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Chapter 4
Alternatives to the Proposed Project

4.1 INTRODUCTION

Environmental Impact Statement Must Compare Proposed Project with Reasonable Alternatives

As outlined in Chapter 3, the Minnesota Environmental Policy Act requires that an Environmental Impact Statement (EIS) compare the potentially significant impacts of a proposed project to those of other reasonable alternatives.[1] In addition, both the Certificate of Need (CN)[2] and route permit[3] regulations require an evaluation of reasonable alternatives to a proposed project. More specifically, Minnesota environmental review regulations require that:

> *The EIS must address one or more alternatives of each of the following types of alternatives or provide a concise explanation of why no alternative of a particular type is included in the EIS: alternative sites, alternative technologies, modified designs or layouts, modified scale or magnitude, and alternatives incorporating reasonable mitigation measures identified through comments received during the comment periods for EIS scoping or for the draft EIS.*[4]

In Scoping the EIS, the Commission Included Recommended Alternatives, Plus One Route Segment

During the scoping process, Minnesota Department of Commerce, Energy Environmental Review and Analysis (DOC-EERA) staff collected input from the public, agencies, tribes, and nongovernmental organizations—including suggestions for alternatives for the EIS. After reviewing the proposed alternatives, DOC-EERA prepared a proposed *Final Scoping Decision Document* and recommended the CN and route permit alternatives to be included in the scope of the EIS. The *Alternatives Screening Report*[5] and the *Final Scoping Decision Document*[6] describe the process used to solicit, evaluate, and select the alternatives included in this EIS.

On November 30, 2016, the Minnesota Public Utilities Commission (Commission) issued its EIS scoping order that included these alternatives as well as one additional route segment.[7]

CN and Route Permit Alternatives Are Addressed Separately

The Commission will use the EIS to help inform its CN decision and the route permit decision. Therefore, the alternatives analysis is divided into two sections to match the alternatives under consideration in

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1 Minnesota Statutes § 216D.04, Subp. 2a.

2 Minnesota Administrative Rules Part 7853.0120.

3 Minnesota Administrative Rules Part 7852.1400.

4 Minnesota Administrative Rules Part 4410.2300(G).

5 *Alternatives Screening Report for Line 3 Replacement Project,* dated September 21, 2016, available at eDockets Number 20169-125058-08.

6 *Final Scoping Decisions Document for Line 3 Replacement Project*, dated September 21, 2016, available at eDockets Number 201612-127062-03.

7 Order Denying Motions, Approving Scoping Decision as Modified, and Requiring Expanded Notice, November 30, 2016, eDockets Numbers 201611-126917-02 and 201611-126917-02.

each of these two separate, sequential decisions. This chapter describes each of the CN, route, and route segment alternatives to the proposed Line 3 Project. Chapter 5 evaluates the potential environmental impacts of CN Alternatives, and Chapter 6 evaluates the potential environmental impacts of route alternatives.

This EIS focuses on providing the applicable environmental information for the CN, the route permit, and other agency decisions. Section 4.2, describes the alternatives evaluated in the EIS for the CN decision. The majority of the economic analysis and other technical information for the CN decision will be provided by the Enbridge Energy, Limited Partnership (Enbridge, or Applicant), other parties, and the public that are participating in the contested case hearing.

4.2 DESCRIPTION OF ALTERNATIVES – CERTIFICATE OF NEED

CN Criteria Address Energy Efficiency and Reliability, and Potential Social and Environmental Effects

In analyzing the need for the proposed Project and alternatives, the Commission must consider whether:

A. The probable result of denial would adversely affect the future adequacy, reliability, or efficiency of energy supply to the Applicant, to the Applicant's customers, or to the people of Minnesota and neighboring states.[8]

B. A more reasonable and prudent alternative to the proposed facility has not been demonstrated by parties or persons other than the Applicant.[9]

C. The consequences to society of granting the CN are more favorable than the consequences of denying the certificate.[10]

D. It has not been demonstrated that the design, construction, or operation of the proposed facility would fail to comply with the relevant policies, rules, or regulations of other federal, state, or local agencies.[11]

For a more detailed discussion of CN criteria, see Chapter 3 in this EIS.

Commission Could Issue a CN for the Project as Proposed or Modified, or They Could Deny It

The Commission could issue a CN for the Project as proposed, modify it, or deny it. As discussed in Chapter 3, the Commission must consider each of the criteria in Minnesota Administrative Rules Part 7853.0130 in determining need. Under these criteria, the Commission first considers the underlying economic need for the proposed pipeline. This economic analysis, conducted by Minnesota Department of Commerce Division of Energy Resources Energy Planning and Advocacy and other parties to the contested case hearing, will aid the Commission in making this evaluation. Then, if the Applicant establishes the underlying need, the environmental and socioeconomic analyses in the EIS will help the Commission weigh the advantages and disadvantages of alternative ways to meet the need and whether to issue a CN for the proposed Project. Therefore, for the CN decision, the Commission has three

8 Minnesota Administrative Rules Part 7853.0130 (A).

9 Minnesota Administrative Rules Part 7853.0130 (B).

10 Minnesota Administrative Rules Part 7853.0130 (C).

11 Minnesota Administrative Rules Part 7853.0130 (D).

options: (1) issue the certificate for the Project as proposed; (2) issue a certificate contingent on modifications; or (3) deny the certificate.[12]

Table 4.2-1 provides an overview of the alternatives included in this section and illustrates how the range of alternatives evaluated in the EIS aligns with each of the four major need-related criteria in Minnesota Administrative Rules Part 7853.0130, A through D. The rows in Table 4.2-1 represent the CN Alternatives evaluated in the EIS, and the columns are the applicable CN criteria. Figure 4.2-1 shows the locations of the CN Alternatives.

The sections that follow provide a detailed description of each of the CN Alternatives. In addition to the CN Alternatives included in Table 4.2-1 and discussed in Sections 4.2.1 through 4.2.9, Section 4.2.10 discusses the alternative of using a smaller diameter pipeline.

4.2.1 Action Alternative – Certificate of Need Approved

Chapter 2 describes the Applicant's proposed Project in detail.

4.2.2 No Action Alternative – Certificate of Need Denied

No Action Alternative is The Denial of Certificate of Need, and Potential Consequences

The EIS must evaluate the environmental consequences of the No Action Alternative. In this case, a Commission decision to deny the CN is the "No Action" Alternative. If the Commission determines that the demand for increased shipping capacity exists but denies the CN, the Applicant (or entities other than the Applicant) could reasonably be expected to meet shipper demand through other means, such as a different pipeline system, or by train or truck.

In analyzing the No Action Alternative, this EIS must therefore consider the human and environmental impacts associated with a variety of CN Alternatives that correspond to potential other reasonable alternatives and the applicable CN decision criteria. As indicated in Table 4.2-1, the No Action Alternative, denying the CN, could lead to any of the following:

1. Continued use of existing Line 3
2. Use of other pipelines
3. System Alternative SA-04
4. Use of Rail as an alternate mode of transport
5. Use of Trucks as an alternate mode of transport
6. Continued use of existing Line 3 supplemented by rail
7. Continued use of existing Line 3 supplemented by truck

[12] Minnesota Administrative Rules Part 7853.0800.

Figure 4.2-1. Locations of Certificate of Need Alternatives

Table 4.2-1. Certificate of Need Alternatives and Criteria

Commission's Decision	Would denial adversely affect future adequacy, reliability, or efficiency of energy supply?	If yes, is there a more reasonable and prudent alternative, such as different endpoints or a different transport method?	If no, are the consequences to society of granting the CN more favorable than denial? Does the Project comply with other laws?	Certificate of Need Alternatives Evaluated for Environmental Impacts	
	Minnesota Administrative Rules Part 7853.0130 A	**Minnesota Administrative Rules Part 7853.0130 B**	**Minnesota Administrative Rules Part 7853.0130 C, D**		
Certificate of Need Not Granted (CN Alternatives)	No Keep using existing Line 3	—	—	**CN Alternative 1** Continued use of existing Line 3	Line 3 operates at existing capacity, no supplemental oil transportation
	Yes	Yes Use a different pipeline system	—	**CN Alternative 2** Other pipelines	Other pipelines transport up to 760,000 barrels per day (bpd)
				CN Alternative 3 System alternative SA-04	SA-04 transports up to 760,000 bpd
		Yes Use a different oil transportation mode		**CN Alternative 4** Transportation by rail	Trains transport up to 760,000 bpd
				CN Alternative 5 Transportation by truck	Trucks transport up to 760,000 bpd
	Yes	No	No The consequences to society of granting the CN are not more favorable than denying it	**CN Alternative 6** Existing Line 3 supplemented by rail	Line 3 operates at existing capacity; trains used to transport up to 370,000 additional bpd to market
				CN Alternative 7 Existing Line 3 supplemented by truck	Line 3 operates at existing capacity; trucks used to transport up to 370,000 additional bpd to market
Certificate of Need Granted	Yes	No	Yes	Applicant's proposed Project	CN granted for the proposed Project or for a modified Project (e.g., a new lower-capacity pipeline)

The sections that follow provide a detailed description of each of the CN Alternatives. In addition, Section 4.2.10 discusses the alternative of a smaller diameter pipeline.

To provide a basis for evaluating the No Action Alternative, the following throughput volumes by destination were assumed for each of the CN Alternatives (Table 4.2-2).

Table 4.2-2. Average Delivery Volume by Destination for Existing Line 3 and Certificate of Need Alternatives (barrels per day)

Alternative	Destination			Total Deliveries
	Clearbrook	Superior[a]	Other	
Continued use of existing Line 3	360,000	30,000	0	390,000
Use of other pipelines	0	0	760,000/various	760,000
System alternative SA-04	0	0	760,000 – Joliet, Illinois	760,000
Transportation by rail	360,000	400,000	0	760,000
Transportation by truck	360,000	400,000	0	760,000
Existing Line 3 supplemented by rail	360,000	400,000	0	760,000
Existing Line 3 supplemented by truck	360,000	400,000	0	760,000

[a] Deliveries by rail or truck would range from 154,000 barrels per day (bpd) (supplement to continued use of existing Line 3 at 390,000 bpd) to up to 494,000 bpd (exclusive use of rail or truck) to achieve a total volume of 760,000 bpd.

Note:

Unit of measure for crude oil: 1 barrel = 42 U.S. gallons

4.2.3 Certificate of Need Alternative 1 – Continued Use of Existing Line 3

As Table 4.2-2 shows, if the existing Line 3 continued to operate under the No Action Alternative, only 390,000 barrels per day (bpd) of transfer capacity would be available, considerably less than the 760,000 bpd planned capacity of the Line 3 Project.

Line 3 has operated at the current lower capacity for integrity reasons. Under the current version of the proposed consent decree (see Section 2.2), increasing the capacity of the existing Line 3 to a higher operating capacity would require significant investment by Enbridge to repair and maintain the existing facilities. Enbridge previously determined that such an investment in new facilities is cost prohibitive and not feasible. Because Enbridge has already determined that upgrading the existing line is not feasible, upgrading the existing line to a higher capacity was not considered in the CN evaluation and, as noted in Table 4.2-2, the analysis of this CN Alternative assumes 390,000 bpd throughput.

Maintaining the Existing Line 3 Would Require 4,000 Excavations over the Next 15 Years

Continued operation of Line 3 at its present capacity would require that Enbridge continue the high level of maintenance that the pipeline currently requires. Enbridge has estimated that up to 4,000 integrity digs (excavating and exposing the pipeline for maintenance and correction of anomalies) would be required over the next 15 years of operation (approximately 267 procedures per year) (Enbridge 2015). The effects of this high level of maintenance activity would continue under the No Action Alterative.

Integrity digs occur when a potential anomaly in the pipeline structure is detected and must be investigated and repaired. The potential repair site is identified and, if required for protecting adjacent operating pipelines, protective matting, or an additional soil layer is temporarily installed around the site. Topsoil at the repair site may be removed and stockpiled.

The pipeline trench is opened using excavating equipment, and the exposed pipeline is inspected and repaired, as warranted. In some cases, a portion of the pipe is removed and a replacement section welded into place, inspected, and tested. When the repair is completed and protective external coating is reapplied, the trench is backfilled, topsoil is replaced, and, if appropriate, vegetation is restored. The disturbed area within the pipeline right-of-way may be a small area for repair of the pipeline at a specific point or a larger area if a section of the pipe is replaced.

Under the consent decree, increasing the capacity of the existing Line 3 to a higher operating capacity would require significant investment by Enbridge in repair and maintenance of the existing facilities.

Annual Cost for Continued Maintenance of Existing Line 3 Is Estimated at $30 to $40 Million

Enbridge estimates that it would cost $30 to $40 million per year to maintain the U.S. portion of the existing Line 3. For comparison, Enbridge estimates that maintaining the new Line 3 would cost approximately $2 million (Enbridge 2014).

