



**Minnesota Department of Commerce  
Energy Environmental Review and Analysis**

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**Alternatives Screening Report  
for  
Line 3 Replacement Project**

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**PUC Docket Nos. PPL-15-137 and CN-14-916**

**September 21, 2016**

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## **Executive Summary**

This Alternatives Screening Report identifies and analyzes pipeline alternatives under consideration for inclusion in the Environmental Impact Statement for the proposed Line 3 Replacement Project (project).

Alternatives to the Applicant's preferred route were identified through comments received in 2015, the EIS scoping process in 2016, and through comments received during the 2014 scoping process for the now withdrawn Sandpiper Project.<sup>1</sup> Input was received from the public, assisting agencies, tribal representatives, nongovernmental organizations, and the Applicant. Based on this input, potential system and route alternatives were developed and analyzed using publicly available data sets to compare them to the Applicant's preferred route. The analysis is based on the following three criteria (1) environmental benefits/impacts, (2) socioeconomic benefits/impacts, and (3) regulatory and economic feasibility. The results of the screening report support further analysis of one system alternative and four route alternatives to the Applicant's preferred route in the EIS.

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<sup>1</sup> On September 1, 2016, the North Dakota Pipeline Company requested the withdrawal of its route and CN applications for the Sandpiper Pipeline Project. North Dakota Pipeline Company. 2016. Sandpiper Pipeline Petition to Withdraw Applications. E-dockets PL6668/PPL-13-474, Document ID: 20169-124579-01.

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## **Acronyms**

bpd	barrels per day
CN	Certificate of Need
DEIS	Draft Environmental Impact Statement
DOC-EERA	Department of Commerce, Energy Environmental Review and Analysis
EIS	Environmental Impact Statement
Enbridge	Enbridge Energy, Limited Partners
FSDD	Final Scoping Decision Document
GAP	National Gap Analysis Program
MEPA	Minnesota Environmental Policy Act
Minn. R.	Minnesota Administrative Rule
Minnesota DNR	Minnesota Department of Natural Resources
Minnesota PCA	Minnesota Pollution Control Agency
NRI	Nationwide Rivers Inventory
PUC	Minnesota Public Utilities Commission
Sandpiper Project	Sandpiper Pipeline Project
ROW	right-of-way

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# 1.0 Introduction

## 1.1 Background

Enbridge Energy proposes to construct and operate 337 miles of new 36-inch diameter pipeline within Minnesota that would replace 282 miles of the existing 34-inch diameter Line 3 pipeline (Line 3 Replacement Project, or project). As proposed by Enbridge, the existing Line 3 pipeline would be permanently deactivated and remain in place. The new pipeline would run parallel to the existing Line 3 along the Enbridge Mainline System right-of-way from the North Dakota-Minnesota border in Kittson County to the Clearbrook Terminal in Clearwater County. From the Clearbrook Terminal the pipeline would be constructed in a new right-of-way, ending at a terminal in Superior, Wisconsin.

The Department of Commerce, Energy Environmental Review and Analysis (DOC-EERA) staff will prepare an Environmental Impact Statement (EIS) for the Line 3 Replacement Project in accordance with the Minnesota Environmental Policy Act and Minnesota Rules 4410. The alternatives considered in the EIS will be available for consideration in the joint certificate of need (CN) and route permit contested case hearing. In addition to this Alternatives Screening Report, DOC-EERA has submitted the following documents to the Minnesota Public Utilities Commission (PUC) for consideration:

- The proposed *Final Scoping Decision Document (FSDD)*, which describes the scope and contents of the EIS; and
- The *Scoping Summary Report for the Line 3 Replacement and Sandpiper Pipeline Projects (Scoping Summary Report)*, which describes the EIS scoping process including public meetings held throughout the state and the comments received from the public, tribes, nongovernmental organizations, and governmental agencies.

## 1.2 Purpose of the Alternatives Screening Report

The EIS for the Line 3 Replacement Project must include a comparison of the potentially significant impacts of the project with those of other reasonable alternatives to the proposed project.<sup>2</sup> Potential alternatives were identified during the scoping process by the public, governmental, non-governmental, assisting agency, and tribal governments. Therefore, the purpose of this Alternatives Screening Report is to identify reasonable pipeline alternatives to the Applicant's proposal to be brought forward for further analysis and comparison in the EIS.

The EIS must address one or more alternatives of each of the following types, or provide a concise explanation of why no alternative of a particular type is included in the EIS:<sup>3</sup>

- Alternative sites,

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<sup>2</sup> Minn. R. 4410.2300(G)

<sup>3</sup> Id.

- Alternative technologies,
- Modified designs or layouts,
- Modified scale or magnitude,
- Alternatives incorporating reasonable mitigation measures identified through comment periods for EIS scoping or DEIS review, and
- No Action Alternative.

This Alternatives Screening Report analyzes only pipeline route alternatives and system alternatives that fall within the “modified designs or layouts” category.

## **2.0 Proposed Project**

Enbridge’s stated purpose for the project is to address safety and integrity concerns on the existing Line 3 pipeline by replacing it with a new line to transport crude oil from Canada to Enbridge’s Clearbrook terminal located near Clearbrook, Minnesota, and then to a terminal near Superior, Wisconsin<sup>4</sup>.

The Applicant’s preferred route would require approximately 337 miles of new pipeline in Minnesota, replacing 282 miles of the existing Line 3 pipeline. The Applicant’s preferred route would be co-located with the existing Enbridge Mainline System corridor from the North Dakota border to Clearbrook, Minnesota. East of Clearbrook, the route would deviate significantly from Line 3’s current location, following a new route between Clearbrook and Superior.

The existing 34-inch-diameter Line 3 pipeline currently transports crude oil from near Neche (Pembina County), North Dakota, to Clearbrook, and terminates at an existing terminal in Superior that is owned and operated by Enbridge. Due to safety and integrity concerns, Enbridge has reduced the volume of crude oil transported through Line 3 to 390,000 barrels per day (bpd). The proposed 36-inch-diameter new Line 3 Replacement pipeline would address Enbridge’s safety concerns and enable the Applicant to transport up to 760,000 barrels per day (bpd), the original capacity of Line 3. Construction of the Line 3 Replacement Project would generally require a 120-foot-wide construction workspace in uplands and a 95-foot-wide construction workspace in wetland areas. The permanent ROW after construction would be 120 feet. Associated facilities for the project would include four new pump stations east of Clearbrook and expansion of existing pump stations west of Clearbrook. Enbridge proposes to permanently deactivate the existing Line 3 pipeline and leave it in place following construction of the new Line 3 Replacement pipeline.

A more detailed description of the Line 3 Replacement Project is in the Scoping Environmental Assessment Worksheet<sup>5</sup>.

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<sup>4</sup> Enbridge (Enbridge Energy). 2015. Certificate of Need Application for the Minnesota Public Utilities Commission. Initial Filing for the Line 3 Pipeline Replacement. PL-9/CN-14-916, Document ID: 20154-109653-03.

## 3.0 Identification of Project Alternatives

### 3.1 Alternatives Identified through Scoping

DOC-EERA held twenty seven scoping meetings across the project area in 2015 and 2016.<sup>6</sup> In addition, seven public scoping meetings were conducted in 2014 for the Sandpiper Pipeline Project (Sandpiper Project), which was proposed to be co-located with the Line 3 Replacement Project east of Clearbrook. Comments were received from the public, assisting agencies, tribal representatives, nongovernmental organizations, and the Applicant.

All of the scoping comments submitted are reviewed, catalogued and summarized in the Scoping Summary Report. The Scoping Summary Report provides a detailed description of the scoping process, the dates and locations of the public meetings, the methodology used to identify actionable comments from the input received, and a summary of the issues identified from the comments. Several of the comments identified alternatives, which were considered in this screening analysis.

During the public scoping processes, a number of different types of alternatives were identified. DOC-EERA sorted the suggested alternatives by type (e.g., alternative technologies versus alternative pipeline routes). DOC-EERA then processed the resulting list of alternatives to determine whether it should be considered in the CN proceeding or the route permit proceeding.

Table 1 defines the three types of pipeline location alternatives identified in scoping. Generally, in the EIS, the evaluation of reasonable system alternatives is relevant to the CN decision and the evaluation of reasonable route alternatives and route segment alternatives is relevant to the route permit decision. For this reason, the analysis in this Alternatives Screening Report makes a distinction between system alternatives and route and route segment alternatives.

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<sup>5</sup> PUC, DOC-EERA (Minnesota Department of Commerce, Energy Environmental Review and Analysis). 2016. Line 3 Replacement Project Scoping Environmental Assessment Worksheet. eDockets: PPL-15-137/CN-14-916.

<sup>6</sup> Details about the scoping process are in the docket materials available via the eDocket search page: <https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showeDocketsSearch&searchType=new>. Line 3 Replacement Project docket numbers are PPL-15-137/CN-14-916. **NOTE:** To search, use the 2-digit number in the Year field and the 3-digit number in the Number field. For example, for the CN, input 14 in the Year field and 916 in the Number field.

<b>TABLE 1 Definition of System, Route, and Route Segment Alternatives</b>			
<b>Category</b>	<b>Symbol</b>	<b>Definition</b>	<b>EIS Section</b>
System Alternative	SA	Route for a new pipeline with different origin, destination, or intermediate points of delivery than those proposed by the Applicant.	Certificate of Need Alternatives
Route Alternative	RA	Relatively long sections of new pipeline with the same origin, destination, and intermediate points of delivery as those proposed by the Applicant. Can be evaluated as an entire route.	Route Permit Alternatives
Route Segment Alternative	RSA	A short deviation along the Applicant’s preferred route (i.e., tenths of miles to a few miles in length). These begin and end at intermediate points along a route and are considered to resolve or mitigate a perceived localized resource conflict.	Route Permit Alternatives

## 3.2 Pipeline Alternatives Considered for Screening

### 3.2.1 System Alternatives

All of the system alternatives were initially identified during scoping for the Sandpiper Project in 2014. See Figure 1. During the Line 3 Replacement Project scoping process in 2015, all of these Sandpiper Project system alternatives were also proposed for the Line 3 Replacement Project.

All of these system alternatives were included in the Draft Scoping Decision Document for the Line 3 Replacement Project with the assumption that Line 3 could be collocated with the Sandpiper Project pipeline east of Clearbrook. On September 1, 2016, the North Dakota Pipeline Company requested the withdrawal of its route and CN applications.<sup>7</sup>

Because the system alternatives were initially developed as alternatives to the Sandpiper Project, they all (1) start in North Dakota for the purposes of carrying Bakken crude and (2) assume construction of a new terminal and associated facilities. None of the proposed Sandpiper Project system alternatives originally envisioned a connection to Line 3 or the existing Clearbrook Terminal. However, in 2015, the Minnesota DNR proposed changes to SA-03 in order to connect it into Line 3 and to avoid sensitive resources near the Detroit Lakes area and populated areas in the northern Twin Cities Metro area near North Branch. See Figure 1.

System alternatives SA-03-SP<sup>8</sup> and SA-04-SP have been further modified to make them feasible pipeline configurations for evaluation in this screening analysis. SA-03-SP was modified to include a connection to the existing Clearbrook Terminal in order to deliver crude oil to the Minnesota Pipeline system. This alternative is shown as SA-03-L3 in Figure 2. While this system alternative connects with the current Line 3 system, the split at Crookston would require construction of a new terminal and associated equipment at Crookston for reasons summarized below.

SA-04-SP was modified for Line 3 to integrate the objectives of a number of different Sandpiper Project system alternatives, providing a direct pipeline to refineries in the Chicago area, thereby avoiding the lakes/headwaters area in northern Minnesota. As noted above, SA-04-SP did not originally include a connector to the Line 3 system. Pipelines, however, must connect to a source in order to serve the basic function of transporting oil. So, SA-04-L3 was modified to connect to Line 3 by including a link between SA-04-SP and the existing Line 3 along the North Dakota-Minnesota border (Figure 2). This system alternative is included as SA-04-L3 in this alternatives screening analysis.

### 3.2.2 Route Alternatives

As a result of the 2016 scoping for the Line 3 Replacement Project and Sandpiper Project EISs, refinement of the preferred route by Enbridge, and input from Minnesota Department of Natural Resources (Minnesota DNR), Minnesota Pollution Control Agency (Minnesota PCA), and DOC-EERA, five route alternatives were identified for screening in this analysis.

The five route alternatives are summarized in Table 2 and are described in detail in Appendix A, Table A-1. The route alternatives are shown on Figure 2.

EERA reconfigured one system alternative proposed in the Sandpiper Project proceedings (SA-03-SP) into a new Line 3 Replacement Project route alternative by connecting it directly into the existing Clearbrook Terminal to provide a connection to the Minnesota Pipeline system. From Clearbrook, the route runs 60 miles west to a site near Crookston, Minnesota where a Clearbrook-West terminal was originally under consideration as part of the Sandpiper Project. The applications for the Sandpiper Project have since been withdrawn. Nevertheless, the reconfigured and re-classified route alternative (now called RA-03-L3, with no new terminal) is shown on Figure 2, and was included in this analysis.

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<sup>8</sup> The SP indicates the system alternative originally proposed for Sandpiper Project, L3 ending indicates system alternative modified for inclusion in Line 3 Replacement Project Scoping.

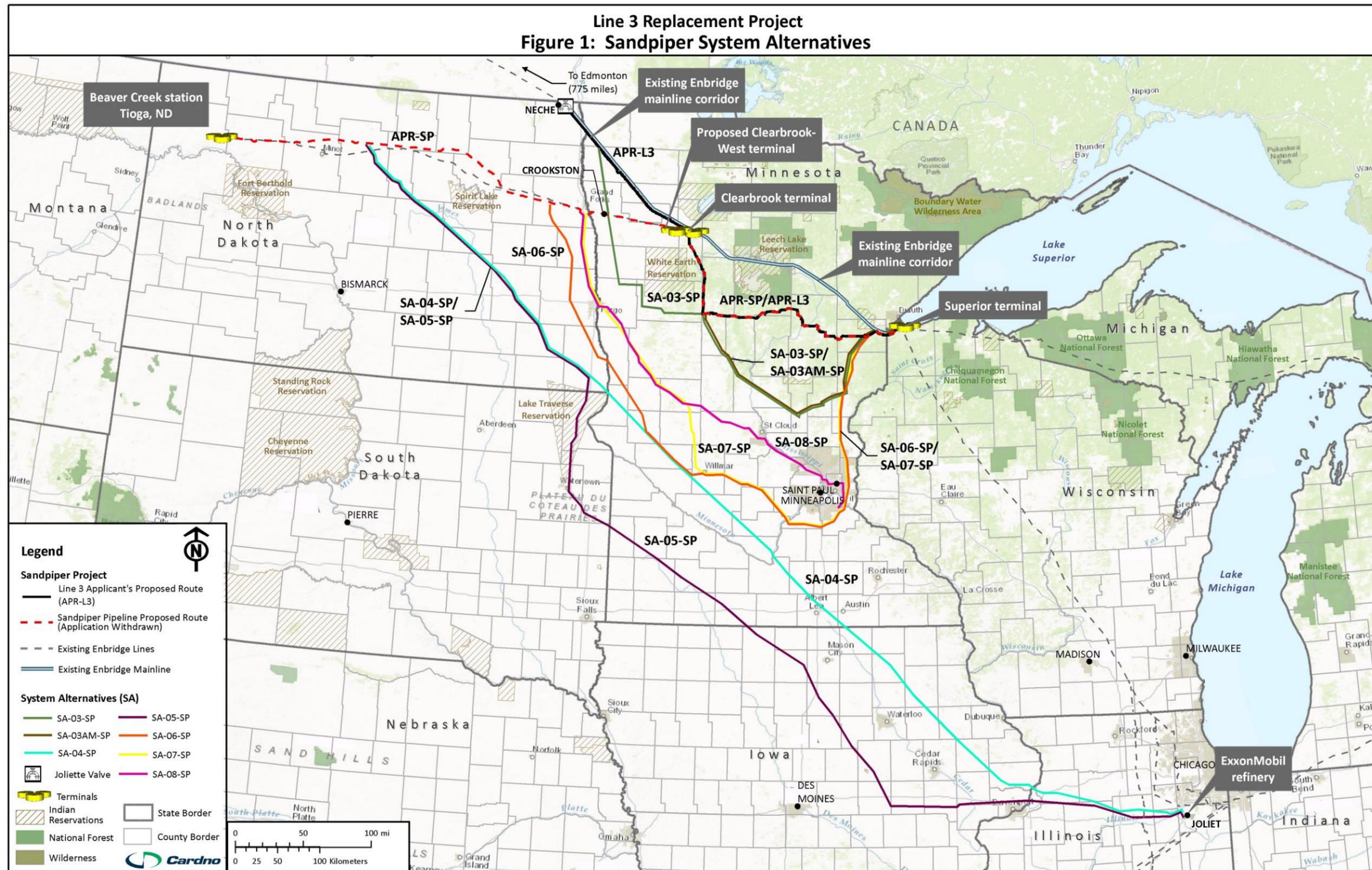


Figure 1 Sandpiper Pipeline System Alternatives.

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### 3.2.3 Line 3 Replacement Route Segment Alternatives

As a result of the 2014 and 2015 scoping processes, Enbridge has incorporated 29 proposed route segment alternatives into its preferred route for the Line 3 project. Twenty one route segment alternatives were not incorporated. Two new route segment alternatives were identified during scoping in 2016. Thus, a total of 23 route segment alternatives remain to be considered (Appendix A, Table A-2). These route segment alternatives will not be screened but each will be included and analyzed in the Line 3 Replacement Project EIS.

## 4.0 Alternatives Screening Process

### 4.1 Selection of Screening Criteria

DOC-EERA used Minn. R. 4410.2300(G)<sup>9</sup> as the primary criteria to determine if alternatives identified in the scoping process were reasonable alternatives to evaluate in detail in the EIS. The criteria states that an alternative may be excluded from detailed analysis if:

*It would not meet the underlying need for or purpose of the project, it would likely not have any significant environmental benefit compared to the project as proposed, or another alternative, of any type, that will be analyzed in the EIS would likely have similar environmental benefits but substantially less adverse economic, employment, or sociological impacts.*

Alternatives are often screened from further analysis in an EIS based on whether they meet a project's stated purpose and need. However, in this case need is determined by the PUC in its CN decision. Therefore, the "underlying need for or purpose of" the project was not used as an initial screen for the alternatives.

