biogenic sheen can often be identified by breaking up the sheen with a stick and observing the sheen behavior. If the sheen remains broken into platelets and fails to re-coalesce quickly, it may be considered natural and not a source of hydrocarbon contamination. If the sheen quickly reforms or exhibits a typical rainbow petroleum-type sheen on the surface of the water, then the material will be considered contaminated.

Additional assessment will be conducted as explained in Section 4 if there is any doubt as to whether material encountered is contaminated.

2.3 PROJECT RELATED SPILLS

Contaminated material that is generated during the Project as a result spills that occur during construction (e.g., equipment releases) will be managed in accordance with Enbridge's Environmental Protection Plan which has been developed separate from this CSMP.

3.0 ROLES AND RESPONSIBILITIES

The following section provides a summary of roles and responsibilities as they pertain to contaminated site management during the Project. Enbridge is committed to achieving a high standard of environmental protection and is committed to the proper management of unanticipated environmental conditions, including contamination.

Enbridge's expectations for work during the Project include conducting all work activities safely and effectively while complying with regulations.

3.1 PROJECT TEAM

Multiple parties will be working together to ensure the Project is executed according to scope. The parties expected to have a major role in maintaining environmental compliance and proper management of contaminated materials are Enbridge, its Contractors, and other stakeholders. Contact information for key personnel is included in the attached Contact List (Appendix A).

3.1.1 Enbridge Major Projects Environmental Staff

The responsibilities of Enbridge Major Projects Environmental Staff associated with this project include:

- manage environmental permit compliance during the Project (does not include in-depth management of contaminated sites);
- serve as the interface between the Project Engineering staff, contractors, and the Liquid Pipelines Environmental Staff;
- oversee site-specific management and disposal of contaminated material that may be encountered during the Project; and
- track Project progress and advise Enbridge's Liquid Pipelines Environmental Staff if contamination is encountered at any given location.

3.1.2 Environmental Inspector

Environmental Inspectors on the Project are considered Enbridge Major Projects Environmental Staff and the responsibilities of the Environmental Inspectors include:

- maintain overall environmental permit compliance during the Project (does not include comprehensive management of contaminated materials);
- serve as an on-site point of contact in the field during the Project;
- provide an initial assessment and on-site guidance regarding contamination or suspected contamination; and
- complete the attached Environmental Inspector Contaminated Site Response Form (Appendix B) when contamination or suspected contamination is encountered during the Project.

3.1.3 Enbridge Liquid Pipelines Environmental Staff

The responsibilities of Enbridge Liquid Pipelines Environmental Staff associated with this project include:

- direct activities specifically associated with the CSMP for the Project;
- serve as the primary point of contact with regulators when addressing contaminated sites;
- provide advance notice to applicable regulatory agencies during the Project when excavation activities are within one day of a location of a known potentially contaminated site;
- oversee site-specific management and disposal of contaminated materials that may be encountered during the Project;
- document conditions at contaminated sites using appropriate field screening and analytical sampling methods (including completing Appendix C, Site Investigation Field Sampling and Screening Log);
- maintain a database of contaminated sites encountered during the Project;

- manage records associated with contaminated material management and disposal; and
- prepare site-specific memorandums and a final report of findings for sites addressed under the CSMP during the Project.

3.1.4 Chief Inspector

The Chief Inspector reports directly to Enbridge and the responsibilities of the Chief Inspector include:

- notify the Enbridge Major Projects Environmental Staff when Project activities involving ground disturbance are two days out from work commencing at known potentially contaminated sites; and
- provide initial notification to the Enbridge Environmental Inspector upon discovery of any type of contamination at a site regardless of whether it is previously known or newly discovered (i.e., unknown site).

3.1.5 Project Contractor

Project Contractor reports to the Chief Inspector and the responsibilities of the Project Contractor include:

- continually evaluate project activities for unanticipated conditions including potential contamination;
- provide the initial report to the Chief Inspector and cease work if contamination is encountered during Project activities; and
- work with Enbridge Liquid Pipelines Environmental Staff to arrange for proper removal, temporary storage/containment, and transport of contaminated materials offsite.