4.2.4 Certificate of Need Alternative 2 – Use of Other Pipelines

Other existing and potential future pipelines with available capacity were considered as alternatives to the Project if they (1) interconnected in the crude oil supply region near Edmonton, Alberta; and (2) served the same Clearbrook and Superior destinations.

Environmental Impacts of Alternative Pipeline Capacity Owned by Enbridge or Others Are Not Evaluated

Existing regional pipelines that originate in the Edmonton area include TransCanada's Keystone pipeline system and the Enbridge Mainline system, which consists of Line 3 and other pipelines, including Line 1 (237,000 bpd), Line 2A (442,000 bpd), Line 2B (442,000 bpd), Line 4 (796,000 bpd), and Line 67 (890,000 bpd). Other pipelines that have recently been constructed, are planned for construction, or are in the planning and permitting stage were also considered. Each potential alternative pipeline is listed and described in Table 4.2-3.

Table 4.2-3. Certificate of Need Alternative Pipelines

Pipeline	Route	Status
Keystone XL pipeline	Canada, North Dakota, South Dakota, Nebraska	Presidential Permit granted. Does not enter Minnesota and does not interconnect with Clearbrook or Superior.
TransCanada Energy East pipeline	From Hardisty, Alberta, to Montreal parallel to the U.S.-Canada border	Not currently approved for construction. Does not enter Minnesota and does not interconnect with Clearbrook or Superior.
Woodriver pipeline	Woodriver, Illinois, to Cushing, Oklahoma	Existing pipeline (inactive)
Minnesota pipeline	Clearbrook to Twin Cities	Existing pipeline
Enbridge Mainline system	Edmonton to Superior via Clearbrook	Existing pipelines

Source: Information Technology Associates 2008.

It is not clear whether these alternative pipelines could meet the need for this proposed project. However, the CN hearing process will evaluate additional information on the economic need or viability of other regional pipelines to transport the volume of additional oil proposed by the Project. The environmental impacts associated with these other pipelines have been (or would be) evaluated in other jurisdictions. Therefore, the "other pipeline" CN Alternatives are not evaluated in the EIS. The environmental implications of a Commission determination that existing and/or other proposed pipelines meet the need for the proposed project is addressed in the review of continued operation of existing line 3 at 390,000 barrels per day. This analysis is provided in Chapter 5 of the EIS.

4.2.5 Certificate of Need Alternative 3 – System Alternative SA-04

System Alternative SA-04 Would Mostly Run Through North Dakota, Iowa, and Illinois

SA-04 was proposed by commenters during the scoping process as an alternative that would completely avoid northern and central Minnesota, and would interconnect with the regional pipeline system closer to the major refineries in central Illinois. In the *Final Scoping Decision Document*, SA-04 was shown to terminate near Joliet, Illinois. Approximately 68 percent of SA-04 is located outside Minnesota in North Dakota, Iowa, and Illinois. System alternative SA-04 is not the same as a "route alternative," such as those evaluated in Chapter 6. It is a conceptual pipeline alternative to a different endpoint that is analyzed for comparative purposes. SA-04 and other CN Alternatives could not actually be permitted under this process.

4.2.5.1 Location

The location of SA-04 follows the Applicant's preferred route from Neche, North Dakota, to the vicinity of U.S. Highway 29 in the northeast corner of North Dakota, where it intersects with the Alliance pipeline corridor. It follows the pipeline corridor until it crosses into Minnesota near Wheaton, in Traverse County. In Minnesota, SA-04 parallels the Alliance pipeline right-of-way and the Minnesota River through Big Stone, Swift, Chippewa, Renville, and Nicolet counties to near 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, in Clinton County, Iowa, generally following the Cedar River. The route crosses the Iowa-Illinois border southeast of Clinton, Iowa, and continues along existing pipelines (Alliance Pipeline, LP; Enterprise Products Operations, LLC; NGL Pipeline, LP) to Joliet, Illinois.

Figure 4.2-1 illustrates the location of SA-04. Figures showing the route at a larger scale are included in Appendix A. Distances for SA-04 are summarized in Table 4.2-4.

4.2.5.2 Pump Stations and Mainline Valves

System Alternative SA-04 Length Would Require 16 New Pump Stations

Enbridge indicated that 16 pump stations would be required along SA-04, or one every 50 miles on average, which is comparable to Enbridge's proposed Project. It was assumed that each pump station would require approximately 8 acres of land and would be located adjacent to the system alternative alignment. Similar to the proposed Project, mainline valves (MLVs) would be required near water crossings, significant environmental resources, and populated areas in order to shut off oil in case of a

leak. Hydraulic analysis of operating the pipeline for SA-04 is not available, so the specific locations of pump stations and MLVs cannot presently be determined.

Table 4.2-4. Measurements for System Alternative SA-04

Feature	Measurement
Total length (origin to destination)	795.4 miles
Length in Minnesota	251.0 miles
Length outside Minnesota	544.4 miles
States crossed (distance)	North Dakota – 233.5 miles Iowa – 187.9 miles Illinois – 123.0 miles
Counties crossed	North Dakota: Pembina, Walsh, Grand Forks, Trail, Cass, Richland Minnesota: Traverse, Stevens, Swift, Chippewa, Kandiyohi, Renville, Sibley, Nicollet, Le Sueur, Blue Earth, Waseca, Freeborn, Mower Iowa: Mitchell, Howard, Chickasaw, Bremer, Fayette, Buchanan, Delaware, Jones, Clinton Illinois: Rock Island, Whiteside, Lee, Bureau, LaSalle, Grundy, Will

4.2.5.3 Construction and Operation of System Alternative SA-04

Constructing and Operating System Alternative SA-04 Could Require Additional State and Local Permits

The analysis of impacts associated with SA-04 in the EIS assumes that it would be constructed and operated in the same manner as the Applicant's preferred route. SA-04 is located within other local and state jurisdictions (approximately 544 miles, or 68 percent of the total route), so other state and local regulations would apply.

4.2.6 Certificate of Need Alternative 4 – Transportation by Rail

This alternative considers rail as an alternative mode of transport to transfer 760,000 bpd to Enbridge's terminals in Clearbrook, Minnesota, and Superior, Wisconsin. The analysis assumes that 48 percent of the 760,000 bpd total (360,000 bpd) would be delivered to Clearbrook, Minnesota, based on the approximate capacity of the Twin Cities refineries that the Clearbrook terminal serves via the Minnesota Pipe Line Company (MPL) pipeline system. The analysis assumes that the remaining 52 percent (400,000 bpd) would be delivered to Superior, Wisconsin. It also assumes that existing rail lines would primarily be used. These destinations and existing routes are shown in Figure 4.2-2.

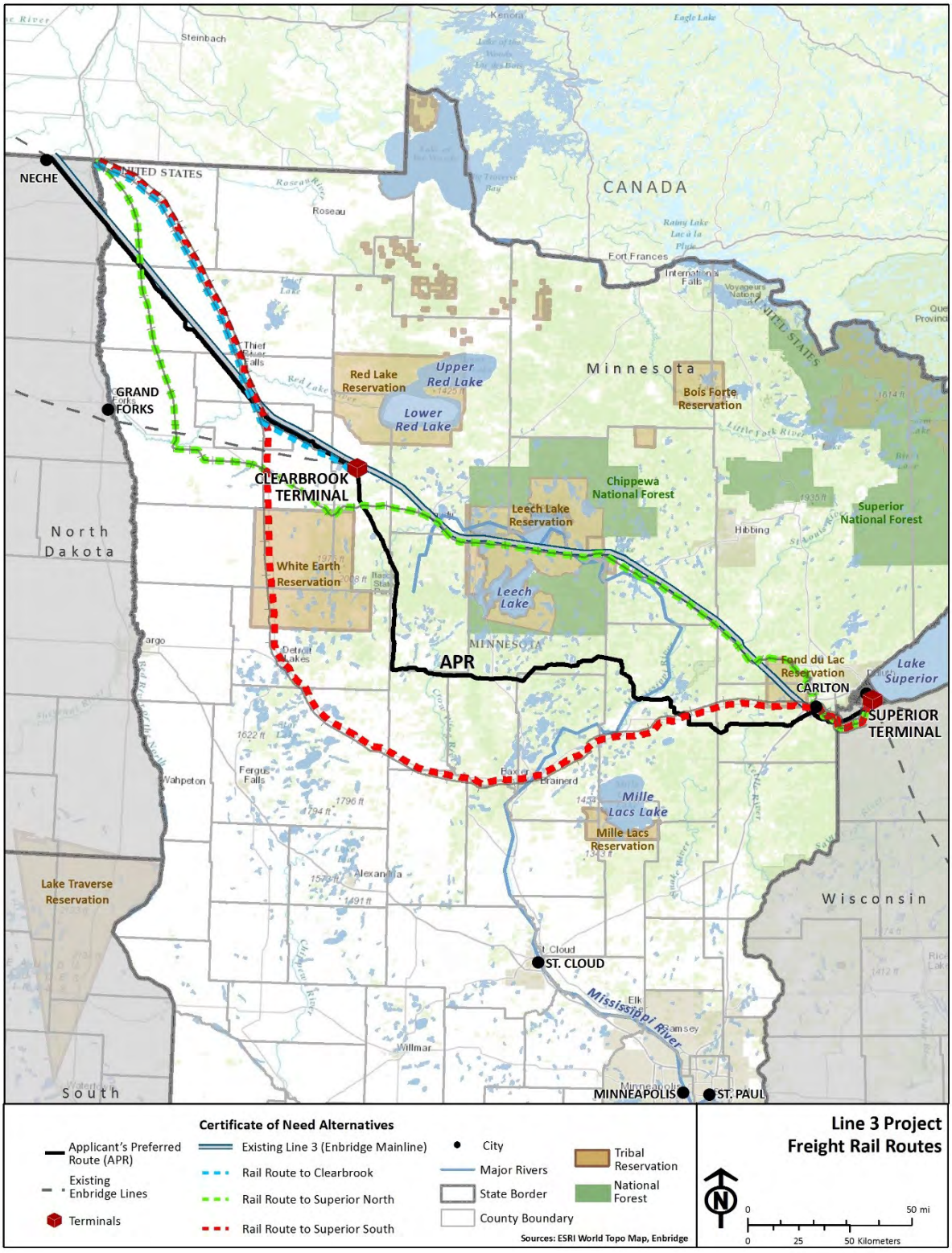

Figure 4.2-2. Potential Railway Routes from Gretna to the Clearbrook and Superior Terminals

Rail Transport Would Require New Oil Storage and Loading Facilities and Upgraded Rail Access

Transporting oil by rail would require an oil storage and rail loading facility near Neche, North Dakota, and could be transported by either the Burlington Northern Santa Fe (BNSF) or the Canadian Pacific rail lines to the Clearbrook and Superior terminals, respectively. There are currently no oil storage facilities, rail loading facilities, or rail access immediately adjacent to the Mainline near the international border. In addition, no rail offloading facilities or rail access are adjacent to the Clearbrook terminal. Some rail access and existing rail offloading capacity is currently available at Superior. Transporting crude oil by rail would require that loading/offloading facilities and new rail access be developed and that existing rail access be upgraded. To implement the rail alternative, the following facilities would be required.

- Gretna (near Neche) – The Mainline pump station and storage facilities closest to Neche are located at Enbridge's pump station in Gretna, Canada, approximately 2 miles north of Neche, North Dakota. Both BNSF and Canadian Pacific rail lines have mainline rail facilities at West Lynn/Emerson, Canada; a distance of approximately 14 miles. The Gretna pump station is in a rural location surrounded primarily by disturbed agricultural land. A 14-mile-long rail line across agricultural land, including some wetlands, would require disturbance of approximately 84 acres in addition to an area of 100 to 200 acres for the rail loading facility.

  The loading facility, which would be constructed in Canada, would include approach tracks, storage tracks, and active loading facilities, which would need to be enclosed to allow operations during winter and would need to accommodate railroad siding, metering equipment, underground piping, secondary containment and vapor control systems, catch basins, retention ponds, electric power, sewer and water systems, and other associated facility requirements. There are existing storage facilities at the Gretna pump station. Rail access would be directly east and could require an estimated six new rural road crossings. Any loading facility at Gretna would require permitting by provincial and national entities in Canada.

- Clearbrook – The existing Enbridge terminal and pump station at Clearbrook is surrounded by semi-disturbed agricultural lands and wetlands. An abandoned rail right-of way is directly adjacent to the existing pump station site. The line is abandoned, and the track from Clearbrook approximately 10 miles northwest to Gully, Minnesota, has been removed. At Gully, rail facilities are still present but would likely need to be upgraded or replaced along the Canadian Pacific route from Gully to Thief River Falls.