Using the remaining criteria in Minn. R. 4410.2300(G), an alternative was screened out of further analysis in the EIS if (1) it would likely not have any significant environmental benefit compared to the proposed project; or if (2) another alternative would likely have similar environmental benefits to another alternative but substantially less adverse economic, employment or sociological impacts. When testing potential alternatives to determine if they met the criteria, environmental benefits were assessed first, and if an alternative met that criteria, other criteria were then considered.

In addition to the criteria set forth in Minn. R. Chapter 4410, the PUC must also consider the criteria for the CN and the route permit. The regulations for evaluating alternatives in the need decision are found in Minn. R. 7853.0120 and Minn. R. 7853.0130(B). The regulations for considering route alternatives in the route permit decision are found in Minn. R. 7852.1900. All include consideration of project cost, efficient use of resources, and technical feasibility. On this basis a third criterion—"regulatory and economic feasibility"—was also used in the evaluation of alternatives. This third criterion is in effect a

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<sup>9</sup> Minn. R. 4410.2300(G)

subset of economic, employment or sociological impacts relevant to the evaluation of pipeline alternatives to the Line 3 Replacement Project.





<b>TABLE 2</b> <b>System and Route Alternatives – Line 3 Replacement Project</b>							
Alternative (Previous Designation)	Origin	Intermediate Terminal	Destination	General Orientation	Total Length (Miles)	Minnesota (Miles)	States
<b>Applicant’s Preferred Route</b>							
APR-L3	Neche, ND	None	Superior, WI	APR-L3 would begin at the Joliette Valve near Neche (Pembina County) in the northeast corner of ND. The existing Line 3 pipeline extends upstream of the Joliette Valve into Canada, to existing crude oil production facilities located in Alberta. From the Joliette Valve, the APR-L3 would parallel the existing Enbridge mainline system to the Clearbrook terminal in Clearbrook, MN. At Clearbrook the route would turn south, paralleling the route of the Minnesota Pipe Line Company pipeline to a point south of Park Rapids, where it would turn eastward and parallel an existing transmission line corridor until it intersected the existing Enbridge Mainline System corridor in Carlton County. It would follow the existing Enbridge Mainline System corridor into Wisconsin, terminating at the Enbridge terminal at Superior, WI. Enbridge has requested a 750-foot-wide right-of-way along the route. The Project would also include construction of pump stations and control valves along the route.	378	337	ND MN WI

<b>TABLE 2 System and Route Alternatives – Line 3 Replacement Project</b>							
<b>Alternative (Previous Designation)</b>	<b>Origin</b>	<b>Intermediate Terminal</b>	<b>Destination</b>	<b>General Orientation</b>	<b>Total Length (Miles)</b>	<b>Minnesota (Miles)</b>	<b>States</b>
<b>System Alternative</b>							
SA-03-L3	Neche, ND	Crookston (Polk Co., MN)	Superior, WI	This alternative would follow the Applicant’s preferred route from Neche, ND to its intersection with the Viking Natural Gas Line in Marshall County. It would then follow the Viking pipeline along U.S. Highway 75 through Polk County to just west of Crookston, MN, where a new terminal would be required to deliver crude oil to the Clearbrook Terminal and the Minnesota Pipeline system. From there, this alternative follows the originally proposed Sandpiper Project SA-03 alternative along the Viking Pipeline toward North Branch, MN. It then turns north to Superior, WI, following existing pipeline corridors.	514.7	473.9	ND MN WI
SA-04-L3 (Alliance-Chicago)	Neche, ND	None	Joliet, IL	This alternative would follow APR-L3 from near Neche (Pembina County), ND, approximately to its crossing with U.S. Highway 29. It would then turn south and run parallel to U.S. Highway 29 to the southern border of ND, where it would intersect and then follow the Alliance pipeline alignment to the vicinity of Joliet, IL.	781	248	ND SD MN IL IA

<b>TABLE 2 System and Route Alternatives – Line 3 Replacement Project</b>							
<b>Alternative (Previous Designation)</b>	<b>Origin</b>	<b>Intermediate Terminal</b>	<b>Destination</b>	<b>General Orientation</b>	<b>Total Length (Miles)</b>	<b>Minnesota (Miles)</b>	<b>States</b>
<b>Route Alternatives</b>							
RA-03-L3 (Viking-Branch-Superior)	Neche, ND	None	Superior, WI	This alternative would follow APR-L3 from Neche (Pembina County), ND, southeasterly to Enbridge’s Clearbrook terminal, where it would interconnect with the Minnesota Pipe Line Company pipeline system. The route would then turn and run west, parallel to the existing Line 81 pipeline to the vicinity of Crookston, MN. The pipeline would continue south following the existing Viking pipeline. In Clay County, MN, it would continue southeast, following the Viking pipeline toward North Branch, MN. It would then turn north to Superior, WI, following existing pipeline corridors.	556	515	ND MN WI
RA-03AM-L3 (as modified)	Neche, ND	Clearbrook (Clearwater County, MN)	Superior, WI	This alternative would follow APR-L3 from near Neche (Pembina County), ND, southeasterly to the vicinity of Clearbrook and would interconnect to the location of where the Sandpiper Clearbrook-West terminal had been proposed. South of the location of where the Sandpiper Clearbrook-West terminal had been proposed, the route would follow the same route as RA-03-L3 to Superior.	434	396	ND MN WI
RA-06-L3	Neche, ND	Clearbrook (Clearwater County, MN)	Superior, WI	This alternative follows APR-L3 from near Neche (Pembina County), ND, southeasterly to the Clearbrook terminal at Clearbrook. From Clearbrook to Superior, WI, the route would be located to the north of the existing Enbridge Mainline System corridor.	355	315	ND MN WI

<b>Alternative (Previous Designation)</b>	<b>Origin</b>	<b>Intermediate Terminal</b>	<b>Destination</b>	<b>General Orientation</b>	<b>Total Length (Miles)</b>	<b>Minnesota (Miles)</b>	<b>States</b>
RA-07-L3	Neche, ND	Clearbrook (Clearwater County, MN)	Superior, WI	This alternative would follow APR-L3 from near Neche (Pembina County), ND, southeasterly to the Clearbrook terminal at Clearbrook. From Clearbrook to Superior, WI, the route would be located along the existing Enbridge Mainline System corridor. Route alternative RA-07 would involve the removal of the existing Line 3 and construction of the new Line 3 in the same trench.	327	286	ND MN WI
RA-08-L3	Neche, ND	Clearbrook (Clearwater County, MN)	Superior, WI	This alternative would follow APR-L3 from near Neche (Pembina County), ND, southeasterly to the Clearbrook terminal at Clearbrook. From Clearbrook to Superior, WI, the route would be located along the existing Enbridge Mainline System corridor, following the same general configuration as RA-07-SP to Superior, except that in the portion of the route located in Beltrami, Cass, Itasca, and St Louis counties, the route has been repositioned south and parallel to U.S. Highway 2.	324	284	ND MN WI

Notes: APR-L3 = Applicant’s preferred route for the Line 3 Replacement Project

## 4.2 Selection of Evaluation Factors

Using the criteria from Minn. R. 4410.2300(G), a set of evaluation factors was identified to evaluate “environmental,” “socioeconomic,” and “regulatory and economic feasibility.” Selection of evaluation factors was governed by (1) the criteria to be evaluated and (2) the availability of data to make uniform assessments of the alternatives relative to the relevant Applicant’s preferred route and the other alternatives. Factors that could not be assessed with readily available computerized data were reevaluated; in some cases surrogate data were identified. For the environmental evaluation factors, some data were available only within the state of Minnesota, limiting the evaluation of some factors to the Minnesota portions of the alternatives.

The specific evaluation factors included within each of the three primary criteria are listed below. The data sources used to assess each evaluation factor and additional description of its purpose in the evaluation can be found in Appendix B.

### 4.2.1 Environmental Factors

Factors evaluated for the entire length of each pipeline alternative were:

- Slopes: Percent of route in area of slopes greater than 15 percent,
- Rivers Crossed: Number of rivers crossed that are listed on the Nationwide Rivers Inventory (NRI) and Wild and Scenic Rivers inventory,
- Major Rivers Crossed: Number of major rivers crossed,
- Wetlands: Number of acres of jurisdictional wetlands within 0.5 mile of the pipeline alternative centerline,
- Prime Farmlands: Number of acres of prime farmlands within 0.5 mile of the pipeline alternative centerline,
- Old-Growth Timber: Number of acres of old-growth timber stands within 0.5 mile of the pipeline alternative centerline,
- Protected Lands: Number of acres of protected (National Gap Analysis Program [GAP]) lands within 0.5 mile of the pipeline alternative centerline,
- Protected Species: Occurrences of protected species (under the Endangered Species Act) within 1 mile of the pipeline alternative centerline, and
- GAP/Risk Species: Number of acres of habitat of at-risk species listed on the GAP index.

Additional factors only available for the Minnesota portion of each pipeline alternative:

- Soil Erosion Potential: Percent of route with few or no erodible soils,
- Water Supply Wells: Number of shallow (less than 50 feet deep) water wells within 2 miles of the pipeline alternative centerline,
- Sites of Biodiversity: Number of acres of high or outstanding biodiversity within 0.5 mile of the pipeline alternative centerline,

- Lakes of Significant Biodiversity: Number of lakes of significant biodiversity within 1 mile of the pipeline alternative centerline,
- Wild Rice: Number of lakes or river sites for production of wild rice within 1 mile of the pipeline alternative centerline,
- Water Quality: Percent of pipeline route alternative located in areas of least water quality impact based on the water quality health index, and
- Calcareous Fens: Number of calcareous fens located within 0.5 mile of the pipeline alternative centerline.

#### 4.2.2 Socioeconomic Factors

- Adjacent Population: Total population living within 0.5 mile of the pipeline alternative centerline,
- Population Density: Length of pipeline alternative located in areas of population density greater than 1,000 persons per square mile (urban density),
- Percent Minority: Percent of total population within 0.5 mile of the pipeline alternative centerline classified by the census as racial minority,
- Low Income: Percent of total population within 0.5 mile of the pipeline alternative centerline classified by the census as low income,
- Recreation Sites: Number of recreation sites within 0.5 mile of the pipeline alternative,
- Annual Crop Value: Annual value of field crops grown within 0.5 mile of the pipeline alternative,
- Annual Wild Rice Crop Value: Annual value of wild rice crops harvested within 0.5 mile of the pipeline alternative,
- Forest Production Value: Annual value of forest production within 0.5 mile of the pipeline alternative,
- Construction Disturbance – Roads: Number of road crossings along the pipeline alternative where road use would be interrupted by construction, and
- Employment: Total Project direct and induced employment for pipeline construction.

#### 4.2.3 Regulatory and Economic Feasibility

- Length: Pipeline alternative total length from origin to destination and length of pipeline alternative within Minnesota,
- Tribal Lands Crossed: Miles of Tribal lands crossed that would require additional approval by the tribal governments and federal agencies,
- Perennial Stream Crossings: Number of perennial (constantly flowing) streams crossed by the pipeline alternative that may require special construction procedures and permits,
- Intermittent Stream Crossings: Number of intermittent (not always flowing) streams crossed by the pipeline alternative that may require special construction procedures and permits,

- Route Co-location: Percent of pipeline alternative co-located with other major infrastructure facilities including pipelines, transmissions lines, and major highways,
- Capital Cost Ratio: Capital cost of the pipeline alternative compared to the Applicant's preferred route; includes a general estimate of costs based on pipeline length, number of pump stations, and number and type of water crossings,
- Supply to Minnesota Refineries: Annual production capacity of refineries located in Minnesota that could be supplied by the pipeline alternative, and
- Pump Stations: General number of pump stations located along the pipeline alternative based on overall length that will require electrical energy.

### 4.3 Data Sources for Screening Criteria

The data used to compare alternatives were obtained from federal, state, and local government public databases. Additional data for the Applicant's preferred route were obtained from the Applicant. The analysis considered potential effects along the entire length of each route beyond the width of construction disturbance, so broad geographic coverage for each route was required. Data from agencies for multiple states were canvassed to assemble the necessary geographic coverage within the six states associated with the range of system and route alternatives to prepare a comprehensive screening analysis. An extensive geospatial data library was developed for the following subjects:

- Natural environment/biological resources (water, wetlands, soils, vegetation, animals),
- Boundaries/recreation (parks, forest, refuges, trails, management areas),
- Rare and unique biological resources (plants and animals),
- High-consequence areas (populations, sensitive ecological areas),
- Economics (housing, property values, income), and
- Transportation and public services (roads, utilities, airports, schools, churches)

A listing and descriptive information for all the obtained data layers is summarized in Appendix B. Publicly available data sources included Minnesota-specific data and national datasets that provided consistent and comprehensive spatial coverage for all the system and route alternatives. Data sources included:

- Minnesota Geospatial Commons
- Minnesota DNR
- Minnesota Department of Transportation
- U.S. Census Bureau
- U.S. Geological Survey
- Natural Resources Conservation Services
- U.S. Department of Agricultural
- Federal Emergency Management Agency

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- Natural Heritage Information System
- U.S. Fish and Wildlife Service
- National Pipeline Mapping System
- U.S. Environmental Protection Agency
- Environmental Systems Research Institute

The range of environmental and socioeconomic data supporting the evaluation factors are graphically presented in Project-wide and Minnesota-specific maps in Appendix C.

## 4.4 Screening Analysis Methodology

Each pipeline alternative and the Applicant’s preferred route were assessed for each evaluation factor. The evaluation results are summarized in Table 3 and provided in greater detail in Table 4. The evaluation factors in Table 4 are grouped by the overall criteria: environmental, socioeconomics, and regulatory and economic feasibility.

Using the screening criteria and evaluation factors, the Applicant’s preferred route was compared to the two system alternatives and five route alternatives (Table 2). The alternatives were then compared to each other. This allowed the alternatives to be assessed individually and within groups of alternatives so that system and route alternative(s) could be assessed relative to environmental benefit, socioeconomic effects, and regulatory and economic feasibility. Through this process any alternatives that did not provide substantial benefits relative to the project as proposed, or another alternative that will be analyzed in the EIS (including both system alternatives and route alternatives) were identified and screened out. In addition, any alternatives that would likely have similar environmental benefits but substantially less adverse economic, employment, or sociological impacts than the project as proposed, or another alternative that will be analyzed in the EIS (including both system alternatives and route alternatives) were identified and screened out.

To assist review of the evaluation results, Table 4 has been color coded. Where an alternative rates at least 20 percent greater benefit than the Applicant’s preferred route for a criteria, a light green color has been applied to the table cell. Where the result is at least 40 percent greater benefit for a criterion, dark green has been applied. Conversely, an alternative that provides 20 percent lower benefit than the Applicant’s preferred route is colored light red, and one that provides at least 40 percent lower benefit than the Applicant’s preferred route is indicated via dark red background.

## 5.0 Screening Analysis Results

The screening analysis recommendations for the Line 3 Replacement Project are shown in Table 3, and the locations of alternatives recommended as reasonable are shown in Figure 3. The basis for these recommendations is discussed in the following section. The analysis shown in Table 4 was reviewed by DOC-EERA in collaboration with staff from Minnesota DNR and Minnesota PCA to identify alternatives to be recommended for detailed analysis in the EIS. Staff from the three agencies discussed the analysis and then DOC-EERA formulated the recommendations shown in Table 3. The basis for these findings is discussed in subsections 5.1.1 and 5.1.2.

<b>TABLE 3 Line 3 Replacement Project Pipeline Screening Evaluation – Results/Recommendations</b>		
<b>Criteria Category</b>	<b>System Alternatives</b>	<b>Route Alternatives</b>
<b>Recommendation for detailed evaluation in the EIS and consideration in the contested case hearing</b>	<b>SA-04-L3</b>	<b>RA-03AM-L3 RA-06-L3 RA-07-L3 RA-08-L3</b>

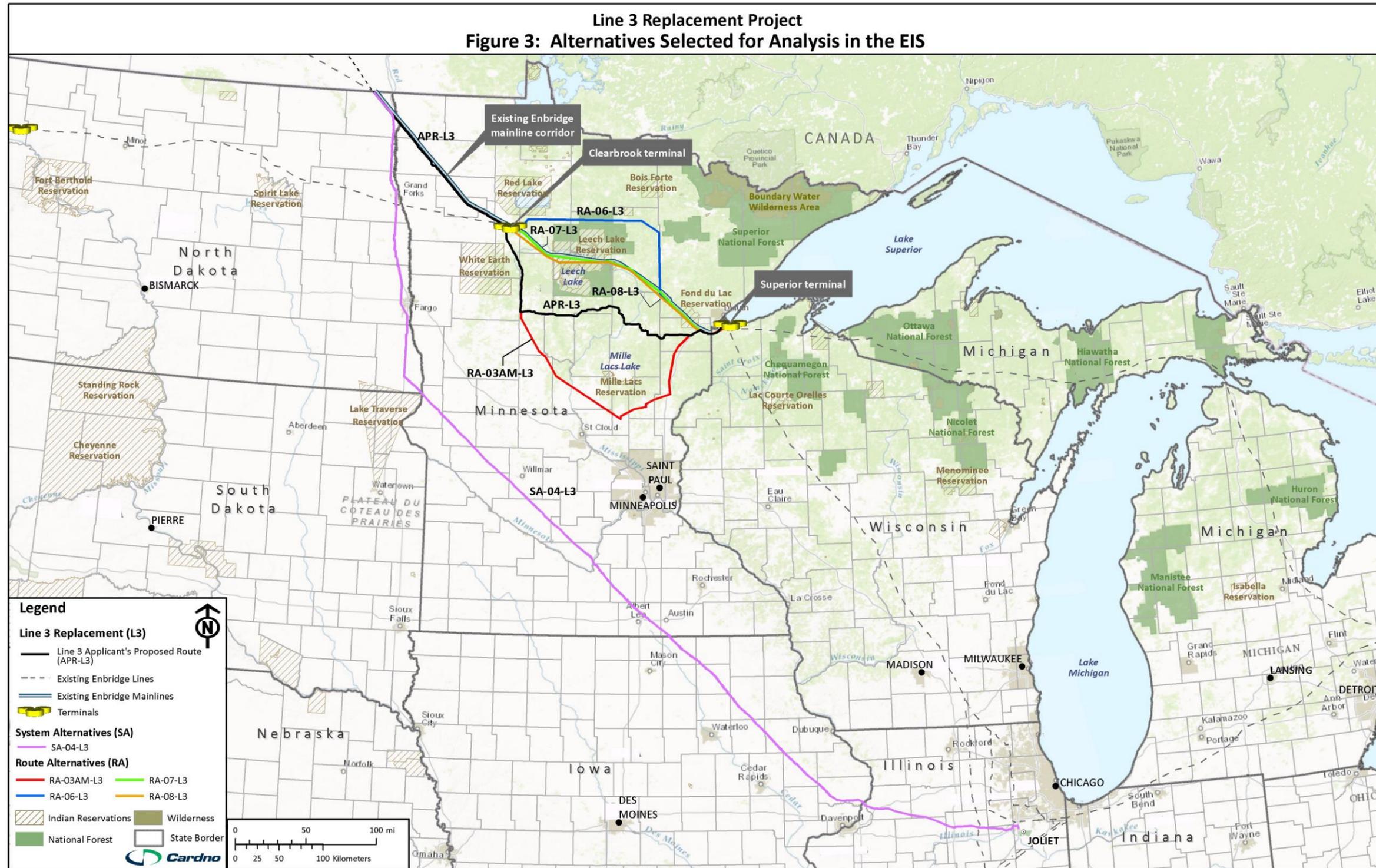


Figure 3 Line 3 Replacement Project – Alternatives Selected for Analysis in the EIS.