4.0 PROJECT CONTRACTOR RESPONSE ACTIONS

In the event that contaminated soil, water, or debris is encountered, the Project Contractor will take the response actions listed below which are also summarized in the Contaminated Materials Management Flowchart (Appendix D).

1. Cease Work
   i The Project Contractor will cease work activity in the vicinity of the contamination.
2. Address Safety
   i The Project Contractor will refer to the Project Safety Plan and consult with Enbridge's Project Safety representatives to determine proper health and safety actions.
3. Notify Enbridge
   i The Project Contractor will notify the Chief Inspector who will notify Enbridge's Compliance Manager and Enbridge Major Projects Environmental Staff as soon as possible after taking initial safety precautions.

ii The Major Projects Environmental Staff will notify Enbridge Liquid Pipelines Environmental Staff.

iii Enbridge's on-site Environmental Inspector will complete the Environmental Inspector Contaminated Site Response Form (Appendix B) documenting response actions and estimated impacts.

iv Enbridge Liquid Pipelines Environmental Staff will make a determination as to whether the contamination is due to an active/ongoing release or a historical release.

4. Prevent Contaminant Migration

i At the direction of Enbridge's Liquid Pipelines staff, the following actions may be taken:

- Build earthen dams within the trench to isolate the contamination particularly if water is present; and/or
- Deploy sorbent pads and booms to remove and isolate petroleum contamination that may be present on water in the trench.

5. Containerize Contaminated Material

i At the direction of Enbridge's Liquid Pipelines staff, the Project Contractor will segregate contaminated material from clean material to the extent possible. The contaminated material will be clearly labeled with the milepost and date it was removed from the trench. The material will be stored at the job site until disposal at an offsite facility is approved.

- **Contaminated dry soil** and debris will be placed on plastic sheeting or within a roll-off dumpster or other suitable containment structure and covered with plastic sheeting.
- **Contaminated water** that needs to be dewatered from the excavation will be pumped into a frac tank or similar container.
  - The Project Contractor will make reasonable efforts to remove crude oil or other free phase petroleum product from the trench to prevent it from being mixed with containerized water.
  - Free phase petroleum product should be removed with a vac truck or sorbent pads, boom, etc. and stored or contained separately from
- **Contaminated hydrovac slurry and drilling mud** will be placed into a water tight roll-off dumpster or other suitable containment structure and covered.
  - Mud and slurry will be solidified only with approval, and, at the direction of Enbridge Liquid Pipelines Environment Staff.
  - Solidification materials may include dry saw dust wood pellets, Portland cement, bentonite, or other appropriate absorbent material that has been approved by Enbridge Liquid Pipelines Environment Staff.

6. Dispose of the Contaminated Material

i Enbridge Liquid Pipelines Environment staff may need to collect samples from the contaminated material for waste characterization and disposal purposes.
ii Enbridge Liquid Pipelines Environment Staff will identify a proper disposal facility for the contaminated material and provide the Project Contractor with shipping papers for transportation to the disposal facility.
iii The Project Contractor will arrange for transportation of contaminated material to one of the disposal facilities listed on Table 2.
iv The Project Contractor will maintain records of shipping and waste disposal and provide copies them to the Enbridge Liquid Pipelines Environment Staff.

7. Assist with Environmental Documentation
   i Depending on the characteristics of the contamination encountered, Enbridge Liquid Pipelines Environment Staff may need to collect additional samples from the excavation bottom and sidewalls before backfilling occurs.
   ii The Project Contractor will assist the Enbridge Liquid Pipelines Environment Staff in this effort.
8. Backfill the trench with clean borrow material
   i Backfill material must be approved by Enbridge Liquid Pipelines Environment Staff.
   ii Do not backfill with contaminated material.
   iii Document the source of the backfill material.