  The offloading facility would require converting 100 to 200 acres of agricultural lands and wetlands to accommodate arrival and departure tracks, enclosed transfer structures, concrete containment areas, repair facilities, support buildings, pumps, above- and below-ground pipelines providing connections to the Clearbrook terminal, electric power, stormwater infrastructure, sewer and water systems, and an oil-water separation area. Recommissioning the abandoned rail facilities could require re-converting approximately 60 acres of partially reclaimed right-of-way. Because an existing rail line would be used, no new road crossings would be created, but existing road crossings would be reactivated.

- Superior – An existing rail logistics facility is located adjacent to the Enbridge terminal at Superior. This facility could have limited capacity and would require expansion to accommodate crude oil transfers of 760,000 bpd. The land adjacent to the existing rail logistics facility consists primarily of wetlands that would need to be converted if used for expansion. Rail access to the BNSF and Canadian Pacific systems appears to be available subject to appropriate tariffs. No new road crossings are likely to be required.

Transporting 760,000 bpd of Oil by Rail Would Require Ten 110-Car Trainloads a Day

Oil is typically transported on unit trains, which consist of approximately 110 specialized tank cars designed to haul liquid freight, and specifically crude. Each of these specialized tank cars, which are regulated by the U.S. Department of Transportation (USDOT), could hold up to 800 barrels (33,600 gallons) of oil. Therefore, a full unit train of 110 tank cars could transport 88,000 barrels (3.7 million gallons) of oil.

Transporting 760,000 bpd of oil by rail would require 10 loaded unit trains per day to travel from Gretna to the Clearbrook and Superior terminals. Assuming that the volume of oil transported to the Clearbrook terminal and subsequently pumped to Minnesota refineries would equal 48 percent of this total and the remaining 52 percent of the total would be transported to Superior, five loaded unit trains would be required to travel from Gretna to the Clearbrook terminal per day, and five loaded unit trains would be required to travel from Gretna to the Superior terminal per day (Table 4.2-5).

Table 4.2-5. Summary of Transportation Requirements for the Rail Alternative

Unit Trains		
Volume	**Number Required[a]**	**Departures per Day**
760,000 barrels per day	66 trains/7,244 cars	10
Facilities		
Facility	**Facility Requirements**	**Land Requirements**
Rail loading and offloading facilities	Gretna – New 100- to 200-acre[b] facility with Class 1 rail connection adjacent to the existing Mainline right-of-way	Gretna – Adjacent agricultural land
	Clearbrook – New 100-to 200-acre[b] facility with Class 1 rail connection adjacent to the existing Clearbrook terminal	Clearbrook – Adjacent semi-disturbed land, agricultural land and wetlands
	Superior – Approximately 100-acre[b] expansion of existing rail logistics facility adjacent to existing Enbridge terminal	Superior – Adjacent wetlands and recreation land (golf course)
Rail upgrades	Gretna – New approximately 14-mile-long spur line connection from Gretna pump station to BNSF or Canadian Pacific rail line at West Lynn/Emerson in Canada	Gretna – Approximately 84 acres[c] of permanent agricultural land converted to rail use; additional road crossings
	Clearbrook – Reestablish approximately 10 miles of track from Gully to Clearbrook and upgrade portions of the existing Canadian Pacific rail line from Thief River Falls to Gully, Minnesota	Clearbrook – Approximately 60 acres[c] of existing abandon right-of-way converted back to rail use
	Superior – Direct interconnection with existing BNSF and Canadian Pacific Class 1 rail line. Less than 0.5 mile of new spur may be required.	Superior – Less than 3 acres[c] of semi-disturbed land converted to rail use

[a] Number of unit trains does not include requirements for locomotives.

[b] Area required for loop track, storage tracks, and transfer facilities for loading or offloading operations are exclusive of rail spur to interconnect with Class 1 rail line.

[c] Assumes a 50-foot-wide permanent right-of-way. An additional right-of-way of up to 50 feet could be disturbed during construction.

Cost of the Required Number of New Tank Cars Estimated at $1 Billion

Based on the calculations for the number of tank cars needed to deliver the specified volumes per day, the estimated transit times of the unit trains, and the time necessary for loading and offloading the tank cars and for empty trains to make return trips to Gretna, approximately 7,200 new tank cars would be required.[13] Assuming a cost of $140,000 per car, the capitalization to amass the needed number of unit trains would be approximately $1 billion.

Availability of Existing and New Tank Cars is Assumed in the Analysis

This estimate assumes that the proposed stock of tank cars would be available. While tank car manufacturers were said to have over 50,000 tank cars back ordered in 2013, more recent analysis indicates that this backlog has cleared (Kloster 2015). This estimate also does not include the cost of constructing the new rail spurs or any associated rail infrastructure needed, railway maintenance, labor costs, fuel, or other associated expenses. Nor does it include the cost of constructing unit train terminal facilities for loading and offloading, which have been estimated to range from approximately $85 to $125 million.

This scenario also assumes that the BNSF and Canadian Pacific rail carriers have availability for this increase in rail traffic and would provide joint rail tariffs for the service proposed. It would require one available route on Canadian Pacific to the Clearbrook terminal and two available routes to the Superior terminal through various combinations and routings of the BNSF and Canadian Pacific rail lines. See Figure 4.2-2.

4.2.7 Certificate of Need Alternative 5 – Transportation by Truck

This alternative considers truck as an alternative mode of transport to transfer 760,000 bpd to Enbridge's terminals in Clearbrook, Minnesota, and Superior, Wisconsin. As with the rail alternative, transporting crude oil by truck as an alternative to replacing Line 3 would require that oil be pumped through the existing Mainline from the Applicant's facilities in Edmonton, Alberta, to an oil storage and truck loading facility at Gretna, adjacent to the existing Mainline. Oil would subsequently be loaded into tanker trucks and transported by highway to the Clearbrook and Superior terminals. The analysis assumes that 48 percent of the 760,000 bpd total (360,000 bpd) would be delivered to Clearbrook, Minnesota, based on the approximate capacity of the Twin Cities refineries that the Clearbrook terminal serves via the MPL system. The analysis assumes that the remaining 52 percent (400,000 bpd) would be delivered to Superior, Wisconsin. It also assumes that existing highways would primarily be used. These destinations and existing routes are shown in Figure 4.2-3.

[13] Calculations are based on figures provided in the MPL, LLC Certificate of Need Application for the Minnesota Pipe Line Reliability Project. MPUC Docket No. PL-5/CN-14-320.

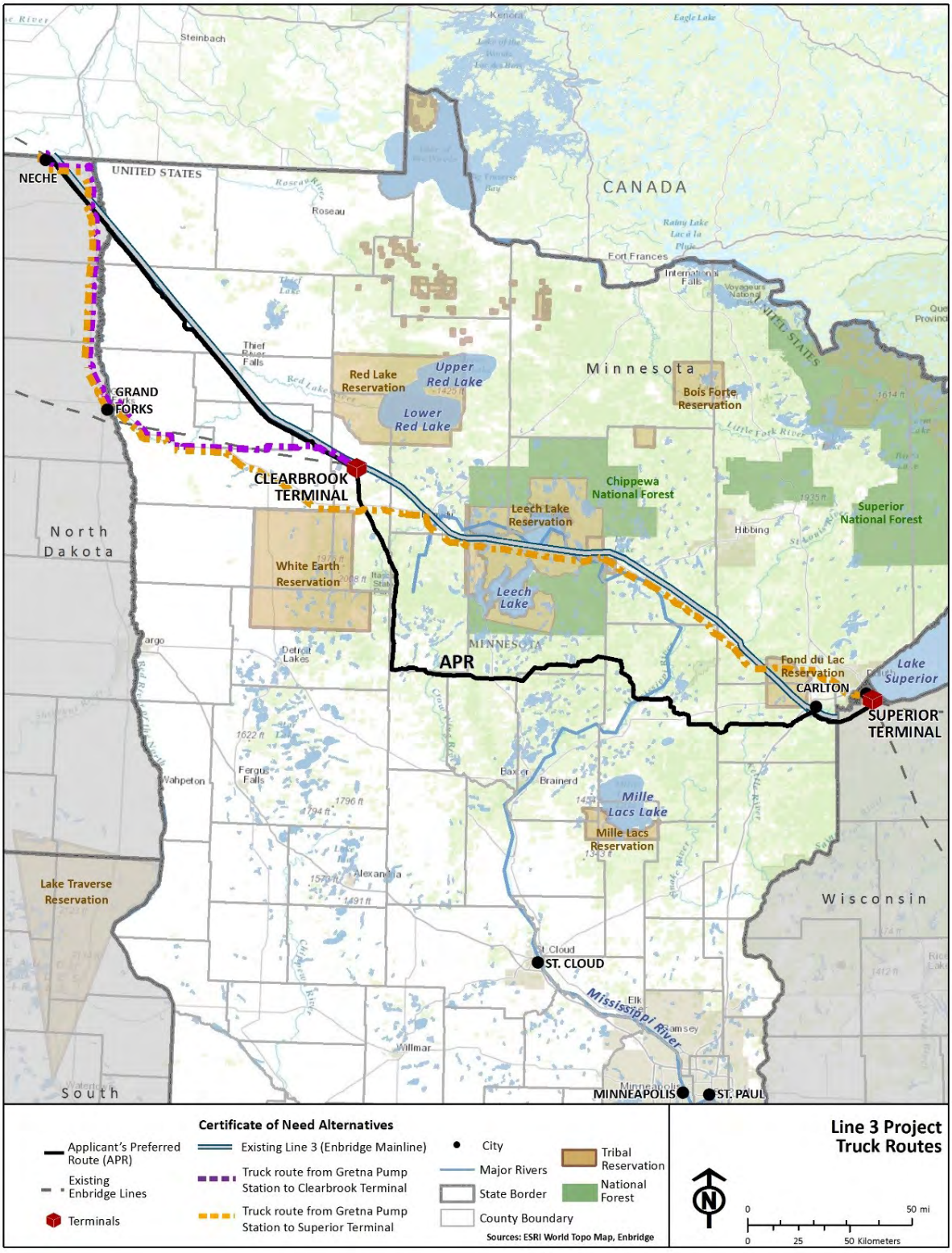

Figure 4.2-3. Potential Truck Routes from Gretna to the Clearbrook and Superior Terminals

Truck Transport Would Require New Loading Facilities and New or Upgraded Access to Highways

This alternative would require development of truck loading and offloading facilities and new or upgraded road access to the interstate highway system. Assuming that the Applicant could maximize use of that portion of Line 3 approved for upgrade in Canada, a truck loading facility would likely be located at the Gretna pump station near the U.S. border. From this point, trucks could be routed to Enbridge's Clearbrook and Superior terminals. To implement the truck alternative, the following facilities would be required.

- Gretna – A truck loading facility would most likely be located at the Gretna pump station. Manitoba Provincial Highway 30, North Dakota State Highway 18, and North Dakota County Road 55 would link the facility to Interstate 29 at Pembina, North Dakota. These roads, spanning 18 miles, may require the addition of passing lanes and other configuration changes to support the increased truck traffic. Due to the uncertainty of what upgrades would be required, amounts for permanently disturbed areas were not estimated, but road upgrades likely would involve only minimal acreage. The facility would require that rural agricultural land and some wetlands be permanently converted to industrial use—approximately 50 acres for the loading facility and 102 acres for road access.

  The loading facility would consist of covered loading bays, piping to connect to existing storage tanks, primary and secondary spill and runoff containment facilities, wastewater systems, and other associated components, including contained overnight parking facilities for the trucks. The location of facilities in Canada could be influenced by permitting and international border crossing requirements.

- Clearbrook – Tanker trucks using the interstate highway system would arrive at the Applicant's Clearbrook terminal and offload crude oil to be delivered to those customers taking deliveries at Clearbrook. It was assumed that existing storage tanks would be sufficient to support the truck delivery operation, but truck offloading facilities would need to be constructed with the same components as the loading facilities described above.

  The existing Enbridge terminal and pump station at Clearbrook are surrounded by semi-disturbed agricultural lands and wetlands that would need to be converted to industrial use to accommodate an approximately 50-acre truck offloading facility. A new 0.6-mile-long access road from the terminal to State Highway 92 would need to be constructed. In addition, State Highway 92 from Clearbrook to its intersection with County Highway 7 south of Oklee, County Highway 7 south of Oklee to its intersection with U.S. Highway 59 south of Brooks, a 1-mile expanse of U.S. Highway 59 connecting State Highway 92 and County Highway 49, and County Highway 49 south of Brooks to its intersection with U.S. Highway 2 15 miles east of Crookston could require upgrades.