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<b>TABLE 4</b>								
<b>Line 3 Replacement Project – System/Route Alternatives Screening Evaluation Summary</b>								
Evaluation Factors	Applicant's Preferred Route (APR-L3)	System Alternative		Route Alternatives				
		SA-03-L3	SA-04-L3	RA-03-L3	RA-03AM-L3	RA-06-L3	RA-07-L3	RA-08-L3
<b>Criteria: Environmental Benefits</b>								
<i>Criteria Evaluated for Entire Route for Each Alternative</i>								
Slopes >15% (% of route)	2.90%	2.00%	0.70%	2.00%	2.50%	2.50%	1.70%	1.60%
NRI and Wild/Scenic Rivers Crossed	11	6	6	8	8	18	6	6
Major Rivers Crossed	35	66	68	67	48	35	24	25
Wetlands (acres within 0.5 mile)	41,770.00	42,890.00	10,602.80	45,351.60	42,944.50	49,314.70	41,818.90	45,276.30
Prime Farmlands (acres within 0.5 mile)	43,873.01	45,617.05	194,669.60	57,439.21	42,174.77	52,872.73	31,668.33	37,082.60
Old Growth Timber Forest Stands (Acres within 0.5 miles)	12.9	0	0	0	0.4	82.1	88.5	88.4
Protected (GAP) (acres within 0.5 mile)	1,933	5,679	38,051	5,686	2,744	1,153	294	837
GAP/Risk Species Habitat (acres within 1 mile)	18,313.71	15,060.00	4,696.16	15,834.06	12,490.42	71,718.39	41,861.26	40,713.04
Endangered Species Act Protected Species (numbers within 1 mile)	11	10	22	12	12	12	12	12
<i>Criteria Evaluated for Minnesota Portion of Alternative Only</i>								
Route % – Minnesota (for reference only)	89.20%	92.10%	31.80%	92.70%	90.60%	88.50%	87.50%	87.40%
Soil Erosion Potential (% of route with few to no erodible soils)	53%	41%	27%	46%	43%	52%	65%	62%
Number of wells (<50-foot depth within 1 mile)	390	1,062	117	1,090	1,113	445	487	326
Medium/High/Outstanding	372.12	998.10	367.2	1,370.37	375.83	372.11	372.11	372.12

<b>TABLE 4</b>								
<b>Line 3 Replacement Project – System/Route Alternatives Screening Evaluation Summary</b>								
<b>Evaluation Factors</b>	<b>Applicant’s Preferred Route (APR-L3)</b>	<b>System Alternative</b>		<b>Route Alternatives</b>				
		<b>SA-03-L3</b>	<b>SA-04-L3</b>	<b>RA-03-L3</b>	<b>RA-03AM-L3</b>	<b>RA-06-L3</b>	<b>RA-07-L3</b>	<b>RA-08-L3</b>
Prairies Biodiversity Rank (acres in 0.5 mile)								
High/Outstanding Sites of Biodiversity Significance (acres within 0.5 miles)	3,552.70	1254	643	2,084.20	2,568.20	1,968.00	2,253.80	4,460.50
Lakes of Significant Biodiversity within 1 mile	19	7	3	10	11	9	34	33
Wild Rice Lakes/Rivers within 0.5 mile	20	11	0	11	13	4	12	12
Water Quality Health Index (% route with least impacted)	32%	5%	0%	5%	9%	21%	37%	39%
Calcareous Fens within 0.5 mile	5	1	1	6	5	5	5	5
<b>Criteria: Socioeconomic Benefits</b>								
Adjacent Population within 0.5 mile	142,154	108,057	198,554	184,379	180,397	137,976	175,885	183,768
Population Density (>1,000/sq. mile) <sup>1</sup>	-	0.26	6.22	0.26	0.26	1.27	0.26	0.26
% Racial Minority	4.70%	4.50%	4.60%	4.40%	4.50%	6.90%	9.30%	8.40%
% Low Income	11.60%	11.60%	9.00%	11.80%	12.00%	12.30%	13.10%	12.70%
Adjacent Recreation Sites within 0.5 mile	10	1	6	4	6	9	6	8
Annual Crop Value within 0.5 mile	\$44,744,508	\$97,747,969	\$232,597,547	\$100,543,663	\$64,025,771	\$38,836,959	\$35,825,060	\$36,936,406
Annual Wild Rice Value within 0.5 mile	\$923,879	\$1,181,886	\$0	\$1,181,886	\$1,045,141	\$498,182	\$1,759,395	\$1,490,399
Forest value within 0.5 mile	\$9,296,628	\$6,667,718	\$1,253,751	\$7,117,012	\$8,358,352	\$7,265,582	\$5,539,479	\$5,758,059

<b>TABLE 4</b>								
<b>Line 3 Replacement Project – System/Route Alternatives Screening Evaluation Summary</b>								
Evaluation Factors	Applicant’s Preferred Route (APR-L3)	System Alternative		Route Alternatives				
		SA-03-L3	SA-04-L3	RA-03-L3	RA-03AM-L3	RA-06-L3	RA-07-L3	RA-08-L3
Construction Disturbance – Roads	791	1,297	2,175	1,423	1,106	677	817	826
Direct/Induced Construction Employment	19,520	26,558	40,272	28,703	22,411	18,334	16,880	16,731
<b>Criteria: Regulatory and Economic Feasibility</b>								
Total Length (miles)	378.3	514.7	780.5	556.3	434.3	355.3	327.1	324.2
Minnesota Length – for reference only (miles)	337.5	473.9	248	515.4	393.5	314.5	286.3	283.4
Tribal Lands Crossed (miles)	0	0	0	0	0	12.94	55.92	55.86
Perennial Stream Crossings	76	82	124	168	108	71	62	69
Percent of Route Co-Located with Infrastructure	84.50%	81.30%	61.40%	88.50%	97.40%	56.20%	100.00%	100.00%
Intermittent Stream Crossings	43	157	425	86	59	72	44	50
Capital Cost Ratio to APR	1	1.26	1.68	1.37	1.11	0.9	0.86	0.84
Supply to Minnesota Refinery (bbl)	359.5	359.5	0	359.5	359.5	359.5	359.5	359.5
Number of Pump Stations (Energy)	8	10	16	11	9	7	7	6

Notes:

APR-L3 = Applicant’s preferred route for the Line 3 Replacement Project; bbl = barrels; GAP = National Gap Analysis Program; NRI = Nationwide Rivers Inventory

<sup>1</sup> Population density for the Applicant’s preferred route was less than 100 persons/square mi. for all but 0.53 miles where it was less than 500 persons/square mile. To assess 20 and 40 percent change, it was assumed that 1 mile of the Applicant’s preferred route had a density of greater than 1,000 persons/square mile.

## 5.1.1 System Alternatives SA-03-L3 and SA-04-L3

### 5.1.1.1 Evaluation of System Alternative SA-03-L3

Based on the results of the screening analysis, SA-03-L3 has certain environmental benefits compared to the project as proposed. However, there are other alternatives recommended for analysis in the EIS that would likely have similar environmental benefits but substantially less adverse economic and sociological impacts. Therefore SA-03-L3 is not recommended for further analysis in the EIS.

Compared to the Applicant's preferred route, SA-03-L3 has certain environmental benefits, but also some drawbacks. Because SA-03-L3 avoids the Mississippi River Headwaters area and lakes areas in northern Minnesota, its environmental benefits compared to Applicant's Proposed Route include significantly fewer Natural Resources Inventory (NRI) and Wild and Scenic River crossings, High/Outstanding Sites of Biodiversity Significance within 0.5 miles, Lakes of Significant Biodiversity within one mile, wild rice waters within 0.5 miles, calcareous fens within 0.5 miles, and waters with a Water Quality Health Index that indicates the lake is among the least impacted in the state. SA-03-L3 also avoids old growth forests and erodible soils to a greater extent than the Applicant's Proposed Route. Relative to some of the other environmental factors, however, SA-03-L3 has drawbacks including significantly more major river crossings, acres of protected (National Gap Analysis Program (GAP)) lands within 0.5 miles, wells with <50-foot depth within one mile, and acres of Medium/High/Outstanding Prairies with a Medium/High/Outstanding Biodiversity Rank within 0.5 miles.

While, on the whole, SA-03-L3's environmental benefits may be significant relative to the Applicant's Proposed Route, similar benefits are provided by RA-03AM-L3 and RA-06-L3 (both recommended for evaluation in the EIS as discussed in Section 5.1.2), but with substantially less adverse economic, employment, or sociological impacts and fewer economic and regulatory feasibility issues.

RA-03AM-L3 partially avoids the lakes areas in northern Minnesota and therefore offers generally similar benefits, with significantly fewer NRI and Wild and Scenic River crossings, High/Outstanding Sites of Biodiversity Significance within 0.5 miles, Lakes of Significant Biodiversity within one mile, wild rice waters within 0.5 miles, waters with a Water Quality Health Index that indicates the lake is among the least impacted in the state, and acres of old growth forest within 0.5 miles. While RA-03AM-L3 does not offer as strong a benefit as SA-03-L3 in some of these categories, it provides benefits to some of the factors that SA-03-L3 does not (e.g., number of acres of habitat for at-risk species within one mile). Overall then, they appear to rank similarly in the assessment relative to the environmental benefit criteria. RA-06-L3 also offers similar benefits to SA-03-L3 as it avoids the lakes areas in northern Minnesota as well as the Mississippi River headwaters area. RA-06-L3 has generally similar benefits to SA-03-L3 in terms of avoiding High/Outstanding Sites of Biodiversity Significance within 0.5 miles, Lakes of Significant Biodiversity within one mile, wild rice waters within 0.5 miles, and waters with a Water Quality Health Index that indicates the lake is among the least impacted in the state. Since these other alternatives recommended for analysis in the EIS would likely have similar environmental benefits as SA-04-L3, the analysis turned to economic and sociological impacts.

As shown in Table 4, SA-03-L3, RA-03AM-L3 and RA-06-L3 each have some socioeconomic and economic and regulatory feasibility benefits and some drawbacks when compared to one another. However, SA-03-L3 has more potential impacts to human settlement as it crosses significantly more high population density areas. In addition, because of its greater length, and the need for additional, redundant infrastructure, SA-03-L3 is more expensive and is a significantly less efficient use of resources than RA-

03-AM or RA-06-L3. For the SA-03-L3 system alternative to be viable, construction of a new a pipeline terminal and associated breakout tanks, pumps and other equipment would be necessary in the Crookston area. This system alternative was developed assuming the construction of both the Sandpiper Project and Line 3 Replacement Project. The proposed withdrawal of the Sandpiper Project applications makes construction of a new terminal unnecessary. SA-03-L3 would require a new terminal roughly equivalent in size to the Clearbrook West tank farm proposed as part of the Sandpiper Project.<sup>10</sup> This terminal would serve a redundant function to the existing Clearbrook tank farm. While Table 4 quantifies the additional length and cost associated with SA-03-L3, it is important to note that RA-03AM-L3 and RA-06-L3 also avoid the significant socioeconomic impacts and regulatory feasibility challenges associated with the construction of a new, redundant, greenfield terminal, which are not quantified in the table. Pipeline terminals have significant land requirements and require construction and ongoing operation of pumps, tanks with approximately 300,000 barrels of capacity, fire suppression systems, and emergency response systems. RA-03AM-L3 and RA-06-L3 avoid expansion of the footprint of the pipeline system and would avoid introducing, for example, new and redundant risk management, emergency response, security, and construction and operating costs.

Because this analysis indicates that there are other alternatives recommended for analysis in the EIS that would likely have similar environmental benefits but substantially less adverse economic and socioeconomic impacts than SA-03-L3, it is not recommended for further analysis in the EIS.

#### 5.1.1.1 Evaluation of System Alternative SA-04-L3

Based on the results of the screening analysis, SA-04-L3 has many environmental benefits compared to the project as proposed. The analysis did not definitively establish that other alternatives recommended for analysis in the EIS would likely have similar environmental benefits, so SA-04-L3 is recommended for further analysis in the EIS.

Relative to the Applicant's preferred route, SA-04-L3 has many environmental benefits, and just a few drawbacks. SA-04-L3 avoids much of northern and western Minnesota, so it avoids the Mississippi River Headwaters area and lakes areas in northern Minnesota as well as many of the designated high value lands and habitats identified within Minnesota. Its environmental benefits relative to Applicant's Proposed Route include significantly fewer crossings of highly sloped areas, NRI and Wild and Scenic River crossings, wetlands within 0.5 miles, acres of old growth timber forest within 0.5 miles, acres of habitat for at-risk species within one mile, High/Outstanding Sites of Biodiversity Significance within 0.5 miles, crossings of highly erodible soils, shallow wells within one mile, Lakes of Significant Biodiversity within one mile, wetlands within 0.5 miles, wild rice waters within 0.5 miles, calcareous fens within 0.5 miles, and waters with a Water Quality Health Index that indicates the lake is among the least impacted in the state. SA-04-L3's drawbacks include significantly more major river crossings, acres of prime farmland within 0.5 miles, acres of protected GAP lands within 0.5 miles, and species protected under the Endangered Species Act within one mile.

While the analysis in Table 4 quantifies the benefits of avoiding designated high value lands and habitats particular to Minnesota (e.g., High/Outstanding Sites of Biodiversity Significance, Lakes of Significant

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<sup>10</sup> As proposed, the Clearbrook West terminal required 26.3 acres of permanent impact

Biodiversity, Wild Rice Lakes/Rivers, and high Water Quality Health Index waters) by routing a significant portion of the pipeline outside of Minnesota, impacts to any high value areas in North Dakota have not been quantified. It is important to note that, because of this, some of the impacts avoided in Minnesota may be offset by impacts in North Dakota, Iowa, and Illinois that have not been reflected in the analysis.

SA-04-L3's environmental benefits are significant relative to the Applicant's Proposed Route, so the analysis turned to the assessment of whether other alternatives offered similar benefits to determine whether screening against the economic and socioeconomic criteria was warranted.

RA-03AM-LM partially avoids the lakes areas in northern Minnesota and therefore offers some similar benefits in terms of significantly fewer NRI and Wild and Scenic River crossings, High/Outstanding Sites of Biodiversity Significance within 0.5 miles, Lakes of Significant Biodiversity within one mile, wild rice waters within 0.5 miles, waters with a Water Quality Health Index that indicates the lake is among the least impacted in the state, and acres of old growth forest within 0.5 miles. RA-03AM-LM does not offer as strong a benefit as SA-03-L4 in some of these categories and provides notably less benefit than SA-03-L4 in terms of impacts to steep slopes and erodible soils, wetlands, calcareous fens and shallow wells. However it provides benefits to some of the factors that SA-03-L3 does not (e.g., number of acres of habitat of at-risk species, Endangered Species Act protected species within one mile, and impacts to prime farmland).

RA-06-L3 also offers benefits as it avoids the lakes areas in northern Minnesota as well as the Mississippi River headwaters area. Like SA-04-L3, RA-06-L3 has benefits in terms of avoiding High/Outstanding Sites of Biodiversity Significance, Lakes of Significant Biodiversity, wild rice waters, and waters with a Water Quality Health Index that indicates the lake is among the least impacted in the state. However, RA-06-L3 does not provide not provide benefits from a wild and scenic river crossing, old growth timber forest, at risk species habitat, soil erosion, or shallow well perspective. On the other hand, RA-06-L3 offers certain benefits that SA-04-L3 does not, including significantly fewer major river crossings, significantly less prime farmland acres within 0.5 miles, significantly fewer protected lands within 0.5 miles, and significantly fewer Endangered Species Act protected species within one mile.

Because the analysis does not indicate a clear similarity between the environmental benefits of other alternatives recommended for analysis in the EIS and SA-04-L3, SA-04-L3 is recommended for analysis in the EIS.

### **5.1.2 Route Alternatives RA-03-L3, RA-03AM-L3, RA-06-L3, RA-07-L3, and RA-08-L3**

The evaluation results for Route Alternatives RA-03-L3, RA-03AM-L3, RA-06-L3, RA-07-L3, and RA-08-L3 show the potential for environmental benefits compared to the Applicant's preferred route. The potential benefits of RA-03-L3 and RA-06-L3 are primarily associated with avoiding water resources in northern Minnesota (lakes region and Mississippi River headwaters), as discussed in detail above in Section 5.1.1., and include avoiding Wild and Scenic river crossings, areas of high biodiversity, high water quality lakes, and wild rice waters. As shown in Table 4, RA-03-L3 avoids the same water resources in northern Minnesota and has benefits compared to the Applicant's Proposed Route that are similar to RA-03-L3 and RA-06-L3. RA-07-L3 and RA-08-L3 offer some significant benefits compared to the Applicant's proposed route including crossing fewer highly sloped areas, NRI and Wild and Scenic Rivers, major rivers, protected lands and wild rice lakes. RA-07-L3 and RA-08-L3 do not avoid the lakes region and Mississippi River headwaters, but offer unique benefits of their own including avoiding highly sloped

areas and major river crossings, prime farm land and protected lands. In addition, RA-07-L3 and RA-08-L3 may offer additional benefits associated with following the existing Line 3 right-of-way, although these potential benefits are not quantified in Table 4.