Table 1 (to be completed prior to construction)

Table 1

Known Potential Contaminated Sites
Contaminated Sites Management Plan – Minnesota,
Fond du Lac Line 4 Project

Site Number	Existing Pipeline Milepost	Site Name	Site Type	Agency Status	Distance to Site (feet)	Direction to Release	Volume (barrels)	Tier

Tier Explanation: 1 = Decent likelihood for encountering contamination during construction

2 = Moderate likelihood for encountering contamination during construction

Table 2 Contaminated Material Disposal Facilities (to be completed prior to construction)

Table 2

Contaminated Material Disposal Sites
Contaminated Sites Management Plan – Minnesota,
Fond du Lac Line 4 Project

Site Name	Site Address	Phone Number	Material Accepted

Figure 1 Route Overview

REVISED: March 15, 2019

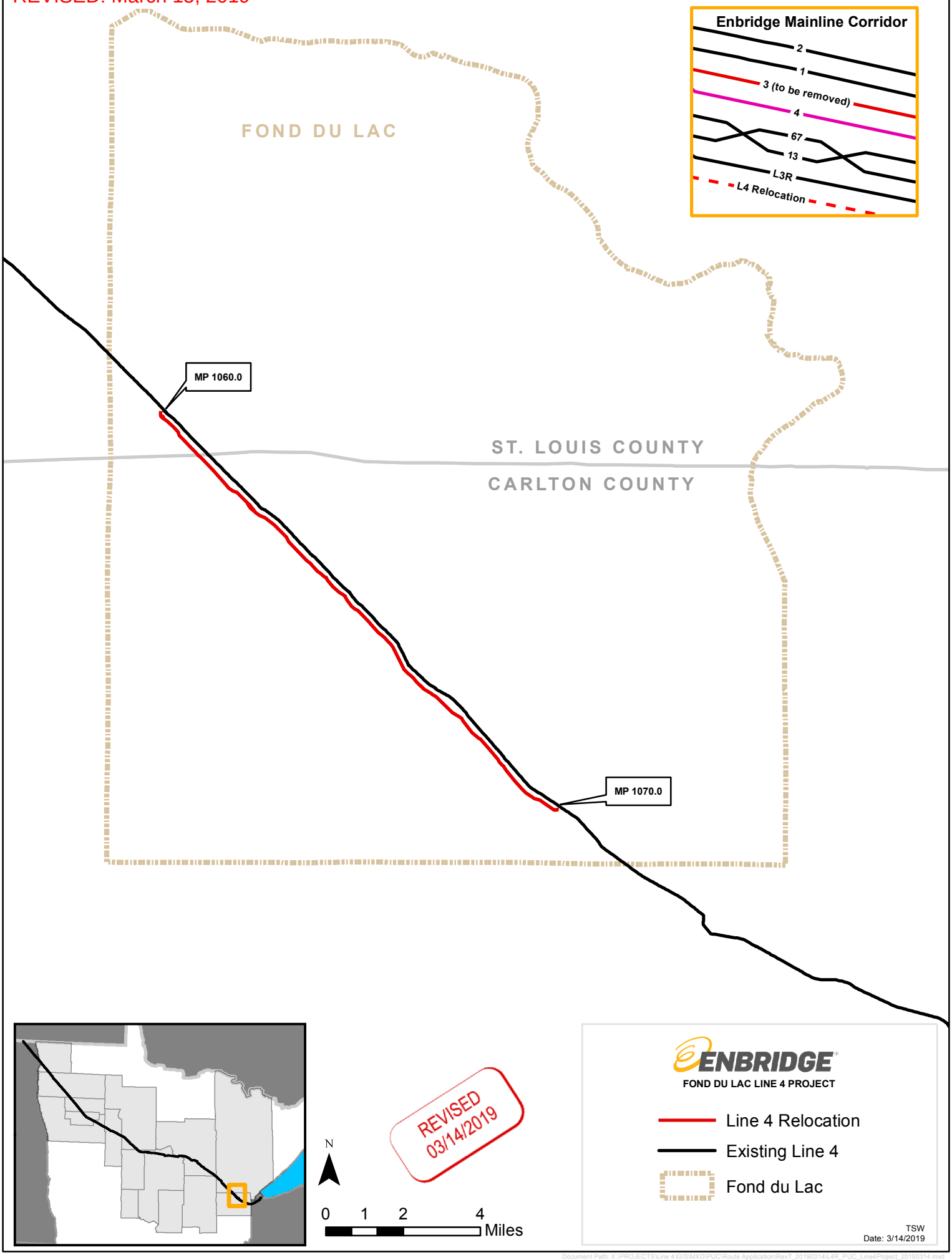


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Figure 2 (To be developed prior to construction)