  The existing 42-mile-long route consists of two-lane highways that could require adding passing lanes and other configuration changes to support the increased truck traffic. Because of the uncertainty of what upgrades would be required, amounts for permanently disturbed areas were not estimated, but road upgrades would likely involve only minimal acreage.
  U.S. Highway 2 runs west to Grand Forks, where it intersects Interstate 29 and the route to Gretna.

- Superior – The route from Gretna to Enbridge's existing terminal at Superior would be on U.S. Highway 2 from the west. This highway crosses into Superior on the Richard I. Bong Bridge and is then routed to the Superior Bay waterfront and on to Enbridge's Superior terminal. Significant additional tanker truck traffic on this route could, however, create unacceptable congestion.

  A new, approximately 5-mile-long more direct truck route could be developed by using an existing rail corridor and airport property. This new access would permanently disturb approximately 34 acres of semi-disturbed and industrial land. Installing a truck offloading facility would permanently disturb an additional approximately 50 acres of wetlands and possibly recreation land (golf course) directly adjacent to the Superior terminal.

Transporting 760,000 bpd by Truck Would Require 4,000 Truck Trips a Day

Tanker trucks can carry approximately 190 barrels and are often used to move oil from wellhead locations not served by pipeline gathering systems to aggregation points and storage facilities. They are not typically used to transport the volumes proposed by the Project. Transporting 760,000 bpd of oil by tanker truck would require 4,000 tanker trucks per day to travel from Gretna to the Clearbrook and Superior terminals.

As noted above, the analysis assumes that the volume of oil transported to the Clearbrook terminal and subsequently pumped to Minnesota refineries would equal approximately 48 percent of this total and that the remaining 52 percent of the total would be transported to Superior. To travel from Gretna to the Clearbrook terminal, 1,920 loaded trucks per day would be required; and 2,080 loaded trucks per day would be required to travel from Gretna to the Superior terminal (Table 4.2-6).

The Cost of the New Trucks for Transportation by Truck Is Estimated at $2.4 Billion per 5 Years

Although the amount of oil transported per day could vary by demand, the Applicant would need to operate a fleet of trucks capable of transporting the full estimated volumes per day. The shortest distances by highway from Gretna to the Clearbrook and Superior terminals are approximately 193 miles and 360 miles, respectively (Figure 4.2-3). Based on the estimated number of tanker trucks needed to deliver the specified volumes per day, a conservative estimate of the time necessary for loading and offloading the tanker trucks, and the time necessary for empty trucks to return to Gretna, 12,000 new tanker trucks would be required.

Assuming an estimated cost of $200,000 per truck, an initial capital investment of $2.4 billion would be required. With the mileage the trucks would cover in steady service, the economic life of a truck would be approximately 5 years, so that cost would be repeated every 5 years throughout the lifespan of the Project.

Table 4.2-6. Summary of Transportation Requirements for the Truck Alternative

Truck Units		
Volume	**Number Required**	**Departures per Day**
760,000 barrels per day	12,200 trucks	4,000 trucks
Facilities		
Facility	**Facility Requirements**	**Land Requirements**
Loading and offloading facilities	Gretna – New approximately 50-acre[a] site with access to freeway	Gretna – Adjacent to agricultural land
	Clearbrook – New approximately 50-acre[a] site with access to freeway	Clearbrook – Adjacent to semi-disturbed land, agricultural land, and wetlands
	Superior – New approximately 50-acre[a] site with access to freeway	Superior – Adjacent to wetlands and recreation land (golf course)
Road access requirements	Gretna – Improvement of approximately 18-miles of Provincial and State Highway and County Road from Gretna pump station to U.S. Interstate 29 at Pembina, North Dakota	Gretna – Upgrades to existing roads.
	Clearbrook – Approximately 0.6-mile-long truck access to State Highway 92 at Clearbrook; potential improvement of approximately 42 miles of State Highway and County Highways from Clearbrook to U.S. Highway 2 near Crookston, North Dakota	Clearbrook – Approximately 4.4 acres[b] of semi-disturbed agricultural land and wetlands converted to road use
	Superior – Could require new, approximately 4.7-mile-long truck route from U.S. Highway 2 entrance to Superior to the vicinity of the terminal	Superior – Less than 34 acres[b] of semi-disturbed land converted to road use

[a] Area required for loading and unloading bays, storage tanks, piping, containment facilities, catch basins, roads, water, wastewater systems and other associated components.

[b] Assumes 60-foot-wide permanent right-of-way. An additional right-of-way of up to 60 feet may be disturbed during construction.

4.2.8 Certificate of Need Alternative 6 – Existing Line 3 Supplemented by Rail

This alternative considers continued operation of existing Line 3 with trains transporting additional oil to achieve a total transfer capacity of 760,000 bpd. This alternative assumes existing Line 3 would supply 390,000 bpd to Superior. Assuming that Line 3 would transport the full amount of its daily operating volume (390,000 bpd) to the Superior terminal, the assumed 48 percent/52 percent division of total oil volume transported to the Clearbrook and Superior terminals, respectively, would result in 360,000 bpd of oil transported by rail to the Clearbrook terminal and 10,000 bpd of oil transported by rail to the Superior terminal.

This alternative would require the ongoing maintenance and repair activities associated with continued use of existing Line 3 (Section 4.2.3) as well as development of the infrastructure for rail transport described in Section 4.2.6.

Existing Line 3 Supplemented by Rail Would Require Six 110-Car Trainloads a Day

Transporting 370,000 bpd of oil by rail would require six loaded unit trains to travel from Gretna to the Clearbrook and Superior terminals per day. Five loaded unit trains would travel from Gretna to the Clearbrook terminal per day, and one unit train would travel from Gretna to the Superior terminal per day.

Existing Line 3 Supplemented by Rail Would Require $500 Million Investment in New Tank Cars and $30 to $40 Million per Year Continued Maintenance of Existing Line 3

Based on the calculations for the number of tank cars needed to deliver the specified volumes per day, the estimated transit times of the unit trains, and the time necessary for loading and offloading the tank cars and for empty trains to make return trips to Gretna, approximately 3,500 new tank cars would be required.[14] Assuming a cost of $140,000 per car, the capitalization to amass the needed number of unit trains would be approximately $495 million.

As noted above, Enbridge estimates that it would cost $30 to $40 million per year to maintain the U.S. portion of the existing Line 3.

4.2.9 Certificate of Need Alternative 7 – Existing Line 3 Supplemented by Truck

This alternative considers continued operation of existing Line 3 with trucks transporting additional oil to achieve a total transfer capacity of 760,000 bpd. This alternative assumes that existing Line 3 would supply 390,000 bpd to Superior. Assuming that Line 3 would transport the full amount of its daily operating volume (390,000 bpd) to the Superior terminal, the assumed 48 percent/52 percent division of total oil volume transported to the Clearbrook and Superior terminals, respectively, would result in 360,000 bpd of oil transported by truck to the Clearbrook terminal and 10,000 bpd of oil transported by truck to the Superior terminal.

This alternative would require the ongoing maintenance and repair activities associated with continued use of existing Line 3 (Section 4.2.3) as well as development of the infrastructure for truck transport described in Section 4.2.7.

Existing Line 3 Supplemented by Trucks Would Require 1,947 Truck Trips per Day

Transporting 360,000 bpd of oil by truck to the Clearbrook terminal and 10,000 bpd to the Superior terminal would require 1,889 trucks per day to travel from Gretna to the Clearbrook terminal and 58 trucks per day to travel from Gretna to the Superior terminal.

The Cost of the New Trucks for Transportation by Truck Is Estimated at $1.2 Billion per 5 Years and $30 to 40 Million per Year Continued Maintenance of Existing Line 3

As noted in Section 4.2.7, although the amount of oil transported per day could vary by demand, the Applicant would need to operate a fleet of trucks capable of transporting the full estimated volumes per day. The shortest distances by highway from Gretna to the Clearbrook and Superior terminals are approximately 193 miles and 360 miles, respectively (Figure 4.2-3). Based on the estimated number of tanker trucks needed to deliver the specified volumes per day, a conservative estimate of the time

[14] Calculations are based on figures provided in the MPL, LLC Certificate of Need Application for the Minnesota Pipe Line Reliability Project. MPUC Docket No. PL-5/CN-14-320.

necessary for loading and offloading the tanker trucks, and the time necessary for empty trucks to return to Gretna, 6,000 new tanker trucks would be required.

As noted above, Enbridge estimates that it would cost $30 to $40 million per year to maintain the U.S. portion of the existing Line 3.

4.2.10 Alternative Pipeline Configuration – Smaller Diameter Pipeline

Smaller Diameter Pipeline Would Have Smaller Throughput but Many of the Same Adverse Effects

The suggestion that a smaller diameter pipeline be used was reviewed. The Applicant's proposed Project includes a pipeline 36 inches in diameter. A smaller diameter pipeline (24 to 34 inches in diameter) operating in the same pressure range as the proposed Project would provide less annual throughput capacity and would likely reduce pumping energy requirements and associated indirect air emissions from electrical energy generation.

It would not, however, change any construction or operating impacts. Installing a smaller diameter pipeline would likely require the same construction work area, materials marshaling areas, earth-moving and pipe-laying equipment, access roads, and permanent right-of-way. The actual construction trench would be narrower and would result in a smaller volume of excavation spoils to be managed, but stripping, storing, and replacing topsoils would be the same.

After the pipeline was installed, restoring the construction work area and monitoring and maintaining the permanent right-of-way long-term would be the same.

A smaller diameter pipeline with lower throughput capacity could possibly be operated with one less pumping station. Determining pumping requirements and optimum pump station locations would, however, depend on pipeline design and operational simulations that are not available. The disturbed area for pump stations is a small area when compared to the disturbed area for the Project overall, so having one fewer pump station would not materially affect overall land disturbance.

MLVs and cathodic protection facilities are located within the permanent right-of-way, so they would not affect the overall area of land disturbance or permanent right-of-way.

The probability of an incident leading to a crude oil release would also be similar for a smaller diameter pipeline. Because the impacts are generally the same, a smaller diameter pipeline configuration was not evaluated as a Project configuration alternative.

4.3 DESCRIPTION OF ALTERNATIVES – ROUTE PERMIT

If the Commission grants a CN for replacement of Line 3 at the Applicant's proposed start and endpoints (North Dakota border to Superior, Wisconsin), the Commission must then determine the best route for the pipeline between those two points. The route permit decision requires a more detailed review of specific routing alternatives between the origin and destination points as approved in the CN process. Since this joint EIS covers both the CN and route permit decisions, the EIS also includes an evaluation of selected routes within Minnesota between the North Dakota and Wisconsin borders.

This section describes the reviewed route alternatives and route segment alternatives that will inform the Commission's decision.

4.3.1 Overview – Route Alternatives

4.3.1.1 Route Locations

The locations of route alternatives RA-03AM, RA-06, RA-07, and RA-08 are shown in Figure 4.3-1. Figures showing the location of each route at a larger scale are included in Appendix A. Detailed descriptions of each route follow. Technically, each of the route alternatives extends from Neche, North Dakota, to Superior, Wisconsin. However, the alignment of all route alternatives is identical to the Applicant's preferred route from Neche to approximately the Clearbrook terminal and from Carlton, Minnesota, to Superior (see description in Section 2.3). As the alignments for all route alternatives only diverge from the alignment for the Applicant's preferred route between approximately Clearbrook and Carlton, the description of each route alternative below, and the environmental impact assessment of the route alternatives in Chapter 6 is limited to the segment between Clearbrook and Carlton.

4.3.1.2 Construction and Operation – Route Alternatives

All route alternatives except RA-07 would be constructed and operated in the same manner as the Applicant's preferred route (see Section 2.7). RA-07 would call for removing the old pipeline and placing the new pipeline in the same location. The construction methods for this alternative are described below and are illustrated in Figure 4.3-2.

4.3.2 Route Alternative RA-03AM

Route Alternative RA-03AM Would Avoid Lakes and Wildlife Management Areas

Route alternative RA-03AM is an alternative between Clearbrook and Carlton. The Minnesota Pollution Control Agency (Minnesota PCA) originally proposed this as a CN "system alternative" that included a new terminal in Crookston, Minnesota, in part to avoid the Mississippi River Headwaters area as well as the Minnesota's Lakes region. During scoping for the Sandpiper Project, this route option was added as a modified version of the original proposal that would provide access to the Clearbrook terminal, allowing deliveries to the Northern Tier Energy and Flint Hills Resources refineries through MPL's pipeline. (Thus, it is called RA-03AM, or "as modified.") Minnesota Department of Natural Resources (Minnesota DNR) subsequently proposed additional modifications during the 2015 Line 3 process. This route alternative parallels an existing pipeline right-of-way from Clearbrook to Park Rapids, thereby focusing pipeline construction and operations impacts in an area already affected by a crude oil pipeline. Compared to some other alternatives, this option reroutes around fens, fish hatcheries, and to some extent communities, and avoids specific Wildlife Management Areas (WMAs).