With all alternatives having benefits compared to the Applicant's preferred route for the environmental criteria, and overall similar environmental benefits when compared to one-another, the screening analysis turned to the socioeconomic criteria. Table 4 shows that all of these route alternatives have both potential socioeconomic benefits and potential costs. However, RA-03-L3 is notably longer, more costly, and has more expected construction impacts than the rest of the group. These impacts are due to the extended length of the interconnection required to link this alternative into the Line 3 system. To develop RA-03-L3, system alternative SA-03-SP was modified to connect directly into the existing Clearbrook Terminal and then connect into a Clearbrook-West terminal that was to be located 60 miles west, near Crookston, Minnesota. At Crookston, the line would connect with SA-03. However, with the proposed withdrawal of the Sandpiper Project, there is no need for the Clearbrook-West terminal and the original synergies this route alternative was designed to take advantage of have been lost. At this juncture RA-03-L3 is simply longer and creates more costs and construction impacts than other route alternatives that provide similar benefits. Because the analysis indicates that there are other alternatives recommended for analysis in the EIS that would likely have similar environmental benefits but substantially less adverse economic and sociological impacts than RA-03-L3, it is not recommended for further analysis in the EIS.

## **Appendix A**

Line 3 Replacement Project System, Route, and Route Segment  
Alternatives

## System, Route, and Route Segment Alternatives

The 2014, 2015, and 2016 scoping periods resulted in a number of alternatives to Enbridge’s proposed route for the Line 3 Replacement Project (Applicant’s preferred route) to be considered in the process of preparing the Draft Environmental Impact Statements (DEIS). These alternatives are categorized as follows:

- **System alternatives (SAs):** Route for a new pipeline with different origin, destination, or intermediate points of delivery than those proposed by the Applicant.
- **Route alternatives (RAs):** Relatively long sections of new pipeline with the same origin, destination, and intermediate points of delivery as those proposed by the Applicant. These can be evaluated as an entire route.
- **Route segment alternatives (RSAs):** A short deviation along the Applicant’s preferred route (i.e., tenths of miles to a few miles in length). These begin and end at intermediate points along a route alignment and are considered to resolve or mitigate a perceived localized resource conflict.

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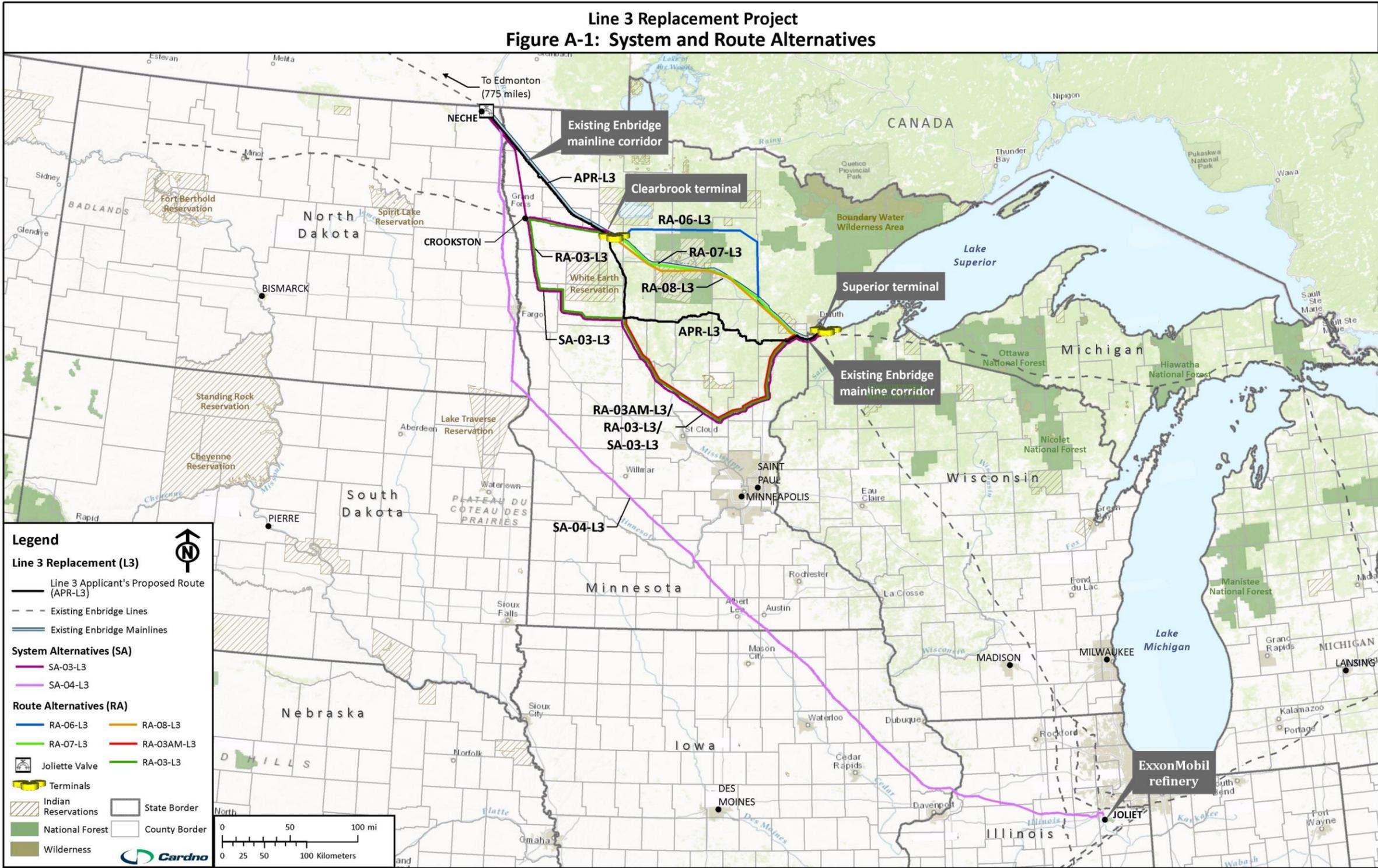


FIGURE A-1 Line 3 Replacement Project System and Route Alternatives

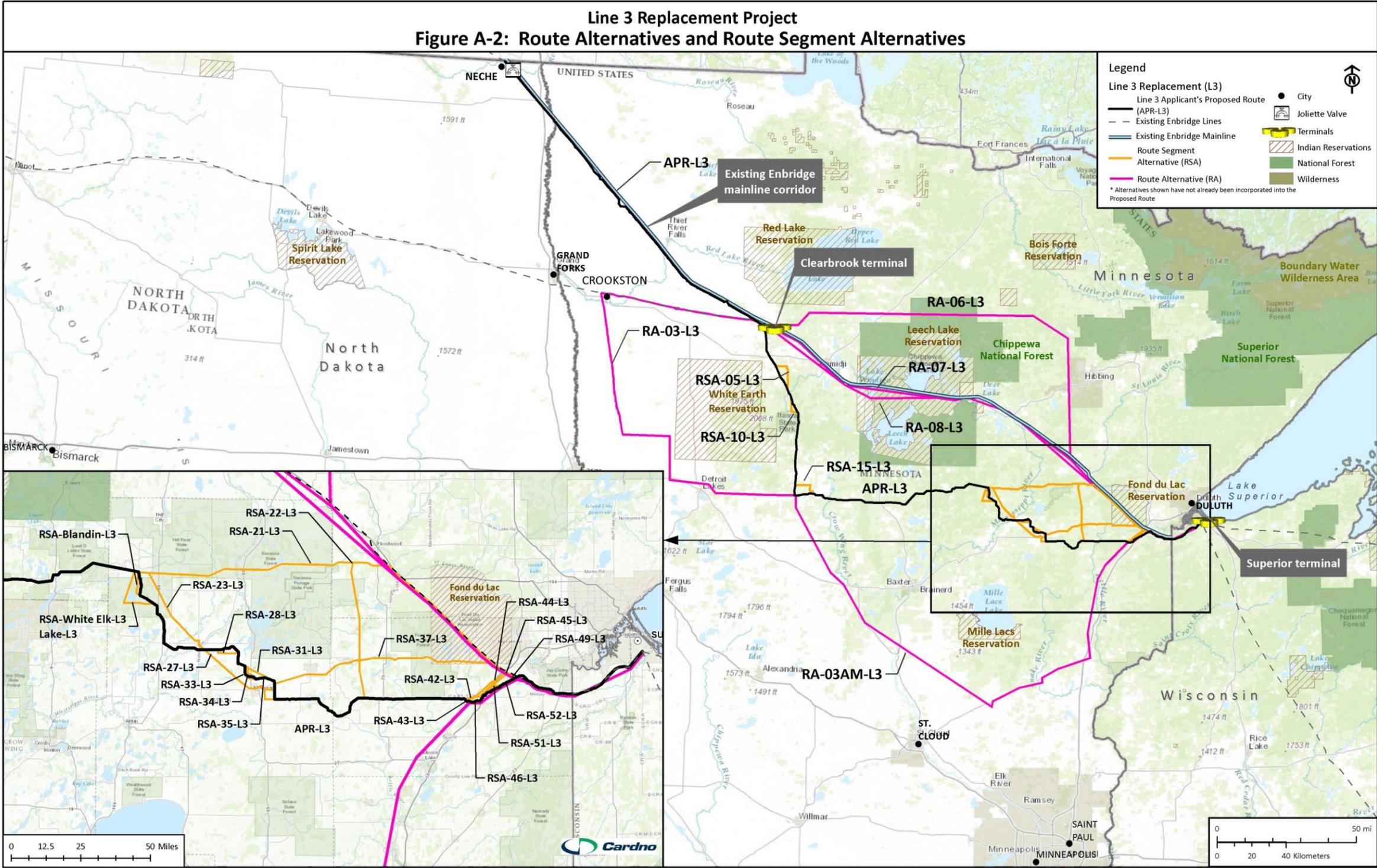


FIGURE A-2 Line 3 Replacement Project Route Segment Alternatives

TABLE A-1 Line 3 Replacement Project – System and Route Alternatives									
Alternative Name/Number	Origin Terminal	Intermediate Terminals	Destination Terminal	General Route Description (see Figure A-1 for locations)	Total Route Length (miles)	Route Length in MN (miles)	States Crossed	Counties Crossed (MN)	
Applicant's Preferred Route (APR-L3)	Joliette Valve, Neche, ND	Clearbrook Terminal (Clearwater County, MN)	Superior, WI	<p><b>Route:</b> The Applicant's preferred route (APR-L3) begins at the Joliette Valve located near Neche (Pembina County) in the northeast corner of North Dakota near the U.S.-Canadian border. The route follows the existing Line 3 pipeline corridor southeast, crossing into Kittson County, Minnesota, continuing southeast through Marshall, Pennington, Red Lake, and Polk counties, and arriving at Clearbrook in Clearwater County. The APR-L3 would interconnect with the existing Clearbrook terminal.</p> <p>From the Joliette Valve to Clearbrook, the Line 3 Replacement Project would be constructed in a ROW immediately adjacent to the existing Line 3 pipeline. From Clearbrook to its intersection with the Enbridge Mainline System in Carlton County, the Line 3 Replacement pipeline would be located in a new pipeline corridor, taking a more southerly route than the existing Line 3 pipeline route between Clearbrook and the Enbridge Mainline System corridor in Carlton County. The route would generally follow the existing Minnesota Pipe Line Company ROW south into Hubbard County. The route runs along the western border of Hubbard County to the locale of Park Rapids. South of Park Rapids, near the border of Wadena County, the route turns eastward and enters Cass County. It continues to the east across Aitkin County, generally following portions of existing ROWs for electric transmission lines through generally undeveloped and agricultural areas. In Aitkin County, the route tends to the southeast to the vicinity of McGregor and then turns east, entering the western portion of Carlton County south of State Route 210. The route continues east, intersecting the U.S. Highway 35 corridor where it trends to the northwest parallel to the interstate, and then turns eastward to the Minnesota-Wisconsin border. The pipeline route crosses the Minnesota-Wisconsin border approximately 5 miles east-southeast of Wrenshall, Minnesota, and terminates at Enbridge's terminal in Superior, Wisconsin.</p> <p>A route width of 750 feet (375 feet on each side of the pipeline centerline) is proposed except in the expanded route width areas already accepted by the PUC for further review for the project.<sup>1</sup></p> <p>The Project would also include construction and operation of access roads along the pipeline route where access from existing roads is not currently available. Terminal facilities at Clearbrook and pump stations and block valves along the pipeline route would also be required.</p>	378.3	337.5	3	12	
<b>Line 3 Replacement Route Alternatives</b>									
RA-03-L3	Joliette Valve, Neche, ND	Requires new terminal at Crookston (Polk County, MN)	Superior, WI	<p><b>Purpose of the Alternative:</b> Route Alternative RA-03-L3 was proposed by Minnesota PCA to consider a southerly route that avoids the Lakes region and less developed portions of the state. It was also proposed to parallel an existing pipeline ROW, thereby focusing pipeline construction and operations effects in an area already affected by a crude oil pipeline.</p> <p>This alternative would connect with the Clearbrook terminal and would be able to make deliveries to the MinnCan pipeline that serves the Northern Tier Energy and Flint Hills Resources refineries. If it included a new terminal at Crookston, it would be able to transfer crude oil into the Enbridge Mainline System for delivery to Superior.</p> <p><b>Route:</b> RA-03-L3 follows the APR-L3 (existing Enbridge Mainline System) from the Joliette Valve to the Clearbrook terminal then turns west for approximately 60 miles to the vicinity of Crookston to intersect the existing Viking pipeline corridor. Crookston is located approximately 20 miles east of the North Dakota-Minnesota border. At approximately Crookston, the route turns south and traverses Polk and Norman counties, generally along the Viking pipeline ROW. The route then crosses into Clay County, continuing southeast following the Viking pipeline corridor, and then turns easterly and traverses the southcentral portion of Becker County to the southwest corner of Hubbard County in the vicinity of Park Rapids, Minnesota. The route then turns southeasterly following the Minnkota Power Cooperative Transmission Line, across Wadena County, the northeast corner of Todd County, and diagonally across Morrison County. It continues across the northeast corner of Benton County and the southern portion of Mille Lacs County to the vicinity of Milaca. The route then turns northeasterly, generally following State Route 23 to approximately the vicinity of Hinckley in Pine County. It then turns northeasterly, paralleling the existing 8-inch Magellan Refined Products pipeline and/or a Northern Natural Gas Pipeline to a point where it meets the APR-L3 near Carlton in Carlton County and then continues to Superior, Wisconsin.</p>	556	515	3	11	
RA-03AM-L3	Joliette Valve, Neche, ND	Clearbrook Terminal	Superior, WI	<p><b>Purpose of the Alternative:</b> Route Alternative RA-03AM-L3 was proposed by Minnesota DNR to modify the Minnesota PCA route (RA-03-L3) and also consider a southerly route that avoids the Lakes region and less developed portions of the state.</p>	434	396	3	15	

TABLE A-1 Line 3 Replacement Project – System and Route Alternatives									
Alternative Name/Number	Origin Terminal	Intermediate Terminals	Destination Terminal	General Route Description (see Figure A-1 for locations)	Total Route Length (miles)	Route Length in MN (miles)	States Crossed	Counties Crossed (MN)	
		(Clearwater County, MN)		<p>This alternative reroutes around fens, fish hatcheries, and communities, and avoids some specific Wildlife Management Areas. It was also proposed to parallel an existing pipeline ROW, thereby focusing pipeline construction and operations effects in an area already affected by a crude oil pipeline. RA-03AM-L3, however, is routed through Clearbrook, providing access to the Clearbrook terminal and allowing deliveries to the Northern Tier Energy or Flint Hills Resources refineries through the MinnCan pipeline.</p> <p><b>Route:</b> RA-03AM-L3 follows APR-L3 (existing Enbridge Mainline System) from the Joliette Valve to the Clearbrook terminal (see description above). From Clearbrook the route would generally follow the existing Minnesota Pipe Line Company ROW south into Hubbard County. The route runs along the western border of Hubbard County to the locale of Park Rapids. The route then turns southeasterly, following the Minnkota Power Cooperative transmission line, across Wadena County, the northeast corner of Todd County, and diagonally across Morrison County. It continues across the northeast corner of Benton County and the southern portion of Mille Lacs County to the vicinity of Milaca. The route then turns northeasterly, generally following State Route 23 to approximately the vicinity of Hinckley in Pine County. It then turns northeasterly, paralleling the existing 8-inch Magellan Refined Products pipeline and/or a Northern Natural Gas pipeline to a point where it meets the APR-L3 near Carlton in Carlton County and then continues to Superior, Wisconsin.</p>					
RA-06-L3	Joliette Valve, Neche, ND	Clearbrook Terminal (Clearwater County, MN)	Superior, WI	<p><b>Purpose of the Alternative:</b> Route Alternative RA-06-L3 was proposed by commenters to develop a route to the north to avoid crossing Minnesota's Lakes region. The route, however, would traverse the CNF, several state forests, and the Dishpan Wildlife Management Area.</p> <p><b>Route:</b> RA-06-L3 follows the APR-L3 (existing Enbridge Mainline System) from the Joliette Valve to the Clearbrook terminal (see description above). At Clearbrook the route alternative runs easterly across Beltrami County to the south of Lower Red Lake and enters the northwest corner of Itasca County. The route continues eastward to the eastern border of Itasca County, primarily across state and national forest lands. Within George Washington State Forest, the route turns south, adjacent to the eastern border of Itasca County. In the southeast corner of Itasca County, the route joins the major pipeline corridor traversing Minnesota from the Canadian border to Superior, which includes the existing Line 3 pipeline. The route then trends southeast across the southwest corner of St. Louis County and the northeast portion of Carlton County, crossing the Fond du Lac Indian Reservation. It crosses the Minnesota-Wisconsin border and terminates in Superior, Wisconsin.</p>	355	315	3	10	
RA-07-L3	Joliette Valve, Neche, ND	Clearbrook Terminal (Clearwater County, MN)	Superior, WI	<p><b>Purpose of the Alternative:</b> Route Alternative RA-07-L3 was proposed by commenters to use an existing pipeline corridor for a major portion of the route across Minnesota to minimize the exposure of new areas of the state to pipeline construction and operations while increasing overall pipeline capacity for deliveries to Superior. It was proposed to address the Minnesota DNR and the Minnesota PCA's concerns regarding further development in the Lakes region. The route would, however, be located in proximity to the CNF and the Leech Lake Band of Ojibwe Reservation and would cross several populated areas.</p> <p><b>Route:</b> RA-07-L3 follows the APR-L3 (existing Enbridge Mainline System) from the Joliette Valve to the Clearbrook terminal (see description above). The Clearbrook terminal is located on the Enbridge Mainline System corridor. At Clearbrook the route would continue on the Enbridge Mainline System corridor, where it would be located adjacent to existing pipelines. From Clearbrook this route trends southeastward across the southern part of Beltrami County, the Lakes region, and the northern part of Cass County and the southern portion of Itasca County, intersecting the Leech Lake Band of Ojibwe Reservation and the CNF. It continues across the southwest corner of Itasca County into Carlton County and then eastward to Superior.</p>	327	286	3	13	
RA-08-L3	Joliette Valve, Neche, ND	Clearbrook Terminal (Clearwater County, MN)	Superior, WI	<p><b>Purpose of the Alternative:</b> Route Alternative RA-08-L3 was proposed by commenters to achieve the same purpose as RA-07-L3. However, the route alignment was located generally to the south of U.S. Highway 2 to avoid to a greater extent proximity to the CNF and the Leech Lake Band of Ojibwe Reservation. The route would cross several populated areas and is space limited due to the presence of other utilities within the corridor.</p> <p><b>Route:</b> RA-08-L3 follows the APR-L3 (existing Enbridge Mainline System) from the Joliette Valve to the Clearbrook terminal (see description above). From Clearbrook the route follows the same general configuration as RA-07-L3 to Superior, except that in the portion of the route located in Beltrami, Cass, Itasca, and St Louis counties, the route has been repositioned south and parallel to U.S. Highway 2.</p>	324	284	3	13	