Appendix A

Contact List

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Appendix A
Contact List
Contaminated Sites Management Plan – Minnesota
Fond du Lac Line 4 Project

Contact	Company	Role	Phone (office)	Phone (cell)	Email
Julianne Motis	Enbridge	Senior Environmental Advisor, Major Projects Environment	218-522-4652	218-409-5239	Julianne.Motis@enbridge.com
Karl Beaster	Enbridge	Senior Environmental Advisor, LP US Environment Operations	218-464-5623	715-718-1040	Karl.Beaster@enbridge.com
		Environmental Inspector TBD			
		Environmental Inspector TBD			
		Chief Inspector TBD			
		Project Contractor TBD			

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Appendix B

Environmental Inspector Contaminated Site Response Form

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Appendix B
Environmental Inspector Contaminated Site Response Form
Contaminated Sites Management Plan – Minnesota
Fond du Lac Line 4 Project

Name: _____

Date: _____ **Time:** _____

Milepost: _____ **Stationing:** _____

Potential Contamination Observed (check all that apply):

- ☐ Petroleum odors in soil or water
- ☐ Visual petroleum staining in soil or on vegetation
- ☐ Petroleum free product or sheen (e.g., rainbow or bluish colors) on water, soil, or debris surfaces
- ☐ Evidence of improper waste disposal such as industrial garbage, scrap materials, used containers, or other by-product type wastes
- ☐ Presence of man-made hills, depressions, or waste piles or evidence of dumping or other waste disposal
- ☐ Stressed or dead vegetation
- ☐ Soil that is discolored compared to adjacent or nearby soils
- ☐ Evidence of present or past chemical storage or use, including tanks, drums or containers
- ☐ Active or closed buildings and structures that suggest current or past industrial activity
- ☐ Evidence of land use associated with potential contamination (landfills, waste treatment plants, agricultural pesticide storage facilities, storage ponds, septic fields, drains, culverts, etc.)
- ☐ Other (describe)

_____

_____

_____

_____

Response Actions

Has containment cell been constructed and lined with plastic? Yes / No
Containment Cell Dimensions (feet):
Quantity of Contaminated Soil Excavated and Stockpiled (cubic yards):

Estimated Impacts

Estimated Extent of Contaminated Soil (horizontal and vertical, in feet):
Has groundwater or surface water been impacted? Yes/No
Describe water impacts (sheen, free oil, etc.):
Nearest surface waterbody (name and distance):

Describe response action activities on reverse.

Appendix B
Environmental Inspector Contaminated Site Response Form
Contaminated Sites Management Plan – Minnesota
Fond du Lac Line 4 Project

Are any impacts observed in the nearest surface water body? Describe:

Appendix B
Environmental Inspector Contaminated Site Response Form
Contaminated Sites Management Plan – Minnesota
Fond du Lac Line 4 Project

Project Contractor Contaminated Site Response Actions:

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Appendix C

Site Investigation Field Sampling and Screening Log

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Appendix C
Site Investigation and Field Sampling and Screening Log
Contaminated Sites Management Plan - Minnesota
Fond du Lac Line 4 Project

Milepost:_____ Date: _____

Sampler:_____

Sample Nomenclature *(Location - sample type - #):*

R = Removed **S** = Sidewall **B** = Bottom **Stockpile** = Stockpile

Field Investigation Instrument Record: Photoionization detector with 10.6 eV bulb

	Calibration	Bump Test 1	Bump Test 2
Time			
Zero reading (ppm)			
Span reading (ppm)			
Background (ppm)			

Sample ID	Depth *(FT)*	Time *(military)*	Soil Type *(USCS)*	Color/ Discolor	Odor/ Sheen	Headspace Reading *(ppm)*
Example: Stockpile-1	*4*	*16:30*	*CL*	*Reddish brown*	*Petroleum/ Rainbow*	*275*

SITE SKETCH : *north arrow, scale, excavation extents & depths, impacted areas, sample locations ,borings, wells, structures, utilities, natural features…*