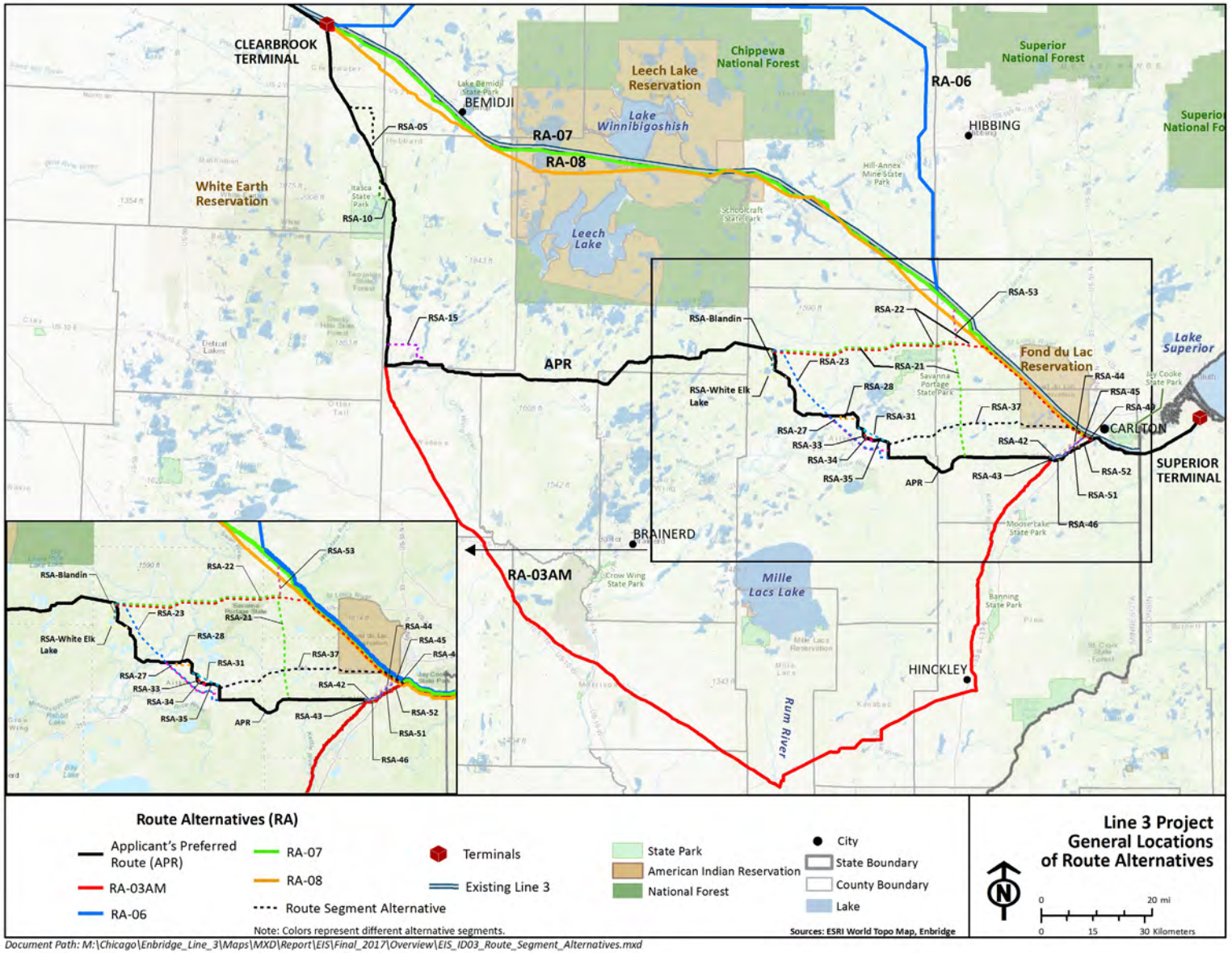

Figure 4.3-1. General Locations of Route Alternatives

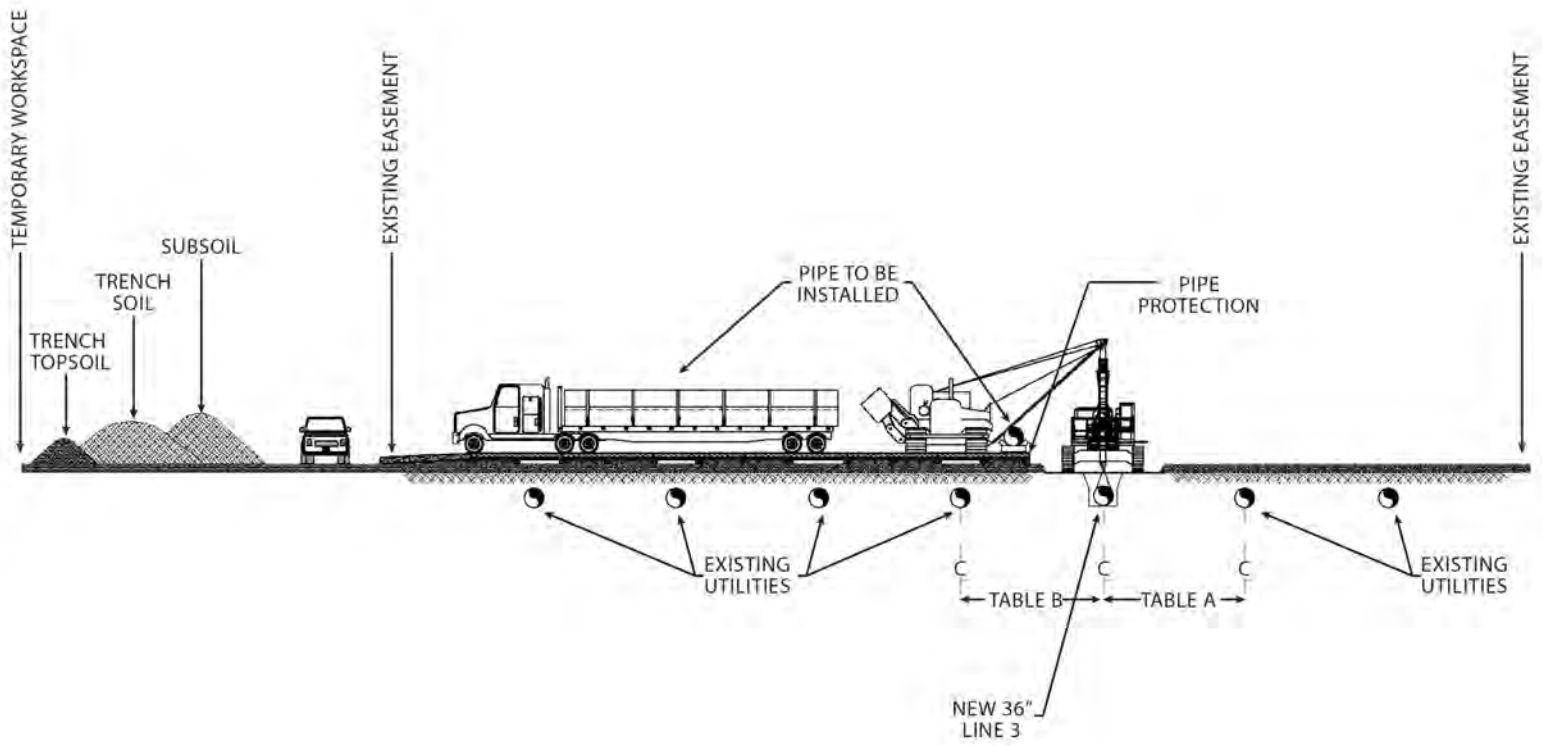

TABLE A

SCENARIO	TYPICAL SEPARATION	TOTAL SCENARIO %
1	0'-10'	3%
2	10'-20'	71%
3	20'+	13%

TABLE B

SCENARIO	TYPICAL SEPARATION	TOTAL SCENARIO %
1	0'-10'	1%
2	10'-20'	25%
3	20'+	40%

Source: Enbridge

Figure 4.3-2. Typical Construction Profile – Same Trench Replacement

4.3.2.1 Route Location

From Clearbrook, the route generally follows the existing MPL right-of-way south into Hubbard County. The route runs along the western border of Hubbard County to the vicinity 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 the vicinity of Hinckley in Pine County. It then turns northeasterly, paralleling the existing 8-inch Magellan Refined Products pipeline or a Northern Natural Gas pipeline to a point where it meets the Applicant's preferred route near Carlton in Carlton County and then continues to Superior, Wisconsin. Measurements for RA-03AM are summarized in Table 4.3-1.

Table 4.3-1. Measurements for Route Alternative RA-03AM

Feature	Measurement
Total length (origin to destination)	435.6 miles
Length in Minnesota	394.9 miles
Length outside Minnesota	40.8 miles
States crossed – distance	North Dakota – 27.6 miles Minnesota – 394.9 miles Wisconsin – 13.1 miles
Counties crossed in Minnesota	Benton, Carlton, Clearwater, Hubbard, Kanabec, Kittson, Marshall, Mille Lacs, Morrison, Pennington, Pine, Polk, Red Lake, Todd, and Wadena

4.3.2.2 Pump Stations and Mainline Valves

Route Alternative RA-03AM Would Require 9 Pump Stations and Approximately 29 MLVs

Enbridge has indicated that nine pump stations would be required along the route of RA-03AM in Minnesota, with six of them between Clearbrook and Carlton. It was assumed that each pump station would require approximately 8 acres of land. The specific location of each pump station would be determined based on pipeline operation hydraulic studies.

As with the proposed Project, MLVs would be placed near water crossings, significant environmental resources, and populated areas. Enbridge has stated that at least 29 MLVs would be located along RA-03AM in Minnesota, including 23 MLVs between Clearbrook and Carlton. Each valve would occupy approximately 0.1 acre and would be located within the permanent pipeline right-of-way. Final valve spacing and location would be determined during final Project permitting.

4.3.3 Route Alternative RA-06

Route Alternative RA-06 Would Avoid Minnesota's Main Lakes Region

Route alternative RA-06 is another alternative to the Applicant's preferred route between Clearbrook and Carlton. RA-06 was proposed by scoping commenters to develop a route north of the Enbridge Mainline corridor to avoid the Mississippi Headwaters and crossing Minnesota's Lakes region.

4.3.3.1 Route Location

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 intersects the Fond du Lac Reservation and the Chippewa National Forest and 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 rejoins 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. Measurements for RA-06 are summarized in Table 4.3-2.

Table 4.3-2. Measurements for Route Alternative RA-06

Feature	Measurement
Total length (origin to destination)	357.3 miles
Length in Minnesota	316. 6 miles
Length outside Minnesota	40.7 miles
States crossed – distance	North Dakota – 27.6 miles Minnesota – 316.6 miles Wisconsin – 13.1 miles
Counties crossed in Minnesota	Aitkin, Beltrami, Carlton, Clearwater, Itasca, Kittson, Marshall, Pennington, Polk, Red Lake, and St. Louis

4.3.3.2 Pump Stations and Mainline Valves

Route Alternative RA-06 Would Require 7 Pump Stations and Approximately 24 MLVs

Enbridge has indicated that seven pump stations would be needed along RA-06 in Minnesota, including four pump stations between Clearbrook and Carlton. It was assumed that each pump station would require approximately 8 acres of land. The specific location of each pump station would be determined based on pipeline operation hydraulic studies.

As with the proposed Project, MLVs would be placed near water crossings, significant environmental resources, and populated areas. Enbridge has indicated that at least 24 MLVs would be required along the route of RA-06, including 16 MLVs between Clearbrook and Carlton. Each valve would occupy approximately 0.1 acre and would be located within the permanent pipeline right-of-way. Final valve spacing and location would be determined during final Project permitting.

4.3.4 Route Alternative RA-07

Route Alternative RA-07 Would Remove the Old Pipeline and Place the New Pipeline Mostly in the Same Trench

Similar to the previous routes, RA-07 is an alternative to the Applicant's preferred route between Clearbrook and Carlton. It was proposed by scoping commenters that the existing Line 3 pipeline be removed and that a new pipeline be installed in the same trench, allowing the use of the existing pipeline corridor without further expansion. This alternative would minimize the exposure of new areas of the state to pipeline construction and operations, while increasing overall pipeline capacity for deliveries to Superior. This alternative addressed concerns of Minnesota DNR, Minnesota PCA, and others about further development of a new corridor for other new or replaced oil pipelines and other infrastructure that could also use the Applicant's preferred route in the future.