TABLE A-1 Line 3 Replacement Project – System and Route Alternatives									
Alternative Name/Number	Origin Terminal	Intermediate Terminals	Destination Terminal	General Route Description (see Figure A-1 for locations)	Total Route Length (miles)	Route Length in MN (miles)	States Crossed	Counties Crossed (MN)	
<b>Line 3 Replacement System Alternative</b>									
SA-03-L3	Joliette Valve, Neche, ND	Requires new terminal at Crookston (Polk County, MN)	Superior, WI	<p><b>Purpose of the Alternative:</b> System Alternative SA-03-L3 was proposed by MN DNR and MPCA to evaluate an alternative that avoids the central portion of Minnesota, terminating the pipeline at Superior, Wisconsin. In 2015, the Minnesota DNR also proposed changes to this system alternative in order to connect it into Line 3 and to avoid sensitive resources near the Detroit Lakes area and populated areas in the northern Twin Cities Metro area near North Branch. With further modifications during development of the scope, this alternative provides access to Enbridge’s terminals at both Clearbrook and Superior, but would also require a new terminal at Crookston, Minnesota.</p> <p><b>Route:</b> SA-03-L3 follows the APR-L3 (existing Enbridge Mainline System) from the Joliette Valve and splits from the APR-L3 heading south to Crookston where a new terminal would be built and the line would split with one portion continuing east to connect with the existing Clearbrook Terminal in Clearbrook Minnesota and the other portion following the same path as RA-03AM-L3 to Superior, Wisconsin.</p>	514.7	473.9	ND MN WI	13	
SA-04-L3	Joliette Valve, Neche, ND	None	Joliet, IL	<p><b>Purpose of the Alternative:</b> System Alternative SA-04-L3 was proposed by commenters to evaluate an alternative that avoids the central portion of Minnesota, terminating the pipeline at Joliet, Illinois. This alternative does not provide access to Enbridge’s terminals at either Clearbrook or Superior. A significant portion of the route for SA-04-L3 is outside of Minnesota.</p> <p><b>Route:</b> SA-04-L3 follows the APR-L3 (existing Enbridge Mainline System) from the Joliette Valve to the vicinity of U.S. Highway 29 in the northeast corner of North Dakota, where it intersects the Alliance pipeline corridor and follows it until it crosses into Minnesota near Wheaton in Traverse County. In Minnesota the route parallels the Alliance pipeline ROW and the Minnesota River through Big Stone, Swift, Chippewa, Renville, and Nicolet counties to approximately Mankato in Blue Earth County. The route continues southeast, diagonally across Faribault and Freeborn counties to the vicinity of Albert Lea. South of Albert Lea the route crosses the Minnesota-Iowa border and continues southeast to the vicinity of Clinton, Iowa, generally following the Cedar River. At Clinton the route crosses the Iowa-Illinois border and continues eastward to an existing terminal near Joliet.</p>	781	248	5	13	

Notes:  
 CNF = Chippewa National Forest; Minnesota DNR = Minnesota Department of Natural Resources; Minnesota PCA = Minnesota Pollution Control Agency; PUC = Public Utilities Commission; ROW = right-of-way; APR-L3 = Applicant’s preferred route for the Line 3 Replacement Pipeline  
**System Alternatives:** routes from the Applicant’s designated origin to alternative destinations.  
**Route Alternatives:** between the Applicant’s designated origin and destination and generally include designated intermediate terminals.  
**Route Descriptions** include the entire routes for both route and system alternatives, which traverse multiple states. While the entire route has been described for each alternative, those portions of the route not within Minnesota are not within the permitting jurisdiction of State of Minnesota regulatory agencies. These extended route descriptions have been included for completeness.

<sup>1</sup> Line 3 Replacement Project Alternative Routes Summary Report: [http://mn.gov/commerce/energyfacilities/documents/34079/CR\\_FINAL\\_MAY12.pdf](http://mn.gov/commerce/energyfacilities/documents/34079/CR_FINAL_MAY12.pdf)

<b>TABLE A-2</b>				
<b>Line 3 Replacement Project – Route Segment Alternatives (see Figure A-2 for locations)</b>				
<b>Route Alternative Number</b>	<b>County</b>	<b>Comment<sup>1</sup></b>	<b>Justification<sup>2</sup></b>	<b>Length (miles)</b>
<b>Clearbrook to Aitkin County</b>				
RSA-05-L3	Clearwater	Route alternative requested to avoid Eastern Wild Rice Watershed and possible hydrological connection to Lower Rice Lake by modifying centerline of APR. Route segment modified by requestor to improve constructability.	Reroute addresses water quality environmental impacts and should not affect operations.	12.9
RSA-10-L3	Clearwater	Lack of access near crossing of LaSalle Creek could result in delayed spill response times; route segment alternative would move route to a crossing that is more accessible.	Addresses Minnesota PCA concern for more accessible crossing, farther away from Big LaSalle Lake. Alternative recommended would impact new property owners.	6.83
RSA-15-L3	Hubbard	Twin Lakes route alternative: lack of access near Twin Lakes and Shell River could result in delayed spill response times. Twin Lakes are identified as wild rice lakes by the Minnesota DNR.	Addresses Minnesota PCA concern for more accessible crossing. Alternative recommended would impact new property owners and traverse an area of center pivot irrigation. It would also be closer to the town of Hubbard.	9.46
<b>Aitkin County</b>				
RSA-Blandin-L3	Aitkin	Route alternative requested to avoid conservation easement held by Minnesota DNR on lands owned by Blandin Paper Company.	Addresses concerns regarding conservation easement and would avoid specific timber resources east of the APR-L3.	3.9
RSA-White Elk Lake-L3	Aitkin	Minnesota DNR requested an alternative to avoid Forest Legacy Program easement and fragmenting Minnesota Biological Survey Site of Biodiversity Significance.	Addresses Minnesota DNR concerns regarding White Elk Lake (a wild rice lake); the route segment alternative would cross fewer acres of wetlands and avoid the recorded location of federally listed northern long-eared bat.	9.7
RSA-21-L3	Aitkin	Minnesota DNR recommended the Aitkin County Power Line as a route alternative to eliminate concerns regarding Sandy River fisheries and wild rice habitat as well as trout stream habitat. This would also avoid 3.1 miles of WMAs and follow the existing corridor.	Addresses Minnesota DNR concerns regarding fisheries and habitat impacts; however, it would impact new property owners.	53.88
RSA-22-L3	Aitkin, St. Louis, Carlton	Minnesota DNR recommended an alternative that would avoid critical habitat in the Big Sandy Lake watershed as well as Grayling Marsh WMA, McGregor WMA, Lawler WMA, and Salo Marsh WMA.	Addresses Minnesota DNR concerns related to resources in the area. The route segment alternative would follow existing corridors; however, it would impact new property owners.	38.82
RSA-23-L3	Aitkin	The Aitkin County Soo Line Route Alternative was considered in the Enbridge January 31, 2014, permit application but removed from further analysis by the company.	The Soo Line Route Alternative removed from further analysis by Enbridge is being carried forward into the route alternatives analysis because it was recommended by several landowners throughout the comment period and it would parallel the existing ATV trail.	31.13
RSA-27-L3	Aitkin, Carlton	Minnesota DNR recommended that the analysis include the Soo Line to avoid the McGregor Scientific and Natural Area and the Sandy River watershed.	Addresses Minnesota DNR concerns related to the McGregor Scientific and Natural Area and the Sandy River watershed.	13.23
RSA-28-L3	Aitkin	Commenter suggested a route alternative that turns south in Aitkin County and meets back with the APR-L3 to the east.	There was a map submitted during the comment period without a written comment attached. Based on the aerial image, this route segment alternative was suggested to avoid gravel pits.	3.50
RSA-31-L3	Aitkin	Commenter requested a route alternative to cut straight and diagonally across several miles in Aitkin County.	Addresses commenter concern regarding distance from home. Alternative recommended would impact new property owners.	6.12
RSA-33-L3	Aitkin	Commenter requested the pipeline be moved east to the back edge of his property where it joins with a peat plant.	Addresses commenter concern and would impact new property owners.	1.80

<b>TABLE A-2</b>				
<b>Line 3 Replacement Project – Route Segment Alternatives (see Figure A-2 for locations)</b>				
<b>Route Alternative Number</b>	<b>County</b>	<b>Comment<sup>1</sup></b>	<b>Justification<sup>2</sup></b>	<b>Length (miles)</b>
RSA-34-L3	Aitkin	Commenter suggesting shifting the pipeline north into the tree line.	Addresses commenter concern regarding distance from home. Alternative recommended would impact new property owners.	2.22
RSA-35-L3	Aitkin	Commenter suggesting route alternative that would cut south on Township Road 270th and travel east until it meets with the APR-L3.	Addresses commenter concern regarding distance from home. Alternative route would impact new property owners and potentially impact a peat farm.	1.72
RSA-37-L3	Aitkin, Carlton	Commenter suggesting route alternative that would parallel State Highway 210 after mile marker 550 and then turn south to reconnect with the APR-L3 south of Cloquet.	The recommended route segment alternative would follow the existing corridor, avoiding the Salo Marsh and Lawler WMAs.	38.68
<b>Carlton County</b>				
RSA-42-L3	Carlton	Commenter requested co-location of pipeline with an existing power line corridor.	Addresses commenter concern. Recommended route segment alternative would impact new property owners.	3.48
RSA-43-L3	Carlton	Commenter suggesting moving pipeline to the north side of U.S. Highway 61, co-locating it with a utility corridor.	Addresses commenter concerns regarding continuity of utility corridors. Recommended route segment alternative would impact new property owners.	3.08
RSA-44-L3	Carlton	Commenter suggested following an existing utility corridor on the north side of U.S. Highway 61 to avoid the Blackhoof River watershed.	Addresses commenter concern regarding groundwater flow around the watershed. Alternative recommended would impact new property owners.	7.66
RSA-45-L3	Carlton	Commenter suggested following the south side of U.S. Highway 61 to avoid the Blackhoof River watershed.	Addresses commenter concern regarding groundwater flow around the watershed. Alternative recommended would impact new property owners.	7.13
RSA-46-L3	Carlton	Commenter suggested shifting the pipeline to the south, running parallel to County Road 61.	Addresses commenter concern. Alternative recommended would impact new property owners.	1.91
RSA-49-L3	Carlton	Commenter requested following the south sides of Interstate 35 and U.S. Highway 61 to distance the pipeline from multiple properties.	Addresses commenter concern. Alternative recommended would impact new property owners.	5.96
RSA-51-L3	Aitkin	Commenter proposed shifting the pipeline north to follow the tree line and distance it from homesteads.	Addresses commenter concern regarding distance from home. Alternative recommended would impact new property owners.	1.41
RSA-52-L3	Aitkin	Commenter proposed shifting the pipeline north to follow the tree line and distance it from homesteads.	Addresses landowner concern regarding distance from home. Alternative would impact new property owners.	0.84

## Notes:

ATV = all-terrain vehicle; Minnesota DNR = Minnesota Department of Natural Resources; Minnesota PCA = Minnesota Pollution Control Agency; APR-L3 = Applicant's Preferred Route for Line 3 Replacement Project; WMA = Wildlife Management Area

<sup>1</sup> **Comment:** The comment column is a summary of the issue that was identified in the comment submitted during scoping period.

<sup>2</sup> **Justification:** The justification column describes why the route alternative is being carried forward for further analysis.

## **Appendix B**

### Alternatives Screening – Evaluation Factors

**List of Tables**

Table B-1 Line 3 Replacement Project – Alternatives Evaluation – Environmental Benefits

Table B-2 Line 3 Replacement Project – Alternatives Evaluation – Socioeconomic Benefits

Table B-3 Line 3 Replacement Project – Alternatives Evaluation – Regulatory and Economic Feasibility

TABLE B-1 Line 3 Pipeline Replacement Project – Alternatives Evaluation – Environmental Benefits											
Criteria - Must have significant environmental benefits compared to APR											
Evaluation Factor	Applicant's Preferred Route (APR-L3)	SA-03-L3	SA-04-L3	RA-03-L3	RA-03AM-L3	RA-06-L3	RA-07-L3	RA-08-L3	Data Source	Purpose	
TERMINUS	Superior, WI	Superior, WI	Joliet, IL	Superior, WI		Identifies pipeline endpoints and potential refinery delivery points					
PIPELINE TOTAL LENGTH (miles)	378.3	514.7	780.5	556.3	434.3	355.3	327.1	324.2		Pipeline length represents total overall environmental disturbance	
Minnesota Length	337.5	473.9	248	515.4	393.5	314.5	286.3	283.4		Pipeline length represents total overall environmental disturbance within Minnesota	
Percent of Route in Minnesota	89.2%	92.1%	31.80%	92.70%	90.60%	88.50%	87.50%	87.40%		Proportion of alternative length within Minnesota represents environmental disturbance within Minnesota compared to overall disturbance	
Wisconsin Length	13.2	13.2	-	13.2	13.2	13.2	13.2	13.2		Pipeline length represents total overall environmental disturbance within Wisconsin	
North Dakota Length	27.6	27.6	228.4	27.6	27.6	27.6	27.6	27.6		Pipeline length represents total overall environmental disturbance within Illinois	
South Dakota Length	-	-	0.1	-	-	-	-	-		Pipeline length represents total overall environmental disturbance within South Dakota	
Illinois Length	-	-	117.5	-	-	-	-	-		Pipeline length represents total overall environmental disturbance within North Dakota	
Iowa Length	-	-	186.6	-	-	-	-	-		Pipeline length represents total overall environmental disturbance within Iowa	
<b>FULL SYSTEM ROUTES DATA ANALYSIS</b>											
<b>TERRAIN</b>											
Slope % Grades (Linear Miles)	<5%	310.51	442.62	718.6	479.9	359.8	302.9	288.5	288.0	USGS - 10m Digital Elevation Models 1.6% <a href="http://nationalmap.gov/">http://nationalmap.gov/</a>	Describes increase in erosion potential – erosion may be increased where pipelines cross steep slopes, and erosion leads to sediment entering waterways, reducing water and fish habitat quality
	>=5% - <=15%	56.91	61.71	56.8	65.5	63.6	43.5	33.1	31.1		
	>15% - <=30%	9.97	9.72	4.4	10.2	10.0	7.9	5.3	4.9		
	>30%	0.90	0.65	0.87	0.66	0.85	1.06	0.27	0.26		
Slopes >15% (% of route)		2.9%	2.0%	2.5%	0.7%	2.0%	2.5%	2.5%	1.7%		Describes increase in erosion potential – erosion may be increased where pipelines cross steep slopes, and erosion leads to sediment entering waterways, reducing water and fish habitat quality
<b>SOILS</b>											
Farmland of Statewide and Local Importance (Acres within 0.5 mile)		48,702.1	58,436.63	31,190.5	66,375.8	58,904.3	32,005.3	34,519.0	35,580.2	USDA/NRCS SSURGO 2.2 Soils Database <a href="http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx">http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx</a>	Describes soils of significant agricultural value at risk during construction, operation, and in the event of a spill
Prime Farmland (Acres within 0.5 mile)		43,873.0	45,617.05	194,669.6	57,439.2	42,174.8	52,872.7	31,668.3	37,082.6		
<b>RIVERS/STREAMS</b>											
National Rivers Inventory (Number of Crossings)		9	3	5	5	4	18	5	5	Nationwide Rivers Inventory (NRI) <a href="https://www.nps.gov/ncrc/programs/rtca/nri/index.html">https://www.nps.gov/ncrc/programs/rtca/nri/index.html</a>	Describes significant river resources at risk during construction and in the event of a spill
Wild & Scenic River (Number of Crossings)		2	3	1	3	4	0	1	1	Designated Water Features - Wild, Scenic and	Describes significant river resources at risk