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Appendix D

Contaminated Materials Management Flowchart

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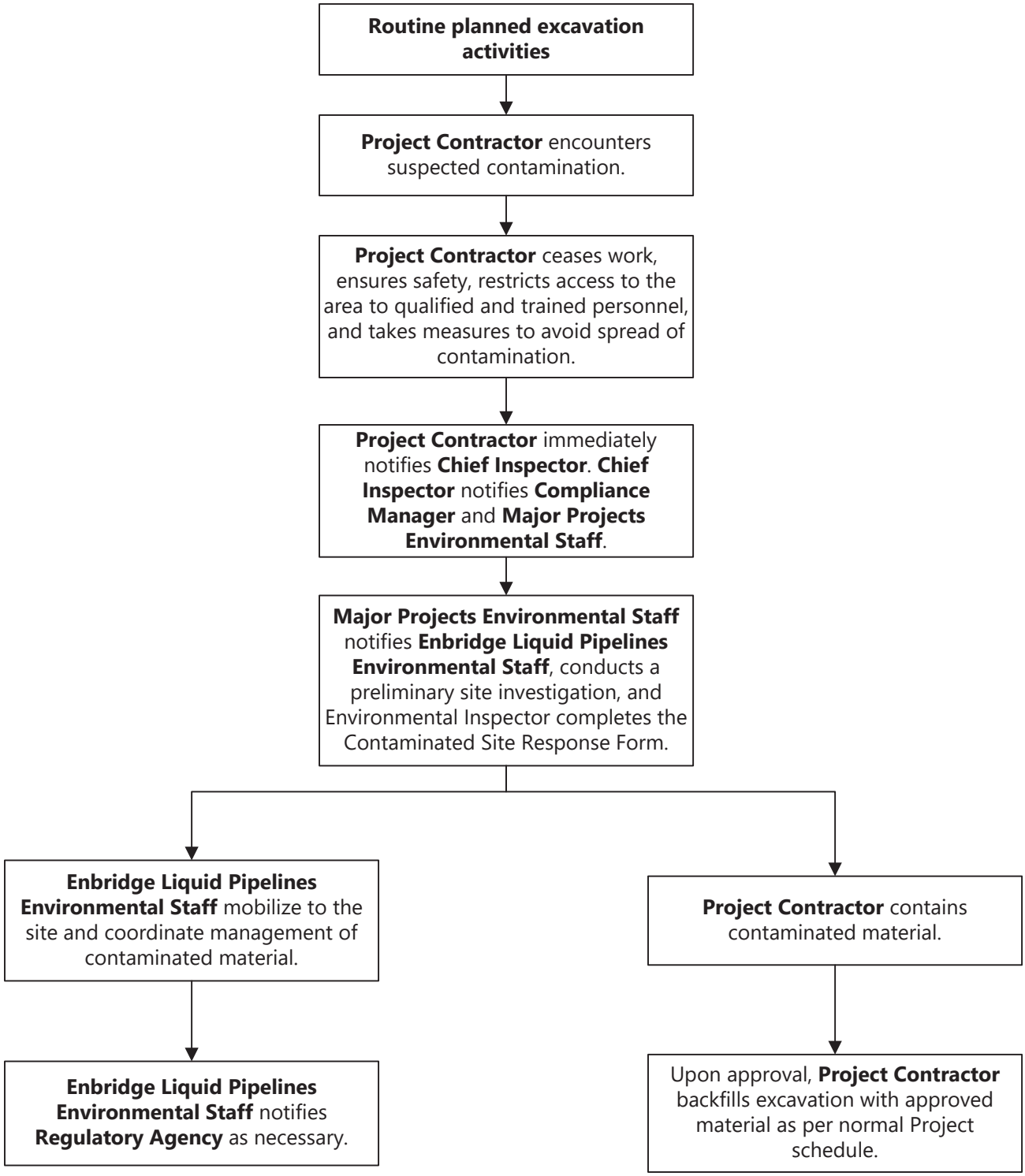
Appendix D
Contaminated Materials Management Flowchart
Contaminated Sites Management Plan - Minnesota
Fond du Lac Line 4 Project



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