RA-07 assumes removing and replacing the existing Line 3 in the same trench from Clearbrook to Carlton. However, the analysis assumed, for the purpose of directly comparing RA-07 to the other route alternatives, that RA-07 would follow the Applicant's preferred route from Neche to Clearbrook, with the existing Line 3 abandoned along this stretch and the RA-07 pipeline placed within a new (25-foot) right-of-way parallel to Enbridge's existing Mainline corridor. Similarly, east of Carlton, the analysis assumed that the RA-07 route would follow the Applicant's preferred route, with the existing Line 3 pipeline abandoned and the RA-07 pipeline placed within a new (25-foot) right-of-way parallel to Enbridge's existing Mainline corridor.

4.3.4.1 Route Location

At Clearbrook, the route continues 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, the northern part of Cass County, and the southern portion of Itasca County, intersecting the Leech Lake Band of Ojibwe and Fond du Lac reservations and the Chippewa National Forest. It continues across the southwest corner of Itasca County into Carlton County and then eastward to Superior. Measurements for RA-07 are summarized in Table 4.3-3.

Table 4.3-3. Measurements for Route Alternative RA-07

Feature	Measurement
Total length (origin to destination)	328.3 miles
Length in Minnesota	287.5 miles
Length outside Minnesota	40.7 miles
States crossed – distance	North Dakota – 27.6 miles Minnesota – 287.5 miles Wisconsin – 13.1 miles
Counties crossed in Minnesota	Aitkin, Beltrami, Carlton, Cass, Clearwater, Hubbard, Itasca, Kittson, Marshall, Pennington, Polk, Red Lake, and St. Louis

4.3.4.2 Pump Stations and Mainline Valves

Route Alternative RA-07 Would Require 7 New or Upgraded Pump Stations and Approximately 22 MLVs

Enbridge has indicated that RA-07 would require three new pump stations west of Clearbrook and upgrades to four pump stations between Clearbrook and Carlton. It was assumed that upgrades to the existing pump stations along the Enbridge Mainline corridor would consist of adding new pumps and would require minimal additional land disturbance.

As with the proposed Project, MLVs would be placed near water crossings, significant environmental resources, and populated areas. Enbridge has indicated that at least 22 MLVs would be located along RA-07 in Minnesota, including 14 MLVs between Clearbrook and Carlton. Each valve would occupy approximately 0.1 acre and would be located within the permanent pipeline right-of-way. Final valve spacing and location would be determined during final Project permitting.

4.3.4.3 Construction – Pipeline Removal and Replacement

From Neche to Clearbrook, Line 3 is one of seven pipelines co-located in a single corridor. From Clearbrook to Superior, the corridor includes six pipelines. Line 3 is in the interior of the multi-pipeline configuration (see Figure 4.3-3), where the pipelines are spaced as close as 10 to 15 feet apart. Chapter 8 provides additional analysis of the distance between Line 3 and the immediately adjacent pipelines. Unlike constructing a new pipeline along the edge of an existing pipeline corridor, removing and replacing the pipeline in the existing trench would require working over the top of existing operating high-pressure pipelines (see Figure 4.3-2). In addition to the construction procedures described in Section 2.7 for normal pipeline construction, removing and replacing the pipeline would require the following:

- Protection for existing buried pipes – A layer of protective soil, mats, or bridging would be placed over the existing pipelines to protect them during the movement of heavy equipment and materials to the work area along the existing pipeline alignment. This protective layer would be continuously moved with the construction activity as pipe removal and replacement progressed.
- Additional work space required – During normal pipeline construction, the additional work space required for operating equipment, storing topsoil and trenching spoils, staging of pipe, and lowering in and backfilling operations would be available directly adjacent to the Mainline corridor permanent right-of-way.

  The presence of the existing pipelines precludes these activities occurring adjacent to the Line 3 trench. They would need to be located adjacent to the outermost buried pipeline. This would increase the construction work area from a width of approximately 120 feet for normal construction to approximately 205 feet for removal and replacement.
- Increased time of open trench – The addition of pipeline removal activity would lengthen the time required for maintaining an open trench. Normal construction would include maintaining an open trench for approximately 3 days. Time for pipeline removal would require extending this time.
- Removal and disposal of existing Line 3 pipe – Following removal and stoppage of topsoil, the existing Line 3 pipeline trench would be open, and the existing pipe would be freed from its bed.

The pipe would then be cut into lengths suitable for transport by truck. Removal of the pipe lengths from the work area would require additional truck movements, although trucks staging new pipe to the work area could be used to haul existing pipe from the work area.

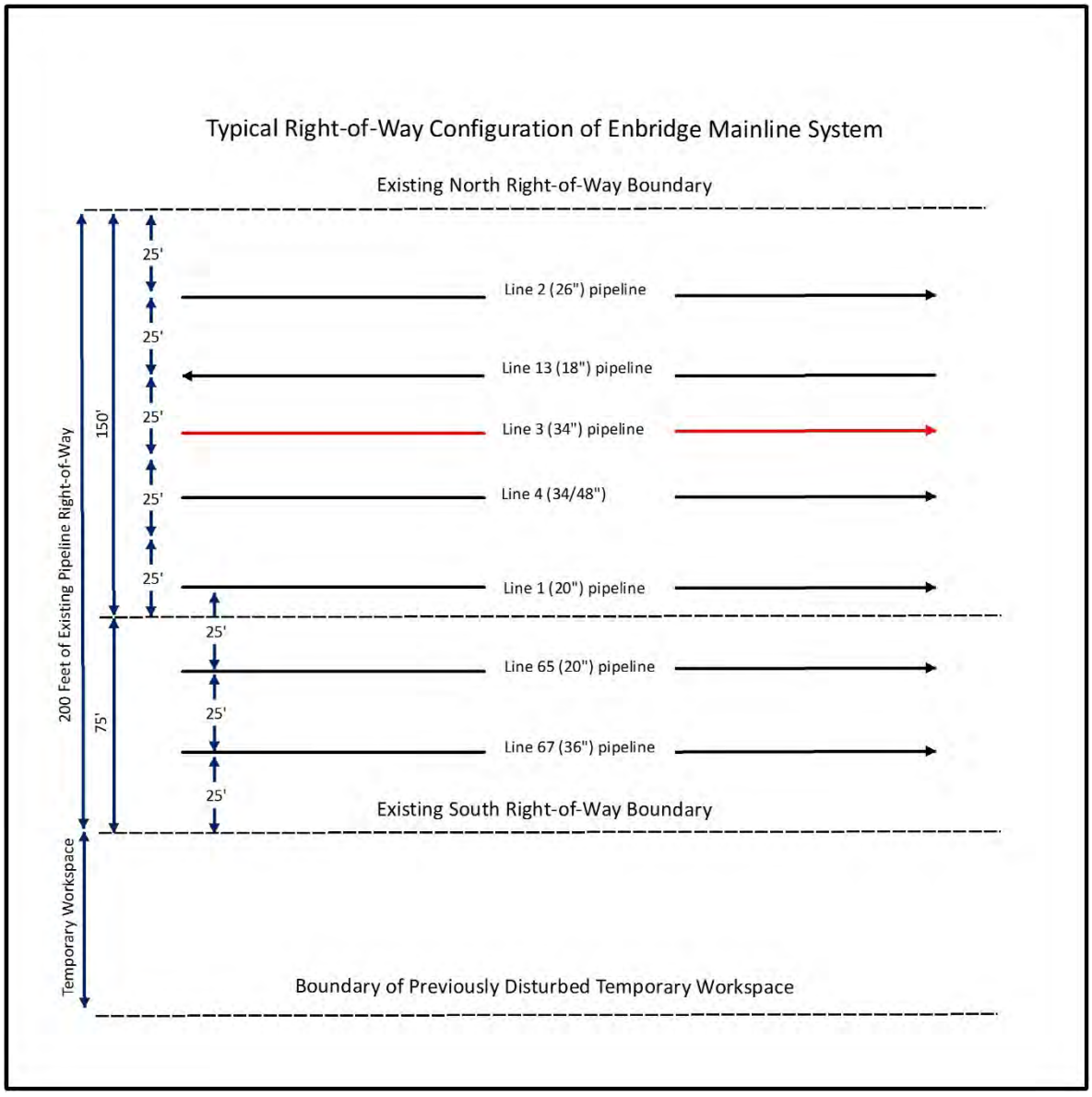

Figure 4.3-3. Enbridge Mainline System Right-of-Way Configuration†

†The shown configuration is a typical configuration. The configuration of adjacent lines changes throughout the pipeline length. Additional discussion of pipeline spacing is provided in Chapter 8.

4.3.5 Route Alternative RA-08

Route Alternative RA-08 Is in the Enbridge Mainline Corridor near RA-07, but along a New Route

Route alternative RA-08 is also an alternative to the Applicant's preferred route between Clearbrook and Carlton. Similar to RA-07, RA-08 was proposed to reduce development in the Lakes region in that it does not require an entirely new oil pipeline corridor between Clearbrook and Superior. The route alignment is generally located south of U.S. Highway 2 along an existing natural gas pipeline and reduces the length of the crossings of the Chippewa National Forest and the Leech Lake Band of Ojibwe Reservation.

4.3.5.1 Route Location

From Clearbrook, the route follows the same general configuration as RA-07 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 of and parallel to U.S. Highway 2. The route intersects the Leech Lake Band of Ojibwe and Fond du Lac reservations and the Chippewa National Forest. Measurements for RA-08 are summarized in Table 4.3-4.

Table 4.3-4. Measurements for Route Alternative RA-08

Feature	Measurement
Total length (origin to destination)	325.4 miles
Length in Minnesota	284.6 miles
Length outside Minnesota	40.7 miles
States crossed – distance	North Dakota – 27.6 miles Minnesota – 284.6 miles Wisconsin – 13.1 miles
Counties crossed in Minnesota	Aitkin, Beltrami, Carlton, Cass, Clearwater, Hubbard, Itasca, Kittson, Marshall, Pennington, Polk, Red Lake and St. Louis

4.3.5.2 Pump Stations and Mainline Valves

Route Alternative RA-08 Would Require 6 New or Upgraded Pump Stations and Approximately 22 MLVs

Enbridge has indicated that RA-08 could require two new pump stations west of Clearbrook and upgrades to four existing pump stations between Clearbrook and Carlton. It was assumed that the existing pump stations along the Enbridge Mainline corridor would be upgraded to accommodate new pumps for the Project, requiring minimal additional land disturbance.

As with the proposed Project, MLVs would be placed near water crossings, significant environmental resources, and populated areas. Enbridge indicated that at least 22 MLVs would be located along RA-08, including 14 MLVs between Clearbrook and Carlton. Each valve would occupy approximately 0.1 acre and would be located within the permanent pipeline right-of-way. Final valve spacing and location would be determined during final Project permitting.

4.3.6 Overview – Route Segment Alternatives

Enbridge Adopted Some Suggested Route Segment Alternatives, and Others are Discussed Below

During the scoping process, a number of route segment alternatives (RSAs) were recommended for consideration. DOC-EERA and the Applicant reviewed these alternatives, and a number of the shorter RSAs were adopted by Enbridge and integrated into the proposed alignment of the Applicant's preferred route. The adopted modifications are included in the proposed Project evaluated in the EIS. The remaining RSAs, which range in length from 1 mile or 2 to more than 60 miles, are evaluated in this EIS (Table 4.3-5). The general location of the RSAs and their relationship to the Applicant's preferred route are shown in Figure 4.3-4.

Table 4.3-5 describes the purpose of each RSA, the route of the RSA, the length compared to the substituted length of the Applicant's preferred route, and a brief summary of the general features of the area surrounding the RSA.

The milepost designations in Table 4.3-5 and in Figure 4.3-4 are based on mile zero at Neche, North Dakota. Milepost designations given by Enbridge in some Project documentation are based on mile zero at Edmonton, Alberta where Line 3 originates.

4.3.6.1 Pump Stations and Mainline Valves

Need for and Location of Pump Stations and Distance between MLVs Cannot Currently Be Determined

Based on the spacing of pump stations along the Applicant's preferred route, new pump stations would likely be required along the route for RSA-21, RSA-22, RSA-23, or RSA-37. Deciding, however, on whether a pump station might be needed and where specifically it should be placed can only be done based on hydraulic studies of pipeline operations, which are not available. It was assumed that approximately 8 acres of land would be required for a pump station on the RSAs.

Similar to the proposed Project, MLVs would be placed near water crossings, significant environmental resources, and populated areas. Average spacing of MLVs along the Applicant's preferred route is approximately 12 miles between valves. It was assumed that similar spacing would occur along the RSA. The specific spacing of valves would be determined during final permitting. It was further assumed that RSAs shorter than approximately 12 miles likely would not include any additional valves. RSAs that would require MLVs (and the number of valves required) include RSA-05 (one), RSA-21 (five), RSA-22 (five), RSA-23 (three), RSA-27 (one), and RSA-37 (three). The average area required for each valve would be 0.1 acre, and each valve would be located within the permanent pipeline right-of-way.