TABLE B-1 Line 3 Pipeline Replacement Project – Alternatives Evaluation – Environmental Benefits											
Criteria - Must have significant environmental benefits compared to APR											
Evaluation Factor	Applicant's Preferred Route (APR-L3)	SA-03-L3	SA-04-L3	RA-03-L3	RA-03AM-L3	RA-06-L3	RA-07-L3	RA-08-L3	Data Source	Purpose	
									Recreational Rivers & National Wild And Scenic River System <a href="https://www.rivers.gov/mapping-gis.php">https://www.rivers.gov/mapping-gis.php</a>	during construction and in the event of a spill	
Commercial Navigable Waterways (Number of Crossings)	-	-	2	-	-	-	-	-	U.S. Army Corps of Engineers <a href="http://www.navigationdatacenter.us/db/gisviewer/">http://www.navigationdatacenter.us/db/gisviewer/</a>	Describes significant river resources at risk during construction and in the event of a spill	
Major River Crossings (1:2M USGS hydrography lines)	35	66	68	67	48	35	24	25	USGS National Hydrological Dataset 1:2M National Atlas <a href="https://www.rivers.gov/mapping-gis.php">https://www.rivers.gov/mapping-gis.php</a>	Describes commercial waterways at risk during construction and in the event of a spill	
NHD perennial streams (Number of crossings)	43	82	124	86	59	72	44	50	USGS National Hydrological Dataset <a href="http://nhd.usgs.gov/">http://nhd.usgs.gov/</a>	Describes large river/stream resources and by analogy water resources and fisheries at risk during construction and in the event of a spill; may also represent potential number of horizontal directional drilling crossings that could be required with potential for frac-out	
NHD intermittent streams (Number of crossings)	76	157	425	168	108	71	62	69		Describes river/stream resources and by analogy water resources and fisheries at risk during construction and in the event of a spill	
NHD perennial streams in PAD US lands (Number of crossings)	5	1	1	1	1	19	6	7	USGS Protected Areas Database (PAD US) <a href="http://gapanalysis.usgs.gov/padus/">http://gapanalysis.usgs.gov/padus/</a>	Describes stream resources and by analogy seasonal water resources and fisheries habitats at risk during construction and in the event of a spill	
<b>WETLANDS</b>											
Wetland Displacement/Emergent Length (miles)	(Use 0.5 mile acres instead of linear miles)								National Wetland Inventory <a href="http://www.fws.gov/wetlands/Data/Mapper.html">http://www.fws.gov/wetlands/Data/Mapper.html</a>	Describes lengths of wetland habitats crossed; crossing construction and spills may degrade wetlands and associated water and biota	
Wetland Displacement/Scrub/Shrub Length (miles)											
Wetland Displacement/Forested Length (miles)											
Wetland Displacement/Acres Emergent (within 0.5 mile)	10,284.3	18,560.4	8,299.90	20,216.00	16,513.20	8,227.60	7,627.10	7,857.70	Describes area of wetland habitats within 0.5 mile of the alternative; construction and spills may degrade wetlands and associated water and biota		
Wetland Displacement/Acres Scrub/Shrub (within 0.5 mile)	16,011.3	13,539.5	343.5	14,160.10	14,913.80	14,019.80	12,293.70	12,791.30			
Wetland Displacement/Acres Forested Wetland (within 0.5 mile)	15,474.3	10,790.2	1,959.40	10,975.50	11,517.50	27,067.30	21,898.10	24,627.30			
Total Wetlands (within 0.5 mile)	41,770.0	42,890.0	10,602.80	45,351.60	42,944.50	49,314.70	41,818.90	45,276.30			
<b>WATER WELLS</b>											
Wells - Number of Wells within 2 miles of Pipeline	* In Progress - gathering data from all states									Describes number of wells and high-density water well areas that could be disrupted during construction and would be at risk from spills and leaks	
Depth of Wells to Groundwater	very shallow <10'	* In Progress - gathering data from all states									Describes wells by water source depth potentially disturbed during construction and water sources at risk from spills and leaks
	ground water level >= 10' - <=50'										
	deep >50'										

TABLE B-1 Line 3 Pipeline Replacement Project – Alternatives Evaluation – Environmental Benefits											
Criteria - Must have significant environmental benefits compared to APR											
Evaluation Factor	Applicant's Preferred Route (APR-L3)	SA-03-L3	SA-04-L3	RA-03-L3	RA-03AM-L3	RA-06-L3	RA-07-L3	RA-08-L3	Data Source	Purpose	
<b>LANDCOVER AND PROTECTED LANDS</b>											
NLCD Land Cover (within 0.5 mile)	Forested (acres)	76,646	54,498	7,345	58,057	68,974	59,526	47,659	48,058	National Landcover Dataset <a href="http://www.mrlc.gov/nlcd2011.php">http://www.mrlc.gov/nlcd2011.php</a>	Describes forest habitats crossed; crossing construction and pipeline operation would result in loss and fragmentation of forested habitats
	Hay/Pasture/Crops (acres)	96,191	197,808	427,737	211,646	135,557	83,675	82,441	84,511		Describes rural and agricultural habitats crossed; crossing construction and pipeline operation would result in disturbance of rural and agricultural habitats
	Developed (acres)	11,806	19,775	43,798	21,357	16,989	10,622	15,115	12,401		Describes developed areas crossed; crossing construction and pipeline operation would result in disturbance of developed areas that do not usually serve as wildlife habitats
	Other (acres)	56,868	56,956	21,005	62,259	55,896	73,763	64,059	62,779		Describes other undeveloped habitats such as grasslands/shrublands crossed; crossing construction and pipeline operation would result in disturbance of other area habitats
	GAP Status 1 (acres)	-	738	228	738	275	60		97	USGS Protected Areas Database (PAD US) <a href="http://gapanalysis.usgs.gov/padus/">http://gapanalysis.usgs.gov/padus/</a>	Describes conservation lands crossed; crossing construction and spills could degrade conservation lands and associated sensitive plant and animal resources
	GAP Status 2 (acres)	1,933	4,941	37,823	4,947	2,469	1,093	294	740		
	GAP Status 3 (acres)	21,511	235	44	296	2,103	39,698	27,565	28,939		
	Lands Managed for Biodiversity (GAP 1 and 2 sum; acres)	1,933	5,679	38,051	5,686	2,744	1,153	294	837		Describes lands managed for conservation (GAP Status 1 and 2 status) crossed; crossing construction and spills could degrade conservation lands and associated sensitive plant and animal resources
	Federal Refuges in Area (Count within 1 mile)	0	0	1	2	1	0	0	0	USFWS IPaC Information for Planning and Conservation <a href="https://ecos.fws.gov/ipac/">https://ecos.fws.gov/ipac/</a>	Describes federal refuges occurring within 1 mile of route alternatives that could be affected by construction and leaks or spills
	Prairie Pothole Region (% Linear Route within PRR)	34.2%	40.4%	58.7%	43.8%	29.8%	36.4%	39.5%	39.9%	USGS Prairie Pothole Region <a href="https://www.sciencebase.gov/catalog/item/54aeaf2e4b0cdd4a5caedf1">https://www.sciencebase.gov/catalog/item/54aeaf2e4b0cdd4a5caedf1</a>	Describes proportion of alternatives that cross through the sensitive Prairie Pothole Region
	Emergent Wetland Acres within Prairie Pothole Region (within 0.5 mile)	2,303	2,578	7,270	4,155	2,303	2,303	2,303	2,303		Describes wetland areas crossed by alternatives within the sensitive Prairie Pothole Region—these wetlands are often maintained by an impermeable clay layer that can be disrupted during excavation
	Shrub Scrub Wetland Acres within Prairie Pothole Region (within 0.5 mile)	639	652	269	1,291	639	639	639	639		
<b>PROTECTED FISH AND WILDLIFE</b>											
	Number of ESA protected species (within 1 mile)	11	10	22	12	12	12	12	12	USFWS IPaC Information for Planning and Conservation <a href="https://ecos.fws.gov/ipac/">https://ecos.fws.gov/ipac/</a>	Describes federal threatened, endangered, or proposed species potentially occurring near the pipeline alternatives
	Federal Designated Critical Habitat in Area (Count within 0.5 mile)	0	0	0	0	0	0	0	0	USFWS IPaC Information for Planning and Conservation <a href="https://ecos.fws.gov/ipac/">https://ecos.fws.gov/ipac/</a>	Describes occurrence of federal designated critical habitat near pipeline alternatives
	Federal Birds of Conservation Concern (BCC) (Species count within 1 mile)	27	30	35	30	29	27	27	27	USFWS IPaC Information for Planning and Conservation	Describes occurrence of federal designated Birds of Conservation Concern species near

**TABLE B-1 Line 3 Pipeline Replacement Project – Alternatives Evaluation – Environmental Benefits**  
**Criteria - Must have significant environmental benefits compared to APR**

Evaluation Factor		Applicant's Preferred Route (APR-L3)	SA-03-L3	SA-04-L3	RA-03-L3	RA-03AM-L3	RA-06-L3	RA-07-L3	RA-08-L3	Data Source	Purpose	
										<a href="https://ecos.fws.gov/ipac/">https://ecos.fws.gov/ipac/</a>	pipeline alternatives	
Occurrences of State or Federal listed and rare plants (NHI count within 0.5 mile)	North Dakota	0	0	0	0	0	0	0	0	North Dakota Parks and Recreation - Natural Heritage Inventory <a href="http://www.parkrec.nd.gov/nature/heritage.html">http://www.parkrec.nd.gov/nature/heritage.html</a>	Describes occurrence of protected and rare plants near the pipeline based on Natural Heritage Inventory data for each state; pipeline construction or spills could result in loss of documented rare plants	
	Minnesota	119	In progress - gathering data from state	316	310	302	378	390	119	Minnesota DNR - Rare Features Database (vascular & non-vascular mneopy); exclude watchlist and extirpated/failed to find <a href="http://www.dnr.state.mn.us/nhnrp/nhis.html">http://www.dnr.state.mn.us/nhnrp/nhis.html</a>		
	Wisconsin	0	100	100	100	100	100	100	100	0		Wisconsin Department of Natural Resources - Natural Heritage Inventory <a href="http://dnr.wi.gov/topic/ERReview/DataAccess.html">http://dnr.wi.gov/topic/ERReview/DataAccess.html</a>
	South Dakota	-	-	-	-	-	-	-	-	0		South Dakota Department of Game, Fish, and Parks - Natural Heritage Database <a href="http://gfp.sd.gov/wildlife/threatened-endangered/default.aspx">http://gfp.sd.gov/wildlife/threatened-endangered/default.aspx</a>
	Iowa	In progress - gathering data from state	-	-	-	-	-	-	-	-		Iowa Department of Natural Resources - Natural Heritage Inventory <a href="http://www.iowadnr.gov/Conservation/Threatened-Endangered/Environmental-Reviews">http://www.iowadnr.gov/Conservation/Threatened-Endangered/Environmental-Reviews</a>
	Illinois	-	-	27	-	-	-	-	-	-		Illinois Department of Natural Resources - Natural Heritage Database <a href="http://www.dnr.illinois.gov/conservation/NaturalHeritage/Pages/NaturalHeritageDatabase.aspx">http://www.dnr.illinois.gov/conservation/NaturalHeritage/Pages/NaturalHeritageDatabase.aspx</a>
	Total	414	Not Complete	146	416	410	402	478	490			Describes sum of protected and rare plants near the pipeline alternative for all states crossed; pipeline construction or spills could result in loss of documented rare plants
Occurrences of State or Federal listed and rare animals (NHI count within 0.5 mile)	North Dakota	1	1	0	1	1	1	1	1	1	North Dakota Parks and Recreation - Natural Heritage Inventory <a href="http://www.parkrec.nd.gov/nature/heritage.html">http://www.parkrec.nd.gov/nature/heritage.html</a>	Describes occurrence of protected and rare animals near the pipeline based on Natural Heritage Inventory data for each state; pipeline construction or spills could result in loss of documented rare animals
	Minnesota	287	In progress - gathering data from state	629	535	205	118	204	232	Minnesota DNR - Rare Features Database (vertebrates & invertebrates mneopy); exclude watchlist and extirpated/failed to find <a href="http://www.dnr.state.mn.us/nhnrp/nhis.html">http://www.dnr.state.mn.us/nhnrp/nhis.html</a>		
	Wisconsin	3	3	0	3	3	3	3	3	3	Wisconsin Department of Natural Resources - Natural Heritage Inventory <a href="http://dnr.wi.gov/topic/ERReview/DataAccess.html">http://dnr.wi.gov/topic/ERReview/DataAccess.html</a>	
	South Dakota	-	-	0	-	-	-	-	-	-	South Dakota Department of Game, Fish, and Parks - Natural Heritage Database <a href="http://gfp.sd.gov/wildlife/threatened-endangered/default.aspx">http://gfp.sd.gov/wildlife/threatened-endangered/default.aspx</a>	

TABLE B-1 Line 3 Pipeline Replacement Project – Alternatives Evaluation – Environmental Benefits											
Criteria - <i>Must have significant environmental benefits compared to APR</i>											
Evaluation Factor	Applicant's Preferred Route (APR-L3)	SA-03-L3	SA-04-L3	RA-03-L3	RA-03AM-L3	RA-06-L3	RA-07-L3	RA-08-L3	Data Source	Purpose	
	Iowa	In progress-gathering data from state	-	-	-	-	-	-	<a href="#">endangered/default.aspx</a>	Iowa Department of Natural Resources - Natural Heritage Inventory <a href="http://www.iowadnr.gov/Conservation/Threatened-Endangered/Environmental-Reviews">http://www.iowadnr.gov/Conservation/Threatened-Endangered/Environmental-Reviews</a>	
	Illinois	46	-	-	-	-	-	-	Illinois Department of Natural Resources - Natural Heritage Database <a href="http://www.dnr.illinois.gov/conservation/NaturalHeritage/Pages/NaturalHeritageDatabase.aspx">http://www.dnr.illinois.gov/conservation/NaturalHeritage/Pages/NaturalHeritageDatabase.aspx</a>		
Total	291	Not Complete	675	539	209	122	208	236		Describes sum of protected and rare animals near the pipeline alternative for all states crossed; pipeline construction or spills could result in loss of documented rare animals	
GAP Species at Risk Richness - High Diversity Habitat Areas (within 1 mile)	Herptiles (acres)	-	-	783.6	-	-	-	-	State ESA, Species of Concern Lists used to select applicable GAP Species Distribution Models <a href="http://gapanalysis.usgs.gov/species/data/">http://gapanalysis.usgs.gov/species/data/</a>	Describes occurrence of high biodiversity areas for amphibians and reptiles of conservation concern for which models have been developed; pipeline construction or spills could result in loss of habitats potentially used by multiple amphibian and reptile species of conservation concern	
	Mammals (acres)	17,818.8	10,809.3	-	10,810.1	10,809.2	71,244.1	41,387.0		40,238.7	Describes occurrence of high biodiversity areas for mammals of conservation concern for which models have been developed; pipeline construction or spills could result in loss of habitats potentially used by multiple mammal species of conservation concern
	Birds (acres)	494.9	4,250.7	3,912.60	4,264.9	1,143.4	474.3	474.3		474.3	Describes occurrence of high biodiversity areas for birds of conservation concern for which models have been developed; pipeline construction or spills could result in loss of habitats potentially used by multiple bird species of conservation concern
GAP/Risk Species Habitat (acres within 1 mile)	18,313.7	15,060.00	4,696.2	15,075.0	11,952.6	71,718.4	41,861.3	40,713.0		Describes occurrence of high biodiversity areas for herptiles, mammals, and birds of conservation concern for which models have been developed	
<b>MINNESOTA ONLY DATA ANALYSIS</b>											
<b>SOILS</b>											
Soil Erosion Potential Index - Catchment Scale (index is opposite of erosion potential)	Low 0-20, Mean erodibility of soils weighted by slope – soils are highly erodible (miles, %)	3.0 (0.8%)	0	0	3.0 (0.6%)	3.0 (0.7%)	3.0 (0.9%)	3.0 (1.0%)	3.0 (1.0%)	Watershed Health Assessment (extends into ND & WI) <a href="https://gisdata.mn.gov/dataset/env-watershed-health-assessment">https://gisdata.mn.gov/dataset/env-watershed-health-assessment</a>	Describes erodibility of soils weighted by slope by index score—more erodible soils increase sediment and water turbidity
	Moderate 21-80 (miles, %)	167.6 (46.5%)	285.3 (57.4%)	181.0 (72.6%)	287.6 (53.4%)	235.5 (56.5%)	160.7 (47.6%)	104.2 (33.7%)	115.1 (37.6%)		
	High 81-100, Mean	189.9 (52.7%)	208.5	68.2	247.9	178.0 (42.7%)	173.8	202.1	188.3		

TABLE B-1 Line 3 Pipeline Replacement Project – Alternatives Evaluation – Environmental Benefits											
Criteria - Must have significant environmental benefits compared to APR											
Evaluation Factor		Applicant's Preferred Route (APR-L3)	SA-03-L3	SA-04-L3	RA-03-L3	RA-03AM-L3	RA-06-L3	RA-07-L3	RA-08-L3	Data Source	Purpose
erodibility of soils weighted by slope – very few to no erodible soils (miles, %)			(42%)	(27.4%)	(46.0%)		(51.5%)	(65.3%)	(61.5%)		
<b>SURFACE WATERS</b>											
Mean Water Quality Health Index - Watershed Scale	Heavily Impacted 0-20 (miles, %)	-	-	-	-	-	-	-	-	Watershed Health Assessment <a href="https://gisdata.mn.gov/dataset/env-watershed-health-assessment">https://gisdata.mn.gov/dataset/env-watershed-health-assessment</a>	Describes mean of water quality metrics as water quality health score at watershed scale; crossing construction or spills could impact high-quality water resources and associated fisheries
	Moderately Impacted 21-80 (miles, %)	229.1 (67.9%)	450.7 (95.1%)	248.0 (100%)	492.3 (95.5%)	365.5 (90.6%)	247.9 (78.8%)	180.9 (63.2%)	174.1 (61.4%)		
	Least Impacted 81-100 (miles, %)	108.4 (32.1%)	23.1 (4.9%)	0	23.1 (4.5%)	37.0 (9.4%)	66.5 (21.2%)	105.4 (36.8%)	109.3 (38.6%)		
Stream Species Quality Index - Watershed Scale	Heavily Impacted, 0-20% (miles, %)	-	-	-	-	-	-	-	-	Watershed Health Assessment <a href="https://gisdata.mn.gov/dataset/env-watershed-health-assessment">https://gisdata.mn.gov/dataset/env-watershed-health-assessment</a>	Describes stream biota quality at watershed scale; crossing construction or spills could degrade aquatic habitats at or near these sites and reduce stream fauna diversity and abundance
	Moderately Impacted, 20-80% (miles, %)	337.5 (100%)	447.6 (94.5%)	248.0 (100%)	489.2 (94.9%)	367.3 (93.3%)	314.5 (100%)	286.3 (100%)	283.4 (100%)		
	Least Impacted, 80-100% (miles, %)	0	26.2 (5.5%)	-	26.2 (5.1%)	-26.2 (6.7%)	-	-	0		
Lakes of Significant Biodiversity MN (Number of Lakes within 1 mile)	Moderate	4	2	2	4	3	2	5	6	DNR Hydrography - Lakes of Biological Significance <a href="https://gisdata.mn.gov/dataset/env-lakes-of-biological-signific">https://gisdata.mn.gov/dataset/env-lakes-of-biological-signific</a>	Describes lakes by biodiversity classification; crossing construction or spills could degrade habitats at or near these sites and reduce biodiversity
	High	1	1	1	1	-	4	6	5		
	Outstanding	14	4	-	5	8	3	23	22		
Calcareous Fens (Number of Fens within 0.5 mile)		5	1	1	6	5	5	5	5	Calcareous Fens - Source Feature Points <a href="https://gisdata.mn.gov/dataset/biota-nhis-calcareous-fens">https://gisdata.mn.gov/dataset/biota-nhis-calcareous-fens</a>	Describes calcareous fens occurring in proximity to pipeline alternatives; construction through fen habitats often degrades the quality of these unique wetland habitats
<b>GROUNDWATER/WATERSHED</b>											
Water Wells - Number of Wells within 2 miles of Pipeline		2,176.0	5,933	1,390.0	6,065.0	5,850.0	2,687.0	2,561.0	2,244.0	Minnesota Geological Survey - located and unlocated non-public water wells; does not include records for public water supply wells <a href="http://www.mngeo.state.mn.us/chouse/groundwater/gis_data.html">http://www.mngeo.state.mn.us/chouse/groundwater/gis_data.html</a> ; <a href="http://www.mngeo.state.mn.us/chouse/metadadata/wells.html">http://www.mngeo.state.mn.us/chouse/metadadata/wells.html</a>	Describes number of wells that could be disrupted during construction and would be at risk from spills and leaks
Depth of Wells to Groundwater	Very shallow <10'	16	54	9	54	39	155	19	15		Describes number of wells by water source depth class that could be disrupted during construction and would be at risk from spills and leaks
	Ground water level >= 10' - <=50'	374	1,008	108	1,036	1,074	290	468	311		
	Deep >50'	1,786	4,871	1,104	4,975	4,737	2,242	2,074	1,918		
MN Groundwater Susceptibility. Index	Linear Miles within High	112.3	171.2	21.5 (8.7%)	195	173.5	73.5	126.6	115.9	Watershed Health Assessment <a href="https://gisdata.mn.gov/dataset/env-watershed-health-assessment">https://gisdata.mn.gov/dataset/env-watershed-health-assessment</a>	Describes relative susceptibility of groundwater to contamination for planning and prevention; spills and leaks during construction and from the pipeline could result in contamination
	Linear Miles within Medium	96.8	184.2	87.9 (35.4%)	173.9	137.1	88.2	67.3	71.5		
	Linear Miles within Low	125.3	113.6	136.5 (55.0%)	141.6	82	148.9	85.6	93.6		
	Linear Miles within Insufficient Data	3.5	5.3	1.9 (0.7%)	5.3	1.3	4.5	7.2	2.9		
Mean Overall		Heavily Impacted,	-	-	0	-	-	-	-	Watershed Health Assessment	Describes average watershed health based on

TABLE B-1 Line 3 Pipeline Replacement Project – Alternatives Evaluation – Environmental Benefits											
Criteria - <i>Must have significant environmental benefits compared to APR</i>											
Evaluation Factor		Applicant's Preferred Route (APR-L3)	SA-03-L3	SA-04-L3	RA-03-L3	RA-03AM-L3	RA-06-L3	RA-07-L3	RA-08-L3	Data Source	Purpose
Watershed Health Index - Watershed Scale	0-20 (miles, %)									<a href="https://gisdata.mn.gov/dataset/env-watershed-health-assessment">https://gisdata.mn.gov/dataset/env-watershed-health-assessment</a>	indices for hydrology, geomorphology, biology, connectivity, and water quality; construction through major watersheds and spills and leaks from the pipeline could reduce watershed health
	Moderately Impacted, 21-80 (miles, %)	337.5 (100%)	473.9 (100%)	248.0 (100%)	515.4 (100%)	393.5 (100%)	314.5 (100%)	286.3 (100%)	283.4 (100%)		
	Least Impacted, 81-100 (miles, %)	-	-	-	-	-	-	-	-		
<b>LANDCOVER AND PROTECTED LANDS</b>											
Native Prairies Biodiversity Significant Rank (Acres within 0.5 mile)	Below	-	109.6	33.2	109.6	-	-	-	-	<a href="https://gisdata.mn.gov/dataset/biota-dnr-native-prairies">https://gisdata.mn.gov/dataset/biota-dnr-native-prairies</a>	Describes a subset of native plant communities containing primarily prairie vegetation communities; construction, operations, spills, and leaks through prairies and prairie wetlands can result in loss and reduce biodiversity
	Moderate	6.8	732.1	73.3	739.1	6.8	6.8	6.8	6.8		
	High	346.7	91.6	215.3	438.3	350.4	346.7	346.7	346.7		
	Outstanding	18.6	174.4	78.6	193	18.6	18.6	18.6	18.6		
Native Plant Communities (Acres within 0.5 mile)		9,152.2	6,505.8	1,000.80	7,559.30	8,790.60	2,081.00	2,869.60	5,303.50	<a href="https://gisdata.mn.gov/dataset/biota-dnr-native-plant-comm">https://gisdata.mn.gov/dataset/biota-dnr-native-plant-comm</a>	Describes native plant communities; construction, operations, spills, and leaks through native plant communities can result in habitat loss and degradation
MCBS Railroad Rights-of-Way Prairies (Miles within 0.5 mile)		5.1	2.7	4.1	7.8	5.1	5.1	5.1	5.1	<a href="https://gisdata.mn.gov/dataset/biota-mcbs-railroad-prairies">https://gisdata.mn.gov/dataset/biota-mcbs-railroad-prairies</a>	Describes untilled native prairies along railroads; crossing construction or spills could degrade native prairie habitats at or near these sites and reduce biodiversity
Wild Rice Lakes and River locations (Count within 0.5 mile)		20	11	0	11	13	4	12	12	<a href="https://gisdata.mn.gov/dataset/env-wild-rice-lakes-rivers-wld">https://gisdata.mn.gov/dataset/env-wild-rice-lakes-rivers-wld</a>	Describes occurrences of wetlands that support wild rice crossed by alternatives; crossing construction or spills could degrade these important resources
State Forest Lands (Acres within 0.5 mile)		21,219.2	4.0	-	4	1,811.60	34,597.30	23,484.80	25,129.20	<a href="https://gisdata.mn.gov/dataset/bdry-state-forest">https://gisdata.mn.gov/dataset/bdry-state-forest</a>	Describes occurrences of state forests; crossing construction or spills could result in loss or degradation of forest resources
State Forest Other Lands (Acres within 0.5 mile)		2,966.8	1,534.3	-	1,577.00	1,804.60	6,632.40	3,030.20	2,823.80	<a href="https://gisdata.mn.gov/dataset/bdry-state-forest">https://gisdata.mn.gov/dataset/bdry-state-forest</a>	Describes occurrences of state forests parcels outside of managed state forests; crossing construction or spills could result in loss or degradation of forest resources
Old Growth Timber Forest Stands (Count within 0.5 mile)		3	0	0	0	2	4	5	10	<a href="https://gisdata.mn.gov/dataset/biota-dnr-forest-stand-inventory">https://gisdata.mn.gov/dataset/biota-dnr-forest-stand-inventory</a>	Describes occurrences of old growth forests parcels– crossing construction or spills could result in loss or degradation of forest resources
Old Growth Timber Forest Stands (Acres within 0.5 mile)		12.9	0	0	0	0.4	82.1	88.5	88.4	<a href="https://gisdata.mn.gov/dataset/biota-dnr-forest-stand-inventory">https://gisdata.mn.gov/dataset/biota-dnr-forest-stand-inventory</a>	Describes occurrences of old-growth forest parcels; crossing construction or spills could result in loss or degradation of forest resources
Sites of Biodiversity Significance (acres within 0.5 mile)	Below	3,039.9	8,466.8	808.2	9,050.90	7,405.50	1,637.90	1,831.20	1,808.10	<a href="https://gisdata.mn.gov/dataset/biota-mcbs-sites-of-biodiversity">https://gisdata.mn.gov/dataset/biota-mcbs-sites-of-biodiversity</a>	Describes areas with high-quality native flora and fauna ranked based on the number of rare species and quality and quantity of the native plant community; construction, operations, spills, and leaks at these sites can result in loss of rare flora and fauna and
	Moderate	22,018.6	14,030.4	865	14,479.00	13,502.40	9,012.30	9,593.10	9,832.50		
	High	2,814.9	928.1	441.3	1,389.10	1,817.50	1,598.80	1,884.60	4,091.30		
	Outstanding	737.8	325.9	201.7	695.1	750.7	369.2	369.2	369.2		

TABLE B-1 Line 3 Pipeline Replacement Project – Alternatives Evaluation – Environmental Benefits											
Criteria - Must have significant environmental benefits compared to APR											
Evaluation Factor	Applicant's Preferred Route (APR-L3)	SA-03-L3	SA-04-L3	RA-03-L3	RA-03AM-L3	RA-06-L3	RA-07-L3	RA-08-L3	Data Source	Purpose	
										reduced biodiversity	
Tribal Lands (Acres within 0.5 mile)	75.9	0	0	57.5	75.9	8,355.5	35,634.2	35,861.1	MNDOT Tribal Boundaries <a href="http://www.dot.state.mn.us/maps/gdma/data/metadata/indian_res.htm">http://www.dot.state.mn.us/maps/gdma/data/metadata/indian_res.htm</a>	Describes area of tribal lands crossed by alternatives – pipeline construction or spills could result in loss or degradation of wildlife habitats on tribal lands	
Mineral Lease Lands (Number of Leases [Acres within 0.5 mile])	10 (1,576.8 ac)	-	-	-	-	3 (404.4 ac)	-	-	Minnesota DNR Active State Mineral Leases <a href="http://www.dnr.state.mn.us/lands_minerals/min_leases.html">http://www.dnr.state.mn.us/lands_minerals/min_leases.html</a>	Describes miner lease lands crossed by alternatives; pipeline construction and operation could disrupt access to leased lands or prevent mineral extraction	
<b>PROTECTED FISH AND WILDLIFE</b>											
Trout Streams (Number of crossings)	6	8	0	8	9	10	6	4	Designated Trout Streams <a href="https://gisdata.mn.gov/dataset/env-trout-stream-designations">https://gisdata.mn.gov/dataset/env-trout-stream-designations</a>	Describes occurrence of cold-water streams crossed; pipeline construction or spills could result in loss or degradation of habitats supporting protected trout waters	
State Wildlife Management Areas (Publicly Accessible) (Acres within 0.5 mile)	1,645.9	1,224.5	342.9	1,224.5	528.1	321.3	24.6	463.3	Publicly Accessible State Wildlife Management Areas <a href="https://gisdata.mn.gov/dataset/bdry-dnr-wildlife-mgmt-areas-pub">https://gisdata.mn.gov/dataset/bdry-dnr-wildlife-mgmt-areas-pub</a>	Describes occurrence of areas managed for wildlife; pipeline construction or spills could result in loss or degradation of habitats used by and supporting production of wildlife populations	
Species at Risk Richness - Watershed Scale	Heavily Impacted 0-20 (miles, %)	-	-	124.0 (50%)	-	-	-	-	Watershed Health Assessment <a href="https://gisdata.mn.gov/dataset/env-watershed-health-assessment">https://gisdata.mn.gov/dataset/env-watershed-health-assessment</a>	Describes occurrence of high biodiversity areas for species of greatest conservation need; pipeline construction or spills could result in loss of habitats potentially used by multiple animals of conservation concern	
	Moderately Impacted 21-80 (miles, %)	337.5 (100%)	473.9 (100%)	124.0 (50%)	515.4 (100%)	393.5 (100%)	314.5 (100%)	286.3 (100%)			283.4 (100%)
	Least Impacted 81-100 (miles, %)	-	-	0	-	-	-	-			-
Rare Plants (Occurrences within 0.5 mile)	351	NA	122	360	347	339	412	424	Minnesota DNR - Rare Features Database [vascular & non-vascular mneopy]; includes watchlist; excludes extirpated/failed to find <a href="http://www.dnr.state.mn.us/nhnrp/nhis.html">http://www.dnr.state.mn.us/nhnrp/nhis.html</a>	Describes protected and rare plants near the pipeline alternatives; pipeline construction or spills could result in loss of documented rare plants	
Rare Animals (Number of occurrences within 0.5 mile)	Birds	62	NA	175	548	39	25	37	48	Minnesota DNR - Rare Features Database [vertebrate & invertebrate mneopy]; includes watchlist; excludes extirpated/failed to find; prairie chicken and bald eagle included in bird totals, not identified as "aggregations" <a href="http://www.dnr.state.mn.us/nhnrp/nhis.html">http://www.dnr.state.mn.us/nhnrp/nhis.html</a>	Describes protected and rare animals near the pipeline alternatives; pipeline construction or spills could result in loss of documented rare animals
	Small mammals	93	NA	0	18	24	18	16	12		
	Herptiles	2	NA	57	13	9	1	0	0		
	Fish	6	NA	176	11	9	5	0	0		
	Invertebrates	148	NA	430	138	140	80	171	189		
Animal Aggregations (Number of occurrences within 0.5 mile)	Nesting colonies	2	NA	0	0	0	5	2	3	Describes protected animal aggregations and sensitive habitats near the pipeline alternatives; pipeline construction or spills could result in loss of documented animal aggregations	
	Bat hibernacula	0	NA	0	0	0	0	0	0		
	Prairie chicken leks	0	NA	0	0	0	0	0	0		
	Bald eagle roosts	0	NA	0	0	0	0	0	0		

<b>TABLE B-2 Line 3 Pipeline Replacement Project – Alternatives Evaluation – Socioeconomic Benefits</b> <b>Criteria - Must have similar environmental benefits but substantially less adverse economic, employment, or sociological impacts</b>										
Evaluation Factor	Applicant's Preferred Route (APR-L3)	SA-03-L3	SA-04-L3	RA-03-L3	RA-03AM-L3	RA-06-L3	RA-07-L3	RA-08-L3	Data Source	Purpose
TERMINUS	Superior, WI	Superior, WI	Joliet, IL	Superior, WI						
<b>PIPELINE TOTAL LENGTH (miles)</b>	378.3	514.7	780.5	556.3	434.3	355.3	327.1	324.2	Applicant provided and/or generated based on scoping comments <a href="http://www.esri.com/data/data-maps">http://www.esri.com/data/data-maps</a>	Estimate of pipeline lengths within each state to identify population and land use/land ownership
Minnesota Length	337.5	473.9	248	515.4	393.5	314.5	286.3	283.4		
% of Route in Minnesota	89.2%	92.1%	31.80%	92.70%	90.60%	88.50%	87.50%	87.40%		
Wisconsin Length	13.2	13.2	-	13.2	13.2	13.2	13.2	13.2		
North Dakota Length	27.6	27.6	228.4	27.6	27.6	27.6	27.6	27.6		
South Dakota Length	-	-	0.1	-	-	-	-	-		
Illinois Length	-	-	117.5	-	-	-	-	-		
Iowa Length	-	-	186.6	-	-	-	-	-		
<b>DEMOGRAPHICS (within 0.5 mile)</b>										
Population in Block Groups located within 0.5 mile of either side of centerline	142,154	108,057	198,554	184,379	180,397	137,976	175,885	183,768	U.S. Census Bureau ACS 2010-2014 Detailed Census Block Group Data <a href="https://www.census.gov/geo/maps-data/data/tiger-data.html">https://www.census.gov/geo/maps-data/data/tiger-data.html</a>	Describes potential impacts to highly populated areas, racial minorities, and low-income groups
Racial minorities	6,645 (4.7%)	4,833 (4.5%)	9,050 (4.6%)	8,070 (4.4%)	8,034 (4.5%)	9,473 (6.9%)	16,395 (9.3%)	15,398 (8.4%)		
Hispanic or Latino	2,776 (2.0%)	2,300 (2.1%)	6,920 (3.5%)	4,000 (2.2%)	3,609 (2.0%)	2,794 (2.0%)	3,065 (1.7%)	3,278 (1.8%)		
Low income	16,258 (11.6%)	12,357 (11.6%)	17,757 (9.0%)	21,376 (11.8%)	21,265 (12.0%)	16,677 (12.3%)	22,644 (13.1%)	22,889 (12.7%)		
<b>Population Density (Population/Square Mile) – Miles</b>									U.S. Census Bureau ACS 2010-2014 Detailed Census Block Group Data <a href="https://www.census.gov/geo/maps-data/data/tiger-data.html">https://www.census.gov/geo/maps-data/data/tiger-data.html</a>	Describes population density along the route alternatives and impacts to highly densely populated areas
Low (1-100/sq mile)	377.77	500.88	743.84	544.19	424.80	350.51	314.78	314.11		
Low/Moderate (101-500/sq mile)	0.53	11.73	22.57	10.72	8.19	4.27	11.91	9.21		
Moderate (501-1,000/sq mile)	-	1.82	8.06	1.82	1.82	-	0.93	1.41		
Moderate/High (1,001-2,000/sq mile)	-	-	5.79	-	-	1.01	-	-		
High (>2,000/sq mile)	-	0.26	0.43	0.26	0.26	0.26	0.26	0.26		
<b>RECREATION (within 0.5 mile)</b>										
Number of Local Parks	-	-	5	-	-	-	-	-	ESRI Detailed Parks <a href="http://www.esri.com/data/data-maps">http://www.esri.com/data/data-maps</a>	Identifies the number of local city or county parks near the pipeline alternatives; pipeline construction or spills could result in loss of recreation area
Number of State Park or Forest	10	0	0	2	5	6	4	5	ESRI Detailed Parks & State Forest Statutory Boundaries and Management Units <a href="http://www.esri.com/data/data-maps">http://www.esri.com/data/data-maps</a> & <a href="https://gisdata.mn.gov/dataset/bdry-state-forest">https://gisdata.mn.gov/dataset/bdry-state-forest</a>	Identifies the number of state parks or forests near the pipeline alternatives; pipeline construction or spills could result in loss of recreation area
Number of National Parks, Forest, River	-	-	-	-	-	1	-	1	ESRI Detailed Parks/Federal Lands <a href="http://www.esri.com/data/data-maps">http://www.esri.com/data/data-maps</a>	Identifies the number of national parks, forests, or rivers near the pipeline alternatives; pipeline construction or spills could result in loss of recreation area
Number of Wildlife Refuges	-	1	1	2	1	2	2	2	ESRI Detailed Parks & MN State Wildlife Refuge Inventory <a href="http://www.esri.com/data/data-maps">http://www.esri.com/data/data-maps</a> &	Identifies the number of wildlife refuges near the pipeline alternatives; pipeline construction or spills could