Table 4.3-5. Purpose and Location of Route Segment Alternatives

Route Segment Alternative	County	Purpose of Route Segment Alternative	Location[a]	Mileposts		Route Segment Alternative Length (miles)	Applicant's Preferred Route Length (miles)	Route Segment Alternative Change (miles)
				From	To			
Clearbrook to Aitkin County								
RSA-05	Clearwater	Enbridge proposed this route alternative to avoid the Eastern Wild Rice Watershed, and a possible hydrological connection to Lower Rice Lake in response to comments raised by the White Earth Band of Ojibwe.	RSA-05 starts at MP 154.1 on the Applicant's preferred route and runs east for approximately 4.0 miles adjacent to the Otter Tail Power Company Minnkota-Winger 230 kV transmission line right-of-way. It then turns south for approximately 9.0 miles, rejoining the Applicant's preferred route at MP 164.0. The route traverses an area of mixed active farm and forested land.	154.1	164.0	13.0	9.8	3.2
RSA-10	Clearwater, Hubbard	Minnesota PCA requested a route alternative that would move the route to a crossing at LaSalle Creek that is more accessible for emergency response in case of a spill.	RSA-10 starts at MP 167.4 and runs south 4.2 miles adjacent to State Highway 108 where it intersects State Highway 200. It then turns east and runs parallel to State Highway 200 for approximately 1.3 miles where it intersects Itasca Township Road 4. RSA-10 then enters Hubbard County where Itasca Township Road 4 becomes 400th Street. The route continues eastward parallel to 400th Street for approximately 1.4 miles, where it rejoins the Applicant's preferred route at MP 173.2. RSA-10 would increase the separation between the Applicant's preferred route and Big LaSalle Lake from 0.1 to approximately 0.7 mile. While it would mainly be located adjacent to highway rights-of-way, the area surrounding the RSA is forested or heavily vegetated areas with some mixed farmland.	167.4	173.1	6.8	5.6	1.2

Table 4.3-5. Purpose and Location of Route Segment Alternatives

Route Segment Alternative	County	Purpose of Route Segment Alternative	Location[a]	Mileposts		Route Segment Alternative Length (miles)	Applicant's Preferred Route Length (miles)	Route Segment Alternative Change (miles)
				From	To			
RSA-15	Hubbard	Minnesota PCA requested a route alternative that would provide better pipeline access near Twin Lakes (wild rice lakes) and Shell River for emergency response in case of a spill.	RSA-15 starts at approximately MP 199.7 on the Applicant's preferred route and runs eastward 5.5 miles adjacent to County Road 14 and the Great River Energy 34.5 kV electric distribution line right-of-way. It then turns south and then east, paralleling Minnesota Power's 34.5 kV distribution line and access road for 3.2 miles to the intersection of County Road 6. At County Road 6, it again turns south and runs adjacent to another Minnesota Power 34.5 distribution line and Road 6 for 0.8 mile, where it rejoins the Applicant's preferred route at MP 210.1.	199.7	210.1	9.5	10.4	-0.9
RSA-Blandin	Aitkin	Minnesota DNR requested a route alternative to avoid a conservation easement held by Minnesota DNR on lands owned by Blandin Paper Company.	RSA-Blandin starts at MP 278.3 on the Applicant's preferred route and runs south approximately 3.2 miles through forested/scrub and wetlands. It turns southeast for another 0.6 mile and rejoins the Applicant's preferred route at MP 282.2. For most of its length, RSA-Blandin runs parallel and approximately 0.3 mile west of County Road 29 – Osprey Avenue.	278.3	282.2	3.9	3.9	0.0
RSA-White Elk Lake	Aitkin	Minnesota DNR requested a route alternative to avoid a Forest Legacy Program easement and fragmenting a Minnesota Biological Survey Site of Biodiversity Significance.	RSA-White Elk Lake departs from the Applicant's preferred route at MP 277.9 and runs south-southwest approximately 5.2 miles parallel to Minnesota Power's Blackberry to Riverton 230 kV transmission line. It then turns east for 4.5 miles along County Road 68 – 540th Lane and rejoins the Applicant's preferred route at approximately MP 284.7. The proposed route for RSA-White Elk Lake runs between Mud Lake and White Elk Lake with a separation of 0.3 mile from either lake. The separation between White Elk Lake and the Applicant's preferred route is 0.7 mile. The RSA runs adjacent to existing infrastructure through forested and wetland areas.	277.9	284.7	9.7	6.8	2.9

Table 4.3-5. Purpose and Location of Route Segment Alternatives

Route Segment Alternative	County	Purpose of Route Segment Alternative	Location[a]	Mileposts		Route Segment Alternative Length (miles)	Applicant's Preferred Route Length (miles)	Route Segment Alternative Change (miles)
				From	To			
RSA-21	Aitkin, St. Louis, Carlton	Minnesota DNR recommended the Aitkin County power line as a route alternative to eliminate concerns regarding Sandy River fisheries, wild rice habitat, and trout stream habitat.	RSA-21 starts at MP 278.5 on the Applicant's preferred route and runs east approximately 33.2 miles adjacent to the right-of-way for the Minnkota Power Cooperative's Arrowhead-Center-1 1,000 kV high voltage DC transmission line. It intersects Northern States Power Company's Forbes-Chisago 500 kV high voltage transmission line and then turns south to run adjacent to the Forbes-Chisago transmission line right-of-way for 20.7 miles, where it rejoins the Applicant's preferred route at MP 331.9. A large portion of the route for RSA-21 is located in wetlands and forested areas.	278.5	331.9	53.9	53.5	0.4
RSA-22	Aitkin, St. Louis, Carlton	Minnesota DNR recommended a route alternative that would avoid important habitat in the Big Sandy Lake watershed as well as Grayling Marsh WMA and the Lawler WMA.	RSA-22 begins at the same point on the Applicant's preferred route as RSA-21 (MP 278.5). RSA-22 uses the same route as RSA-21 to the point where RSA-21 intersects the Northern States Power Company's Forbes-Chisago 500 kV high voltage transmission line right-of-way (approximately 33.2 miles). Instead of turning south along the Forbes-Chisago transmission line right-of-way, RSA-22 continues east adjacent to the Detroit Edison Forbes to Center-1 transmission line right-of-way for an additional approximately 5.7 miles, where it intersects the Enbridge Mainline corridor. It then runs approximately 25.8 miles southeast adjacent or parallel to the existing Enbridge Mainline corridor fir 26 miles and rejoins the Applicant's preferred route at MP 356.8. Similar to RSA-21, most of the route is located in forested and wetland areas until it joins the Enbridge Mainline corridor, which is located in areas that include some farming in addition to forest/wetlands land cover types. RSA-22 crosses the Fond du Lac Reservation.	278.5	356.8	64.7	73.8	-9.1

Table 4.3-5. Purpose and Location of Route Segment Alternatives

Route Segment Alternative	County	Purpose of Route Segment Alternative	Location[a]	Mileposts		Route Segment Alternative Length (miles)	Applicant's Preferred Route Length (miles)	Route Segment Alternative Change (miles)
				From	To			
RSA-23	Aitkin	The Applicant removed this route segment alternative from further analysis; however, it is being carried forward into the route alternatives analysis because it was recommended by several landowners throughout the comment period.	Similar to RSA-21 and RSA-22, RSA 23 starts at MP 278.5 on the Applicant's preferred route but runs generally southeast instead of directly eastward. It is located adjacent to Minnkota Power Cooperative's Arrowhead-Center-1 1000 kV high voltage DC transmission line right-of-way eastward for 1.6 miles where it intersects the Soo Line North ATV Trail. RSA-21 turns and runs south-southeast approximately 12.9 miles adjacent to the trail, approximately to the town of Palisade. The route jogs 1.2 miles to the east around Palisade and rejoins the Soo Line North ATV Trail as it continues southeast. On the south side of Palisade, the route is located adjacent to the Great Power Energy Round Lake to Palisade 69 kV distribution line right-of-way for a short distance. From Palisade, the route then continues southeast for 9.7 miles to the vicinity of the town of McGregor. At McGregor, SA-23 turns east and crosses north of the town for 1.0 mile, where it intersects the BNSF railroad right-of-way. It runs northeast adjacent to the railroad right-of way for 1.0 mile, turns southeast, crosses under the rail line, and then continues south approximately 2.2 miles, were it intersects Minnesota Power's McGregor to Cromwell 115 kV transmission line. RSA-23 then turns east and runs adjacent to the transmission line right-of-way for approximately 1.5 miles, where it rejoins the Applicant's preferred route at MP 315.5. RSA-23 is primarily dominated by wetlands, with some forested areas.	278.5	315.5	31.2	37.0	-5.8

Table 4.3-5. Purpose and Location of Route Segment Alternatives

Route Segment Alternative	County	Purpose of Route Segment Alternative	Location[a]	Mileposts		Route Segment Alternative Length (miles)	Applicant's Preferred Route Length (miles)	Route Segment Alternative Change (miles)
				From	To			
RSA-27	Aitkin	Minnesota DNR recommended that the analysis include the Soo Line to avoid the McGregor Scientific and Natural Area and the Sandy River watershed.	RSA-27 starts at MP 298.1 on the Applicant's preferred route just south of the town of Palisade. It follows the same route as RSA-23 along the Soo Line Trail (an abandoned railroad right-of-way designated as a recreation trail) southeast for approximately 9.0 miles to the vicinity of the town of McGregor. It continues to follow the same route as RSA-23 around the northern side of McGregor adjacent to a railroad right-of-way for approximately 2.0 miles. It then turns southeast, crosses under the rail line, and runs south approximately 0.8 mile, where it turns east for 1.5 miles and rejoins the Applicant's preferred route at approximately MP 314.0. A major portion of the route for RSA-27 occurs in an area of agricultural use with some forest/wetlands. A portion of the route is also located near McGregor.	298.1	314.0	13.2	16.0	-2.8
RSA-28	Aitkin	RSA-28 would cross an active wetland mitigation site. Through landowner communication, Enbridge confirmed the presence of a wetland mitigation site, where normally the purpose is to restore wetland habitat. Typically, wetland mitigation sites have either deed restrictions or conservation easements associated with them that prevent pipeline construction.	RSA-28 starts at MP 300.2 on the Applicant's preferred route and runs south for approximately 0.5 mile adjacent to an existing road. It then turns east for 3.1 miles, also adjacent to an existing road, and intersects the Applicant's preferred route at approximately MP 303.9. This RSA generally shifts the pipeline route approximately 0.8 mile to the south and runs adjacent to existing roads. It is located in an area of agricultural use and wetlands, and reportedly would cross a wetland mitigation site.	300.2	303.9	3.6	3.8	-0.2

Table 4.3-5. Purpose and Location of Route Segment Alternatives

Route Segment Alternative	County	Purpose of Route Segment Alternative	Location[a]	Mileposts		Route Segment Alternative Length (miles)	Applicant's Preferred Route Length (miles)	Route Segment Alternative Change (miles)
				From	To			
RSA-31	Aitkin	Commenter requested a route alternative to cut straight and diagonally across several miles in Aitkin County.	RSA-31 starts at MP 305.5 on the Applicant's preferred route and runs southeast for approximately 6.1 miles to rejoin the Applicant's preferred route at MP 312.7. The route cuts diagonally across developed farmland and undeveloped forest/wetland areas. It does not follow any existing linear infrastructure.	305.5	312.7	6.1	7.2	-1.1
RSA-33	Aitkin	This RSA would move the route to a different portion of the commenter's property, where it is adjacent to a peat plant.	RSA-33 starts at MP 306.7 on the Applicant's preferred route and runs southeast for 0.5 mile. It then turns south for 1.4 miles and rejoins the Applicant's preferred route at MP 308.4. RSA-33 is located approximately 0.4 mile east of the Applicant's preferred route and is not located adjacent to any existing infrastructure rights-of-way. It is located in undeveloped forested land and farmlands.	306.7	308.4	1.8	1.7	0.1
RSA-34	Aitkin	A commenter suggested shifting the pipeline north into the tree line to increase the distance from a residence.	RSA-34 starts at MP 307.6 on the Applicant's referred route and runs southeast for approximately 2.2 miles, where it rejoins the Applicant's preferred route at MP 310.1. The proposed RSA route runs diagonally, primarily across undeveloped land but intersects some developed farmland.	307.6	310.1	2.2	2.5	-0.3
RSA-35	Aitkin	A commenter suggested a route alternative that would cut south on Township Road 270 and travel east until it rejoins the Applicant's preferred route to increase the distance from a residence.	RSA-35 starts at MP 308.4 on the Applicant's preferred route and runs south adjacent to an unnamed road approximately 0.4 mile. It then turns eastward and runs 1.3 miles, where it rejoins the Applicant's preferred route at MP 309.8. The portion of the route adjacent to the road is generally forested. The remaining portion of the route is primarily developed farmland.	308.4	309.8	1.6	1.4	0.2