<b>TABLE B-2 Line 3 Pipeline Replacement Project – Alternatives Evaluation – Socioeconomic Benefits</b> <b>Criteria - Must have similar environmental benefits but substantially less adverse economic, employment, or sociological impacts</b>											
Evaluation Factor	Applicant's Preferred Route (APR-L3)	SA-03-L3	SA-04-L3	RA-03-L3	RA-03AM-L3	RA-06-L3	RA-07-L3	RA-08-L3	Data Source	Purpose	
Tourist visitors/spending									<a href="https://gisdata.mn.gov/dataset/bdry-wildlife-refuge-inventory">https://gisdata.mn.gov/dataset/bdry-wildlife-refuge-inventory</a>	result in loss of recreation area	
<b>LAND USE (within 0.5 mile)</b>											
Agricultural lands (acres) NLCD	96,191	197,808	427,737	211,646	135,557	83,675	82,441	84,511	National Landcover Dataset <a href="http://www.mrlc.gov/nlcd2011.php">http://www.mrlc.gov/nlcd2011.php</a>	Describes agricultural lands crossed; crossing construction and pipeline operation could result in loss and fragmentation of agricultural habitats	
Annualized crop value (2015\$)	\$44,744,508	\$97,747,969	\$232,597,547	\$100,543,663	\$64,025,771	\$38,836,959	\$35,825,060	\$36,936,406		Estimation of agricultural crop value based on cropland acres within 0.5 mile	
Wild Rice (acres)	746.6	955.1	0	955.1	844.6	402.6	1,421.9	1,204.5	Wild Rice Lakes Identified by DNR Wildlife <a href="https://gisdata.mn.gov/dataset/biota-wild-rice-lakes-dnr-wld">https://gisdata.mn.gov/dataset/biota-wild-rice-lakes-dnr-wld</a>	Describes wild rice lakes crossed; crossing construction and pipeline operation could result in loss and fragmentation of wild rice lakes	
Wild Rice commercial value (2015\$)	\$923,879	\$1,181,866	\$0	\$1,181,886	\$1,045,141	\$498,182	\$1,759,395	\$1,490,399	<a href="http://www.rma.usda.gov/pilots/feasible/pdf/wildrice.pdf">http://www.rma.usda.gov/pilots/feasible/pdf/wildrice.pdf</a> and <a href="http://www.rma.usda.gov/fields/mn_rso/2016/2016mncultivatedwildrice.pdf">http://www.rma.usda.gov/fields/mn_rso/2016/2016mncultivatedwildrice.pdf</a>	Estimation of wild rice crop value based on acres of wild rice lakes within 0.5 mile	
Forest Lands (acres)	76,646	54,498	7,345	58,057	68,974	59,526	47,659	48,058	National Landcover Dataset <a href="http://www.mrlc.gov/nlcd2011.php">http://www.mrlc.gov/nlcd2011.php</a>	Describes forest lands crossed; crossing construction and pipeline operation could result in loss and fragmentation of forest lands	
Forest value (2015\$)	\$9,296,628	\$6,667,718	\$1,253,751	\$7,117,012	\$8,358,352	\$7,265,582	\$5,539,479	\$5,758,059	<a href="http://files.dnr.state.mn.us/forestry/um/forestryresourcesreport_14.pdf">http://files.dnr.state.mn.us/forestry/um/forestryresourcesreport_14.pdf</a> & <a href="http://www.nrs.fs.fed.us/pubs/rb/rb_nrs50.pdf">http://www.nrs.fs.fed.us/pubs/rb/rb_nrs50.pdf</a> & <a href="http://www.fs.fed.us/nrs/pubs/ru/ru_fs44.pdf">http://www.fs.fed.us/nrs/pubs/ru/ru_fs44.pdf</a>	Estimation of forest land value based on acres of forest land using several intermediate value measures	
Tribal Lands (Acres within 0.5 mile)	75.9	0	0	57.5	75.9	8,355.5	35,634.2	35,861.1	MNDOT Tribal Boundaries <a href="http://www.dot.state.mn.us/maps/gdma/data/metadata/indian_res.htm">http://www.dot.state.mn.us/maps/gdma/data/metadata/indian_res.htm</a>		
PAD US - Protected Areas - Ownership (within 0.5 mile; acres)	Federal	304.7	2,184.9	44,789.8	2,245.7	1,307.4	5,568.3	4,093.6	3,919.8	USGS Protected Areas Database (PAD US) <a href="http://gapanalysis.usgs.gov/padus/">http://gapanalysis.usgs.gov/padus/</a>	Describes conservation lands crossed by ownership; crossing construction and spills could degrade conservation lands and associated sensitive plant and animal resources
	State	23,262.5	2,246	525.2	2,246.0	2,950.5	34,900.6	23,895.9	25,978.9		
	Nongovernment Organization	-	-	100.0	-	-	499.5	-	-		
	Private	1,101.3	2,837.9	2,773.5	2,844.4	1,805.4	1,115.4	1,102.8	1,110.2		
	Unknown	-	964.8	93.1	964.8	157.8	1,869.8	14.1	-		
<b>EMPLOYMENT</b>											
Construction employment										Describes potential employment opportunities created based on IMPLAN	
Direct (construction jobs)	8,924	12,141	18,410	13,121	10,245	8,381	7,717	7,648	2010 U.S. IMPLAN Model		
Indirect and Induced (multiplier effect)	10,597	14,417	21,862	15,581	12,166	9,953	9,164	9,083	2010 U.S. IMPLAN Model		
Total	19,520	26,558	40,272	28,703	22,411	18,334	16,880	16,731	2010 U.S. IMPLAN Model		
Construction income (million dollars)											
Direct (construction income)	\$509	\$692	\$1,050	\$748	\$584	\$478	\$440	\$436	2010 U.S. IMPLAN Model		

<b>TABLE B-2 Line 3 Pipeline Replacement Project – Alternatives Evaluation – Socioeconomic Benefits</b> <b>Criteria - Must have similar environmental benefits but substantially less adverse economic, employment, or sociological impacts</b>											
Evaluation Factor	Applicant's Preferred Route (APR-L3)	SA-03-L3	SA-04-L3	RA-03-L3	RA-03AM-L3	RA-06-L3	RA-07-L3	RA-08-L3	Data Source	Purpose	
Indirect and Induced (multiplier effect)	\$598	\$814	\$1,234	\$879	\$687	\$562	\$517	\$513	2010 U.S. IMPLAN Model		
Total	\$1,107	\$1,506	\$2,284	\$1,628	\$1,271	\$1,040	\$957	\$949	2010 U.S. IMPLAN Model		
Fiscal Revenue Effects											
Sales/use Income											
Federal Income Tax	\$571	\$377	\$407	\$318	\$260	\$239	\$237	\$571	2010 U.S. IMPLAN Model Results and <a href="http://taxfoundation.org/article/2016-tax-brackets">http://taxfoundation.org/article/2016-tax-brackets</a>		
<b>STATE INCOME TAX</b>											
	Minnesota	\$51.20	\$98.4	\$106.30	\$81.20	\$64.90	\$59.10	\$58.50	\$51.2	2010 U.S. IMPLAN Model Results and <a href="http://www.revenue.state.mn.us/newsroom/Documents/20151105%20Income%20tax%20rates%20for%202016.pdf">http://www.revenue.state.mn.us/newsroom/Documents/20151105%20Income%20tax%20rates%20for%202016.pdf</a>	
	Wisconsin	\$0.00	\$2.2	\$2.40	\$2.40	\$2.40	\$2.40	\$2.40	\$0.0	2010 U.S. IMPLAN Model Results and <a href="https://www.revenue.wi.gov/taxpro/calctbls.html">https://www.revenue.wi.gov/taxpro/calctbls.html</a>	
	Illinois	\$12.90	\$0.0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$12.9	2010 U.S. IMPLAN Model Results and <a href="http://www.revenue.state.il.us/TaxRates/Income.htm">http://www.revenue.state.il.us/TaxRates/Income.htm</a>	
	South Dakota	\$0.00	\$0.0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.0	2010 U.S. IMPLAN Model Results and <a href="https://smartasset.com/taxes/south-dakota-tax-calculator">https://smartasset.com/taxes/south-dakota-tax-calculator</a>	
	North Dakota	\$13.60	\$1.5	\$1.60	\$1.60	\$1.60	\$1.60	\$1.60	\$13.6	2010 U.S. IMPLAN Model Results and <a href="http://www.bankrate.com/finance/taxes/state-taxes-north-dakota.aspx">http://www.bankrate.com/finance/taxes/state-taxes-north-dakota.aspx</a>	
	Iowa	\$43.20	\$0.0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$43.2	2010 U.S. IMPLAN Model Results and <a href="http://www.bankrate.com/finance/taxes/state-taxes-iowa.aspx">http://www.bankrate.com/finance/taxes/state-taxes-iowa.aspx</a>	
	Total State Income Tax	\$120.90	\$102.2	\$110.40	\$85.30	\$69.00	\$63.10	\$62.50	\$120.9		
	Property										
<b>ROW CROSSINGS (within 0.5 mile)</b>											
Number of Road Crossings	791	1,297	2,175	1,423	1,106	677	817	826	Detailed ESRI Tiger Street Network <a href="http://www.esri.com/data/data-maps">http://www.esri.com/data/data-maps</a>	Identifies the number of infrastructure crossings due to pipeline alignment; pipeline construction or spills could result in traffic disruption or infrastructure impacts	
Number of Railroad Crossings	36	43	71	53	44	41	49	52	ESRI Railroads <a href="http://www.esri.com/data/data-maps">http://www.esri.com/data/data-maps</a>		
Number of Natural Gas Pipeline Crossings	19	38	98	37	34	33	47	35	Purchased utility data from S&P Global Platts <a href="http://www.platts.com/products/gis-data">http://www.platts.com/products/gis-data</a>		
Number of Oil Pipeline Crossings	27	16	12	14	26	23	24	23			
Number of Transmission Line Crossings	80	126	257	133	106	66	102	100			
Number of Refined Productions Pipeline Crossings	8	6	44	5	8	10	9	10			
% Co-Located with other Existing Infrastructure	84.5%	81.3%	61.40%	88.50%	97.40%	56.20%	100.00%	100.00%	General Linear Corridor co-location with existing	Provides a general approximation of	

<b>TABLE B-2 Line 3 Pipeline Replacement Project – Alternatives Evaluation – Socioeconomic Benefits</b> <b>Criteria - <i>Must have similar environmental benefits but substantially less adverse economic, employment, or sociological impacts</i></b>										
Evaluation Factor	Applicant's Preferred Route (APR-L3)	SA-03-L3	SA-04-L3	RA-03-L3	RA-03AM-L3	RA-06-L3	RA-07-L3	RA-08-L3	Data Source	Purpose
									pipelines, transmission lines, railroads, and roads (Purchased Platts Utility GIS data, ESRI detailed Streets, Railroads) - Exact ROWs not determined at this time	the percentage of pipeline alignment shared with existing linear infrastructure

TABLE B-3 Line 3 Replacement Project – Alternatives Evaluation – Regulatory and Economic Feasibility										
Criteria - <i>Must be reasonable (technical feasibility, cost, reliability, energy demand, overall state energy needs)</i>										
Evaluation Factor	Applicant's Preferred Route (APR-L3)	SA-03-L3	SA-04-L3	RA-03-L3	RA-03AM-L3	RA-06-L3	RA-07-L3	RA-08-L3	Data Source	Purpose/Units
<b>TERMINUS</b>	Superior, WI	Superior, WI	Joliet, IL	Superior, WI		Identifies pipeline endpoints				
<b>PIPELINE TOTAL LENGTH (miles)</b>	378.3	514.7	780.5	556.3	434.3	355.3	327.1	324.2		Route lengths used in estimation of number of support facilities and cost projections
Minnesota Length	337.5	473.9	248	515.4	393.5	314.5	286.3	283.4		
% of Route in Minnesota	89.2%	92.1%	31.80%	92.70%	90.60%	88.50%	87.50%	87.40%		
Wisconsin Length	13.2	13.2	-	13.2	13.2	13.2	13.2	13.2		
North Dakota Length	27.6	27.6	228.4	27.6	27.6	27.6	27.6	27.6		
South Dakota Length	-	-	0.1	-	-	-	-	-		
Illinois Length	-	-	117.5	-	-	-	-	-		
Iowa Length	-	-	186.6	-	-	-	-	-		
Pipeline Loaded Cost (includes pump stations, valves, waterbody crossing) (@ \$3.9M/mile)	\$1,475	\$2,007	\$3,044	\$2,169	\$1,694	\$1,386	\$1,276	\$1,265	<a href="http://www.enbridge.com/projects-and-infrastructure/projects/line-3-replacement-program-us">http://www.enbridge.com/projects-and-infrastructure/projects/line-3-replacement-program-us</a>	General estimation of pipeline infrastructure cost
<b>TRIBAL LANDS CROSSED (Miles)</b>	0	0	0	0	0	12.94	55.92	55.86	2012 U.S. Current American Indian/Alaska/Native Hawaiian Areas National Boundaries - Data.Gov <a href="http://catalog.data.gov/dataset">http://catalog.data.gov/dataset</a>	Determines if pipeline route crosses tribal lands/ jurisdiction
<b>WATER CROSSINGS (NHD)</b>										
Number of Perennial Stream Crossings	43	82	124	86	59	72	44	50		Describes river/stream resources that have year-round water that increases cost and risk for pipeline construction
Number of Intermittent Stream Crossings	76	157	425	168	108	71	62	69	USGS National Hydrological Dataset <a href="http://nhd.usgs.gov/">http://nhd.usgs.gov/</a>	Describes river/stream resources that may contain standing or running water that increases cost and risk for pipeline construction
Water Crossing Cost (@ \$1.5M/crossing)	\$179	\$359	\$824	\$381	\$251	\$215	\$159	\$179	Cost will vary based on waterbody crossing method (e.g., wet open cut, dry open cut, conventional bore, horizontal directional drilling, etc.), which often varies across waterbodies within a project <a href="http://nhd.usgs.gov/">http://nhd.usgs.gov/</a>	General estimation of pipeline water crossing cost; cost will vary greatly based on crossing method
<b>BLOCK VALVES</b>										
Number of Block Valves (1 every 15 miles)	25	34	52	37	29	24	22	22	ND Industrial Commission Crude Oil Pipeline Feasibility Study Bakken to Keystone (April 15, 2009)	General estimate of number of block valves needed for the pipeline based on linear length with valves occurring every 15 miles
Block Valve Cost (@ \$0.22M/Block Valve)	\$6	\$8	\$11	\$8	\$6	\$5	\$5	\$5		Estimation of block value cost
<b>PUMP STATIONS</b>										
Number of Pump Stations (1 every 50 miles)	8	10	16	11	9	7	7	6	<a href="http://www.ogi.com/articles/print/volume-112/issue-9/special-report-pipeline-economics/crude-oil-pipeline-growth-revenues-surge-construction-costs-mount.html">http://www.ogi.com/articles/print/volume-112/issue-9/special-report-pipeline-economics/crude-oil-pipeline-growth-revenues-surge-construction-costs-mount.html</a> <a href="http://www.enbridge.com/projects-and-infrastructure/projects/~media/2509CBF391B74FB9B33935264971D1C1.ashx">http://www.enbridge.com/projects-and-infrastructure/projects/~media/2509CBF391B74FB9B33935264971D1C1.ashx</a>	Estimation of number of pump stations needed for the pipeline based on linear length occurring every 50 miles

<b>TABLE B-3 Line 3 Replacement Project – Alternatives Evaluation – Regulatory and Economic Feasibility</b>										
<b>Criteria - Must be reasonable (technical feasibility, cost, reliability, energy demand, overall state energy needs)</b>										
<b>Evaluation Factor</b>	<b>Applicant's Preferred Route (APR-L3)</b>	<b>SA-03-L3</b>	<b>SA-04-L3</b>	<b>RA-03-L3</b>	<b>RA-03AM-L3</b>	<b>RA-06-L3</b>	<b>RA-07-L3</b>	<b>RA-08-L3</b>	<b>Data Source</b>	<b>Purpose/Units</b>
Pump Station Cost (@ \$12.8M/Station)	\$97	\$132	\$200	\$142	\$111	\$91	\$84	\$83	<a href="http://www.enbridge.com/projects-and-infrastructure/projects/~media/2509CBF391B74FB9B33935264971D1C1.ashx">http://www.enbridge.com/projects-and-infrastructure/projects/~media/2509CBF391B74FB9B33935264971D1C1.ashx</a>	Estimation of pump station cost
<b>ENERGY</b>										
Annual Energy/Station (KWh) at full capacity (millions)										Estimation of annual energy use at each pump station, estimates of greenhouse gas production
Annual Energy Cost at \$0.xx/KWh										Calculation based on number of pump stations and estimated energy usage
<b>DISTURBANCE</b>										
Total Construction disturbance @ 3 acres/1,000 ft. line)	5,992.2	8,152.8	12,363.5	8,811	6,879.8	5,628	5,181.8	5,136		Calculation to determine estimated area of disturbance
Total permanent ROW maintained @ 1.15 acres/1,000 ft. line	2,297.0	3,125.2	4,739.3	3,377.6	2,637.3	2,157.4	1,986.4	1,968.8		Calculation to determine estimated area of permanent ROW maintained
Total Annual Capacity (bbl)										Estimated pipeline capacity
<b>COST</b>										
Cost/bbl to Terminus Construction/Energy Refineries Served										Estimated cost to deliver bbl to terminus
Updated Linear Cost (\$M)	\$1,194	\$1,510	\$2,009	\$1,638	\$1,326	\$1,075	\$1,028	\$998		Estimated updated cost of pipeline construction only, with the removal of water crossing, block valves, and pump station
Updated Linear Cost/Mile (\$M)	\$3.16	\$2.93	\$2.57	\$2.94	\$3.05	\$3.03	\$3.14	\$3.08		Estimated updated linear cost per mile
Compare to Proposed Alignment	1	1.26	1.68	1.37	1.11	0.9	0.86	0.84		Estimated cost ratio of the proposed route to the APR
Total Water Crossing, Block Valve, Pump Station Cost (\$M)	\$281	\$498	\$1,035	\$532	\$368	\$311	\$248	\$266		Estimated total cost of water crossing, block valves, and pump stations