Table 4.3-5. Purpose and Location of Route Segment Alternatives

Route Segment Alternative	County	Purpose of Route Segment Alternative	Location[a]	Mileposts		Route Segment Alternative Length (miles)	Applicant's Preferred Route Length (miles)	Route Segment Alternative Change (miles)
				From	To			
RSA-37	Aitkin, Carlton	A commenter suggested a route alternative that would parallel State Highway 210 after mile marker 550 and then turn south to reconnect with the Applicant's preferred route south of Cloquet avoiding Salo Marsh and Lawler WMAs.	RSA-37 starts at MP 313.1 on the Applicant's preferred route and runs generally eastward parallel to State Highway 210, on the south side of the highway right-of-way. It runs 34.4 miles to the Enbridge Mainline corridor between Clearbrook and Superior. Along this portion of the route, the RSA passes near the communities of Tamarack, Wright, Cromwell, and Sawyer. It also crosses the Fond du Lac Reservation. At its intersection with the Mainline corridor, RSA-37 turns southeast for 4.3 miles, where it rejoins the Applicant's preferred route. Along the last section of the route, RSA-37 is located adjacent to the Mainline corridor. A major portion of the area adjacent to RSA-37 is forested/ scrub and wetlands. The remaining portion of the route is generally located in areas of active agriculture. The route also is located adjacent to four communities.	313.1	356.8	38.7	43.7	-5.0
Carlton County								
RSA-42	Carlton	A commenter requested co-location of the pipeline with an existing transmission line corridor.	RSA-42 starts at MP 347.1 on the Applicant's preferred route and runs east-northeast approximately 1.8 miles adjacent to Minnesota Power's Wrenshall to Mahtowa 115 kV transmission line right-of-way. It turns east-southeast and continues to parallel the right-of-way of the Wrenshall to Mahtowa transmission line for approximately 0.6 mile, crossing under State Highway 61. It then turns northeast continuing to parallel the transmission line for approximately 1.1 miles, where it crosses under Interstate Highway 35 and rejoins the Applicant's preferred route at MP 351.4. Most of the area adjacent to RSA-42 is forested land and wetlands.	347.1	351.4	3.5	4.3	-0.8

Table 4.3-5. Purpose and Location of Route Segment Alternatives

Route Segment Alternative	County	Purpose of Route Segment Alternative	Location[a]	Mileposts		Route Segment Alternative Length (miles)	Applicant's Preferred Route Length (miles)	Route Segment Alternative Change (miles)
				From	To			
RSA-43	Carlton	A commenter suggested moving the pipeline to the north side of U.S. Highway 61 and co-locating it with a utility corridor.	RSA-43 starts at MP 347.9 on the Applicant's preferred route and runs northeast 1.4 miles parallel to State Highway 61 and the Willard Munger State Trail on the highway's north side. The route then intersects Minnesota Power's Wrenshall to Mahtowa 115 kV transmission line right-of-way, where it turns eastward for 0.6 mile running adjacent to the transmission line right-of-way and crosses under State Highway 61. It then turns northeast, continuing to parallel the transmission line for approximately 1.3 miles, where it crosses under Interstate Highway 35 and rejoins the Applicant's preferred route at MP 351.4. Most of the area adjacent to RSA-42 is forest/wetlands.	347.9	351.4	3.1	3.5	-0.4
RSA-44	Carlton	A commenter suggested following an existing utility corridor on the north side of U.S. Highway 61 to avoid the Blackhoof River watershed and potential impacts from groundwater flow around the watershed.	RSA-44 starts at MP 347.9 and runs northeast 7.2 miles parallel to State Highway 61 and the Willard Munger State Trail. The pipeline is offset from the highway right-of-way approximately 0.1 mile. RSA-45 intersects the Enbridge Mainline corridor, where it turns southeast and runs approximately 1.8 miles and rejoins the Applicant's preferred route at MP 356.8. Approximately half of the area adjacent to the proposed route is forest/wetland. The remaining area is active agriculture and includes residential uses and gravel mining activity.	347.9	356.8	9.1	8.9	0.2

Table 4.3-5. Purpose and Location of Route Segment Alternatives

Route Segment Alternative	County	Purpose of Route Segment Alternative	Location[a]	Mileposts		Route Segment Alternative Length (miles)	Applicant's Preferred Route Length (miles)	Route Segment Alternative Change (miles)
				From	To			
RSA-45	Carlton	A commenter suggested following an existing utility corridor on the north side of U.S. Highway 61 to avoid the Blackhoof River watershed and potential impacts from groundwater flow around the watershed.	RSA-45 also starts at MP 347.9 on the Applicant's preferred route and runs 1.4 miles northeast, parallel to the State Highway 61 and the Willard Munger State Trail. It then turns eastward and crosses under State Highway 61, following the same alignment as RSA-44 for approximately 0.6 mile. It then turns northeast and runs for approximately 3.3 miles generally parallel to Interstate Highway 35 to the vicinity of the community of Otter Creek, where it intersects the Interstate Highway 35 right-of-way. The route crosses under Interstate Highway 35 and runs 2.3 miles generally parallel to the highway to intersect the Enbridge Mainline corridor. It then turns southeast and continues for 1.5 miles, where it rejoins the Applicant's preferred route at MP 356.8. Approximately one-third of the area adjacent to the proposed route is forest/wetland. The remainder is active agriculture, open undeveloped land, and limited agriculture.	347.9	356.8	9.0	8.8	0.2
RSA-46	Carlton	RSA-46 shifts the pipeline to the south to avoid active farmland.	RSA-45 starts at MP 348.9 on the Applicant's preferred route and runs east for approximately 0.8 mile, where it turns north for 0.2 mile and rejoins the Applicant's preferred route and RA-03AM at MP 349.8. RSA-45 re-locates a short portion of the Applicant's preferred route approximately 0.2 mile to the south; the RSA is located in a forested area adjacent to active agriculture.	348.9	349.8	1.0	0.9	0.1
RSA-49	Carlton	A commenter requested following the south sides of Interstate 35 and State Highway 61 to distance the pipeline from multiple properties.	RSA-49 starts at MP 351.4 on the Applicant's preferred route and runs parallel, on the south side of the right-of-way of Interstate Highway 35 and State Highway 61 for approximately 4.5 miles, where it intersects the existing Enbridge Mainline corridor. It then turns southeast for 1.5 miles and rejoin the Applicant's preferred route at MP 356.8. The area adjacent to the RSA is primarily forest and wetland.	351.4	356.8	6.0	5.3	0.7

Table 4.3-5. Purpose and Location of Route Segment Alternatives

Route Segment Alternative	County	Purpose of Route Segment Alternative	Location[a]	Mileposts		Route Segment Alternative Length (miles)	Applicant's Preferred Route Length (miles)	Route Segment Alternative Change (miles)
				From	To			
RSA-51	Carlton	A commenter proposed shifting the pipeline north to follow the tree line and distance it from homesteads.	RSA-51 starts at MP 352.8 on the Applicant's preferred route and runs north and then northeast for approximately 0.6 mile, where it turns eastward. It then runs 0.8 mile and rejoins the Applicant's preferred route at MP 354.1. The route does not parallel any existing infrastructure right-of-way. It is located in an area of undeveloped forest and agricultural land.	352.8	354.1	1.4	1.3	0.1
RSA-52	Carlton	A commenter proposed shifting the pipeline north to follow the tree line and distance it from homesteads.	RSA-52 starts at approximately MP 353.2 on the Applicant's preferred route and runs north along the west side of State Highway 5 for approximately 0.3 mile. It then turns east and runs 0.7 mile, where it rejoins the Applicant preferred route at MP 3.54.1. The route parallels an existing road and traverses agricultural land.	353.2	354.1	1.0	0.9	0.1
RSA-53 (RA-07)	St. Louis	The alternative route was proposed to connect RA-07 with RSA-22, allowing a connection between the northern routes (RA-06, RA-07, and RA-08) and the Applicant's preferred route to avoid crossing the Fond du Lac Reservation.	RSA-53 starts at the point where RA-07, which parallels the Enbridge Mainline corridor, intersects the Northern States Power Company's Forbes – Chisago 500 kV high voltage transmission line, approximately 4.8 miles northwest of the town of Fleetwood. RSA-53 runs south adjacent to the transmission line for approximately 6.2 miles in an area of primarily undeveloped and forested land and active farmland, where it intersects the Minnkota Power Cooperative's Arrowhead-Center-1 high voltage 1,000 kV DC transmission line.	270.4	279.4	11.9	9.0	2.9

[a] See Figure 4.3-2 for locations of RSAs.

ATV = all-terrain vehicle, kV = kilovolt, MP = milepost, Minnesota DNR = Minnesota Department of Natural Resources, Minnesota PCA = Minnesota Pollution Control Agency, RSA = route segment alternative, WMA = Wildlife Management Area

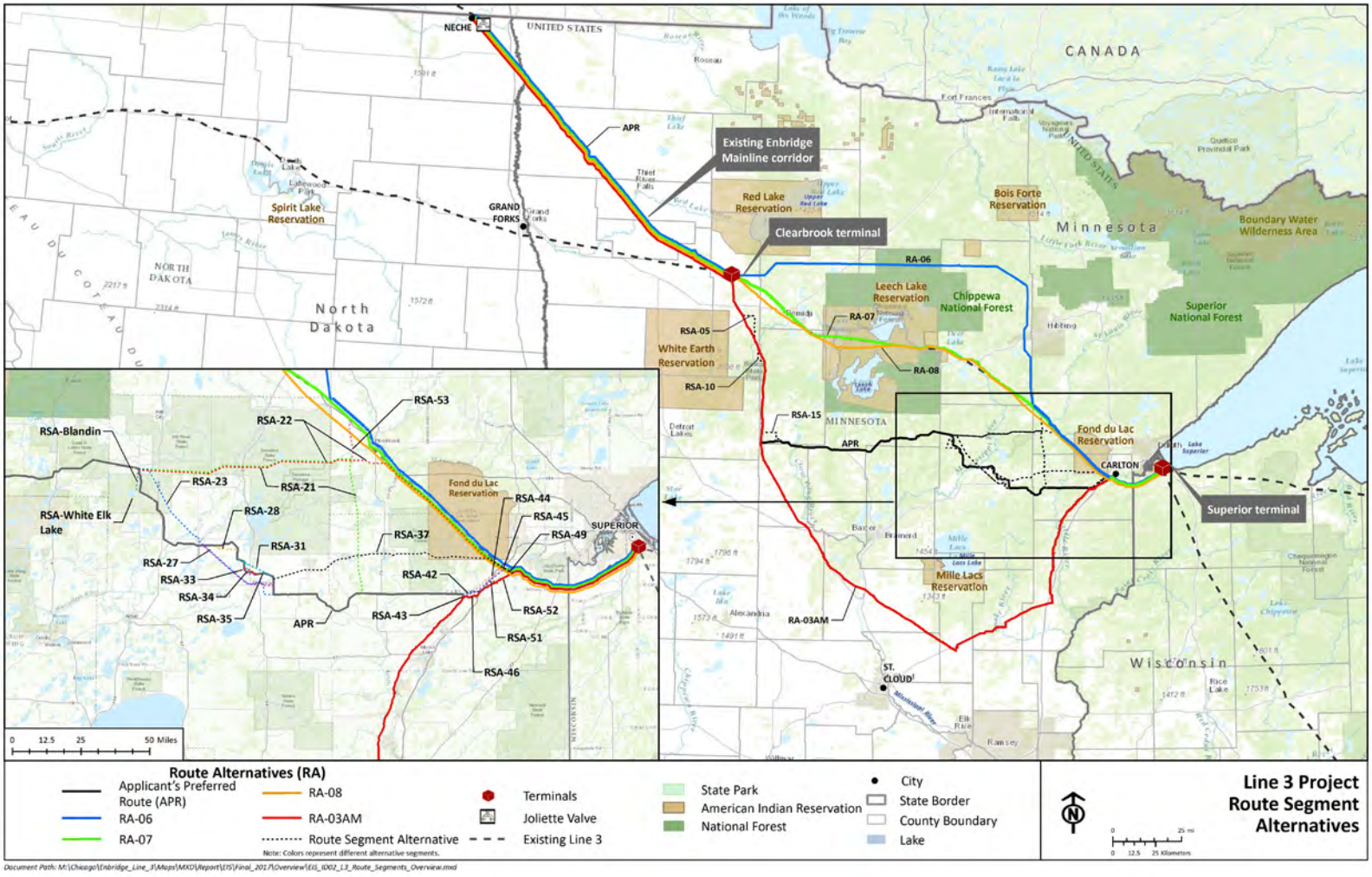

Figure 4.3-4. Locations of Route Segment Alternatives

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